Progress on the proportion of domestic and industrial wastewater flows safely treated

Mid-term status of SDG Indicator 6.3.1 and acceleration needs, with a special focus on climate change, wastewater reuse and health

2024

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Abbreviations and acronyms

BOD_5	Biochemical Oxygen Demand
CH_4	Methane
CO_2	Carbon Dioxide
COD	Chemical Oxygen Demand
CWIS	Citywide Inclusive Sanitation
EPA	Environmental Protection Agency
GHG	Greenhouse Gas
IAEG-SDG	Inter-Agency and Expert Group on Sustainable Development Goal Indicators
IMI-SDG6	UN-Water Integrated Monitoring Initiative for SDG 6
ISIC	International Standard Industrial Classification of All Economic Activities
IWRM	Integrated Water Resources Management
LAC	Latin America and the Caribbean
N_2O	Nitrous Oxide
NACE	Statistical Classification of Economic Activities in the European Community
NSO	National Statistical Office
OECD	Organisation for Economic Co-operation and Development
OLAS	The Water and Sanitation Observatory for Latin America and the Caribbean
SDG	Sustainable Development Goal
UNDESA	United Nations Department of Economic and Social Affairs
UNEP	United Nations Environment Programme
UN-Habitat	United Nations Human Settlements Programme
UNSD	United Nations Statistics Division
UN-Water	United Nations Water
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization
WWTP	Wastewater Treatment Plant

UN-Water Foreword

We stand at a critical juncture. At the midpoint of the United Nations 2030 Agenda for Sustainable Development, we risk failing to meet the promise of SDG 6 – to ensure the availability and sustainable management of water and sanitation for all.

The 2024 series of indicator reports, published by the UN-Water Integrated Monitoring Initiative for SDG 6 (IMI-SDG6), depict a crisis with profound repercussions for many other SDGs, particularly those related to poverty, food, health, education, gender equality, sustainability and environmental integrity.

Billions of people worldwide are still living without access to safely managed drinking water and sanitation services. Water pollution levels are alarmingly high. Inefficient water use practices are common. Water scarcity is a growing problem. Degradation of water-related ecosystems continues unabated. Governance and transboundary cooperation on water resources are too weak, and every continent suffers the impacts of inadequate investment in water and sanitation infrastructure.

Despite concerted efforts and global commitments, we are compelled to acknowledge that progress so far has been insufficient to meet all eight targets of SDG 6. In some regions and countries, for some indicators, progress is even reversing.

However, over the past year, the UN-Water family has come together to develop a response that aims to accelerate progress through a more holistic and integrated approach.

After the UN 2023 Water Conference, in response to the high ambitions set by Member States, UN-Water released the *Blueprint for Acceleration: SDG 6 Synthesis Report on Water and Sanitation 2023*, which identifies two crucial needs: for Member States to develop a United Nations political process for water and for the United Nations system to better unify its water-related efforts to support Member States.

On the first, Member States adopted a resolution that, among other things, established two future UN water conferences – one in 2026 and one in 2028.

On the second, the resolution requested that the United Nations Secretary-General present a United Nations system-wide water and sanitation strategy in consultation with Member States. The Secretary-General looked to UN-Water, under my leadership, to assist with this.

The strategy will be presented in July 2024: the middle of a year that marks a pivotal moment in our collective journey towards achieving SDG 6. It is time to redouble our efforts, recalibrate our strategies, and mobilize resources to make good on our commitments to global society and the future of our planet.

We face unprecedented challenges, but we now have unprecedented tools and political momentum. The data and insight gathered by the IMI-SDG6 must guide our prioritization of efforts and investments to the areas of greatest need, ensuring no one is left behind.

Thank you for your unwavering dedication to this vital cause.

Alvaro Lario,
President of the International Fund for Agricultural Development (IFAD)
Chair of UN-Water

UN-Habitat Foreword

Ms. Anacláudia Rossbach,
Executive Director and Under-Secretary General, United Nations Human Settlements Programme (UN-Habitat)

The Sustainable Development Goals (SDGs), adopted by all United Nations Member States in 2015, represent a shared blueprint for peace and prosperity for people and the planet. Among these, SDG 6 aims to "Ensure availability and sustainable management of water and sanitation for all." A key component of this goal is Target 6.3, which focuses on improving water quality by reducing pollution, minimizing the release of hazardous chemicals, halving the proportion of untreated wastewater, and substantially increasing recycling and safe reuse globally by 2030. Indicator 6.3.1 specifically tracks the proportion of wastewater safely treated. UN-Habitat are pleased to share the co-custodianship of this indicator with WHO and UNSD, and I must acknowledge this very fruitful collaboration.

This global report on the monitoring of wastewater for SDG 6.3.1 represents a significant step towards achieving these ambitions. This report provides a comprehensive analysis of the current state of wastewater management, highlighting both the progress made and the challenges that remain. The report emphasizes the importance of reliable data and effective monitoring systems to inform policy-making and investment decisions, enabling countries to prioritize actions that will have the greatest impact on water quality and public health, and the impacts associated with climate change. Compared to our previous report in 2021, I am happy to say that many more Member States are now reporting on this indicator. However, we are still some way off being able to report a global estimate, as we need to have data from both 50% of countries and 50% of the world's population. We are very close to reaching this threshold, and it is my sincere wish that we reach this goal in our next report, due in 2027.

This report draws on data from around the world, offering insights into the diverse approaches' countries are taking to monitor and manage wastewater. It underscores the need for enhanced international cooperation, knowledge-sharing, and sustained efforts to build on the momentum generated by the 2023 UN Water Conference.

The 2023 UN Water Conference marked a pivotal moment in our global commitment to addressing water-related challenges. It brought together leaders, experts, and stakeholders from around the world to galvanize action towards SDG 6. At this conference, a significant commitment was led by a group of Member States and UN-Habitat, focused on enhancing the sustainable management of wastewater. This initiative underscores the critical role of wastewater treatment in ensuring safe, resilient, and inclusive urban environments. The commitment calls for increased investment in wastewater infrastructure, capacity-building, and the promotion of innovative technologies to advance global progress towards SDG 6.3.

Wastewater management is not just a technical or environmental issue; it is intrinsically linked to social equity, economic growth, and climate resilience. Properly treated wastewater can become a valuable resource, contributing to water security and the circular economy. Conversely, untreated or inadequately treated wastewater poses serious risks to ecosystems, human health, and livelihoods, particularly in vulnerable communities. For the first time in this report, we also present some initial data on wastewater reuse.

As we approach the 2030 deadline, it is imperative that we accelerate efforts to improve wastewater treatment and management. This report serves as a vital tool for decision-makers, practitioners, and stakeholders committed to safeguarding our water resources for future generations. By advancing the monitoring of wastewater under SDG 6.3.1, we can move closer to achieving a healthier, more equitable and sustainable world.

Executive summary

The objective of monitoring progress against Sustainable Development Goal (SDG) Indicator 6.3.1 is to ensure accountability among United Nations Member States regarding reducing water pollution, minimizing the release of hazardous chemicals and increasing safe wastewater treatment and reuse to improve sustainable water management, while providing necessary and timely information to decision-makers and stakeholders to make informed decisions. With this purpose, SDG Indicator 6.3.1 tracks the proportion of wastewater flows generated by domestic and industrial economic activities that are safely treated. Wastewater is considered to be safely treated if it is discharged in compliance with relevant standards or treated to a level commensurate with secondary (or higher) processes.

The United Nations Human Settlements Programme (UN-Habitat), the World Health Organization (WHO) and the United Nations Statistics Division (UNSD) are the three United Nations custodian agencies responsible for monitoring SDG Indicator 6.3.1. This indicator has been disaggregated into three components, namely the safely treated proportions of total, industrial and domestic wastewater flows. However, distinct methodologies are employed for the total and industrial components, which are monitored by UN-Habitat, and the domestic component, which is monitored by WHO. To avoid confusion between the two different approaches, this report presents the methods and results on total/industrial wastewater in separate subsections from domestic wastewater. Table 1 presents a summary of the main estimates and statistics for the indicator – comparing figures between the 2024 and 2021 progress reports and corresponding data availability.

Table 1. Summary of global wastewater monitoring data for SDG Indicator 6.3.1 comparing data between the 2024 and 2021 progress reports.

INDICATOR COMPONENT/ VARIABLE	DATA COVERAGE				STATISTIC/ESTIMATE	
	NUMBER OF UN MEMBER STATES		PROPORTION OF GLOBAL POPULATION			
	2021 REPORT	2024 REPORT	2021 REPORT	2024 REPORT	2021 REPORT	2024 REPORT
Volume of total wastewater generated	56	85	22%	46%	132 bn m^3	187 bn m^3
Volume of total wastewater treated	57	95	20%	69%	42 bn m^3	220 bn m^3
Proportion of total wastewater treated (any treatment)	42	73	18%	42%	32%	76%
Proportion of total wastewater safely treated	15	42	6%	12%	17%	60%
Volume of industrial wastewater generated	32	49	12%	16%	45 bn m^3	36 bn m^3
Volume of industrial wastewater treated	15	27	4%	10%	4 bn m^3	8 bn m^3
Volume of industrial wastewater safely treated	3	17	<0.1%	5%	0.1 bn m^3	3 bn m^3
Proportion of industrial wastewater treated	14	22	4%	8%	30%	38%
Proportion of industrial wastewater safely treated	3	16	<0.1%	4%	3%	27%
Volume of wastewater reuse		59				36 bn m^3
Volume of household wastewater generated	193	193	>99%	>99%	*271 bn m^3	*268 bn m^3
Volume of household wastewater safely treated	116	129	80%	89%	*150 bn m^3	*155 bn m^3
Volume of household wastewater not safely treated	116	129	80%	89%	*121 bn m^3	*113 bn m^3
Proportion of household wastewater safely treated	116	129	80%	89%	*56%	*58%

** Indicates that the data reported for the indicated data point are globally representative*

Total and industrial wastewater flows

There is an alarming lack of countries' reported wastewater statistics worldwide (Table 1) that could be addressed through the monitoring of SDG Indicator 6.3.1. However, the previous global SDG 6.3.1 progress report presenting the statistics reported by United Nations Member States shows that in 2015, national-level reporting on the proportion of total wastewater treated represented only 20 per cent of the world's population; for the proportion of industrial wastewater treated, the figure was only 5 per cent of the world's population (UN-Habitat and WHO, 2021).

Across the 107 countries reporting some wastewater statistics for 2022 (representing 73 per cent of the world's population) in the present report, the proportion of total wastewater receiving some level of treatment (76 per cent) could only be calculated for 73 countries (representing 42 per cent of the global population); whereas the proportion of total wastewater "safely" treated, i.e. at least secondary treatment (60 per cent), could only be calculated for 42 countries (representing 12 per cent of the population) (Table 1). These data are insufficient to establish global statistics on the proportion of total wastewater treated and safely treated.

This increase in data coverage has resulted in a different aggregate estimate of the proportion of total wastewater treated: from 32 per cent in 2015 (as reported in the 2021 report) to 76 per cent in 2022 as found in this report. This change in the SDG indicator value does however not reflect a significant increase in the flows treated, but rather an increase in data collection by taking into account the latest record over the last six years (from 2017 to 2022) – and not only for one given year as for the previous report. In 2022, globally, more wastewater was indeed treated (220 billion m^3) than generated (187 billion m^3) according to the reports, highlighting the need to improve the state of knowledge about wastewater generation by economic activities. The overall differences between generated and treated flows may vary for a variety of reasons: (i) different countries interpret "wastewater generated" in different ways. Some countries will calculate it based on a percentage of the water used and this will result in an underestimate as they will not include independent water supplies (i.e. non-municipal sources); (ii) in many countries, combined sewers are used, so that some surface water is co-treated with blackwater from toilets; (iii) in some countries, the methods for domestic use are based on population-based estimates (based on per capita water use). Moreover, statistics for wastewater treatment are reported more than those for wastewater generated. There is thus limited scope for comparing the aggregate statistics in the two reports (2021 and 2024) and interpreting the evolution of the proportion of total and industrial wastewater treated and safely treated.

Another lesson from this report is that urban wastewater treatment plants are key to collecting wastewater statistics, since almost all countries reporting some treated wastewater statistics for 2022 reported some data from such treatment plants (91 of 95 countries) and 85 per cent of the countries who reported some wastewater statistics reported some urban flows treated (91 out of 107 countries).

In contrast, it is still extremely challenging to readily assess industrial wastewater flows, with 49 countries reporting some statistics on flows generated and only 27 countries reporting some statistics on flows treated. In fact, many industries abstract water from (and discharge treated or untreated effluent into) water resources such as lakes, rivers and groundwater, which are frequently not monitored by public drinking water operators and included in national statistics. Moreover, the water sector's institutional responsibility is often fragmented between a high number of actors and industrial data are not systematically disclosed and/or centralized by a dedicated institution.

A dedicated section of this report is finally presenting the cross-cutting benefits of wastewater reuse and climate change adaptation and mitigation. It strongly supports the inclusion of supplementary variables on wastewater reuse and safe reuse, as part of future progress reports and as called for in the Target 6.3 wording but not yet monitored within the SDG 6 framework. In this purpose, this report is for the first time presenting the countries' wastewater reuse statistics available in the databases that are used to populate SDG Indicator 6.3.1. This approach of using reuse data already reported would also limit the monitoring burden that the SDG reporting could impose on countries by creating a supplementary SDG indicator and/or global reporting mechanism. This section of the report encourages a paradigm shift in intersectoral wastewater management and monitoring, that could greatly contribute to human well-being and to the protection of the environment and biodiversity; while significantly leveraging circular economy through wastewater reuse and nutrient recovery, as needed to adapt to climate change impacts on the world's limited and threatened freshwater resources.

Domestic wastewater flows

WHO monitors global household wastewater generated and subsequent flows collected (in urban and independent collection systems), delivered to treatment (urban wastewater treatment plants or independent treatment facilities) and safely treated (treated and discharged in compliance with standards, or treated by secondary or higher processes). Globally, an estimated 268 billion m^3 of household wastewater was generated in 2022, of which 155 billion m^3 (58 per cent) was estimated to have been collected, delivered to treatment and safely treated and discharged. While the proportion of household wastewater safely treated in 2022 is slightly higher than that previously reported for 2020 (56 per cent), trends on the indicator remain inconclusive until estimates are made over a longer time period. Additionally, the lack of data for a 2015 baseline estimate inhibits the assessment of progress towards Target 6.3 (halving the proportion of untreated discharges by 2030).

Estimates of the proportion of household wastewater safely treated were computed for 140 countries, areas and territories (including 129 United Nations Member States) covering 92 per cent of global household wastewater flows and 89 per cent of the global population. Regional estimates were produced and published for all eight SDG regions, as well as other regional groupings (e.g. Least Developed Countries). Broad disparities were found in the proportion of household wastewater safely treated across the SDG regions.

Globally, an estimated 113 billion m^3 of household wastewater was discharged without safe treatment in 2022 – negatively impacting receiving water bodies and putting the health of humans and ecosystems at risk. The burden of disease and health implications associated with untreated wastewater have also been discussed in this report, including implications for cholera control, antimicrobial resistance, food safety and security, vector-borne disease and recreational water quality. Much of the fraction of household wastewater that was not safely treated was attributable to households lacking adequate blackwater and greywater collection systems, such as sewer connections or septic tanks (45 per cent). A moderate proportion was attributable to septic tanks that did not adequately contain excreta, or from which faecal sludge was not properly emptied and disposed (24 per cent) and sewer flows that received only primary treatment or did not comply with discharge standards (19 per cent).

The quality and robustness of the WHO database on household wastewater has improved significantly since the first indicator report was published in 2018. While data coverage for the household component of the indicator is high and global and regional aggregate estimates have been established for 2020 and 2022, the WHO methodology of computing country estimates based on a snapshot of the most recent country data on household wastewater occasionally results in significant variability in the estimates between reporting years – most often due to new, revised, or reinterpreted data. To address this issue and to report on progress towards Target 6.3 for the first time, WHO intends to refine its methodology for monitoring household wastewater to allow for the computation of time series estimates using all relevant and recent historical country data.

Key messages

Total and industrial wastewater flows

Statistics on total and industrial wastewater are produced from data reported by countries in standard questionnaires regularly circulated by UNSD, Eurostat and OECD, or directly by UN-Habitat. While this report presents global summary statistics (total volumes and proportions safely treated), these should not be interpreted as being representative of the complete global flows of total wastewater generation and treatment, since data were available from fewer than half of countries, representing less than half of the global population.

- We are still unable to make a global estimate of total and industrial wastewater flows due to the under-reporting. There has however been improvement in the level of reporting since the last indicator report in 2021.
- 107 countries reported some wastewater statistics for 2022, representing 73 per cent of the world's population.
- Across the 85 countries reporting some wastewater generated statistics for 2022, 60 countries reported some flows for the domestic sector; whereas 49 countries reported some data for the industrial sector.
- The proportion of total wastewater treated (76 per cent) could be calculated for 73 countries, representing 42 per cent of the global population.
- The proportion of total wastewater "safely" (i.e. at least secondary treatment) treated (60 per cent) could be calculated for 42 countries (representing 12 per cent of the population).
- Globally, more wastewater was treated (220 billion m^3) than generated (187 billion m^3) reported for 2022, highlighting the need to better monitor wastewater generated flows, reviewing individual countries calculation methods, the impacts of combined sewer flows and generation by non-domestic sectors.
- Across the 95 countries reporting some treated wastewater statistics for 2022, 91 countries reported some data from urban treatment plants (whereas only 27 countries reported some data on treated industrial wastewater). This shows that urban wastewater treatment plants and water operators are the key to collecting national wastewater statistics.
- Some countries report more wastewater treated than generated, because urban plants also treat a proportion of surface water flows (often as a result of combined sewerage), as well as illegal wastewater discharged in public sewers and some proportion of industrial wastewater, which may be treated at source.
- There is a relative lack of monitoring and/or reporting of the wastewater flows generated by some economic activities, notably in the industrial sector, which can frequently use self-supplied water resources (e.g. from rivers and groundwater) that are generally not included in the public drinking water statistics available and/or are regulated by different actors and institutions with limited coordination.
- Conversely, frequent underestimation of the industrial wastewater flows generated also strongly limits interpretation of the total flows and therefore interpretation of Indicator 6.3.1.
- The report finally justifies why safe wastewater reuse should be promoted and monitored in the context of climate change adaptation, while presenting the existing statistics that could be monitored through SDG Indicator 6.3.1. following revision of the related metadata.

Domestic wastewater flows

Statistics on domestic wastewater are produced from data reported by countries in the same standard questionnaires (UNSD, Eurostat and OECD), as well as from other official national sources (reports and databases from statistical offices, line ministries, regulators, etc.). In some cases, missing data are replaced by standard assumptions (e.g. per capita domestic water consumption). Data coverage is accordingly relatively higher for domestic than for industrial or total wastewater flows (well above 50 per cent for many variables) and allows extrapolations to be made from countries with data, to produce global and regional aggregate estimates. All global and regional estimates for domestic wastewater presented in this report are therefore considered representative of entire global or regional wastewater flows.

- In 2022, 268 billion m^3 of household wastewater were generated globally in 2022, of which 155 billion m^3 (58 per cent) were safely treated.
- This proportion safely treated represents a marginal increase compared to the estimates for 2020 that were published in the 2021 progress report; however, more data points are needed before conclusions can be drawn on global progress and trends.
- 46 per cent of global household wastewater flows were safely treated through sewers and urban treatment plants, while 12 per cent were safely treated through septic tanks and onsite treatment and disposal.
- Considering household wastewater that was not safely treated, most was attributable to: households without an adequate wastewater collection system (45 per cent), such as a sewer or septic tank connection; inadequately functioning or emptied septic tanks (24 per cent); and sewer flows that received only primary treatment or did not comply with discharge standards (19 per cent).
- Estimates of the proportion of wastewater safely treated were computed for all eight SDG regions and for 140 countries, areas and territories (including 129 United Nations Member States) representative of 89 per cent of the global population and 92 per cent of the global volume of household wastewater generated.
- Regional disparities in the proportion of household wastewater safely treated were found to be broad.

1. Wastewater monitoring and its importance to the SDGs and beyond

Wastewater and the global development agenda. In the seventy-first session of the United Nations General Assembly in 2017, the 193 Member States approved the global indicator monitoring framework developed by the Inter-Agency and Expert Group on Sustainable Development Goal Indicators (IAEG-SDG) and, for the first time, put wastewater on the global development agenda for low-, middle- and high-income countries alike. Sustainable Development Goal (SDG) 6 is dedicated to ensuring the availability and sustainability of water and sanitation for all by 2030. SDG Target 6.3 seeks to "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" and includes two complementary indicators to monitor progress:

- Indicator 6.3.1: the proportion of domestic and industrial wastewater flows safely treated; and
- Indicator 6.3.2: the proportion of bodies of water with good ambient water quality.

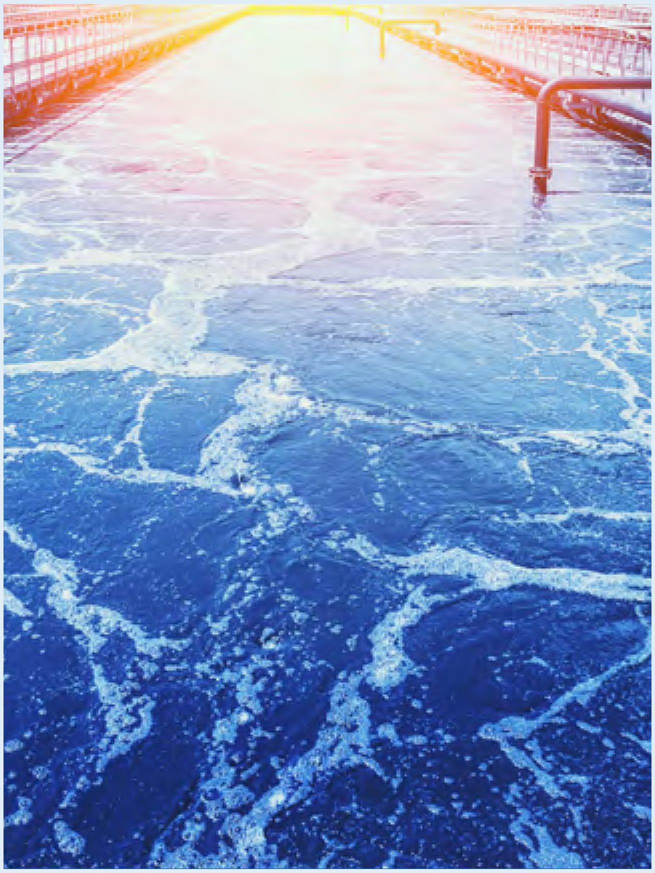
SDG Indicator 6.3.1 tracks the proportion of wastewater flows generated by different point sources (households, services, industrial economic activities and agriculture) that are safely treated, either at urban or other wastewater treatment plants (WWTPs) or independent treatment systems, before being discharged into the environment.

Why monitor wastewater? The purpose of monitoring progress against SDG Indicator 6.3.1 is to ensure accountability among all United Nations Member States towards reducing water pollution, minimizing the release of hazardous chemicals and increasing safe wastewater treatment and reuse to improve sustainable water management, while providing necessary and timely information to decision-makers and stakeholders to make informed decisions. This relatively simple monitoring framework therefore provides a unique opportunity to explain why countries are advised to compile wastewater statistics and show them the benefits it will have on their citizens and the environment.

The UN 2023 Water Conference held in New York in 2023 saw the adoption of the Water Action Agenda, representing voluntary commitments of nations and stakeholders to accomplish the SDGs and their targets connected to water. The United Nations Human Settlements Programme (UN-Habitat) and the Government of Ghana also presented a commitment[1] on behalf of 10 countries determined to strengthen wastewater monitoring in the context of SDG 6 (Box 1).

1 https://sdgs.un.org/partnerships/wastewater-2030-striving-circular-economy-climate-resilient-world

Box 1. Wastewater 2030: striving for a circular economy in a climate-resilient world.



The UN 2023 Water Conference held in New York in March 2023 saw the adoption of the Water Action Agenda, representing voluntary commitments of nations and stakeholders to accomplish the SDGs and their targets connected to water. The United Nations Human Settlements Programme (UN-Habitat) and the Government of Ghana presented a commitment on behalf of 10 countries determined to strengthen wastewater monitoring in the context of SDG 6.

Wastewater warrants much more attention for health, environment, or justice reasons. If we are consistent in adopting a much-needed global transformation into a resilient circular economy, wastewater management must feature more strongly in development policy. The situation is critical in a range of Member States and is further exacerbated by the climate crisis. Wastewater is wasted, since it cannot be adequately treated for safe reuse. This commitment takes a fresh look at SDG Indicator 6.3.1., promoting a new initiative to better integrate wastewater statistics and policies into support for Agenda 2030. The initiative will review the following subtopics:

Tackling wastewater pollution from all sources

In order to better understand and quantify the problem of wastewater pollution and to make decisions about its management, the monitoring capacity of responsible authorities will be strengthened. We must not only include wastewater from all sources but also understand the critical links to solid waste management, plastic pollution and drainage and their combined impact on the natural environment.

Promoting climate-resilient wastewater infrastructure

Extreme climate events have revealed that our wastewater management infrastructure is hopelessly inadequate. Climate change has catalysed new thinking for the water, sanitation and hygiene (WASH) sectors. We will revisit wastewater management, overview existing systems and retrofit and modify them. Nature-based solutions can support win-win situations where treatment costs (including energy) are reduced, while at the same time improving system capacity to manage storm water.

Adopting a new inclusive policy for wastewater

For too long the wastewater sector has remained divided, with both wastewater and excreta from onsite systems being considered differently from offsite, networked solutions. Aside from technical options, wastewater as a sector suffers from divided institutional responsibility. Better local-level management will lead to improved national-level impacts. Reuse of wastewater and excreta as an easily-exploited and cost-effective resource should be considered the norm.

Promoting good practices and stimulating investment

In addition to technological advances, new governance methods are demonstrating greater alignment and improved productivity and efficiency. The conservatism of the sector needs to be overcome and strategic investments made. Wastewater-based epidemiology is also now leading the way in helping us to predict and better manage future health pandemics. Platforms for sharing this information and ensuring that the latest approaches are included in teaching and research curricula are lacking.

Towards a more-aligned international effort on wastewater

Building on the work on wastewater and with the continued support of the co-custodians of SDG 6.3 and related SDGs, the consortium agrees to meet regularly and consolidate our findings, leading to a more detailed commitment on wastewater globally. We agree to share our findings at appropriate fora and to seek further financial resources to achieve our aims.

Wastewater and SDG 6. Improving wastewater management and monitoring is in fact an essential component of the overall SDG 6, since it can have direct positive impacts on all SDG 6 targets (Figure 1). Improving wastewater treatment has indeed direct impacts on the quality of drinking water sources (Target 6.1), while being closely connected to Target 6.2 on the use of safely managed sanitation services. Indicator 6.3.1 has also strong connections with Target 6.4 on water-use efficiency through the monitoring of the flows of wastewater generated by sectors, while the characterization of wastewater flows is also key to implementing integrated water resources management (IWRM) (Target 6.5). Indicator 6.3.1 is also strongly related to Target 6.6 on water-related ecosystems, since the latter are directly impacted by wastewater discharged into water-receiving systems. Finally, wastewater management, facilities and services are interconnected with Target 6.b, for the participation of local communities in water and sanitation planning and management, including through international cooperation and capacity building (Target 6.a).

Wastewater and the SDGs at-large. Target 6.3 and the improvement of wastewater management and treatment is also key to reach the SDGs, since it has synergies with all the 17 other SDGs through the three dimensions of sustainable development (social, economic and environmental) (Figure 2). Some examples that are demonstrated in this report include: SDG 3 on health and wellbeing (further discussed in Section 5.2); SDG 11 (sustainable cities and communities) since most available wastewater statistics come from urban WWTPs which therefore play a major role in water diagnostics approaches as needed for urban water resources management and Citywide Inclusive Sanitation (CWIS) strategies; SDG 13 on climate action, specifically the strong links between wastewater management and climate change, since wastewater treatment represents a high energy demand, but also acts as an important source of greenhouse gases, whereas wastewater reuse is a crucial climate change adaptation measure for reducing water stress; and SDG 14 (life below water) as coastal marine water pollution is primarily caused by land-based activities, including the discharge of inadequately treated urban and industrial effluents (Tuholske et al., 2021).

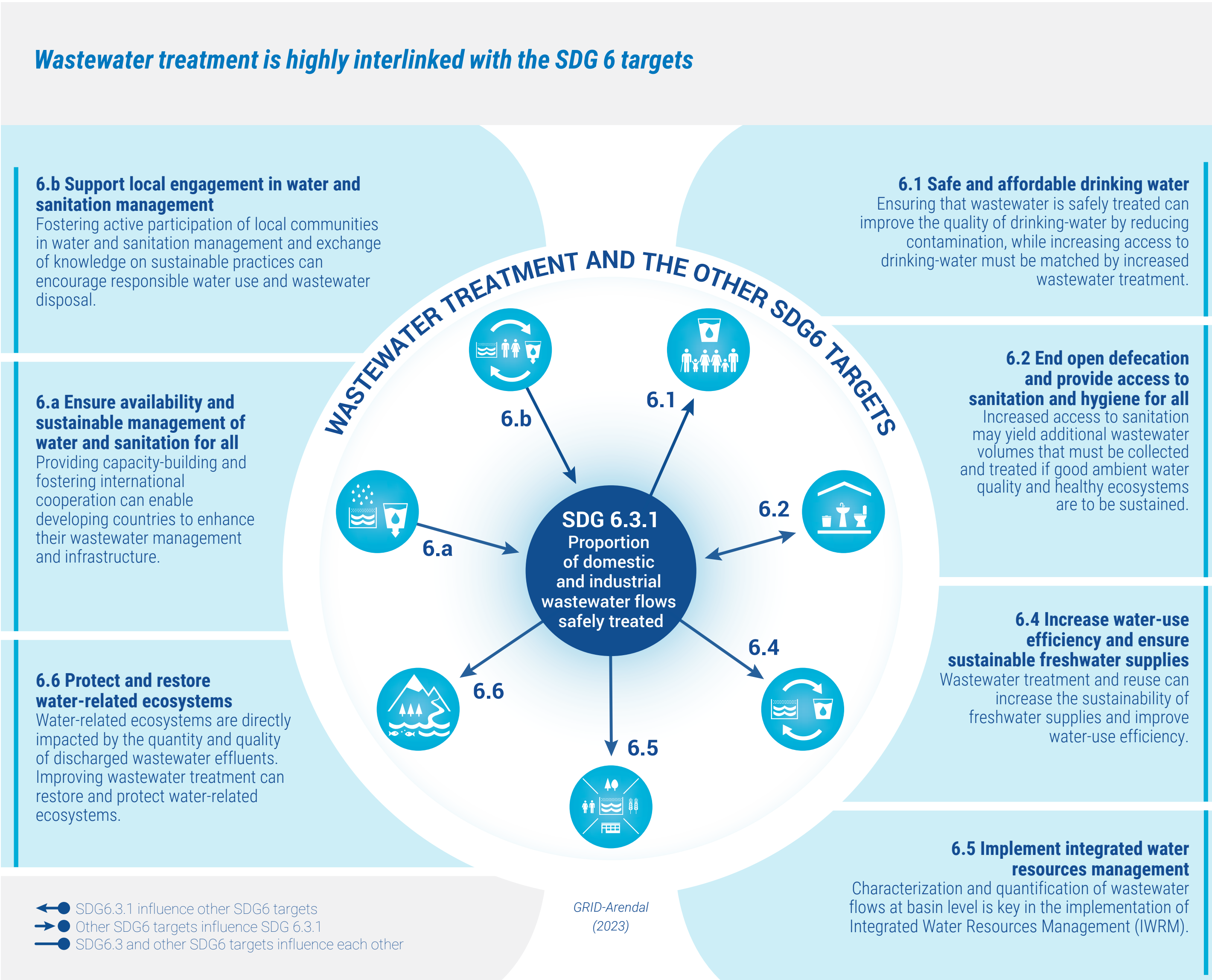


Figure 1. SDG Indicator 6.3.1 interlinkages with the other SDG 6 indicators.

(UN-Habitat 2023)

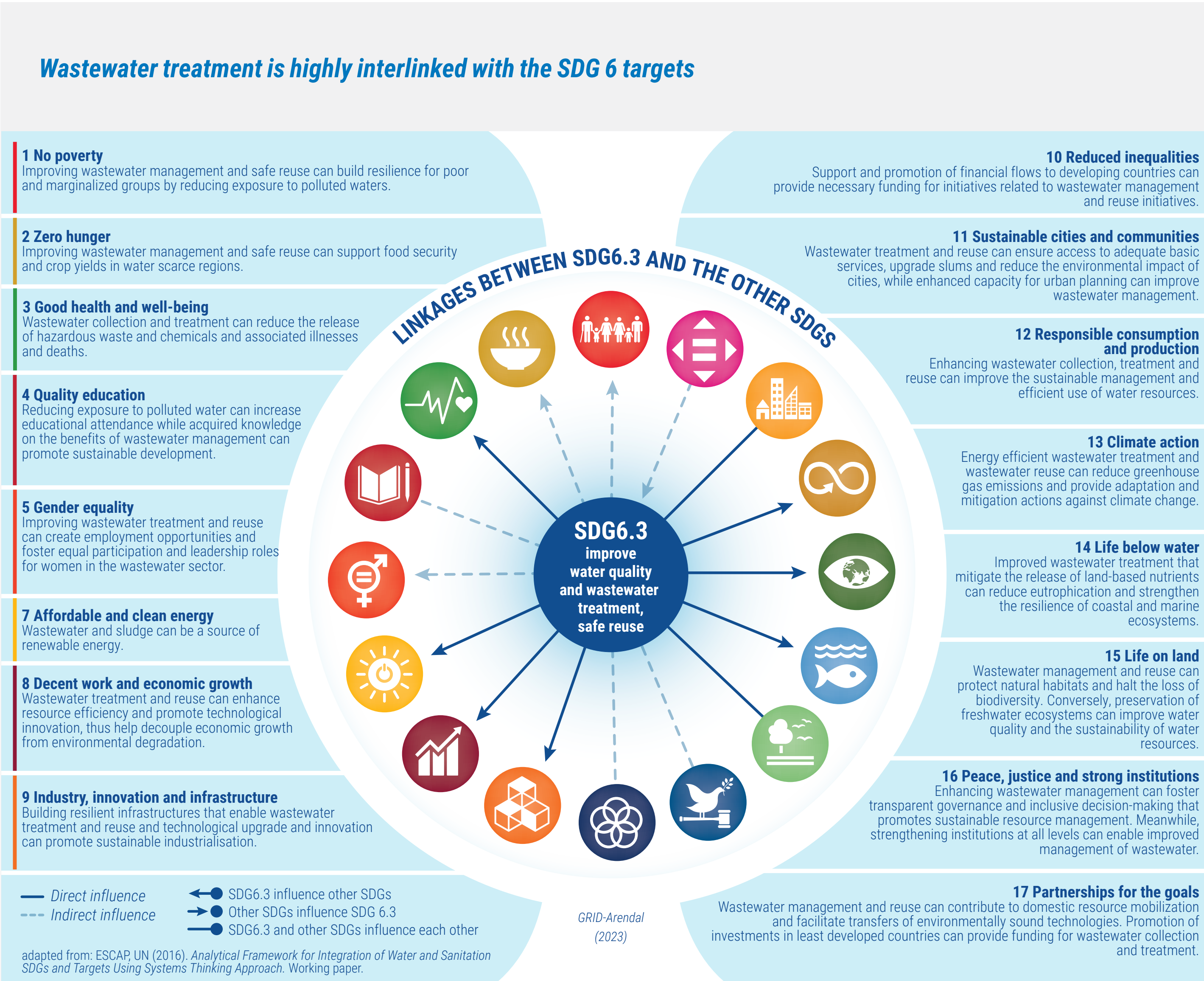


Figure 2. SDG Target 6.3.1 interlinkages with the other SDGs.

(UN-Habitat 2023)

2. Methods and process

Custodians and accountabilities for global wastewater monitoring. UN-Habitat, WHO and the United Nations Statistics Division (UNSD) are the three United Nations custodian agencies for SDG Indicator 6.3.1. This indicator has been disaggregated into three components, namely the safely treated proportions of total, industrial and domestic wastewater flows. Distinct methodologies are employed for the total and industrial components of Indicator 6.3.1, which are monitored by UN-Habitat, and for the domestic component which is monitored by WHO. Figure 3 presents a schematic diagram of data sources (orange), data inputs (light blue), core data variables (dark blue) and Indicator 6.3.1 components (pink) – highlighting the commonalities and differences between the UN-Habitat and WHO components of the indicator respectively.

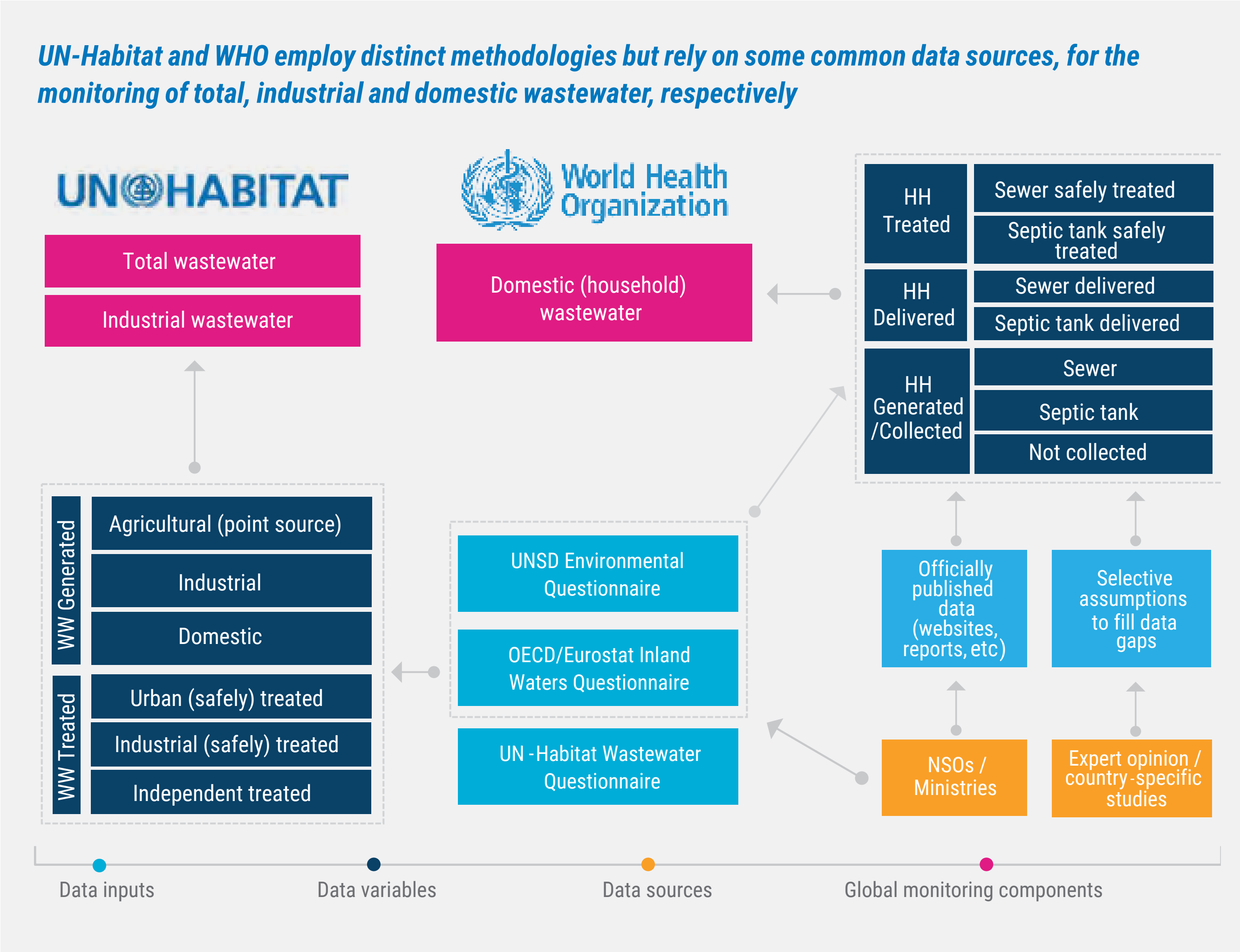


Figure 3. SDG Indicator 6.3.1 data sources (orange), data inputs (light blue), data variables (dark blue) and global monitoring components (pink).

Harmonized data collection for wastewater statistics. Three data collection initiatives (Figure 3) serve as a repository and data source for most wastewater-related statistics relevant to Indicator 6.3.1 monitoring and covering all countries, namely:

- UNSD and United Nations Environment Programme (UNEP) Environment Statistics[2] and corresponding questionnaire.[3] UNSD serves as a co-custodian for Indicator 6.3.1 monitoring due to its mandate for wastewater data collection via this questionnaire;
- Organisation for Economic Co-Operation and Development (OECD) Environment Statistics;[4]
- Eurostat Environmental Statistics.[5]

2 https://unstats.un.org/unsd/envstats/
3 https://unstats.un.org/unsd/envstats/questionnaire
4 https://www.oecd-ilibrary.org/environment/data/oecd-environment-statistics_env-data-en
5 https://ec.europa.eu/eurostat/web/environment/information-data/water

While OECD and Eurostat operate separate databases, they collect data via a unified questionnaire (OECD/Eurostat Joint Questionnaire on Inland Waters[6]). National Statistical Offices (NSOs) are typically responsible for completing their relevant environmental questionnaire as fully as possible[7] (Figure 3). UNSD sends out its questionnaire to NSOs for a new round of data collection every two years while OECD and Eurostat do so annually.

Collaboration for harmonization. Over the past decade, efforts have been made by UNSD, OECD, Eurostat and more recently UN-Habitat and WHO, to harmonize terms, definitions and the methods used by their respective data instruments and monitoring efforts to collect and use countries' official national wastewater data. UN-Habitat and WHO have worked in close collaboration with these agencies to ensure that the most recent data are used for global reporting. Annex 1 presents a list of the key wastewater terms used in this report and their respective definitions – most of which are accounted for in the indicator metadata and many of which are closely aligned to those published by UNSD, OECD and Eurostat.

Key differences in total/industrial versus domestic wastewater monitoring. UN-Habitat and WHO compute and publish the volumes of wastewater generated and the volumes and proportions safely treated, for their respective components of the indicator. UN-Habitat utilizes officially reported data (Figure 3) without manipulation to publish statistics on total and industrial flows generated, treated and safely treated (whether subcomponents associated with total or industrial flows generated or treated are complete or incomplete). These statistics are therefore indicative of reported flows only and are not necessarily representative of global or country-wide wastewater conditions, due to reporting gaps for some countries. WHO uses a combination of official country data and standard assumptions (Figure 3) to comprehensively characterize domestic wastewater flows at country level. However, the influence of these assumptions is limited and estimates cannot be computed if minimum data reporting requirements have not been met. As each aspect of household wastewater is characterized without any data gaps, nationally representative statistics on volumes and proportions safely treated are produced – while maximizing the number of countries for which estimates can be published. While data coverage and completeness are maximized by this approach, the accuracy of the estimates may be impacted if any assumptions used in the computation differ from the true conditions in a given country.

Data sources for global wastewater reporting. The components of both UN-Habitat and WHO draw on wastewater data from the UNSD Environment Statistics database and the OECD/Eurostat Joint Questionnaire on Inland Waters. In addition, in 2023 UN-Habitat launched a similar wastewater-specific questionnaire to monitor the SDG 6.3.1, which can be used by NSOs, ministries, regulators and/or operators to report data and ensure that the most up-to-date statistics are used for global reporting (Figure 3). UN-Habitat exclusively utilizes data reported to these aforementioned sources; WHO also collects data from other official sources – such as directly from NSO websites or environmental and wastewater sector thematic reports (Figure 3).

Safely treated wastewater flows. Safely treated wastewater is defined as that which has been discharged in accordance with relevant standards or has been treated by processes classified as being secondary or higher (Annex 1). The aforementioned data sources maintained by UNSD, OECD, Eurostat and UN-Habitat do not include data on compliance with discharge standards. As such, UN-Habitat relies on secondary or higher treatment data to determine the flows safely treated. Additionally, due to limited data availability on flows treated by secondary or higher processes, UN-Habitat also presents statistics for *"any treatment"*. WHO compiles compliance data from other sources and gives preference to such data (over that reported by treatment technology) when available. However, data on flows associated with secondary or higher processes are also commonly used as a proxy for safe treatment.

6 Data Collection Manual for the OECD/Eurostat Joint Questionnaire on Inland Waters and Eurostat Regional Water Questionnaire. https://ec.europa.eu/eurostat/documents/1798247/6664269/Data+Collection+Manual+for+the+OECD_Eurostat+Joint+Questionnaire+on+Inland+Waters+%28version+3.0%2C+2014%29.pdf/f5f60d49-e88c-4e3c-bc23-c1ec26a01b2a

7 Joint Questionnaire on Inland Waters for European and OECD member countries and the UNSD/UNEP Environment Statistics questionnaire for all other countries.

Global reporting on domestic wastewater. UN-Habitat statistics relating to total wastewater include a subcomponent on domestic wastewater (Figure 3). While the definitions for domestic wastewater are consistent between the two agencies (Annex 1), UN-Habitat and WHO employ two distinct methodologies for domestic wastewater monitoring that result in different and incomparable results. UN-Habitat only uses country data that are reported into the harmonized questionnaires. In some cases, WHO applies assumptions in combination with reported data to compute estimates for domestic wastewater. Furthermore, domestic wastewater includes flows generated by households and by services. However, WHO monitoring of domestic wastewater currently only covers wastewater produced by households, because of insufficient data on wastewater produced by services. Because of these methodological differences, domestic estimates produced by WHO are not used by UN-Habitat in its total wastewater calculations.

Global progress updates for SDG Indicator 6.3.1. UN-Habitat updates its dataset for total and industrial wastewater statistics every three years (the 2021 report showed data for 2015, while the current 2024 report shows data for 2022). WHO updates its domestic wastewater dataset every two years at which time country, regional and global estimates are revised. The most recent estimates – which are presented in this report – were published in 2023 for the year 2022.

To avoid confusion between the two methodological approaches, this report presents the methods and results on total/industrial wastewater generation and treatment compiled by UN-Habitat in separate subsections from estimates of domestic wastewater generation and treatment produced by WHO. Sections 2.1 and 2.2 present the detailed methodologies for total/industrial and domestic wastewater monitoring, respectively, while further details can be found in the Indicator 6.3.1 metadata[8] and a methodological note on domestic wastewater monitoring.[9]

2.1. Total and industrial wastewater statistics

SDG Indicator 6.3.1 monitoring on total and industrial wastewater flows relies exclusively on the aggregation of standardized national-level statistics (i.e. country data adjusted). These are reported directly to UN-Habitat by the governments of the Member States, through a dedicated questionnaire sent to the focal points, or extracted from three databases relating to two global monitoring systems: the UNSD/UNEP Questionnaire on Environment Statistics and the OECD/Eurostat Joint Questionnaire on Inland Waters for OECD and EU Member States (Figure 4). The UN-Habitat questionnaire was commissioned recently, to encourage non-reporting countries to start the process, to support reporting countries in reporting the wastewater variables needed to calculate the SDG 6.3.1 indicator and to improve not only the quantity but also the quality of the wastewater statistics reported.

UN-Habitat uses only data officially reported by countries, as directly reported by their NSOs, line ministries, water operators or regulators, in the questionnaires – without any modification, estimation or interpolation for missing values; except for the countries that did not report a total volume of wastewater generated/treated but did report one or more disaggregated variables. In such cases, the sum is calculated using only the reported data for the disaggregated variables in the questionnaire following its definitions and assimilated to the total (Figure 5 and Figure 6).

Concerning the sources of the 2022 data reported in this 2024 report from 107 countries, 42 were extracted from the UNSD database, 24 and 7 from the Eurostat and OECD databases respectively and 34 were reported to UN-Habitat directly (Figure 4).

8 https://unstats.un.org/sdgs/metadata/files/Metadata-06-03-01.pdf.

9 https://www.unwater.org/publications/domestic-wastewater-treatment-methodology-2024

SDG 6.3.1 monitoring builds on different databases and data sources

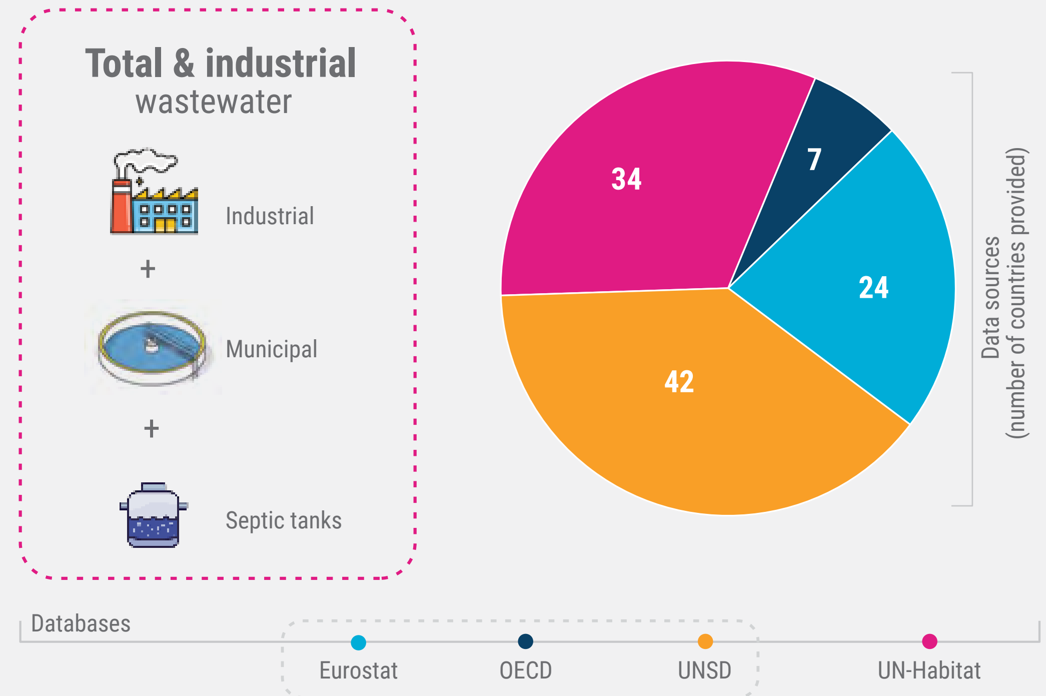


Figure 4. UN-Habitat SDG Indicator 6.3.1 monitoring approach, with the wastewater databases and the number of countries provided by the different sources of data.

As shown by the data reported in the former 2015 indicator report (UN-Habitat and WHO, 2021), which presented the most complete data coverage over the last decade in the UNSD database, the time series is available for multiple years for some wastewater variables but only for discrete years for others. For this reason, and also to better align the methodologies of UN-Habitat and WHO (the latter is monitoring the household component of the indicator by drawing on the most recent data reported over the last ten years), the total and industrial wastewater statistics reported here covered the last six years, from 2017 to 2022, and not only one given year as was the case in the previous (2021) report. By taking the most recent year across this range for all variables, all values are reported as 2022 in the present report. The specific years corresponding to the data can however be found in the SDG Global Database.[10]

2.1.1. Total and industrial wastewater flows generated and safely treated

This report takes total wastewater generated to include wastewater from industries, households, services and agriculture, i.e. point sources that can be geographically located and represented as a point on a map. Although non-point sources such as runoff from urban and agricultural land can contribute significantly to wastewater flows, these flows cannot be monitored at source and are not considered in this methodology.

As shown on the flow diagram below (Figure 5), wastewater streams generally combine different sources, but also runoff and storm water that cannot be separately tracked and monitored. As a consequence, although the flow of total wastewater generated is disaggregated by source (industrial, domestic and agriculture) based on

10 https://unstats.un.org/sdgs/dataportal.

water supply and uses, the statistics on treated wastewater flows are disaggregated by type (urban, industrial and independent) and by level of treatment (Figure 6).

Wastewater delivered to urban WWTPs here refers to used water from any combination of domestic, industrial and commercial activities, surface runoff or storm water and any sewer inflow or infiltration conveyed in a sanitary sewer or transported in a combined sewer to an urban WWTP; including septage and faecal sludge from septic tanks when transported and treated at a WWTP (Figure 5).

Within Indicator 6.3.1 monitoring, wastewater generation is disaggregated into the following categories based on the International Standard Industrial Classification of All Economic Activities (ISIC) and its equivalent for OECD and EU Member States (Statistical Classification of Economic Activities in the European Community, NACE) to attribute wastewater generation to economic activities (Figure 6):

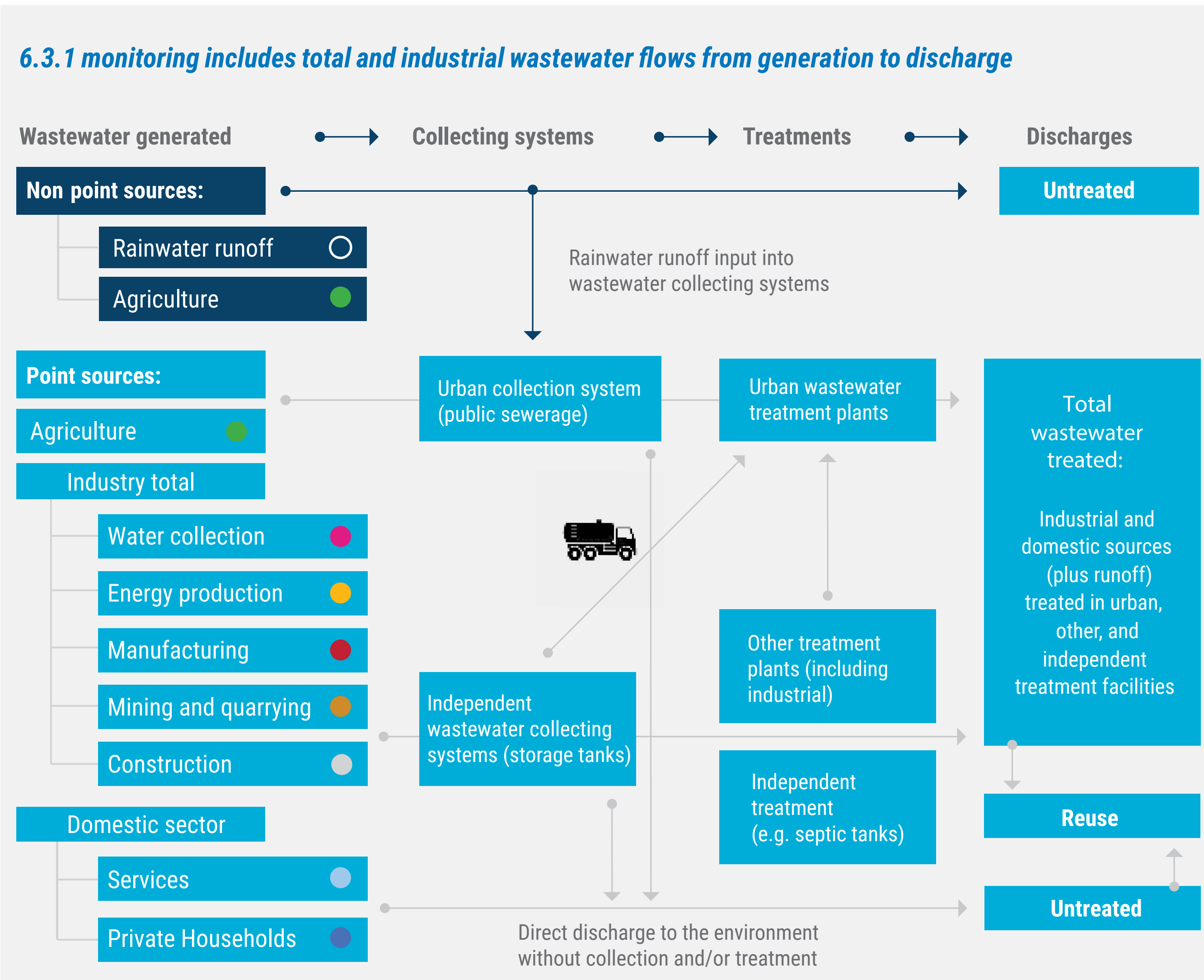


Figure 5. Total and industrial flow diagram showing from left to right: the different point sources, the collecting systems and the treatments.

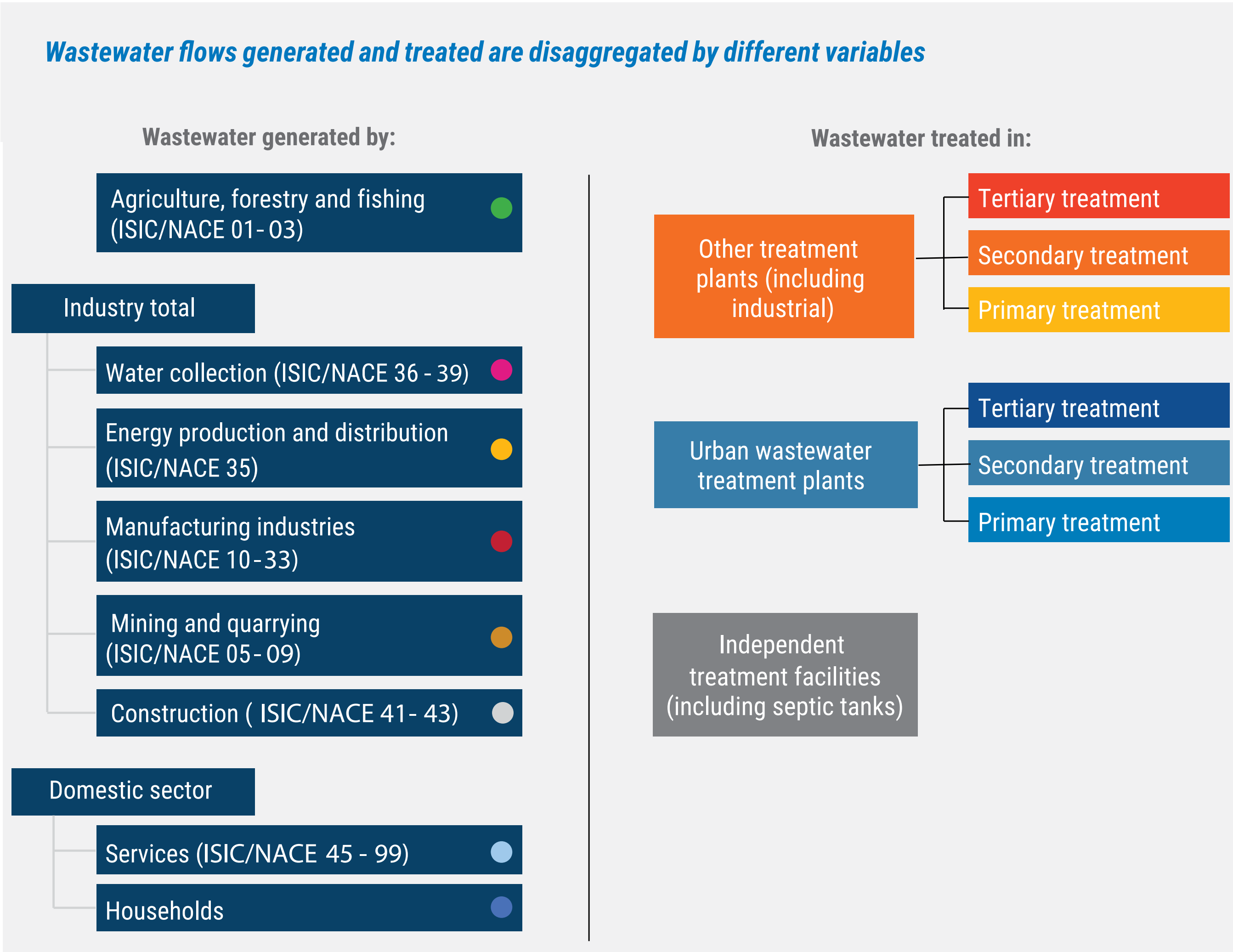


Figure 6. Disaggregated variables used for the generation (left) and treatment (right) of wastewater used to report on SDG Indicator 6.3.1.

- Agriculture (ISIC/NACE codes 01–03);
- Industry: mining and quarrying (ISIC/NACE codes 05–09); manufacturing (ISIC/NACE codes 10–33); electricity production and distribution (ISIC/NACE code 35); water collection and distribution (ISIC/NACE codes 36–39); construction (ISIC/NACE codes 41–43);
- Services or other economic activities that are not classified as economic activities by ISIC/NACE (ISIC/NACE codes 45–96) and wastewater produced by private households.

While wastewater from agricultural activities that is discharged from point sources is included in 6.3.1 reporting, the predominant non-point sources are not (e.g. runoff and irrigation from agricultural fields). Similarly, cooling water from the production and distribution of electricity is excluded.

The variables and their ISIC/NACE codes are reported in Figure 6, whereas their full definitions are available from the United Nations Department of Economic and Social Affairs (UNDESA, 2008) and Eurostat (Eurostat, 2008), as well as in the previous indicator report (UN-Habitat and WHO, 2021) and metadata description.[11]

11 https://unstats.un.org/sdgs/metadata/files/Metadata-06-03-01.pdf.

In the total wastewater assessment as developed by UN-Habitat, “domestic wastewater” is the combination of wastewater produced by services and households (Figure 3). Wastewater from services and households were indeed paired due to the relative similarity of the composition of their wastewater (OECD and Eurostat, 2018).

The statistics to report on the flows of wastewater treated are disaggregated by type (industrial, urban and independent) and by level of treatment technology (primary, secondary, tertiary) at the treatment plants (Figure 6).

Safely treated wastewater as reported for the monitoring of total wastewater and industrial wastewater is defined as receiving at least secondary treatment. Indeed, in the absence of effluent compliance data in the databases used to extract the statistics for the indicator, the level of treatment technology (secondary or higher processes) is used as a proxy for the global reporting of safely treated wastewater flows.

2.2. Domestic (household) wastewater estimates

Domestic and household wastewater. A small proportion of countries are currently reporting wastewater data associated with the services sector (Box 2). At present, WHO monitoring of domestic wastewater for SDG purposes is restricted to flows from households only and flows generated by services are not accounted for in the estimates. This is reflected in the terminology used in the remainder of this report (whereby flows are referred to as *household* rather than domestic flows).

Box 2. Monitoring of wastewater generated by services.

WHO has estimated the total volume of household wastewater generated for 235 countries, areas and territories – either based on a data point reported from official national sources or a WHO-administered calculation based on population, water use, and water use to wastewater conversion factor. Characterizing flows of wastewater generated by the service sector is comparatively difficult – as the service sector is not proportional to a country’s population and different types of services may be associated with different water needs (and correspondingly different levels of wastewater generation). Therefore, methods to estimate the volume of wastewater generated by the service sector require a characterization of country-specific service sectors in terms of their size and water use.

Globally, such data has only been reported by 37 countries, most of which have been high-income countries. Figure 7 presents the proportion of domestic wastewater generated by households versus the services sector for a subset of 22 countries which reported data on both. The proportion of domestic wastewater comprising flows by the services sector ranges from 3 per cent to 52 per cent, with an overall average of 21 per cent. Figure 7 also suggests that some data quality issues may be present, as demonstrated by Czechia, Romania and Austria generating very large volumes of wastewater from their service sectors compared to other nations with similar populations and economy size and composition.

- continuation of Box 2

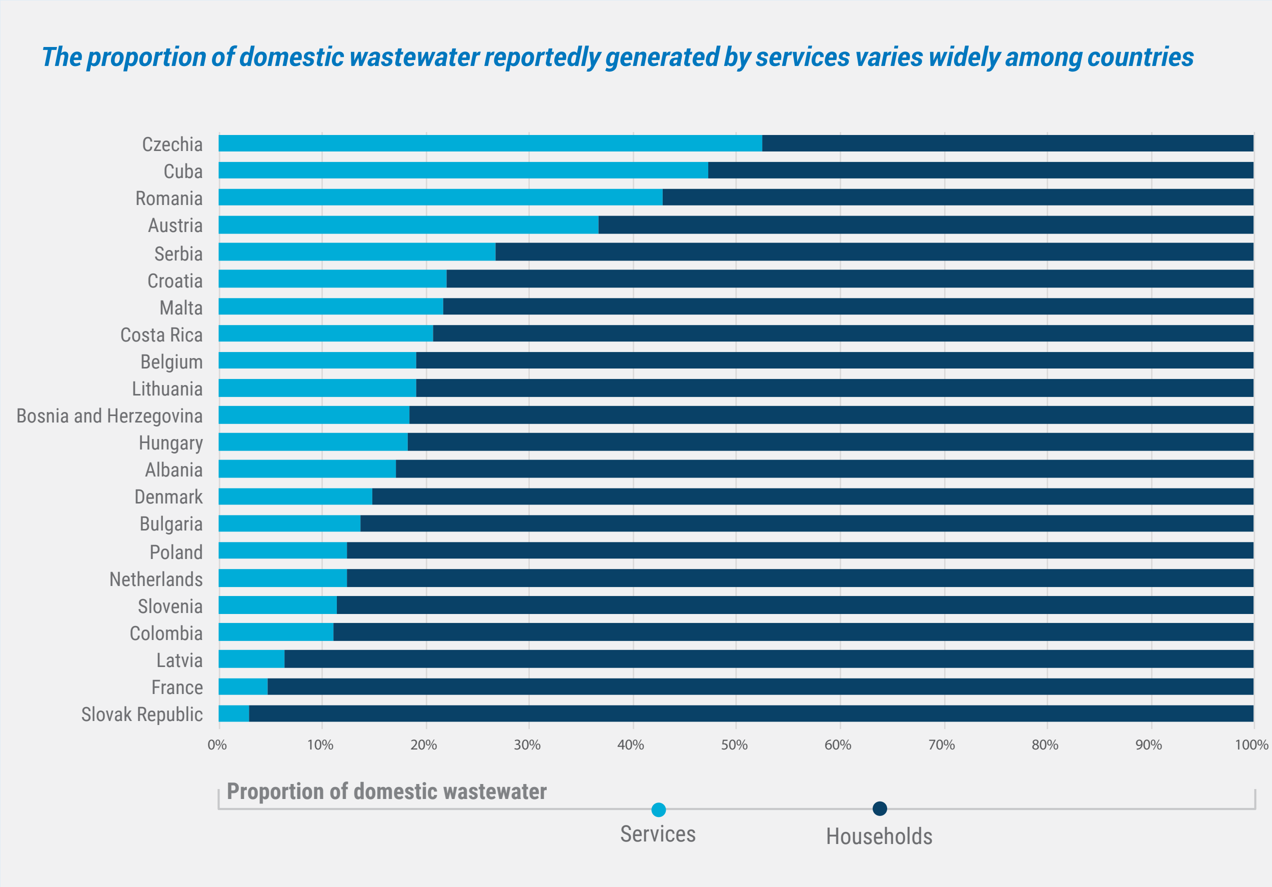


Figure 7. Contributions of household and services wastewater to domestic wastewater generation.

Total annual volume and proportion of household wastewater safely treated. The domestic component of Indicator 6.3.1 is represented as the proportion of household wastewater that is *safely treated*. This proportion is estimated at the national level (referred to as a "country estimate") using data that are compiled by WHO from a variety of sources (as described in Section 2 and Figure 3). Volumes of household wastewater generated and safely treated are also computed at the national level and aggregated to regional and global levels to compute regional and global estimates. The estimates produced by WHO for a given year represent a snapshot of the latest[12] and most reliable data available at the time of compilation and reporting. Changes in estimates over time may therefore be attributable to actual changes in the treatment of household wastewater flows, or the result of new, reinterpreted or revised data.

Safely treated wastewater. Both the target and indicator make reference to "safely treated" wastewater. *Safely treated* household flows are defined as those conveyed into wastewater collection systems, delivered to treatment facilities and subsequently treated to safe levels before discharge or reuse. *Treatment to safe levels* is defined in terms of compliance with relevant national discharge standards. In countries where data on the proportion of wastewater flows discharged in compliance with relevant standards are not available, the proportion treated by secondary or higher technologies is accepted as a proxy for safe treatment. However, even wastewater flows treated in compliance or by secondary or higher processes are not likely to be entirely "safe" – rather, such treatment is considered to reflect an acceptable level of risk to humans and the environment.

12 Over a 10-year time frame up to the reporting year.

Household wastewater conceptual framework. To characterize household wastewater flows at country level, WHO compiles nationally representative data for twenty-two input variables (Table 2) over the five stages of a conceptual framework presented in Figure 8: 1) Generation; 2) Collection; 3) Delivery to treatment; 4) Treatment; 5) Discharge. These five stages are discussed in greater detail in Annex 2. Household wastewater comprises both blackwater and greywater, though countries rarely produce data about greywater management, which is separate from blackwater management (see Box 3 for a rare example). For some variables in the conceptual framework, nationally representative data are rarely reported by countries. In some cases, WHO substitutes missing data with standard assumptions (Figure 3), which have been developed based on research, country specific studies, or expert opinion and allow subsequent calculations to be executed. However, the influence of some of these assumptions is minimized by several data rules that must be followed for a country estimate to be published. These methodological details are beyond the scope of this report and additional information can be found in a methodological note published by WHO.[13] The limitations associated with these assumptions are discussed in Section 4.2.

Table 2. List of variables covering the household wastewater conceptual framework for which WHO aims to compile reported data from countries.

CATEGORY	VARIABLE
Household wastewater generation	Country/territory population
	Percentage of population with drinking water supply on/off-premises
	Average amount of water used by household with water supply on/off-premises
	Proportion of household water used converted into wastewater generated
	Total volume of household wastewater generated
Household sanitation facilities	Proportion of the population living in households connected to sewers
	Proportion of the population living in households connected to septic tanks
	Proportion of the population living in households using other improved sanitation facilities
	Proportion of the population living in households using unimproved sanitation facilities
	Proportion of the population living in households whose members practise open defecation
Sewer wastewater flows	Proportion of sewer wastewater delivered to treatment plants
	Proportion of received sewer wastewater safely treated (by compliance) at treatment plants
	Proportion of received sewer wastewater safely treated (by technology) at treatment plants
Septic tank wastewater flows	Proportion of septic tanks with wastewater collected and contained
	Proportion of septic tanks with faecal sludge emptied and buried onsite
	Proportion of septic tanks with faecal sludge emptied and discharged locally (not delivered to treatment)
	Proportion of septic tanks with faecal sludge emptied and removed offsite
	Proportion of septic tanks with faecal sludge not yet emptied
	Proportion of septic tanks with faecal sludge removed and delivered to offsite treatment plants
	Proportion of septic tanks with faecal sludge delivered to and safely treated at offsite treatment plants

13 https://www.unwater.org/publications/domestic-wastewater-treatment-methodology-2024

Monitoring of household wastewater covers sewer, septic tank and other flows across the stages of collection, delivery to treatment, treatment and discharge into the environment

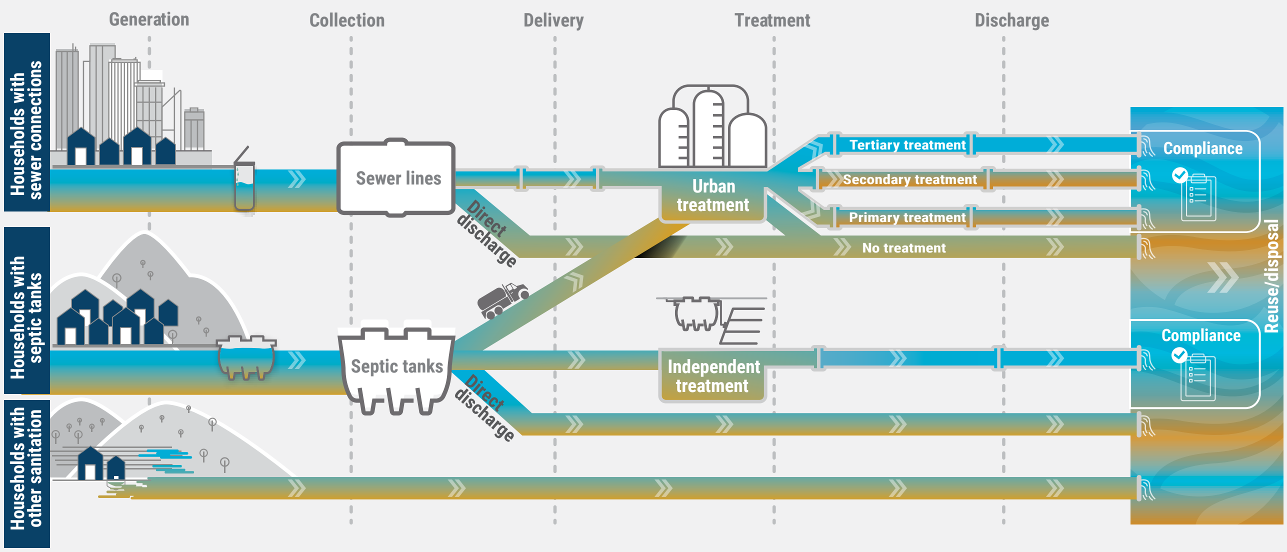


Figure 8. Conceptual framework for household wastewater monitoring.

Box 3. Management of household greywater: Case study of the Swachh Bharat Mission in India.

The Swachh Bharat Mission (SBM) was launched in 2014 and is an initiative of the Government of India that aims to promote hygiene, sanitation, and waste management practices – as well as to make India open defecation free. In 2019, the Government of India reported that nation-wide open defecation free (ODF) status had been achieved – supported by the construction of over 100 million toilets in rural India. Phase II of the SBM was launched later that year, with a focus on sustaining sanitary behavioural changes and addressing local solid and liquid waste (greywater) management, as part of an ODF+ classification (Figure 9).

Greywater refers to household wastewater that does not come from toilets and is typically derived from sinks, drains, and laundry machines. The quantity of household greywater generated per capita varies widely depending on water availability, affordability, and the presence of water consuming household facilities and appliances (such as showers, bathtubs, dishwashers, and washing machines).

Greywater management is a core component of Phase II of the SBM because typical practices commonly result in standing water in the community that serve as breeding ground for potentially disease-transmitting flies and mosquitoes. A secondary reason for its inclusion in Phase II is to support groundwater and aquifer recharge – resources that are experiencing stress in some parts of the country.

Greywater management activities under SBM Phase II are largely led and implemented by local governments. Technical guidelines have been developed and disseminated to support local governments and communities with understanding their local greywater context and designing appropriate solutions. These guidelines include a set of design factors to aid decision-making and planning, namely the size and density of the community, its hydrogeological conditions, proximity land use and available space.

The Government of India promotes various types of greywater management facilities, such as the community leach pit shown here

Figure 9. Example of greywater management (Government of India, 2021).

Greywater conveyance systems (above or below ground sewers) and subsequent treatment technologies are prescribed to match these local conditions. Such technologies include those at household-scale (kitchen gardens, soak pits, and leach pits) and those at community-scale (waste stabilization ponds and constructed wetlands). Such treatment technologies are prescribed because they are low tech (do not require chemical or energy inputs), low cost, and low maintenance. Therefore, the programme ensures the maximum chance that these technologies and designs will correctly be functioning and sustained into the future. Financial support for such local initiatives is made available to them through various levels of government – and this is combined with private investments from households themselves.

Implementation of the SBM Phase II is monitored through a Management Information System (MIS) covering almost 178 million households across over 585,000 villages. The greywater management infrastructure that has been established under the programme is summarized in Table 3. Drainage facilities include covered channels and sewers. Soak, leach and magic pits represent several types of facilities that discharge partially treated greywater into the ground. Kitchen gardens offer a convenient and practical use for greywater that would be otherwise discarded. Greywater management systems include more sophisticated, but also low energy and low maintenance technologies that can accept wastewaters with higher organic content, higher flows, or require treatment to a higher level of efficiency. Further technical details on the technologies and approaches behind SBM Phase II can be found in a greywater management Manual and Toolkit published by SBM.

Table 3. Monitoring of greywater management infrastructure established under SBM Phase II (and associated funding sources).

TYPE OF ASSET	COMMUNITY-SCALE	HOUSEHOLD-SCALE
Drainage facilities	994,027	N/A
Soak/ leach/magic pits	1,528,137	6,761,580
Kitchen gardens	N/A	12,626,300
Greywater management systems	147,482	N/A

Data compilation. Data for the variables represented in the conceptual framework (Table 2) can be compiled from many types of sources, such as population-based estimates from household surveys and volumetric data from administrative questionnaires. WHO compiles data from different national data sources – such as NSO websites, statistical extracts or dashboards and waste-water sector performance reports. NSOs are encouraged to submit relevant wastewater data to their applicable global/regional environmental questionnaire (UNSD, Eurostat, or OECD). However, these questionnaires do not capture all variables in the conceptual framework.[14] WHO also coordinates and aligns data collection activities with the Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP), which produces official statistics on behalf of WHO and UNICEF for SDG Indicator 6.2.1a on safely managed sanitation.[15] Box 4 presents a comparison between the interconnected SDG Indicator 6.2.1a and the domestic component of SDG Indicator 6.3.1. Estimates of the proportion of households with sewer and septic tank connections published by the JMP also serve as a data source for estimates of the volume of household wastewater collected.

14 Missing variables include those related to compliance with discharge standards and septic tank wastewater (namely faecal sludge emptying, delivery to faecal sludge treatment facilities, and safe treatment therein).

15 Including estimates of the proportion of households that use sanitation facilities connected to sewers and septic tanks.

Box 4. Safely managed sanitation services (SDG Indicator 6.2.1a) and safely treated wastewater (SDG Indicator 6.3.1, domestic component).

Safely managed sanitation vs safely treated wastewater

The SDG framework includes two indicators relating to sanitation and wastewater. SDG Indicator 6.2.1a concerns the proportion of the population using safely managed sanitation services, while SDG Indicator 6.3.1 concerns the proportion of wastewater safely treated. The latest available statistics for SDG Indicator 6.2.1a are available online from the JMP website[16] or the UN-Water Integrated Monitoring Initiative website.[17] While safe treatment of domestic wastewater is closely related to safely managed sanitation services, and the two indicators often draw upon the same national data sources, there are also important differences.

- **Units of measurement.** Safely managed sanitation services is expressed as the proportion of the population having a certain level of service, while safely treated wastewater reflects the proportion of volumetric flows safely treated.
- **Acceptable sanitation facilities.** Any kind of improved sanitation facility can potentially be safely managed, but only wastewater associated with households with septic tank and sewer connections can potentially be safely treated. This is because all households generate wastewater, including blackwater (from defecation and urination) and greywater (from other domestic uses, including washing and bathing). Safely managed sanitation refers to the safe management of blackwater, while safely treated wastewater refers to both blackwater and greywater. Sewers and septic tanks, unlike pit latrines, have the potential to manage greywater as well as blackwater flows. In principle, greywater could also be safely treated separately from blackwater (for example, through household or community soakaway pits).
- **Acceptable treatment.** Secondary or higher treatment processes are adequate for safely managed sanitation services and are sometimes also used in calculations concerning safely treated wastewater. However, additional data on the compliance of treated wastewater with relevant national or local standards (for example, discharge standards) is used for SDG indicator 6.3.1 when it is available.
- **Shared sanitation facilities.** Shared facilities are excluded from safely managed sanitation services because of human rights concerns about accessibility, privacy and health impacts. These factors are not considered for wastewater flows, so shared facilities can lead to safely treated wastewater.
- **Estimation method.** The JMP uses linear regression among all available data points to produce estimates of safely managed sanitation over a range of years, while WHO uses the most recent available data points for each variable in the conceptual framework to produce estimates of safely treated domestic wastewater for a single year.

16 https://washdata.org
17 https://www.sdg6data.org

Estimates for safely managed sanitation services and safely treated domestic wastewater are closely correlated, but because of the above methodological differences, estimates for individual countries can be significantly different (Figure 10). The impact of differences in the types of sanitation facilities counted as safely treated/managed is evident in many low- and lower-middle-income countries such as Kyrgyzstan, the Lao People's Democratic Republic and Malawi, where large proportions of the population use improved pit latrines, particularly in rural areas. When these are not shared and have not been emptied (or have been emptied and the contents either buried onsite or removed offsite where they receive treatment), corresponding populations count toward safely managed sanitation, but associated wastewater flows are not classified as safely treated. The impact of wastewater effluent standards is seen in more upper-middle-income and high-income countries, such as Malta, Romania, and the Russian Federation. In these countries, sewer coverage is high, and much of the wastewater receives secondary treatment (qualifying as safely managed sanitation) but does not meet relevant discharge standards, and so is not counted as safely treated. Finally, the impact of shared sanitation is evident in American Samoa, where almost everyone uses sewer connections or septic tanks, and nearly all sewage is treated with primary processes followed by a long ocean outfall, which is considered as adequate for both safely treated wastewater and safely managed sanitation. However, nearly half of the population uses shared sanitation facilities. These are excluded from safely managed sanitation, but not from safely treated wastewater.

Estimates for safely treated domestic wastewater (SDG Indicator 6.3.1) are often lower than for safely managed sanitation (SDG Indicator 6.2.1a) in countries with estimates for both indicators

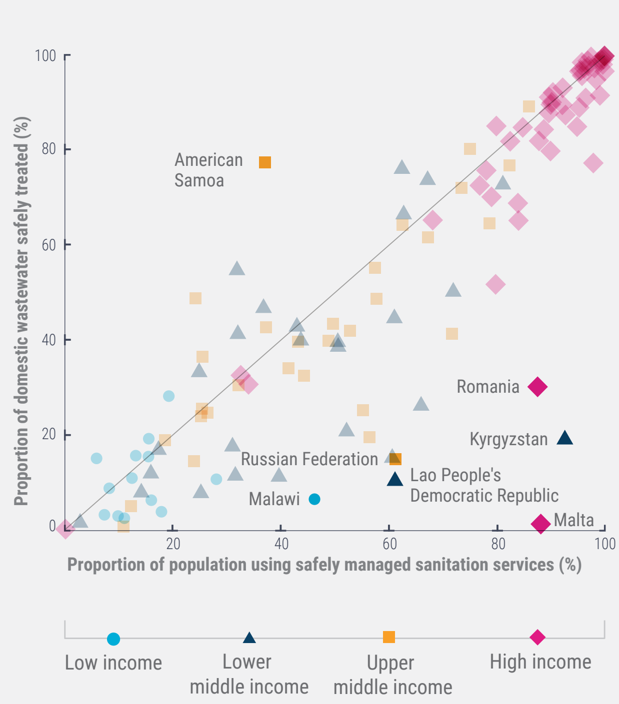


Figure 10. Comparison of SDG indicators 6.2.1a (safely managed sanitation services) and 6.3.1 (safely treated domestic wastewater) for 2022.

Adapted from UNICEF and WHO, 2023

Data used for estimates. All data compiled by WHO for the twenty-two input variables are applicable to a particular calendar year and are eligible to be used in the computation of country estimates if they are within a ten-year time window from the reporting year. If there are multiple data points for a given variable, only the data point corresponding to the most recent year is utilized for computation of the country estimate. The estimates computed by WHO therefore represent the most recent available data and, for this progress update, are given a reporting date of 2022 irrespective of which years are referenced by the individual data points used to produce the estimates. WHO monitors household wastewater in 235 countries, areas and territories for which population statistics are published by the United Nations (referred to as "countries" in this text, for brevity), including all 193 United Nations Member States.[18] The database maintained by WHO and associated estimates are updated every two years. Draft estimates are shared with country-level focal points for review, feedback and revision as part of a consultation process prior to finalization.

For the computation of regional and global aggregate estimates, imputed data are used to fill the data gaps created by countries without estimates due to insufficient data. For such countries, the proportion of household wastewater safely treated is imputed from the country's corresponding subregional average [19] and the total volume safely treated is computed by multiplying the imputed proportion by the total volume of household wastewater generated (which is estimated for all countries). Regional estimates are only reported if imputed data account for less than 50 per cent of the regional safely treated wastewater flow. Reported global and regional estimates are therefore representative of their entire domain (and not only the countries with estimates).

Demonstrative example. An example of the development of a country estimate – including types of data sources, assumptions and calculations – is shown in Box 5 for Iraq in 2022.

18 See the World Population Prospects, 2022 revision: https://population.un.org/wpp/

19 Using the M49 subregions: https://unstats.un.org/unsd/methodology/m49/

Box 5. Demonstrative example of the development of a country estimate for the proportion of household wastewater safely treated.

The computation of a country estimate is associated with forty variables - comprising up to twenty-two data input variables and eighteen calculated variables. These forty variables have a corresponding name and ID number. For reference in the proceeding text, ID codes are shown in curved brackets, e.g. {1} is variable ID 1, the country/territory population. Full details on country data and their sources and calculations for the country estimates can be referred to in publicly available individual country files[20]. This box presents the development of the country estimate for Iraq in 2022, referring to relevant variables across the conceptual framework, described below and with flows generated, collected, delivered to treatment and safely treated proportionally represented in the flow diagram in Figure 11.

Generation [A]: The volume of household waste-water generated per year {8} was reported by Iraq's Central Statistical Organization (CSO) in a report on Environmental Economic Accounting in 2021. Therefore, data for estimating total household wastewater generated (based on population and water use) were not used to produce the country estimate. Rather, these data are only needed for countries for which total household wastewater generated has not been officially reported.

Collection [B]: Approximately 30 per cent of household wastewater flows in Iraq are estimated to be collected in sewers {14} based on sanitation facility data compiled and reported by the JMP from historical national household surveys. Flows associated with households connected to a septic tank make up 62 per cent of total household flows {15}. Flows generated by households with other improved sanitation facilities (typically pit latrines {16}) or unimproved sanitation {17} are classified as not collected. While open defecation is not practised in Iraq, households practising open defecation would be counted as generating wastewater that is not collected {18}.

Delivery to treatment [C]: The Iraqi CSO reported in Environment Statistics of Iraq: Sanitation Sector report for 2021, that of the 37 per cent of households connected to sewer networks, 29 per cent were connected to networks with an urban WWTP. This population-based ratio (29 per cent/37 per cent =76 per cent) for sewer connections that deliver flows to urban WWTPs was used as a proxy for volumes {19}, resulting in an estimated 734 million m^3 of household wastewater conveyed in sewers being delivered to urban WWTPs {29}. For septic tanks, no data was available in Iraq on the proportion of tanks safely containing wastewater. Therefore, the standard assumption of 50 per cent containment {22} was applied. The Multiple Indicator Cluster Survey conducted in 2018 revealed that 61 per cent of households with septic tanks had either not yet emptied their tank {25} or buried their emptied faecal sludge on their property {23} - indicative of the delivery of flows to onsite treatment. Additionally, 33 per cent of households with a septic tank-had their faecal sludge emptied and carried away by a private or public service provider {25} – indicative of the delivery of flows to offsite treatment. A small fraction of septic tank connected households (5 per cent) reported having disposed of faecal sludge unsafely {24}, contributing to flows not delivered to treatment. Population-based data from household surveys were once again inferred onto volumetric estimates as a proxy – resulting in an estimated 601 million m^3 of household wastewater conveyed in septic tanks being delivered to treatment {30}.

20 https://www.who.int/teams/environment-climate-change-and-health/water-sanitation-and-health/monitoring-and-evidence/wash-monitoring/2023-country-files-for-sdg-6.3.1

Treatment performance [D]: For sewer wastewater flows delivered to urban WWTPs, no data on the compliance of discharges with standards were available for Iraq. However, the CSO reported that nearly all (99.7 per cent) such flows were treated by secondary or higher processes {21} and were therefore considered as safely treated (732 million m³ {33}). All of the septic tank flows delivered to onsite forms of treatment were considered to have been treated to levels commensurate with secondary or higher treatment. For septic tank flows associated with faecal sludge delivered to offsite forms of treatment (treatment facilities), no data were compiled on treatment performance and the standard assumption of 0 per cent safely treated was employed {28}. A total of 601 million m³ of septic tank wastewater was estimated to have been safely treated {30; 31}

Country estimate [E]: In total, 42 per cent of household wastewater flows (1,332 million m³ {36}) were estimated to have been safely treated in Iraq in 2022 – including 23 per cent from households connected by sewers to urban WWTPs, where received flows were treated by secondary or higher processes, and 19 per cent from households with septic tanks, where flows were likely to be contained in well designed and maintained systems and where faecal sludge was treated onsite (either in-situ in a yet-to-be emptied tank or buried safely onsite).

Conclusions. Iraq has achieved a moderate level of household wastewater treatment, and could increase its performance on this indicator by:

- Compiling data on, and addressing, septic tank containment
- Compiling data on, and addressing, the treatment of faecal sludge delivered offsite
- Increasing the proportion of households with a sewer or septic tank connection
- Decreasing the proportion of sewer wastewater that discharges directly to the environment

Inadequately treated septic tank flows are the main contributor to unsafe household wastewater discharges in Iraq

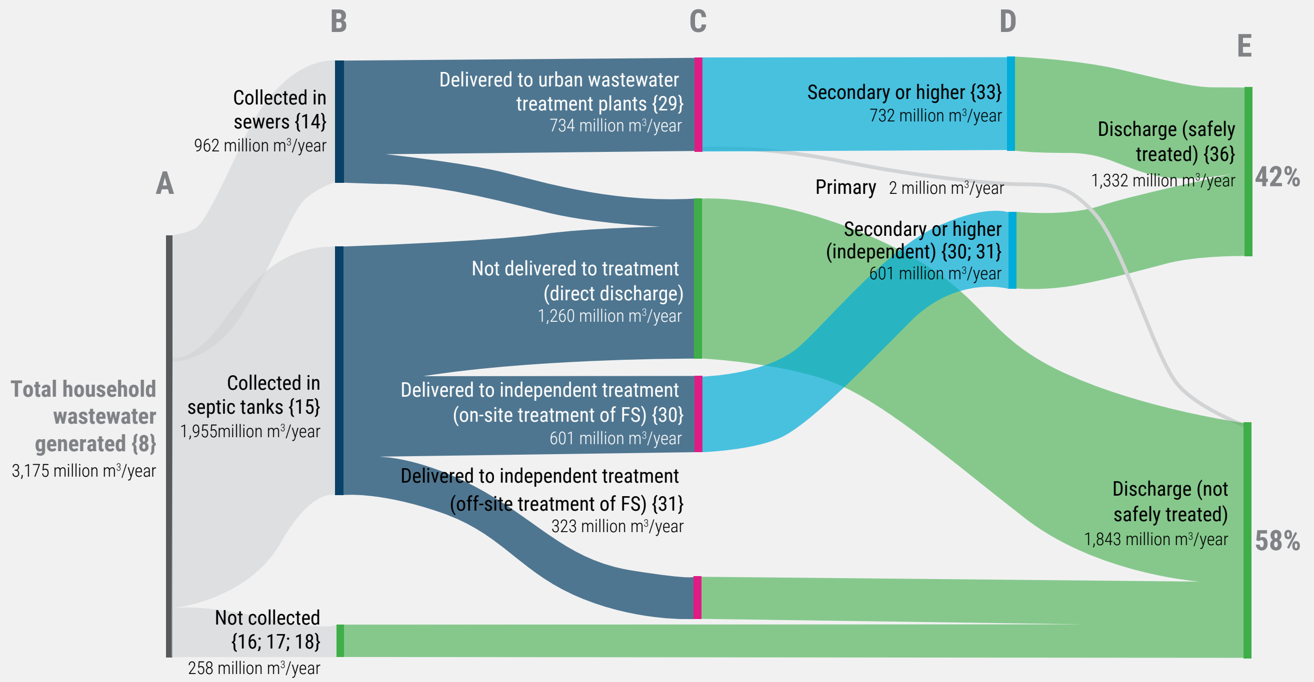


Figure 11. Household wastewater flow diagram for Iraq, 2022.

3. Results and analysis

3.1. Frequency of harmonized data reporting

Results from the latest harmonized data collections on wastewater statistics. Figure 12 presents a plot of the proportion of United Nations Member States reporting key volumetric wastewater statistics to UNSD, OECD and Eurostat from 2012 to 2022 based on their respective latest data collection rounds.[21] Only OECD has published data for 2022. There is generally less frequent reporting of data for the most recent years (approximately 2020 to 2022), as some countries are delayed in computing or submitting statistics (reporting lag). Discounting this reporting lag, reporting frequency is generally stable with wastewater volumes treated by urban WWTPs representing the most commonly reported variable (averaging 30 per cent of Member States each year) followed by total volumes generated (averaging 23 per cent of Member States each year). A smaller proportion of Member States report data on other WWTPs and independent wastewater treatment (10 per cent of Member States for each). A more comprehensive analysis of harmonized data reporting is given for volumetric and population-based variables in the heat map represented in Annex 3. The response rate to the UNSD/UNEP environmental questionnaire as a whole (at least partial completion of the questionnaire) is typically around 50 per cent of the approximately 160 countries to which UNSD sends the questionnaire.

The frequency of wastewater data reported by countries to the OECD/Eurostat/UNSD questionnaires is generally stable, but drops for the most recent years

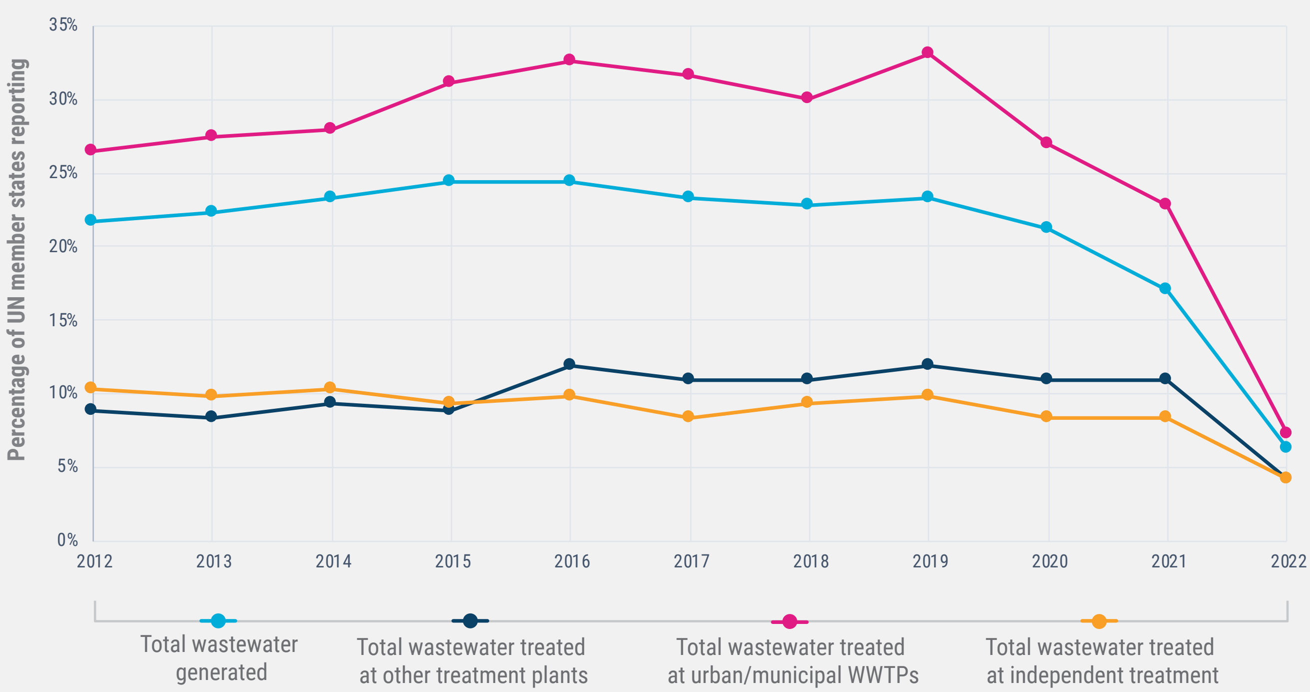


Figure 12. Proportion of United Nations Member States (n=193) reporting data to the UNSD, OECD and Eurostat databases on total flows of wastewater generated and treated.

21 Based on publicly available data accessed in April 2024.

3.2. Total and industrial wastewater statistics

Regional and global statistics for total and industrial wastewater flows are not reported here, as the representativeness of the datasets among countries with official figures was insufficient, according to the IAEG-SDGs definition for Tier 1[22] indicators (i.e. data are produced regularly by at least 50 per cent of countries and 50 per cent of the population in every region in which the indicator is relevant).

3.2.1. Total wastewater generated and safely treated

TOTAL WASTEWATER GENERATED IN 2022

In 2022, the total reported wastewater generated by economic activities and households accounts for 187 billion m^3 from the 85 reporting countries covering 46 per cent of the global population (3.6 billion people) (Figure 13).

By comparison, the data for total wastewater generated in 2015 accounted for 132 billion m^3 from the 56 reporting countries covering 22 per cent of the global population (1.6 billion people).

Disaggregation of the flow of wastewater generated by economic and household activities (Figure 14) reveals that there are gaps and significant differences in the composition of the total wastewater flows reported. This variability, which could represent different national water uses and dominant sectors, most certainly reflects that many variables are not being systematically reported by most countries. Moreover, some countries only reported some variables from the domestic or from the industrial sectors and some countries did not provide any disaggregation of the total flow of wastewater generated in their reports.

Across the 85 countries reporting some wastewater generated data, 60 countries reported some values for the domestic sector – whereas only 49 countries reported some data on the industrial sector – most likely thanks to the improved monitoring of drinking water volumes supplied by public water operators (Figure 15). Although the concentrations of pollutants in industrial treated sewage are generally monitored for effluent compliance, industrial flows are not necessarily quantified. Moreover, the industrial-related data can be urban by different institutions (e.g. the regulator and the Ministry of Industry).

22 https://unstats.un.org/sdgs/iaeg-sdgs/tier-classification/.

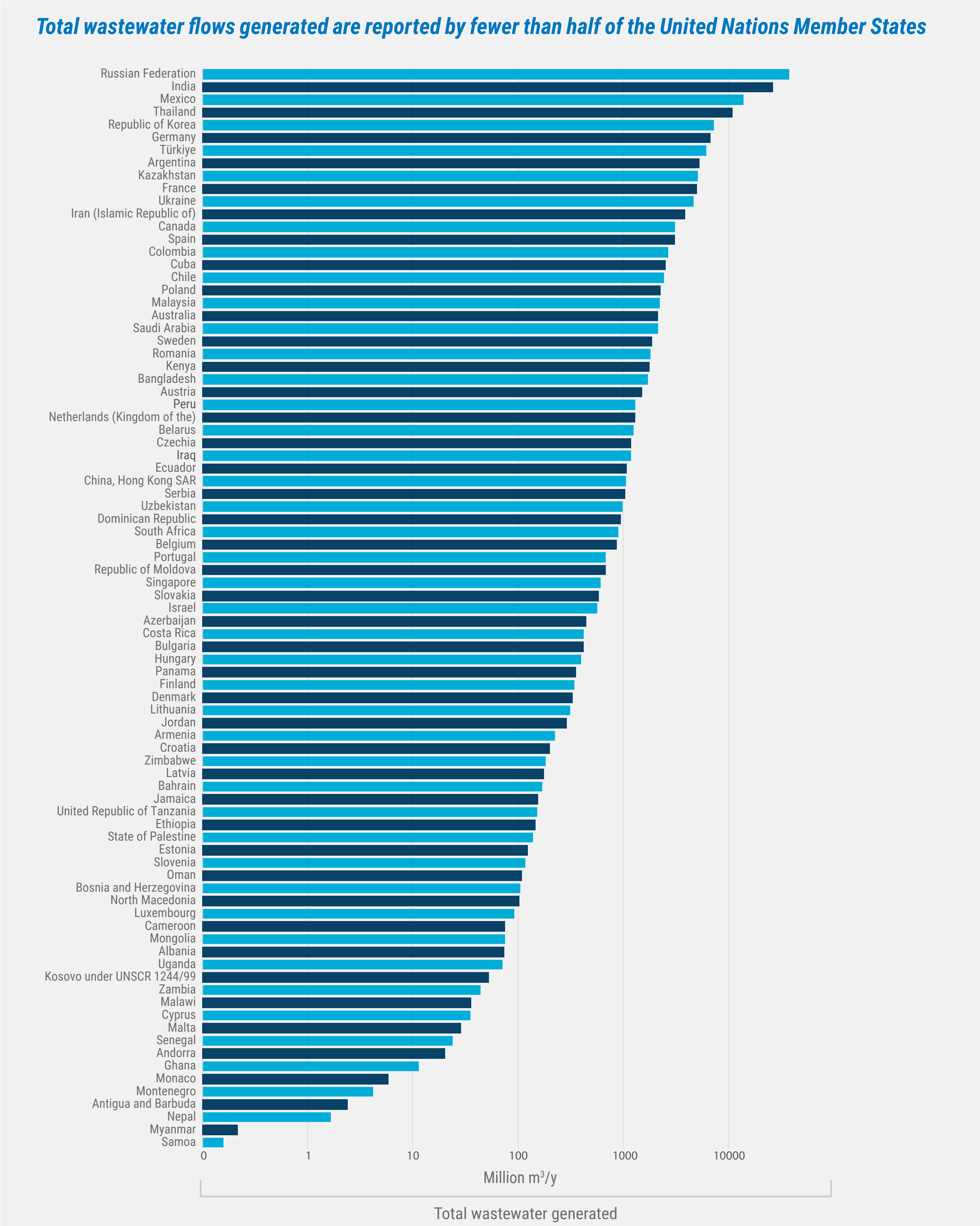


Figure 13. Total wastewater flows generated (million m³) in 2022, by country, using a base-10 logarithmic scale on the x-axis.

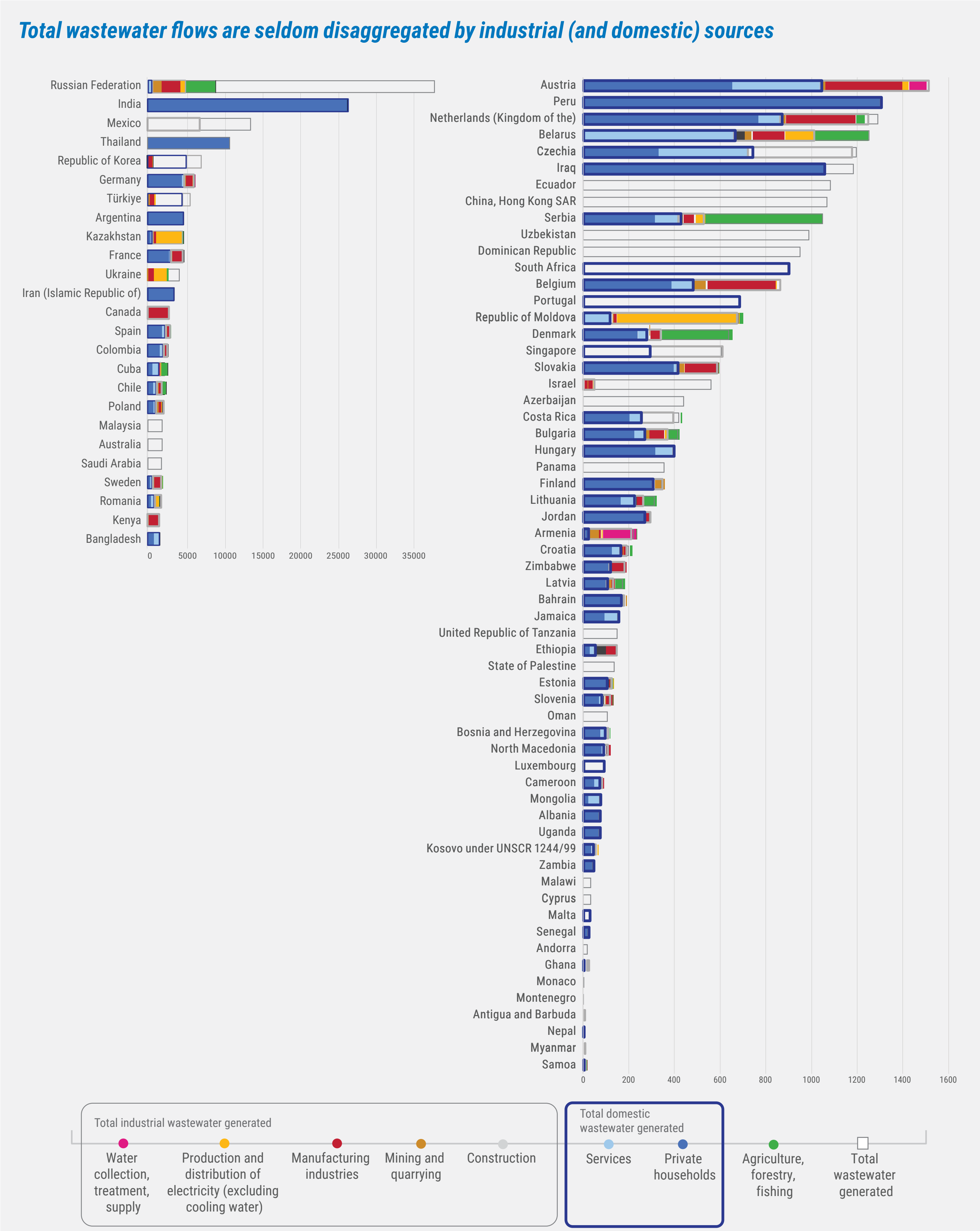


Figure 14. Total wastewater flow generated (million m³) in 2022 disaggregated by industrial and domestic sectors. (left) The 25 highest values and (right) the values of the other 60 countries.

Countries primarily report statistics on generation by domestic sources and treatment by urban plants

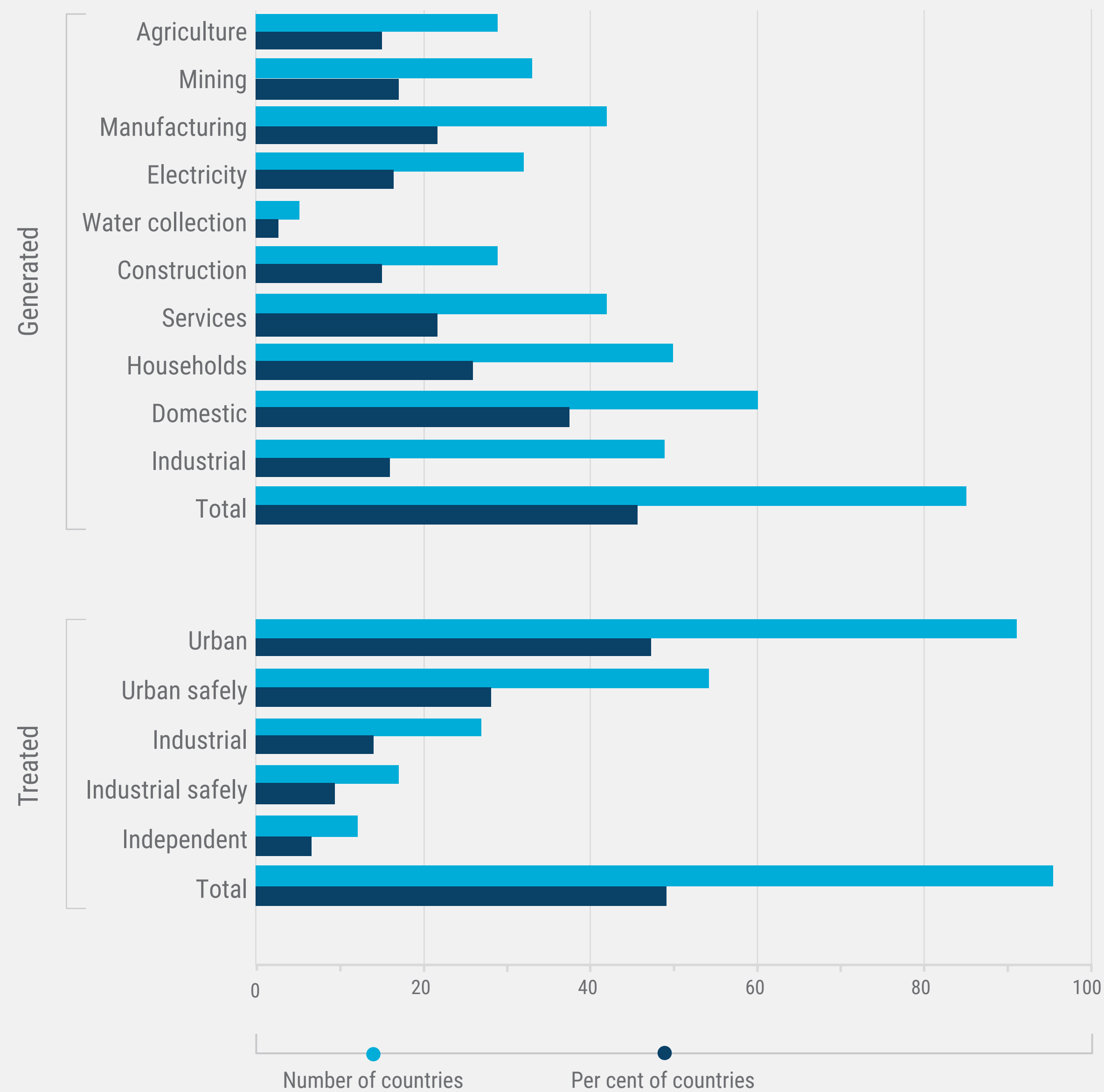


Figure 15. Number of countries and associated proportion of countries (over 193 Member States) that reported on the different variables for wastewater generation and treatment.

TOTAL WASTEWATER TREATED IN 2022

Total wastewater treated in 2022 accounted for 220 billion m^3 from the 95 reporting countries covering 69 per cent of the global population (5.4 billion people) (Figure 16).

By comparison, the total wastewater treated in 2015 accounted for 41.6 billion m^3 from the 57 reporting countries covering 20 per cent of the global population (1.4 billion people).

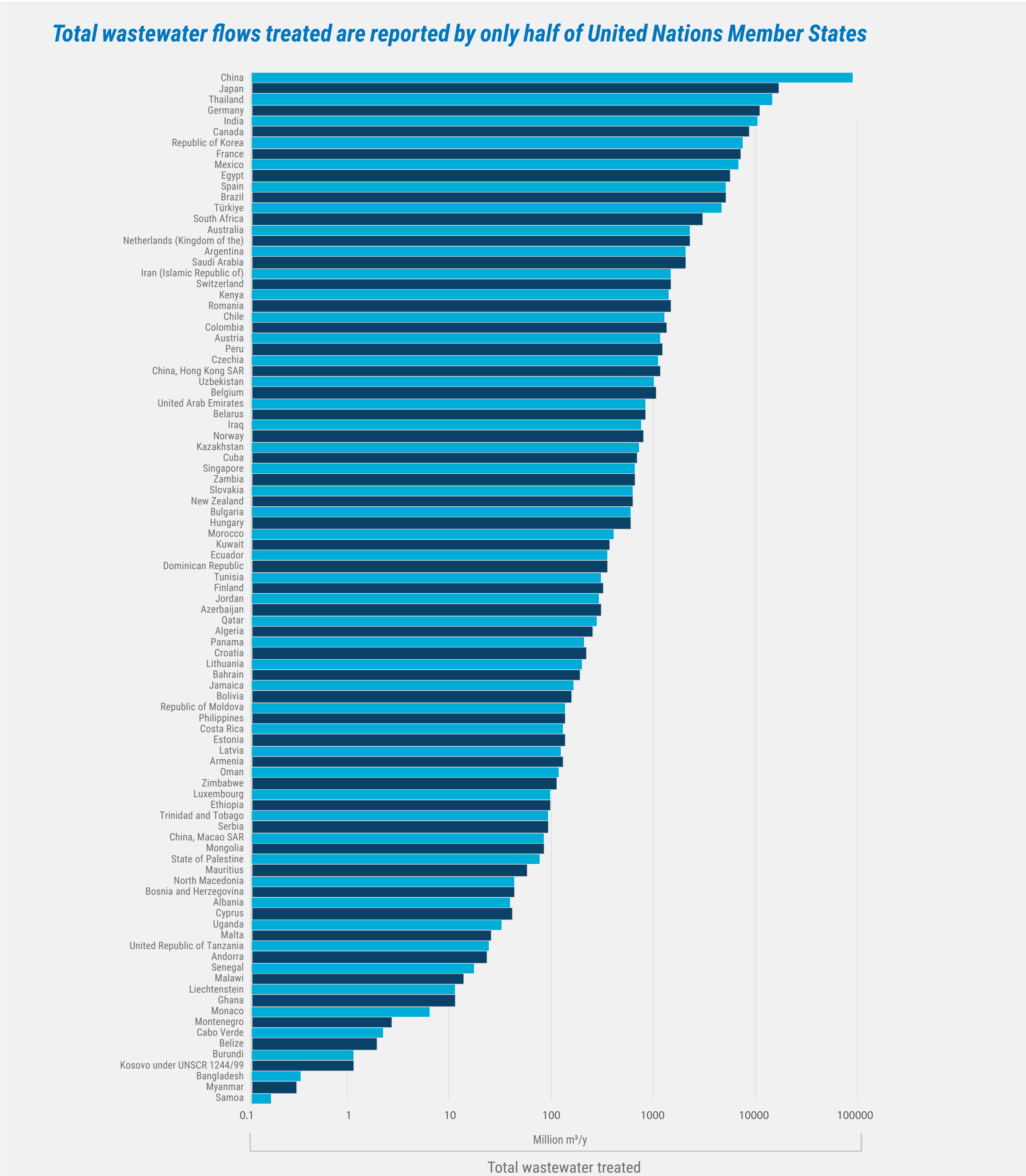


Figure 16. Total wastewater flows treated (million m^3) in 2022, by country, using a base-10 logarithmic scale on the x-axis.

There is a significant lack of statistics from industrial (other) treatment plants

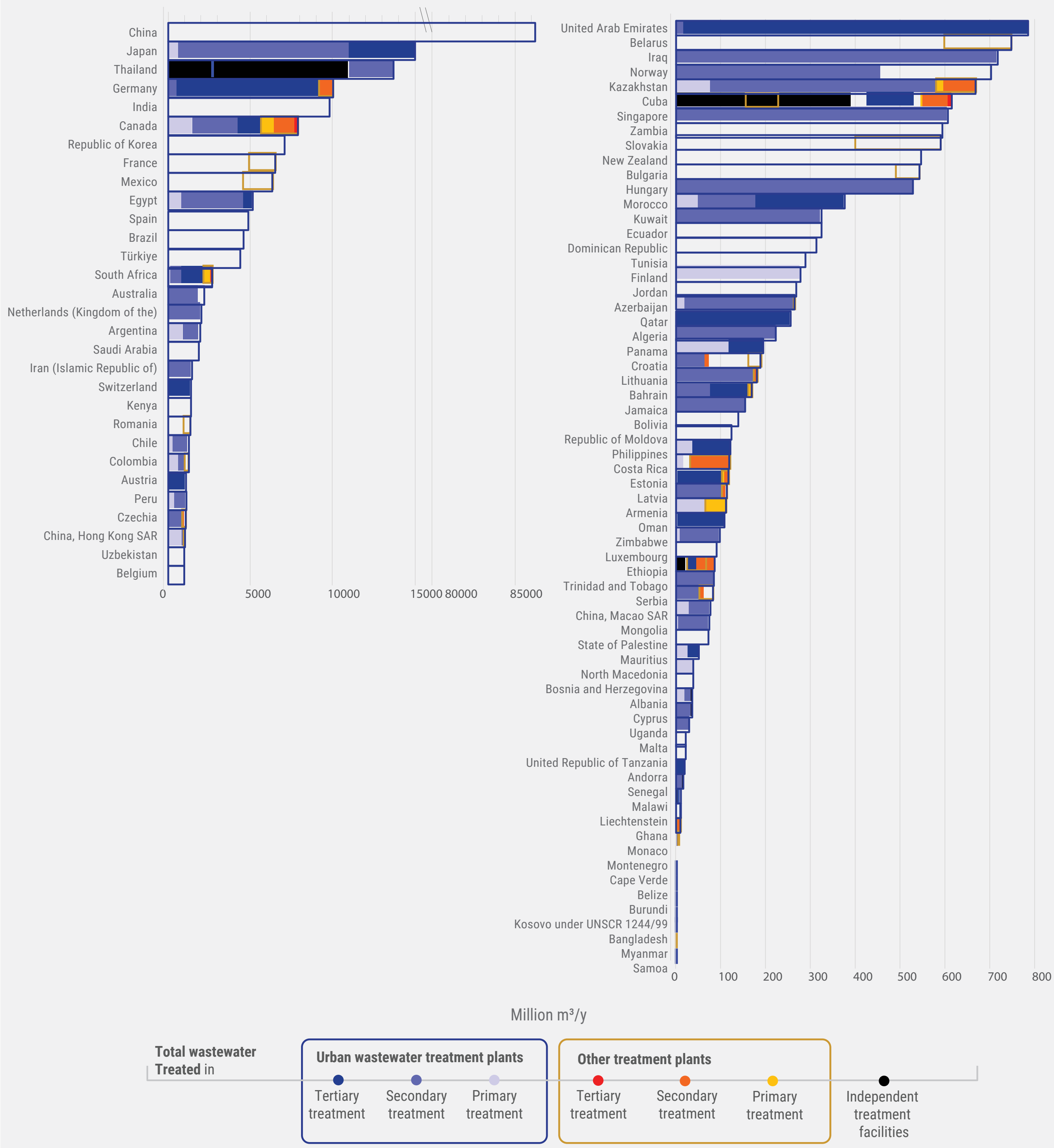


Figure 17. Total wastewater flow treated (million m³) in 2022 disaggregated by type and level of treatment.

(left) The 30 highest values and (right) the values of the other 65 countries.

The disaggregation of the flow of wastewater treated by type and level of treatment (Figure 17) shows that the variables reported strongly differ among countries, possibly depending on national infrastructures and management capacities in (public and private) utilities, but also most certainly due to important disparities in data monitoring and reporting.

Figure 17 indicates that some countries do not systematically monitor and/or report disaggregated treated wastewater statistics. It is also striking to note that of the 95 countries reporting some treated wastewater statistics, 91 reported some data from urban WWTPs, while only 27 countries reported some industrial wastewater treated data. Only 12 countries reported statistics on independent treatment.

It is important to understand that urban WWTPs also generally receive and treat not only a significant proportion of the wastewater produced by industries, services and institutions, in addition to household wastewater collected in sewers, but also runoff and urban storm water inputs, so that the associated wastewater flows cannot be exclusively attributed to domestic sources.

Despite the fact that the wastewater flows treated in urban plants are generally the most reported variable to assess the flow of total wastewater treated, the wastewater questionnaires sent by international organizations are not always completed with standardized WWTPs data. In order to improve countries' capacities to manage their wastewater treatment data and facilitate the sustainability of a regional inventory to catalogue WWTPs in the Latin America and the Caribbean (LAC) region, the Water and Sanitation Observatory for Latin America and the Caribbean (OLAS) has sponsored a project to generate wastewater treatment data from the ground up (Box 6; Figure 18).

PROPORTION OF TOTAL WASTEWATER SAFELY TREATED

It is meaningful to note from Figure 13 and Figure 16, that some countries reported some statistics on wastewater generation but not on wastewater treatment, while, conversely, some countries reported some statistics on wastewater treatment but not on wastewater generation. The proportion of wastewater treated can only be calculated when total generated and treated data are available. As a consequence, over the 107 countries which reported some wastewater statistics for 2022 (representing 73 per cent of the population), the proportion of total wastewater treated could only be calculated for 73 countries (Figure 19).

Taking all 73 countries together (representing 42 per cent of the population) reporting on both total wastewater generation and treatment for 2022 (Figure 19), 76 per cent of total wastewater flows received at least some treatment (103 billion m^3 of the 136 billion m^3 of wastewater generated) and 60 per cent was "safely treated", based on the 42 countries (representing 12 per cent of the population) reporting different treatment levels (i.e. at least secondary treatment); 36 billion m^3 of the 59.3 billion m^3 of wastewater generated was safely treated.

By comparison, across the 42 countries reporting on both total wastewater generation and treatment in 2015, 32 per cent of total wastewater flows received at least some treatment (37 billion m^3 of the 113 billion m^3 of wastewater generated) and 17 per cent was safely treated, based on the 15 countries reporting different treatment levels (4 billion m^3 of the 24 billion m^3 of wastewater generated).

Box 6. Taking stock of wastewater treatment capacity in Latin America and the Caribbean (LAC).

The wastewater statistics used to monitor SDG 6.3.1 on the proportions of total and industrial wastewater treated come from the country reports of international monitoring systems. However, standardized methodologies and data are not always available and some countries only partially fill the questionnaires or do not report at all, while urban WWTPs potentially represent a valuable source of data that can be both complex and multifaceted.

The Water and Sanitation Observatory for Latin America and the Caribbean (OLAS) has sponsored a project to generate urban wastewater treatment data from the ground up. The project involves the creation of a regional inventory to catalogue WWTPs in the region as well as relevant data such as location, treatment capacity, average year treatment volumes, collection of biogases, treatment technologies, sludge volumes, reuse volumes and more.

Collecting the facilities' locations enables the plant's characteristics to be confirmed visually via satellite imagery, while collecting related characteristics makes it possible to estimate subnational, national and regional statistics relating to urban wastewater treatment and carbon emissions associated with wastewater treatment and reuse.

Most countries in LAC have national inventories. However, the collected data varies widely from country to country, making harmonization a challenge. The project encourages countries to enrich their national inventories in order to improve their capacity to manage their wastewater treatment data and facilitate the sustainability of the regional inventory.

3. Country 2. Treatment plant name 7. Year of plant 17. Treatment process 18. Treatment 21. Is the 9. Size

3. Country	2. Treatment plant name	7. Year of plant operation commencement	17. Treatment process	18. Treatment process details	21. Is the biogas utilized? (Yes/no)	9. Size
Perú	PTAR Carapongo	1988	02 Lagoons	Rejas-Secundario-Desinfección [Orgánica]	ND !	Large
Perú	PTAR Taboada	2013	11 Outfall	Rejas	No X	Mega plant
Perú	PTAR San Jeronimo	2014	04 Biofilters	Rejas-Primario-Secundario-Desinfección [Orgánica/Hidráulica]	Yes ✓	Large
Perú	PTAR La Enlozada	2015	04 Biofilters	Rejas-Primario-Secundario-Desinfección	No X	Mega plant
Perú	PTAR San Bartolo	2015	02 Lagoons	Rejas-Secundario-Terciario-Desinfección	No X	Mega plant

Figure 18. Screenshot of the OLAS dashboard showing some of the information available for a WWTP from Peru. (http://www.olasdata.org).

Only 73 Member States (representing less than 50 per cent of the population) reported on both total wastewater generation and treatment

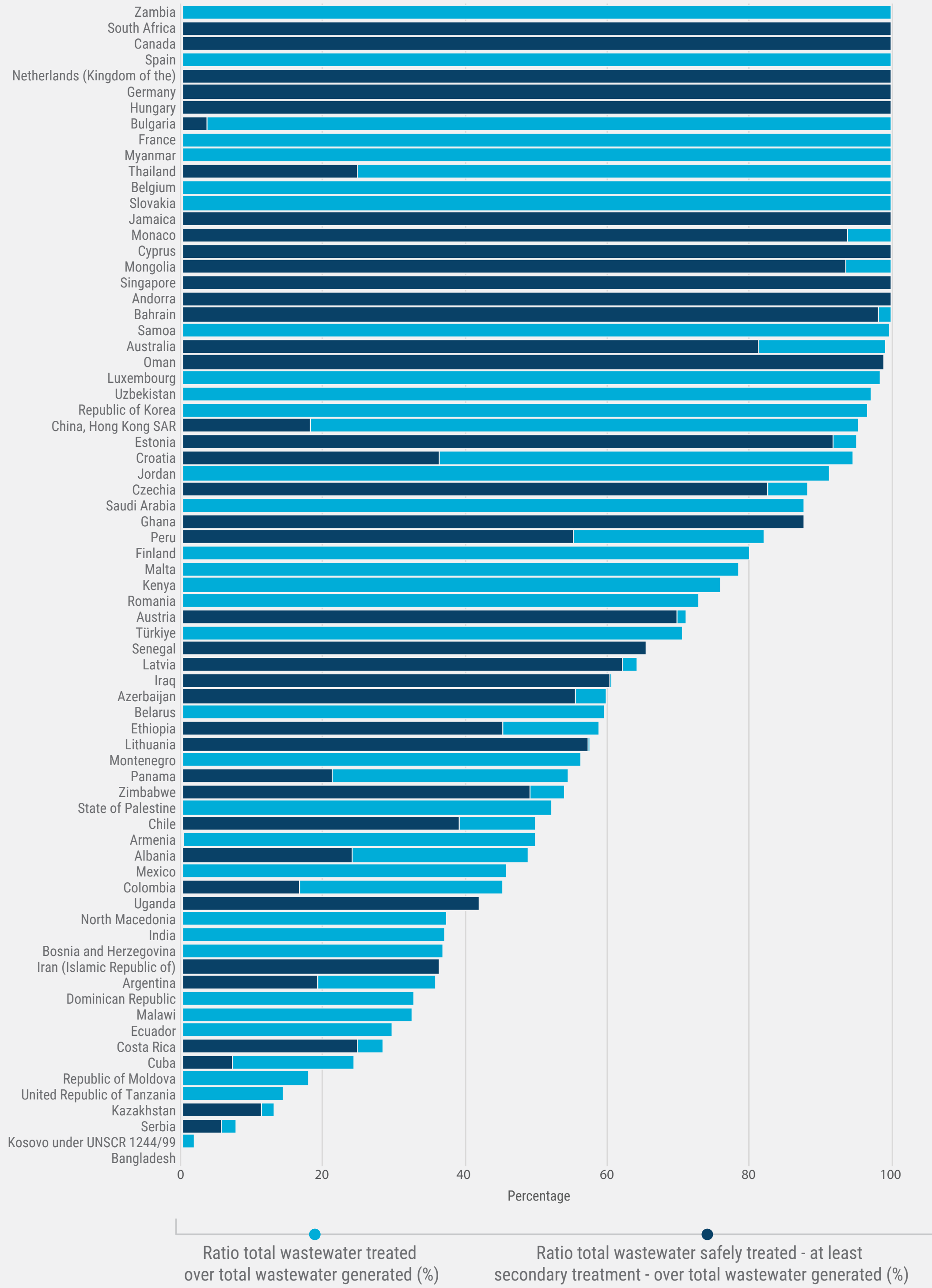


Figure 19. Countries' proportions of the total flow of wastewater treated versus the total flow of wastewater generated (%) for 2022, including safely treated wastewater (i.e. receiving at least secondary treatment).

The proportions treated were rounded to 100 per cent for the 12 countries who reported some volumes treated that exceeded the volumes generated.

It is important to understand that the very high increase in the proportion of total wastewater treated, from 32 per cent in 2015 to 76 per cent for 2022, does not reflect a significant increase in the proportion of flows treated worldwide, but rather a threefold increase in the higher treated flows effectively reported due to the last six years being taken into account. Such a result demonstrates the inherent limitations on interpretation of the evolution of this component of the indicator, which can vary greatly according to the different variables reported (or not) and because there is generally more information available about the flows treated than generated.

For the same reason, globally, more wastewater is reported treated (58.3 billion m^3 from 95 countries, 69 per cent of the global population) than generated (36.0 billion m^3 from 85 countries, 46 per cent of the population). This highlights the need to better populate wastewater generation variables, especially for the industrial sector, in order to improve the national representativeness of country data and, subsequently, the significance of this component of the indicator.

This observation also explains why some countries' proportions are equivalent or even higher than 100 per cent (i.e. 12 countries reported higher volumes of wastewater treated than generated) (Figure 19). Although this could also genuinely be due to a higher volume of wastewater being treated than generated in some countries – because urban WWTPs also treat runoff water flows collected in the drainage basin, as well as some illegal and industrial wastewater discharged in public sewers – such figures can also reflect a relative lack of monitoring and/or reporting of the flows of wastewater generated, especially by the industrial sector as explained above and in the next section.

3.2.2. Industrial wastewater generated and safely treated

INDUSTRIAL WASTEWATER GENERATED IN 2022

It is striking to note from Figure 14 and Figure 17 that statistics on industrial wastewater flows generated and treated are only seldom reported.

National data reported for the volume of industrial wastewater generated in 2022 account for 36 billion m^3 for the 49 reporting countries (covering 16 per cent of the global population) (Figure 14).

In comparison, the former data for industrial wastewater generated in 2015 accounted for 45 billion m^3 for the 32 reporting countries (covering 12 per cent of the global population).

The reason why the volume reported in 2022 is lower than the volume reported in 2015 despite an increase in reporting countries, is that Brazil did not report any wastewater generated data in 2022, but had reported 16 billion m^3 in 2015 (2015 being outside the time window for which data can be compiled for indicator monitoring).

INDUSTRIAL WASTEWATER TREATED IN 2022

National data available for the volume of industrial wastewater treated accounted for 8 billion m^3 for the 27 reporting countries (covering 10 per cent of the global population) (Figure 17). The volume of industrial wastewater safely treated accounted for 3 billion m^3 for the 17 reporting countries (covering 5 per cent of the global population).

By comparison, industrial wastewater treated in 2015 accounted for 4 billion m^3 for the 15 reporting countries (covering only 4 per cent of the global population); whereas the volume of industrial wastewater safely treated accounted for 0.1 billion m^3 for the three reporting countries (covering less than 0.1 per cent of the global population).

In the previous indicator report focusing on 2015, which was the most populated year of the wastewater databases used to report on Indicator 6.3.1, the proportion of the industrial wastewater treated could not be calculated for any African country (UN-Habitat and WHO, 2021). To fill this data gap and to inspire other countries, a pilot study was undertaken in Ghana to assess the quantity and quality of industrial and urban wastewater flows. These characteristics were then used to estimate the pollutant loads generated and treated by industrial and municipal facilities in Ghana during 2021/2022 (UN-Habitat and EPA, 2023) (Box 7).

Box 7. Industrial and urban wastewater flows as monitored by the Environmental Protection Agency (EPA) Ghana.

The first assessment of the flows of wastewater from industrial and municipal sources was conducted by the Environmental Protection Agency (EPA) Ghana in collaboration with UN-Habitat. The resulting technical report presents a summary of available data on the wastewater flows but also on the pollutant loads generated and treated by industrial and domestic activities in Ghana during 2021/2022 (UN-Habitat and EPA, 2023).

Wastewater information was received from 150 facilities across the country (143 industrial and 7 urban) representing 38 per cent of the 400 targeted, using a questionnaire developed for this data collection exercise. Data from this pilot project showed that an estimated total volume of 29 million m^3 of water was consumed per year, whereas 11 million m^3 per year of wastewater was generated from 150 industrial and urban facilities, mostly by industries (85 per cent).

The 60 industries that performed wastewater treatment contributed to 63 per cent of the total wastewater generated, while the 83 that did not perform wastewater treatment contributed to only 12 per cent.

The sum of the total pollutant loads (nitrate, phosphorus, Chemical Oxygen Demand [COD] and Biochemical Oxygen Demand [BOD_5]) in the industrial and urban wastewater generated was 10,343 tons per year (t/y). Of this total, 29 per cent was BOD_5, 68 per cent COD, 1 per cent Nitrate and 1 per cent phosphorous. A load of 107 t/y of nitrate was generated with 66 t/y (62 per cent) being eliminated from the wastewater before discharge. Also, of a load of 148 t/y of phosphorous generated, 115 t/y (78 per cent) was eliminated from the wastewater before discharge. Furthermore, from a load of 3,049 t/y of BOD_5 generated, 2,379 t/y (78 per cent) was eliminated from the wastewater. Finally, of a load of 7,041 t/y of COD generated, 4,894 t/y (70 per cent) was eliminated from the wastewater before discharge (Figure 20).

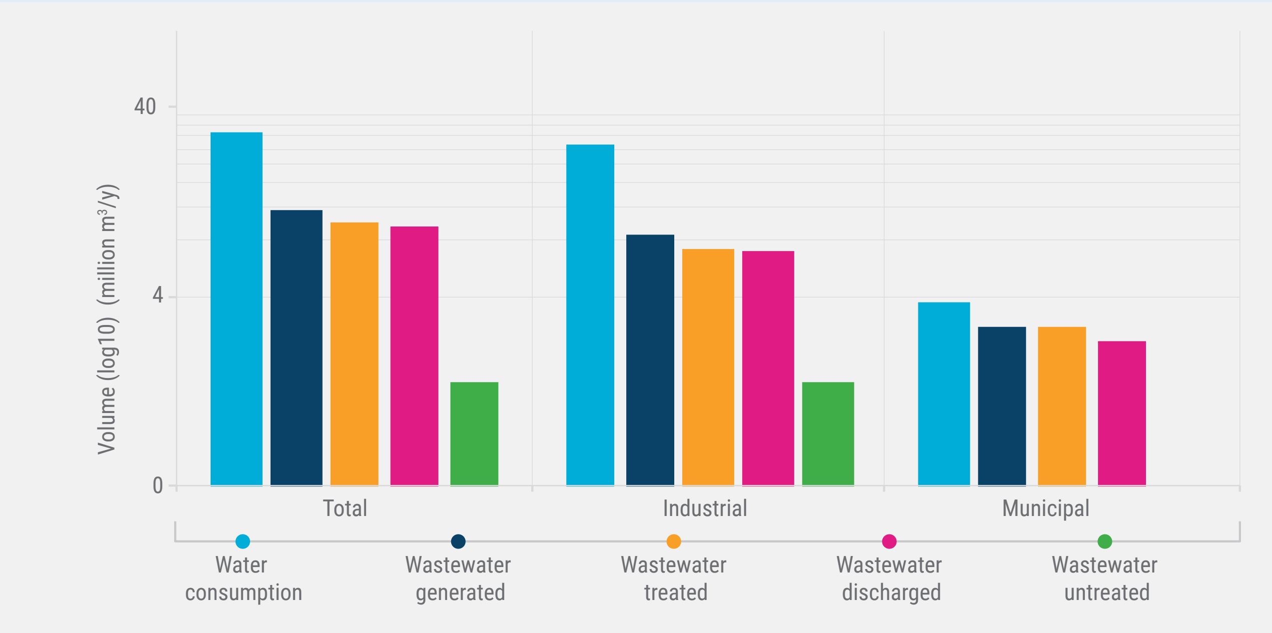


Figure 20. Estimated volumes of water consumption, wastewater generated, wastewater treated, wastewater discharged and wastewater untreated from the 150 industrial and urban facilities, in million m^3 per year.

PROPORTION OF INDUSTRIAL WASTEWATER SAFELY TREATED

The proportion of reported industrial wastewater flow treated (Figure 21) accounted for 38 per cent (8 billion m^3 of industrial wastewater safely treated divided by 21 billion m^3 of industrial wastewater generated) for the 22 countries reporting on both variables and 27 per cent for the 16 countries also reporting on safely treated industrial wastewater (3 billion m^3 of industrial wastewater safely treated divided by 3 billion m^3 of industrial wastewater generated).

By comparison, in 2015, the proportion of industrial wastewater treated accounted for 30 per cent for the 14 countries reporting on both variables and 3 per cent for the 3 countries also reporting on safely treated industrial wastewater.

Different challenges may explain the scarcity of the industrial wastewater flows reported, such as non-disclosure agreements to protect the confidentiality of company-specific information. Moreover, many industries use self-supplied water resources (e.g. rivers and groundwater) that are frequently not included in the available public statistics, which tend to focus exclusively on the public drinking water network.

Another issue relating to the monitoring of industrial flows is that institutional responsibility in the wastewater sector is often fragmented among different stakeholders (e.g. water operators and regulators, ministries of water and industry, etc.) and the various data sources are not systematically centralized by a dedicated institution using a standardized methodology.

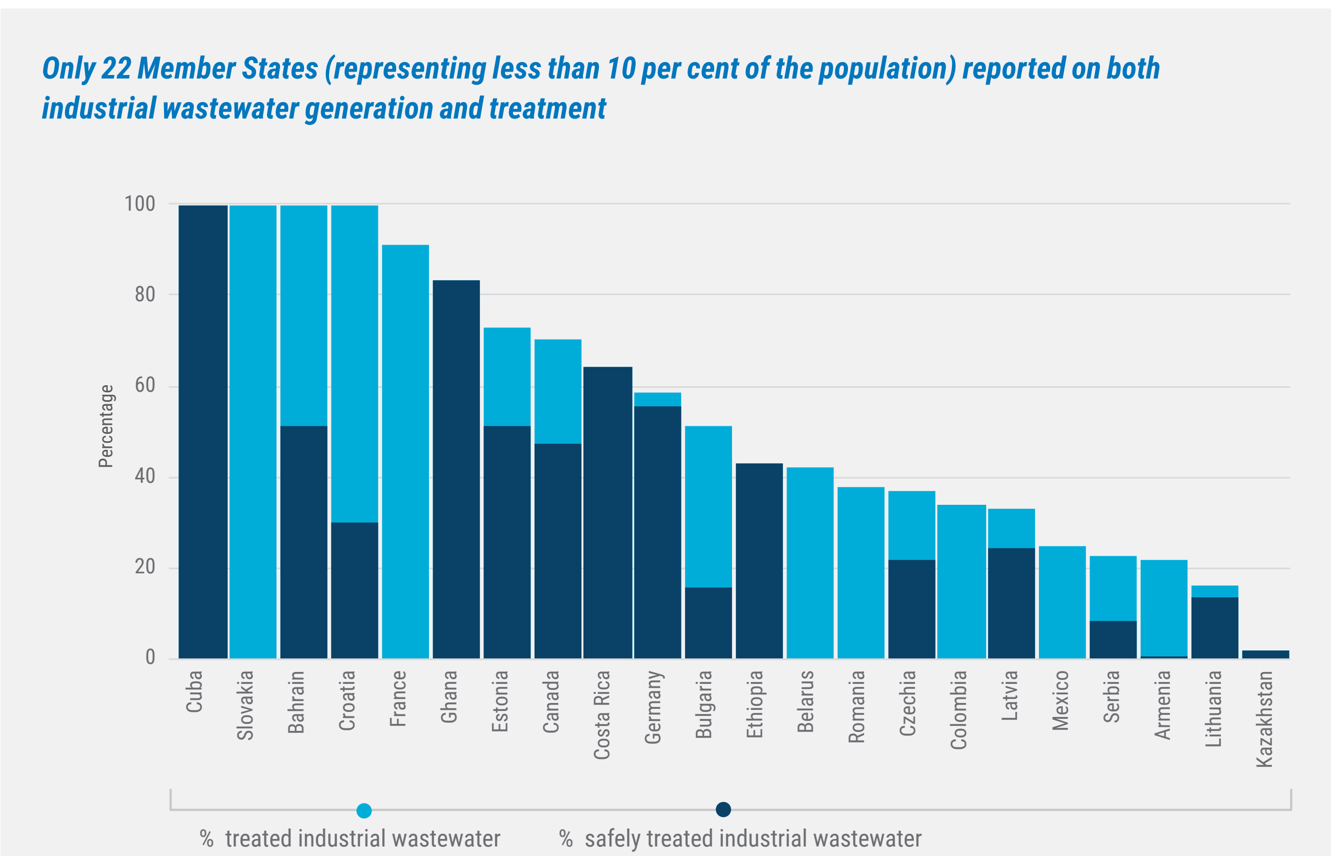
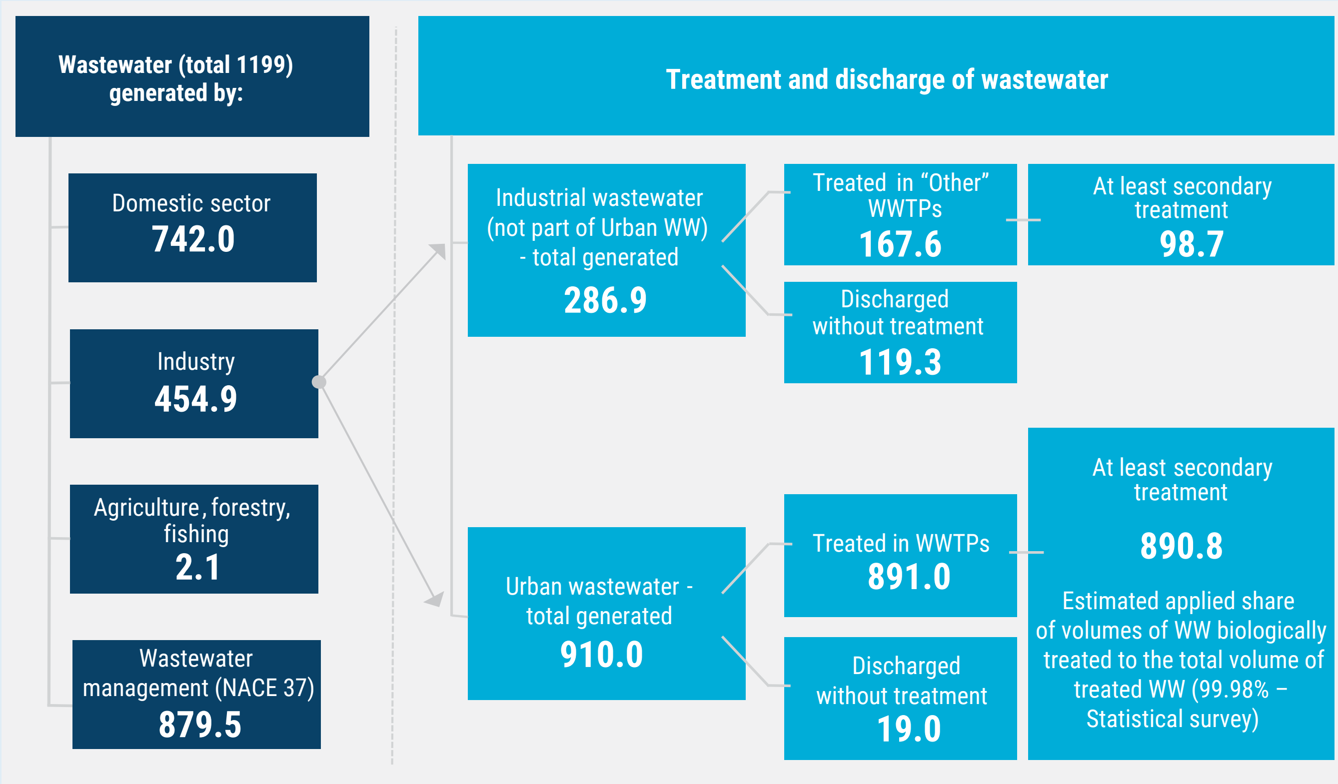


Figure 21. Proportion of industrial wastewater flows treated and safely treated (%) in 2022.

The proportions treated were rounded to 100 per cent for the three countries reporting some treated volumes that exceeded the volumes generated.

Box 8. Czechia industrial wastewater monitoring.



Finally, it is also important to mention that industrial wastewater flows can be double-counted when treated both at source (within the industrial site) and at urban WWTPs (i.e. when the treated effluent is discharged into a sewer), thereby artificially increasing the volume of wastewater treated at urban WWTPs (Box 8).

3.3. Domestic (household) wastewater estimates

Regional and global estimates for household wastewater flows have been reported for 2022 because sufficient data were compiled to compute country estimates for at least 50 per cent of countries and 50 per cent of the population in every SDG region (according to the IAEG-SDGs definition for a Tier 1 indicator). Estimates from countries with sufficiently robust data were used to impute estimates for countries without sufficient data, resulting in global and regional estimates that can be interpreted as being representative of their entire domain.

Globally, approximately 268 billion m^3 of household wastewater was generated in 2022. Estimates of the total volume of household wastewater generated were made for all 235 countries and territories covering >99 per cent of the global population. Of this total, 155 billion m^3 (57.8 per cent) was estimated to have been safely treated. Global (and regional) estimates of the proportion of household wastewater flows safely treated are presented in Figure 22 for both 2020 and 2022. The global estimate for 2022 represents an increase of two percentage points from that for 2020; however, temporal trends cannot be determined due to insufficient data. Additionally, progress towards Target 6.3 cannot be evaluated until a baseline data point has been established for 2015.

Compiled national data were sufficient to produce country estimates of the proportion and volume of household wastewater safely treated for 140 of these countries (including 129 Member States) (Figure 23)

– an increase from 128 in 2020. These 140 countries represent 92 per cent of the global volume of household wastewater generated and 89 per cent of the global population. The United States of America and China were the top dischargers of safely treated wastewater (Figure 23-A) while India and China were the top dischargers of wastewater that was not safely treated (Figure 23-B). Of the 95 countries without estimates (those that did not meet data availability requirements), representing approximately 20 billion m^3 of household wastewater generated, Indonesia was the largest (Figure 23-C). The data, calculations and sources used for all countries for which WHO has compiled at least some wastewater data (n=165), including those with country estimates (n=140), are individually presented in publicly available Excel country files.[23]

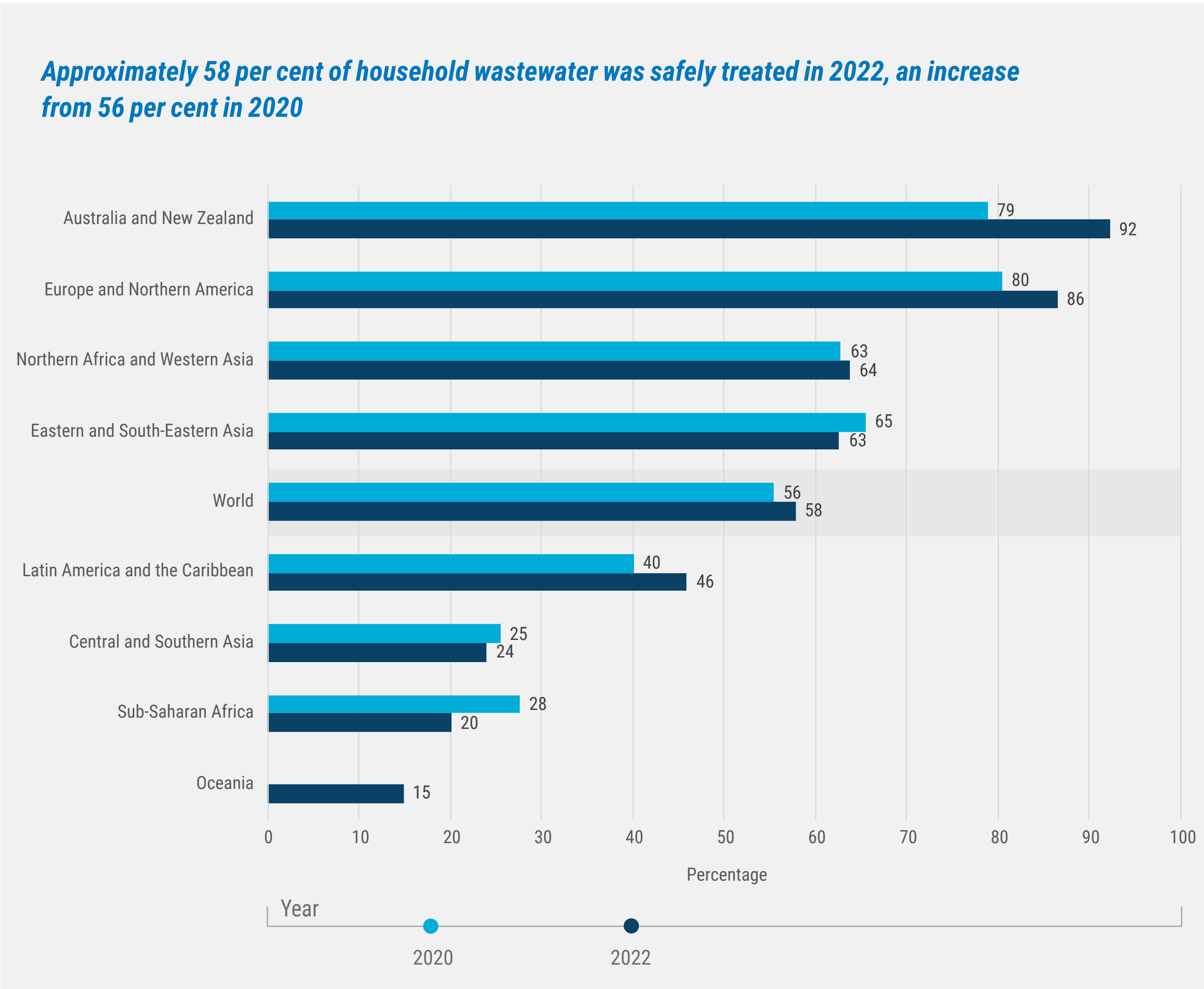


Figure 22. Estimated proportions of household wastewater safely treated, by year and region.

23 https://www.who.int/teams/environment-climate-change-and-health/water-sanitation-and-health/monitoring-and-evidence/wash-monitoring/2023-country-files-for-sdg-6.3.1.

The United States of America and China discharge a large fraction of the world's safely treated household wastewater, while India, China and Brazil are the largest contributors of flows that have not been safely treated

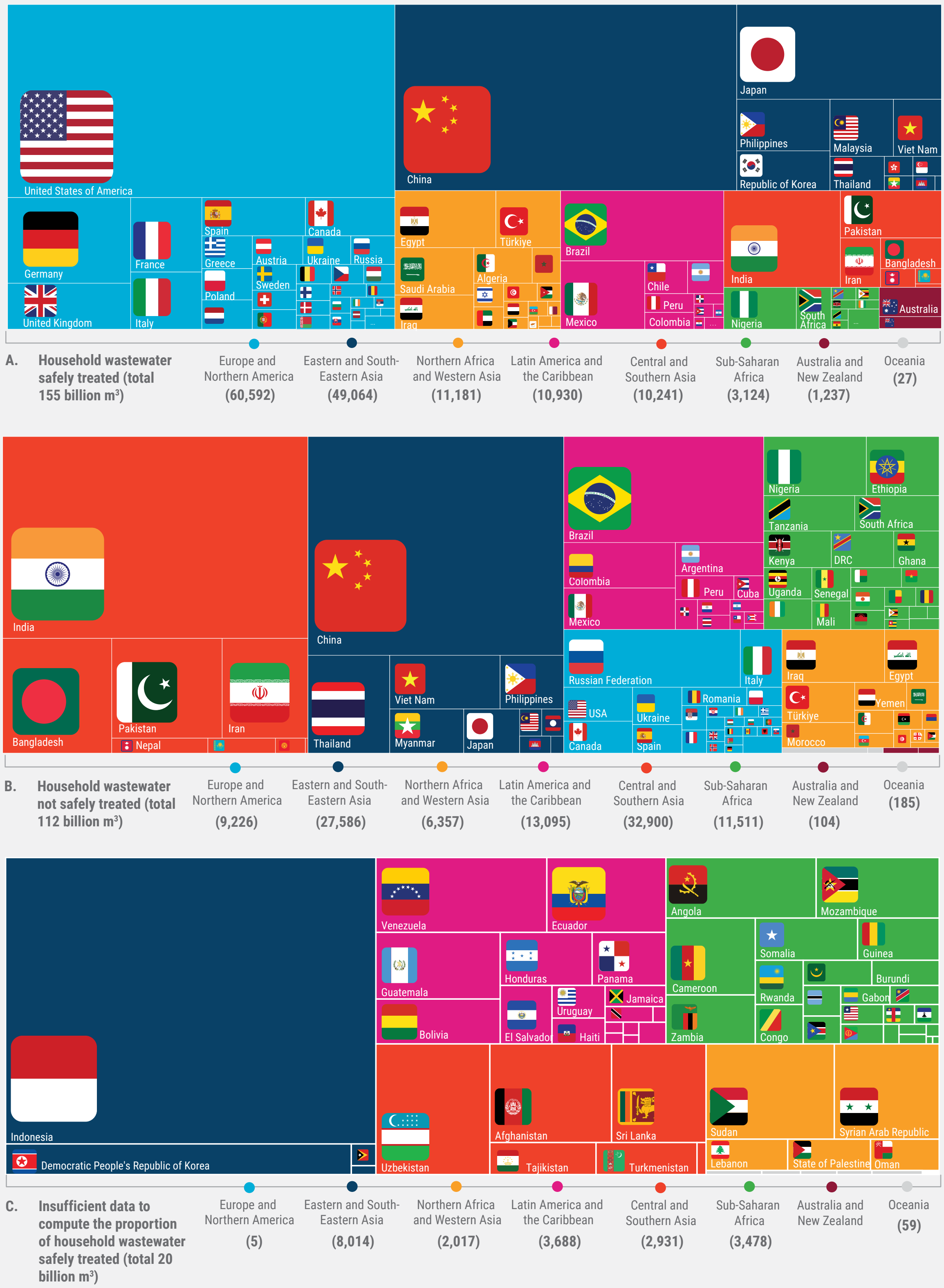


Figure 23. Proportional representation of volumes of household wastewater safely treated (A), not safely treated (B) and undefined (C), by country and region.

The "total household wastewater" bar represented in Figure 24 presents the proportion of global household wastewater flows in 2022 that were:

- delivered to treatment and subsequently safely treated (58 per cent);
- delivered to treatment but not safely treated (10 per cent);
- not safely treated because flows were not delivered to treatment (32 per cent).

As presented in the additional three bars, an estimated 57 per cent of all household wastewater flows were generated by households with sewer connections, 24 per cent by households with septic tank connections and 19 per cent by households with all other types of sanitation facilities.

Examining sewer wastewater flows alone, 82 per cent of all sewer flows were delivered to urban WWTPs and safely treated. An estimated 5 per cent of sewer flows were not delivered to urban WWTPs (presumably discharged directly to the environment) while 14 per cent of sewer flows were delivered to urban WWTPs but were not safely treated (either because only primary treatment was performed, or because the discharges did not meet compliance standards). Data on the treatment and discharge performance of sewer wastewater flows at urban WWTPs were reported for 116 countries. These data were mostly reported by technological process (primary, secondary, tertiary) (64 per cent) as opposed to compliance with relevant standards (36 per cent). The majority of data on the compliance of wastewater discharges with relevant standards were compiled from European Union countries in the context of compliance with the Urban Wastewater Treatment Directive (Box 9).

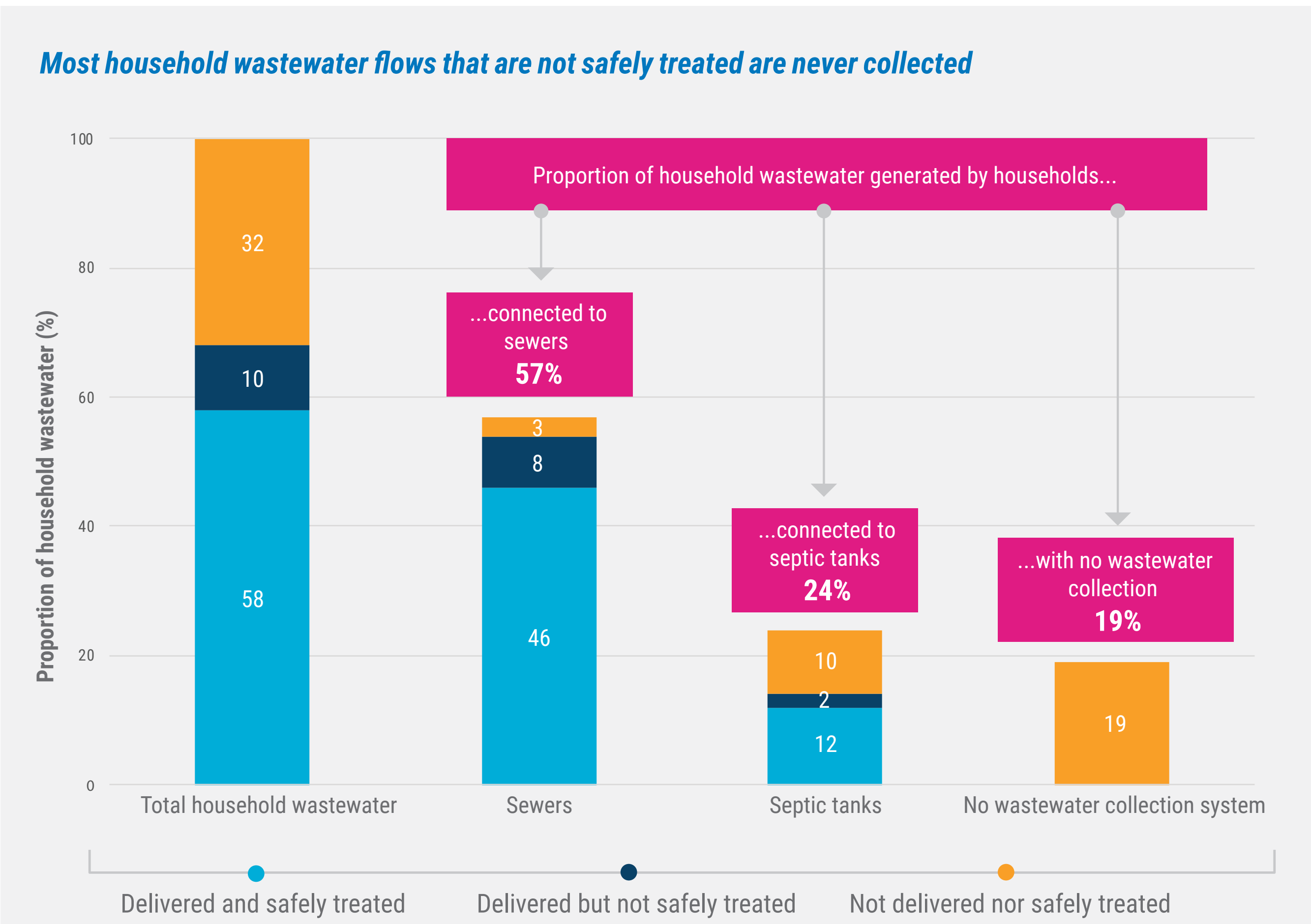


Figure 24. Breakdown of the global proportion of household wastewater flows generated, delivered to treatment facilities and safely treated by type of wastewater collection system.

Examining septic tank wastewater flows alone, 48 per cent of all septic tank flows were collected, delivered to treatment and safely treated. An estimated 44 per cent of septic tank flows were not delivered to treatment (due to not being properly contained, or associated faecal sludges being disposed of directly to the surface environment) while 8 per cent were delivered to treatment but not safely treated.

Box 9. The European Union's Urban Wastewater Treatment Directive: Progress, evolution, and future.

The European Union (EU) and its Member States ratified the Urban Wastewater Treatment Directive (UWWTD) in 1991 to regulate the discharge of urban wastewater to the environment and support the remediation of water resources and protection of public health. To achieve these aims, the directive has established three core mandates: (1) agglomerations with a population equivalent of 2,000 or more must operationalize urban wastewater collection and treatment systems; (2) standards for the concentrations of discharged organic pollution, suspended solids, phosphorus, and nitrogen must be adhered to and are defined based on agglomeration size and the sensitivity of receiving water bodies; and (3) Member States must monitor compliance with the Directive over time.

Recently, an independent evaluation concluded that the Directive has been largely successful in achieving its aims since its inception more than 30 years ago. Most Member States have achieved a high level of compliance (overall EU compliance stands at 82 per cent as of 2018). Compliance is measured through Articles 3, 4, and 5 of the Directive, correspondingly requiring that:

- All agglomerations equal to or larger than 2,000 population equivalents have requirement meeting wastewater collection systems (sewers) for urban wastewater, except where exceptions can be justified. (Article 3)
- Urban wastewater entering collection systems (sewers) are treated by at least secondary processes in accordance with mandated discharge standards. (Article 4)
- Treatment works discharging to sensitive environmental areas and serving agglomerations of more than 10,000 population equivalents are subject to more stringent treatment processes and standards. (Article 5)

Compliances associated with each of these articles for the EU are presented in Figure 25 and overall compliance levels by country are presented in Figure 26.

Within the European Union, compliance with the Urban Wastewater Treatment Directive is generally high

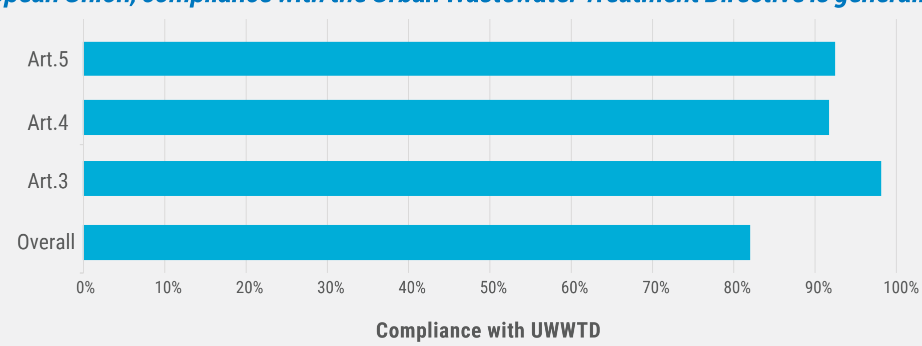


Figure 25. Overall and article-specific compliance with the UWWTD.

As a result of these achievements, organic and nutrient loadings to surface waters have been reduced, significantly contributing to the improvement of water quality and establishing a new baseline for future protection efforts. Public health is now better protected through improvement of the quality of water resources and bathing waters. One of the notable contributors to the successful implementation of the Directive has been the simplicity and clarity of the requirements and their enforcement. However, these positive developments have been partly offset by continued agricultural loadings and discharges that are not covered by the Directive. Additionally, the costs associated with implementing the Directive and achieving high levels of compliance have been substantial and at times controversial. However, the evaluation has concluded that the benefits associated with the Directive have outweighed these costs and limitations.

Compliance gaps with the European Union's Urban Wastewater Treatment Directive continue to exist in some countries

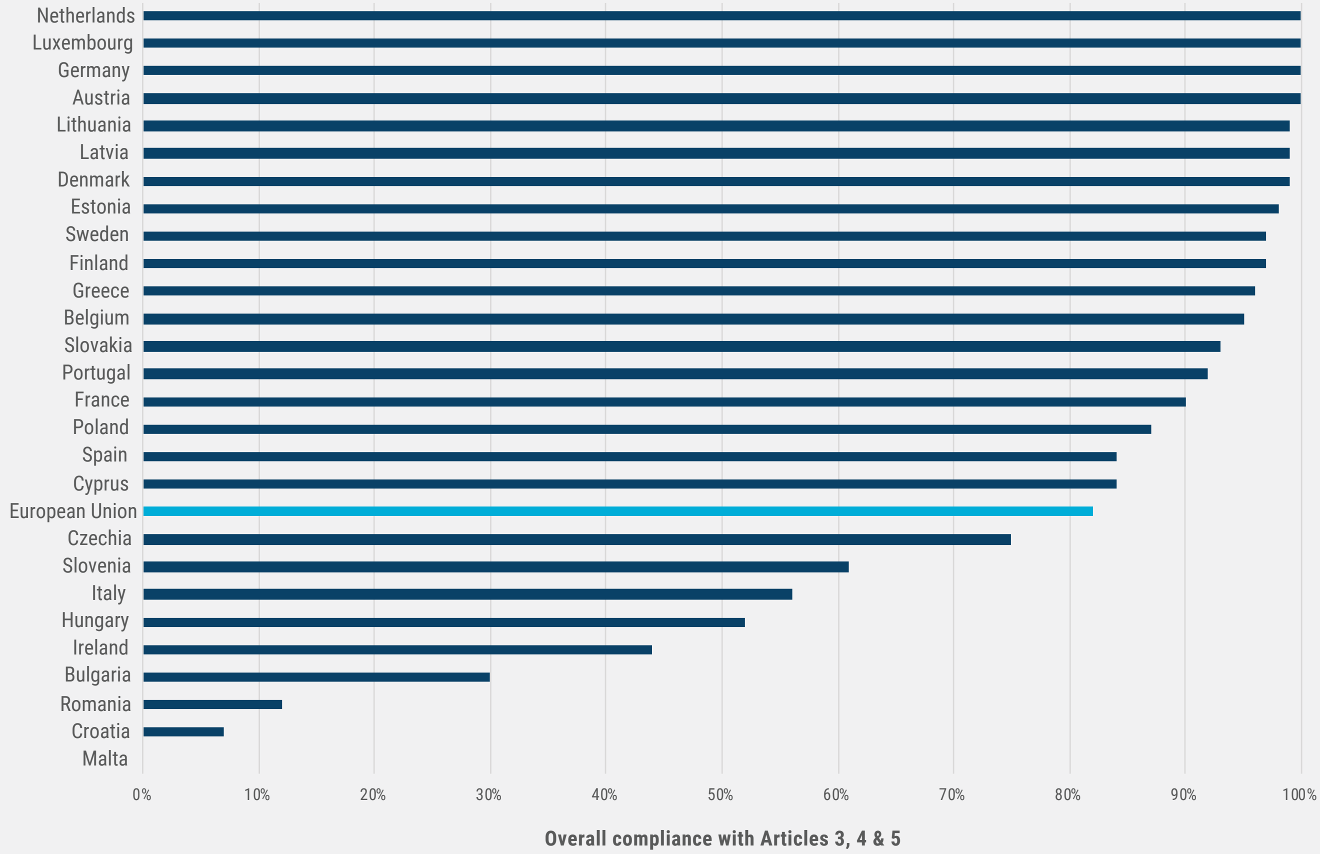


Figure 26. Overall compliance with the UWWTD by country.

Despite the success of the Directive, various challenges and outstanding issues remain. Firstly, country-level compliance gaps remain (Figure 26), particularly in Member States that have joined the EU more recently. Combined sewer overflows comprise a notable fraction of remaining non-compliant pollution loads and have not been fully addressed in the language of the Directive. Micropollutants are not fully treated by traditional technologies and represent an emerging concern – particularly mercury and those associated with pharmaceuticals and cosmetics. Contaminants concentrated in sludges (a by-product of treatment processes at treatment plants) pose risks to groundwater systems and agricultural products. A proposed revision to the Directive has been designed to address these challenges and limitations – as well as those relating to sanitation services among vulnerable communities, energy efficiency, greenhouse gas emissions, the circular economy, and implementing a "polluter pays" principle to industry. The provisions and language associated with the revision is being debated and agreed among Member States.

Figure 27 shows a proportional flow diagram of household flows through each node of the conceptual framework: collection, delivery to treatment, treatment and discharge. Globally, most household wastewater is collected in sewers, delivered to urban WWTPs and safely treated, as represented by the thicker bars along the top of the figure. A very small proportion of sewer flows are directly discharged into the environment (potentially an underestimate, as this is not a commonly reported variable) while a more sizable proportion is not safely treated at urban WWTPs (either because it is treated by primary processes alone, or because it does not meet discharge compliance standards).

Among non-sewer flows, approximately half were not collected in septic tanks (disposed of directly into the environment or into a pit latrine) and were not treated. For septic tank flows, a small majority was not delivered to treatment (associated with septic tanks that contaminate the surface environment or those associated with faecal sludges that are unsafely disposed of) while a slight minority was delivered to treatment (with liquid and solid fractions remaining onsite, or solid fractions emptied and delivered to a treatment plant). Among flows delivered to treatment, a small fraction was not safely treated (associated with flows that were delivered to treatment plants but not safely treated). While the solid fraction (faecal sludge) is commonly delivered to centralized treatment plants (including urban WWTPs), the flow diagram presents the directional flows of the liquid fraction only (which are classified based on the solid fraction).

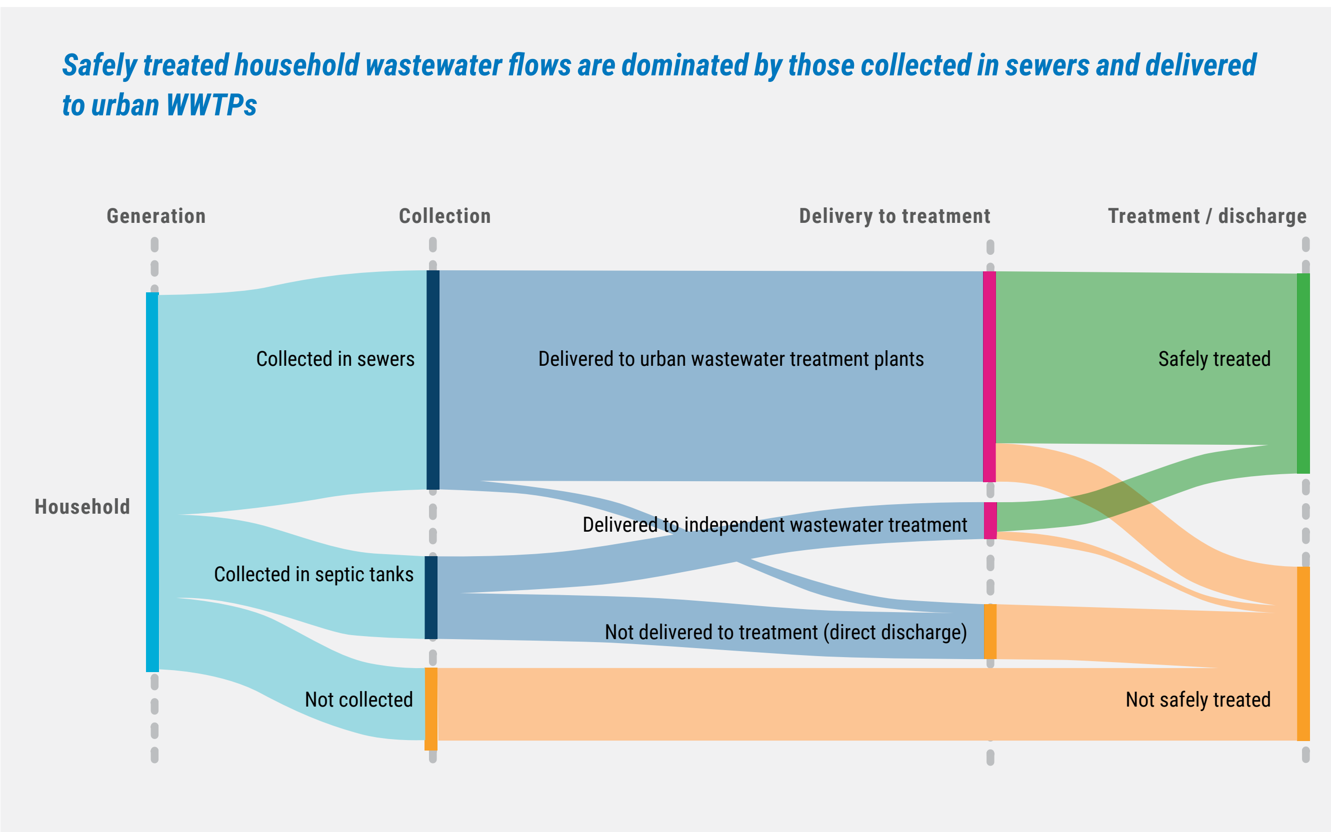


Figure 27. Proportional representation of global household wastewater flows in 2022 through the stages of the conceptual framework.

Figure 28 presents a map of the countries where estimates of the proportion of household wastewater safely treated could (n=140) and could not (grey; n=95) be computed based on data availability.

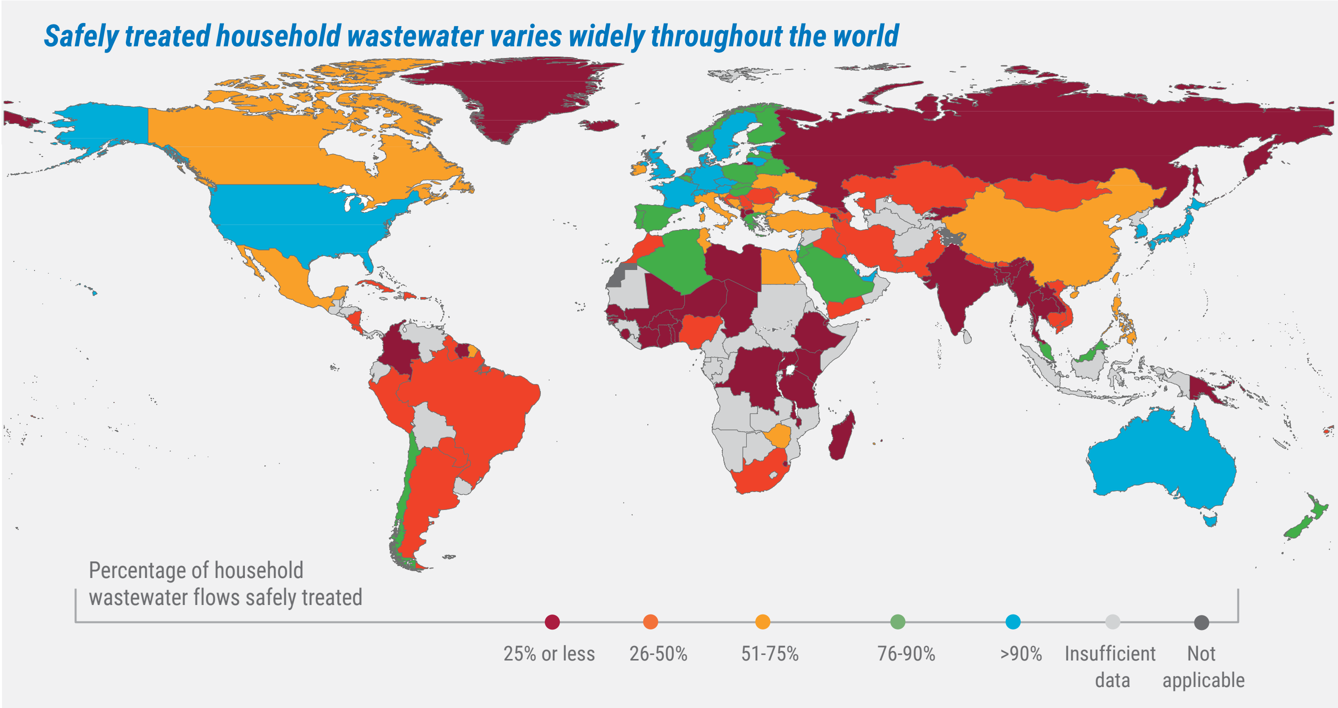


Figure 28. Estimated proportions of household wastewater safely treated by country (2022).

Figure 29 presents the breakdown of household wastewater collection across the domains of sewer, septic tank and not collected, and by SDG region. In Australia and New Zealand, Northern America and Europe, Latin America and the Caribbean, and Western Asia and Northern Africa, the majority of household wastewater flows are collected in sewers. Septic tanks serve approximately one third of the population in Eastern Asia and South-eastern Asia, Central and Southern Asia, Oceania and sub-Saharan Africa. Roughly half of household wastewater is not collected in Central and Southern Asia, Oceania and sub-Saharan Africa.

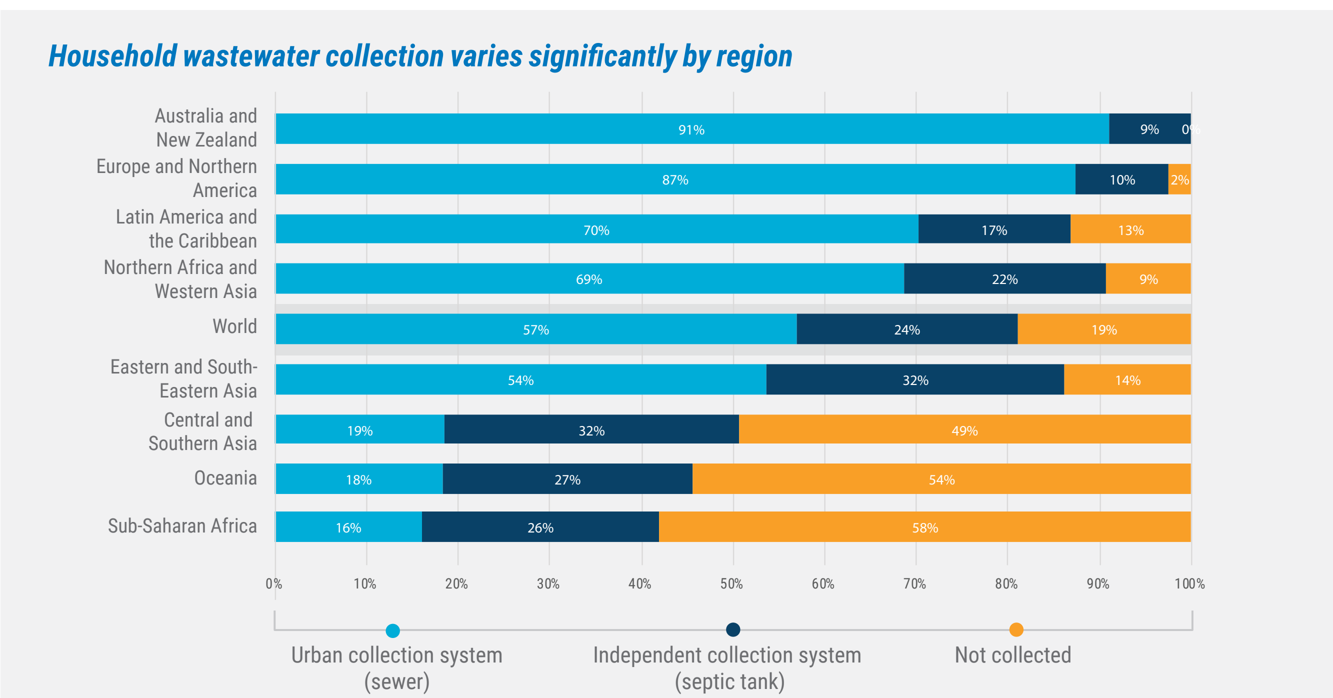


Figure 29. Proportions of household wastewater collected, by collection type and SDG region.

4. Status and progress of SDG Indicator 6.3.1

4.1. Total and industrial wastewater statistics

STATUS AND STRATEGY

The 2021 indicator report, which focused on the 2015 record for total and industrial flows and presented the most complete data coverage over the last decade, also coincided with the beginning of the 2030 Agenda. The 2015 baseline showed that there was no official information available on the proportion of total wastewater treated for 80 per cent of the world's population, nor on the proportion of industrial wastewater treated for 95 per cent of the world's population, based on the statistics directly reported to the relevant international databases (UN-Habitat and WHO, 2021).

In order to better populate the SDG Indicator 6.3.1, over the last three years, UN-Habitat has worked on three complementary approaches to improve the quantity but also the quality of the worldwide wastewater statistics:

- Regular online meetings with the two other custodians United Nations Agencies (UNSD and WHO) also involving OECD and Eurostat focal points, to better align their wastewater questionnaires with the SDG 6.3.1 metadata and thus coordinate the data collection and validation effort.
- Identification of countries' overall and technical focal points continuously updated in the United Nations Water (UN-Water) SDG 6 database (almost 200 focal points have been identified for this part of the indicator).
- Organization of five series of webinars in Africa, the Arab States, Asia, the Caribbean and Latin America, involving more than 100 countries and 141 water and sanitation utilities; which were followed by wastewater data collection exercises conducted with the regional co-organizers and which led to the publication of a policy brief (UN-Habitat, 2023) (Box 10).

Box 10. Policy brief on setting the agenda for safe and sustainable wastewater management and monitoring in the context of the SDGs.

In 2020–2023, UN-Habitat partnered with regional water associations, operators and regulators, ministries, development partners, academic, public and private sectors, to organize a series of five regional webinars on "Setting the Agenda for Wastewater Treatment and Monitoring in the Context of the SDGs" in Africa, the Arab Region, Asia and the Caribbean and Latin America. High-level webinars were finally organized in each region to advocate for the importance of wastewater monitoring to decision-making in investment and policy development.

The objective of this initiative was to build awareness of some of the most critical aspects of wastewater management and to support countries in reporting wastewater statistics at national level in order to improve global monitoring of SDG indicator 6.3.1. This initiative builds on the commitment made at the UN 2023 Water Conference (Box 1) and on the outcomes of the series of webinars, which explored regional practices on wastewater monitoring and discussed how to strengthen policy development and decision-making for investment in wastewater management.

These webinars involved more than 100 countries and 141 water and sanitation utilities, regional water associations, regulators, line ministries, development partners, academic institutions and others from public and private sectors. They were followed by data-collection exercises conducted by the regional co-organizers to support national institutions in their efforts to report more accurately on SDG Indicator 6.3.1 and enhance water and wastewater monitoring worldwide.

The outcomes of these webinars were published in a policy brief (UN-Habitat, 2023) providing the rationale for fostering integrated and transparent, participatory and accountable wastewater management at local and national levels, to generate synergies and important environmental and economic benefits and to promote further actions for ensuring sustainable and equitable water resources management.

This publication presents the outcomes and key recommendations of the series of webinars, with the aim of increasing understanding and awareness of the positive impacts that improved wastewater management and monitoring can bring to vital sectors, including institutional capacity and governance, environmental and public health, climate change adaptation and mitigation, increasing urbanization and water security, and policy planning and investment.

PROGRESS AND TARGET

The 2023 data drive has led to the collection of the data presented in this report, which are summarized in Table 4 and Figure 30; 107 countries reported some wastewater statistics for 2022 (compared to 69 in 2015). The ratio for total wastewater treated can be calculated for 73 countries (compared to 42 in 2015) and the ratio of total "safely" treated wastewater for 42 countries (compared to 15 in 2015). The ratio of industrial wastewater treated can be calculated for 22 countries (compared to 14 in 2015) and the ratio of "safely treated" industrial wastewater for 16 countries (compared to 3 in 2015).

These results show an almost doubling of the number of reporting countries between the 2021 and 2024 indicator reports. Although the number of countries reporting some wastewater statistics is relatively high for 2022: 107 countries (representing 73 per cent of the world population), the indicator which requires flows of wastewater treated but also generated to calculate the proportion treated, could only be calculated for 73 countries (representing 42 per cent of the world population).

However, based on the observed progress, it is likely that for the next indicator report in 2027 (following the 2026 data drive) UN-Habitat will succeed in acquiring additional country data, bringing total representation up to more than 50 per cent of the population and 50 per cent of countries for the proportion of wastewater treated, so that the indicator could be eventually classified as Tier 1 (defined as: "Indicator is conceptually clear, has an internationally established methodology and standards are available, and data are regularly produced by countries for at least 50 per cent of countries and of the population in every region where the indicator is relevant").

Substantial progress was achieved from 2015 (baseline) to 2022 in statistics reporting

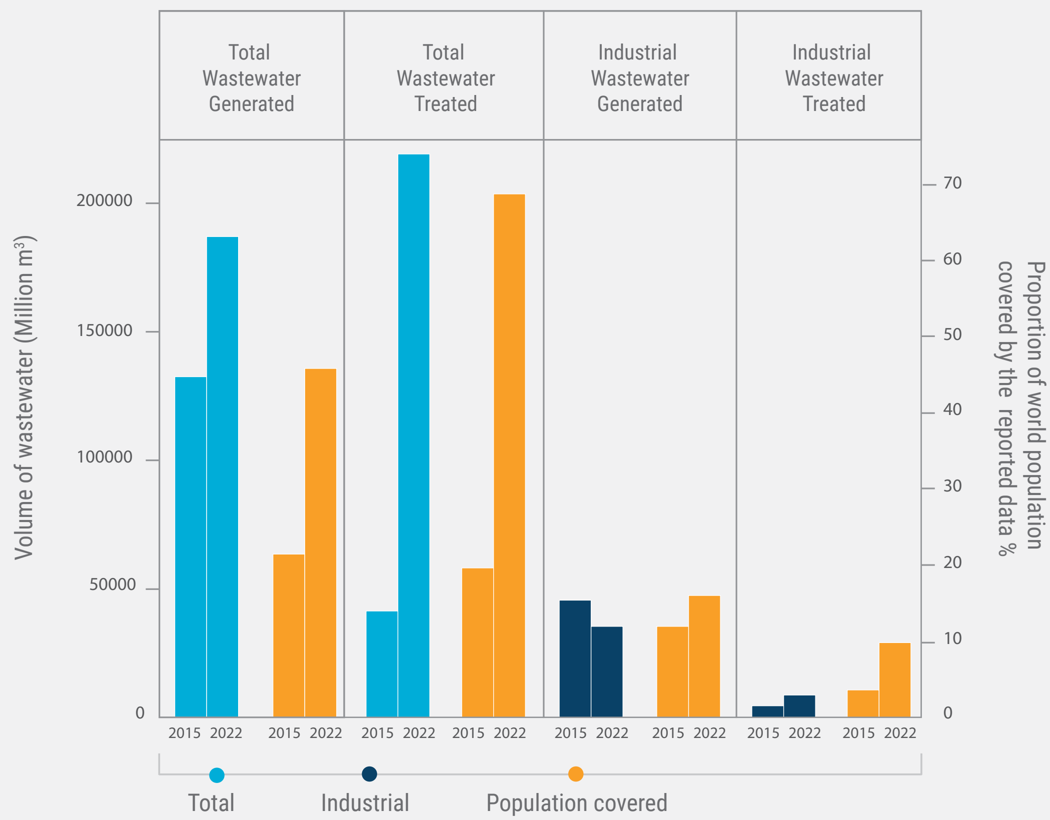


Figure 30. Comparison of data collected for the 2021 and 2024 reports.

Total (in light blue) and industrial (in dark blue) flows of wastewater generated and treated (in million m^3) in 2015 and 2022 (left y-axis), with the corresponding world population covered by the reported data (in orange, right y-axis). The temporal changes reflect changes in data collection not changes in wastewater management.

Table 4. Comparison of wastewater statistics collected in 2021 and 2024 for the SDG 6.3.1 Indicator report.

	2021 INDICATOR REPORT BASED ON 2015 DATA			2024 INDICATOR REPORT BASED ON 2022 DATA		
	Number of reporting countries	% of population	Volume (billion m^3) or proportion treated (%)	Number of reporting countries	% of population	Volume (billion m^3) or proportion treated (%)
Wastewater statistics	69			107	73.2	
Total wastewater generated	56	21.5	131.871	85	46.0	187.024
Industrial wastewater generated	32	12.0	45.311	49	16.0	35.963
Total wastewater treated	57	19.6	41.643	95	68.7	219.612
Total wastewater safely treated	25	7.1	5.839	56	17.8	58.287
Industrial wastewater treated	15	3.5	4.296	27	9.6	8.293
Industrial wastewater safely treated	3	0.004	0.121	17	5.2	2.799
% Total wastewater treated	42	17.9	32.5	73	41.6	75.7
% Total wastewater safely treated	15	6.1	17.1	42	12.0	60.0
% Industrial wastewater treated	14	3.5	29.9	22	7.9	37.6
% Industrial wastewater safely treated	3	0.004	2.8	16	4.4	26.5

4.2. Domestic (household) wastewater estimates

Reporting frequency and coverage over time. The performance of household wastewater flow monitoring under Indicator 6.3.1 has been strengthening with each progress update, but challenges and limitations remain. In the 2018 (pilot), 2021 and 2024 progress reports, estimates of the proportion of household wastewater safely treated were produced for 79, 128 and 140 countries respectively (including for 75, 116 and 129 United Nations Member States). Estimates associated with this latest update represent nearly all of the world's largest generators of household wastewater (with the notable exception of Indonesia) – covering 92 per cent of all household wastewater flows.

Time series estimates. While there have been some cases of data quality, completeness, and interpretation affecting the consistency of individual country estimates between the 2020 and 2022 estimates (Annex 4), the monitoring methodology being employed by WHO largely appears to be producing coherent and consistent results. The potential for significant temporal variability remains a product of the "snapshot" methodology that relies on the use of the most recent data point for each variable within a time window of 10 years from the year of reporting. With the continued strengthening of the WHO household wastewater database and the temporal data series for the variables in the conceptual framework, WHO anticipates that the next progress update will include time series estimates from 2015 onwards.[24] Time series estimates will allow – for the first time – an assessment of progress against Target 6.3 of halving untreated wastewater discharges by 2030 (in comparison to 2015 levels) for the household wastewater component of the indicator.

Assumptions. One additional and notable source of potential inaccuracy in the estimates is associated with the standard assumptions used to populate variables without officially reported data.

Figure 31 presents, for each variable, the number of countries (among those for which estimates were published) whereby the standard assumption was employed. The analysis is presented separately for sewer and septic tank dominant countries, for which there are different minimum data reporting requirements that must be satisfied to compute and publish a country estimate. A summary of the variables for which the assumptions are most influential (and potentially most detrimental if they are far from the true national situation) is given as follows:

- Water use has an influence on the calculation of the total volume of household wastewater generated, but no influence on the proportion safely treated. The standard assumption for water use among households with an onsite water supply is 120 litres/capita/day. By comparison, the median water use reported by countries (n=41, mostly higher income countries) was 135 litres/capita/day. However, countries that use larger quantities of water may be more likely to report such data.
- The variable for the water use to wastewater conversion ratio employs a standard assumption of 80 per cent, but may vary in different contexts and at different times of the year - particularly where the watering of lawns and gardens may be more common (whereby water used by a household does not result in wastewater generated).
- Sewer wastewater flows that are not delivered to urban WWTPs – such as sewer overflows and direct sewer discharges to the environment – are difficult to assess as they are typically not directly measurable. WHO commonly uses population-based estimates as a proxy for delivered volumetric flows (based on the ratio of the proportion of the population connected to sewers to the proportion of those connected to WWTPs). The median reported proportion of sewer wastewater delivered to WWTPs (n=83) was 98 per cent, while the standard assumption is 100 per cent. The average proportion however is 80 per cent, indicating that there are outlier countries where the proportion of sewer wastewater delivered to urban WWTPs is very low. The proportion of sewer wastewater flows delivered to WWTPs is not a variable for which reported data must be present for sewer dominant countries, in order to compute a country estimate.
- Aspects of septic tank containment and pit emptying are being increasingly included in household surveys, but remain uncommon in some regions, and particularly among higher income countries where non-sewered sanitation is less common. Average and median reported data for these variables are presented alongside their standard assumptions in Table 5. The standard assumptions associated with containment and septic tanks emptied by a service provider are moderately lower and higher, respectively, than the corresponding reported data. These differences may result in an underestimation of the proportion of septic tank wastewater flows classified as safely treated in countries where they are applied. The frequency of data on septic tank containment is expected to continue to increase significantly in the future.[25]

24 Represented by annual estimates of the proportion of household wastewater safely treated over a fixed linear time period, based on data for specific years across the time period

25 Containment-related questions have recently been added to the standard Multiple Indicator Cluster Survey (MICS) household questionnaire, which has been employed in over 100 countries around the world.

Table 5. Comparison of septic tank emptying assumptions and reported data.

VARIABLE	STANDARD ASSUMPTION	REPORTED DATA		
		MEDIAN	AVERAGE	N
Containment	50%	83%	73%	24
Septic tank faecal sludge…				
…emptied and buried onsite	0%	4%	6%	63
…emptied and discharged unsafely	0%	3%	9%	62
…emptied and removed offsite	50%	22%	31%	85
…not yet emptied (in-situ)	50%	70%	62%	82

WHO plans to further examine and refine the standard assumptions themselves and their overall influence on the proportion of global flows as part of the development of the next progress report. However, there is no clear and apparent need to urgently revise the standard assumptions being applied, neither the protocol for when assumptions can and cannot be employed (refer to the methodological note for further details) nor the assumptions themselves.

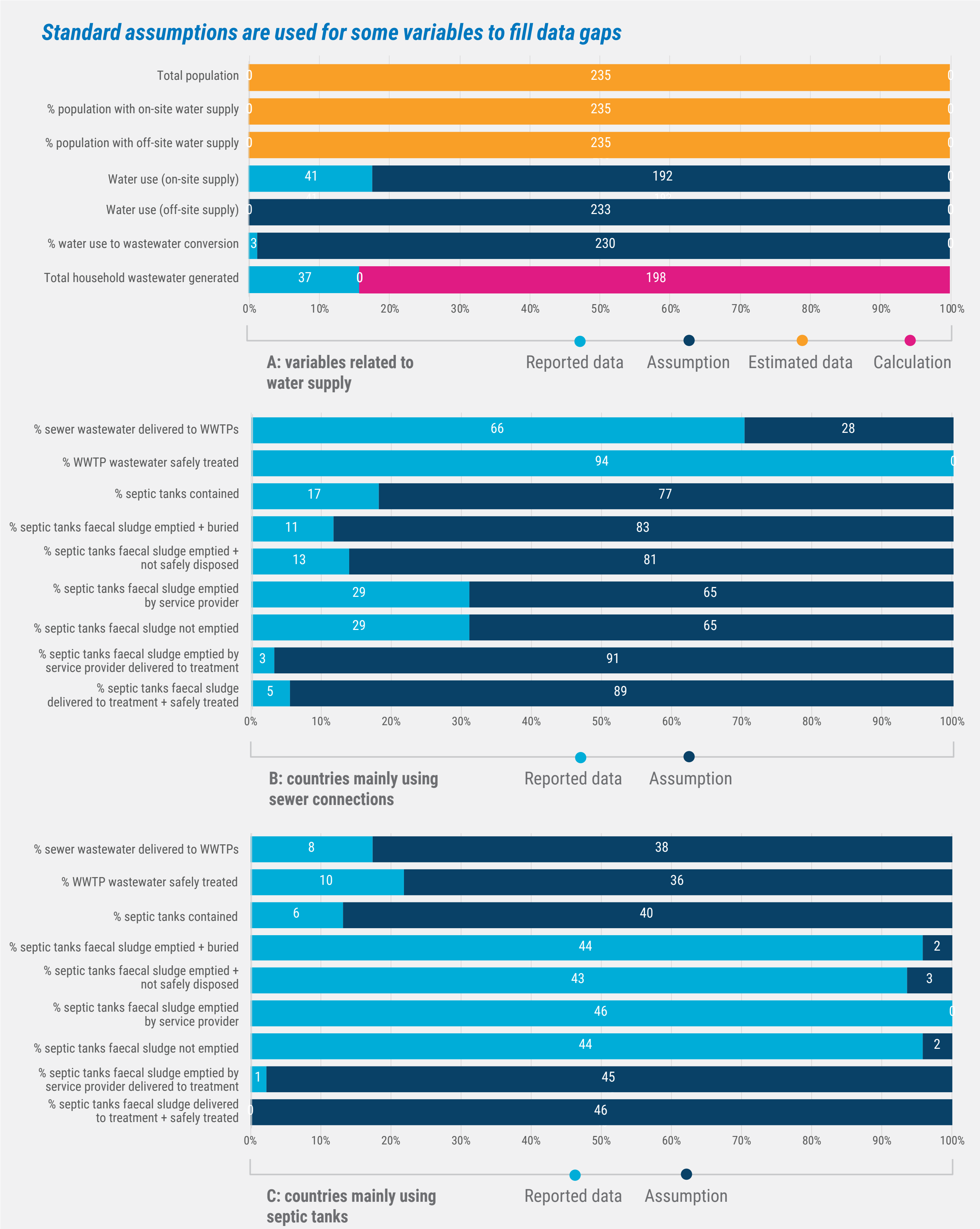


Figure 31. Number of countries with domestic wastewater estimates for which standard assumptions were employed, by data input variable and country type (sewer or septic tank dominant).

5. Two examples of SDG Target 6.3 cross-cutting issues

5.1. Total and industrial wastewater reuse and climate change adaptation and mitigation

CONTEXT

Climate change is strongly affecting the availability and the distribution of our limited freshwater resources, with the majority of the world's population being increasingly exposed to water scarcity and water shortage situations, floods and extreme rainfall events. In parallel, the growing population is constantly increasing the demand for freshwater withdrawals for agriculture (70 per cent), industry (20 per cent) and domestic (or centralized) uses (12 per cent) (United Nations, 2024), whereas the amount of water stored in large natural lakes and reservoirs has decreased over the past three decades (Yao et al., 2023).

An urgent paradigm shift towards promoting safe wastewater reuse is strongly needed to contribute to sustainable development and climate change mitigation and adaptation. Safe wastewater treatment and reuse can indeed significantly increase freshwater resources availability while protecting its quality, whereas improved wastewater treatment and resource recovery can reduce the important amounts of energy consumed in treatment processes, as well as some direct greenhouse-gas (GHG) emissions by the wastewater sector.

Although not currently monitored by SDG Indicator 6.3.1, safe wastewater reuse is called for in the language of 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"* – to respond to growing water demands, increasing water pollution loads and increasing climate change impacts on freshwater resources (UN-Water, 2017).

There is to date an overall lack of knowledge and accounting of the global volumes of wastewater reuse directly reported by United Nations Member States, as well as an urgent need to better monitor wastewater reuse at local and regional level, in order to adapt to climate change impacts on the water cycle, growing water demands, and to better protect biodiversity and ecosystems.

This section presents the justification to monitor wastewater reuse, using the countries' responses to the questionnaires which serve as the primary data sources (UNSD/UNEP and OECD/EUROSTAT; Figure 3) for monitoring SDG Indicator 6.3.1; with the objective to include this supplementary variable as part of a future revision of the SDG 6.3.1 indicator metadata.

WASTEWATER REUSE TO ADDRESS WATER QUANTITY AND QUALITY CRISIS

Water stress already affects more than half of the global population who live under conditions of severe physical water scarcity for at least one month per year (Mekonnen and Hoekstra, 2016). There is no doubt that human pressures on water resources are increasing. Although water withdrawals will likely increase, the promotion of alternative sources can reduce the stress. One opportunity is the reuse and recycling of wastewater. This will require additional investments in treatment and improved infrastructure, as well as supportive policy and legislative frameworks, to facilitate reuse. Additionally, wastewater reuse for irrigation and within industrial sectors could also reduce dependency on limited freshwater resources.

In addition to an increasing water demand, the world also faces an invisible crisis of water quality which is eliminating one-third of potential economic growth in heavily polluted areas, and threatening human and environmental well-being (Damania et al., 2019; Wilkinson et al., 2022). In absence of regulation and clean water supply, irrigation water contaminated by wastewater is frequently used in urban and peri-urban agriculture for the production of vegetables, despite obvious health risks to the farmers and consumers (FAO, 2019). Water-intensive industries can also reduce their freshwater use by reusing wastewater. This can be accomplished by closed-loop in-house recycling (which is not reflected in reported data). In some cases treated wastewater can be shared between co-located industries.

There is therefore an urgent need for greater investment in wastewater treatment and safe reuse, through urban WWTPs and decentralized independent wastewater treatment systems; particularly in heavily populated and water stressed areas of the developing world and where intensive livestock/crop production systems, or water-intensive industry, can put at risk subsistence water uses and essential economic activities (Jones et al., 2022).

Achieving these goals on wastewater treatment and reuse requires an integrated approach across water-related authorities and sectors, as well as a supportive policy and legislative environment. Implementing integrated water resources management (IWRM, SDG Indicator 6.5.1) is critical to ensure that wastewater treatment and reuse reaches its full potential for supporting the achievement of SDG 6 and other water-related targets (UNEP, 2024). Unfortunately, more than 45 per cent of countries report limited pollution control measures (Figure 32).

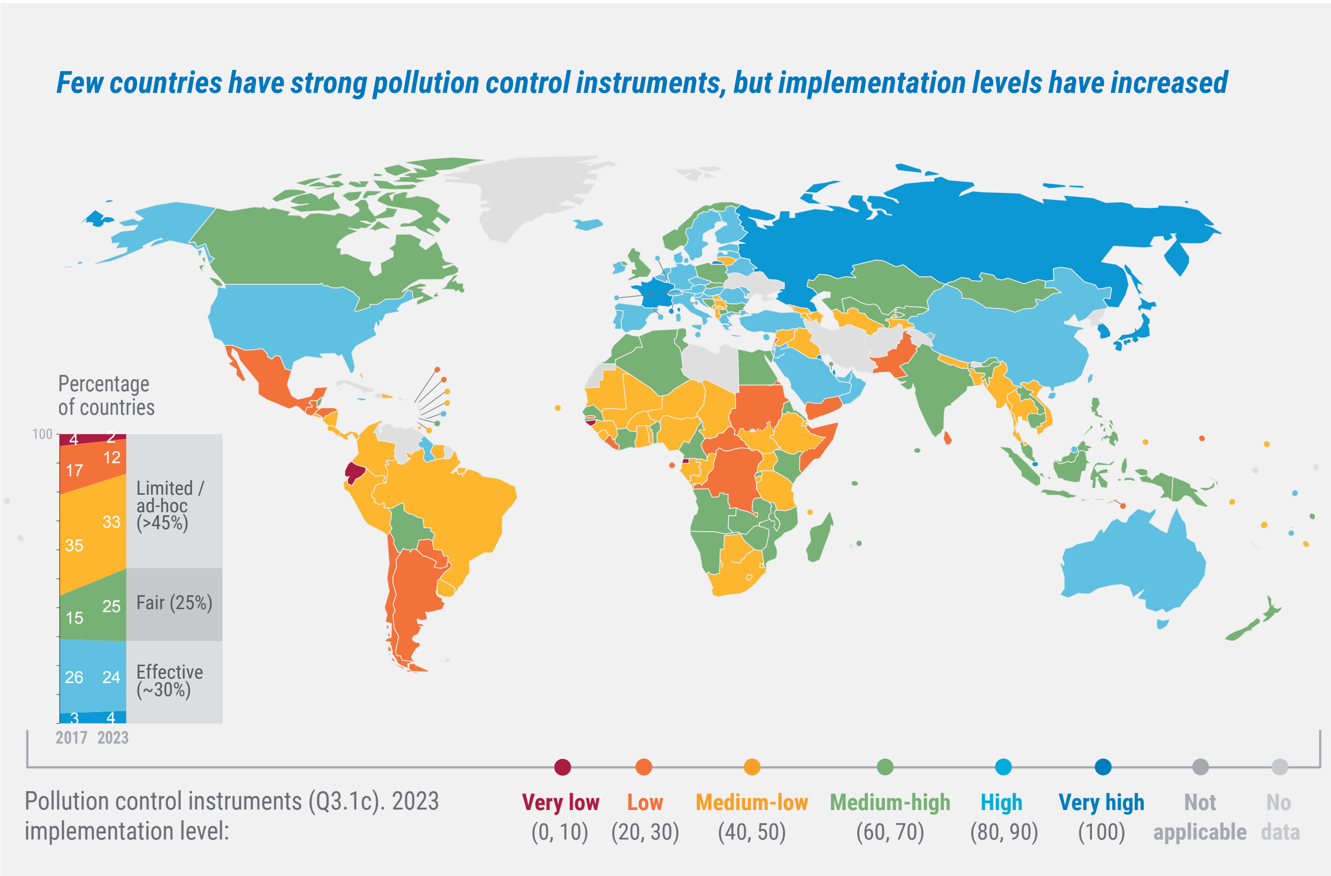


Figure 32. Management instruments for pollution control.

(SDG 6.5.1, UNEP, 2024)

WASTEWATER REUSE AND ITS INTERLINKAGES WITH CLIMATE CHANGE MITIGATION AND ADAPTATION

As global warming increases, the frequency, severity and duration of droughts, increasing water-use efficiencies will be key to reducing the threat posed by water scarcity on biodiversity and human welfare and sustainable development (Mekonnen and Hoekstra, 2016). Under future climate change scenarios, in which freshwater supplies will become more stressed, the discharge of treated wastewater into receiving streams with reduced wastewater dilution capacity may become even more crucial to maintaining ecosystem health and environmental flows.

While wastewater reuse is decisive for global climate warming adaptation, considering that climate change is exacerbating both water scarcity and water-related hazards such as droughts, there are also additional strong interlinkages between wastewater treatment reuse and climate change mitigation strategies. The energy consumption of the water sector worldwide corresponds for instance to 4 per cent of total global electricity consumption and wastewater treatment alone represents roughly a quarter of the water sector's electricity consumption (IEA, 2017). Nevertheless, the wastewater itself contains significant amounts of embedded energy that could provide most of the electricity required for urban wastewater treatment, or even more energy than is required for its treatment.

Sanitation and wastewater systems not only contribute to GHG emissions during treatment processes, but also directly through the breakdown of excreta discharged into the environment (Dickin et al., 2020; IPCC, 2006). The degradation of organic matter during wastewater treatment contributes to approximately 1.6 per cent of global GHG emissions and 5 per cent of global non-carbon dioxide GHG emissions, while re-envisioning wastewater treatment could offset the industry's GHG footprint and make it a globally significant contributor of negative carbon emissions (Lu et al., 2018).

Improved wastewater management and treatment could therefore significantly contribute to the reduction of carbon dioxide (CO_2), nitrous oxide (N_2O) and methane (CH_4) emissions from the wastewater treatment sector. Valorization of the large and increasing quantities of sewage sludge produced worldwide could furthermore represent an important local, sustainable and renewable energy source, producing biogas for process heating or onsite electrical generation, or to be used as a building material and in the composition of concrete.

GLOBAL MONITORING OF WASTEWATER TREATMENT AND SAFE REUSE: CHALLENGES AND OPPORTUNITIES

Improving wastewater management and reuse is a complex challenge, but many countries worldwide have experience to build on and scale up: solutions can be adapted to different socioeconomic and environmental contexts. With the right policies, it has been suggested that wastewater could provide alternative energy to half a billion people, supply over 10 times the water provided by the current global desalination capacity and offset over 10 per cent of global fertilizer use (UNEP, 2023).

Concerning reuse options, agriculture is by far the most important in terms of volume, because it is the activity that demands the most water worldwide. This reuse is expected to increase because the potential to reuse wastewater is still high (even agricultural reuse only represents <1 per cent in volume of the total water demand of the sector; Jiménez and Takashi, 2008). Reusing nitrogen, phosphorus and potassium from wastewater would also help reduce dependence on synthetic fertilizers, offsetting approximately 13 per cent of the global agricultural nutrient demand (UNEP, 2023).

Recycling, safe water reclamation and reuse need, however, to be regulated and aligned with national quality standards or international guidelines; the WHO guidelines for the safe use of wastewater, excreta and greywater in agriculture and aquaculture, for instance (WHO 2006). However, in contrast to potable water, wastewater reuse has no universal standards. There are three reasons for this: (1) it can cover very different uses; (2) it is a relatively recent human practice and (3) it has been developed locally in different ways to address specific needs that are difficult to extrapolate to other conditions (Jiménez and Takashi, 2008).

In the absence of a standardized definition of safe wastewater reuse, in which the required levels of treatment would have to correspond to the level of risk to human health and the environment of the specific type of reuse, it is very challenging to define compliance standards with the aim of reporting on a common definition of wastewater reuse at global level. The environmental and health hazards associated with the widespread presence of persistent micropollutants in (treated) wastewater streams (e.g. heavy metals, herbicides, pesticides, pharmaceuticals and hormones) are indeed difficult to consider regarding the dilution in the receiving systems and the safe reuse options.

The global reporting of national wastewater reuse flows within SDG Target 6.3 could therefore initially be monitored through two quantitative components: untreated (direct reuse) and treated (indirect reuse) without considering either the technologies used to treat the wastewater flows or the standards with which they should comply, both of which strongly depend on the local environmental context and national regulations.

WASTEWATER REUSE MONITORING WITHIN SDG INDICATOR 6.3.1

A supplementary variable on safe wastewater reuse at country and regional level could possibly be integrated into future revisions of the SDG 6.3.1 indicator metadata to address the intent of the Target 6.3 language more comprehensively and, given the major and increasing concerns to adapt to climate warming impacts on hydrological resources whose quality need to be better protected (UN-Habitat and WHO, 2021). Such an approach would be a first step before a supplementary SDG indicator and/or reporting mechanism on safe reuse could be adopted, while providing a well-defined and internationally comparable variable for global wastewater reuse analysis and use by policymakers and urban/land planners, within the existing framework of the UN-Water Integrated Monitoring Initiative for SDG 6 (IMI-SDG6).

Currently, wastewater statistics are typically compiled by National Statistical Offices (NSOs), line ministries, national water operators or regulators. Over the past decade, efforts have been made to introduce standardized methodologies and protocols to promote international compilation and comparison. One of the most prominent initiatives includes the three databases (UNSD/UNEP, OECD and Eurostat) that are used to populate SDG Indicator 6.3.1.

The wastewater reuse data from the three aforementioned databases and reported directly to UN-Habitat through the 2023 data drive, are presented in Figure 33 and Annex 5, taking into account the latest year reported over the last ten years (from 2012 to 2022). These data show that, of the 55 countries that reported some data for this variable, 35 countries reported a measurable flow, whereas 20 countries reported a zero value.

These results therefore demonstrate a relatively low level of reporting for this variable worldwide. However the reporting of wastewater reuse statistics could substantially increase by including this variable in the SDG 6.3.1 indicator methodology before the next data drive in 2026. Another finding is that nearly a third of the reporting countries reported an absence of reused wastewater flows, highlighting the absence of wastewater reuse practices in many countries. It is, however, well known that many countries have recently expressed their willingness to develop wastewater reuse policy guidelines to adapt to climate change impacts and growing demands on water.

Finally, it is meaningful to note that UNSD/UNEP methodology does not distinguish between treated and untreated wastewater, whereas the OECD and Eurostat databases only include treated wastewater reuse, thereby excluding the untreated wastewater reuse. In fact, reused water is defined by UNSD as “Used water directly received from another user with or without treatment for further use. It also includes treated wastewater received for further use from treatment plants, but excludes water discharged into a watercourse and used again downstream. It also excludes water recycling within industrial sites”; whereas OECD and Eurostat define it as “Water that has undergone wastewater treatment and is delivered to a user as reclaimed wastewater. This means the direct supply of treated effluent to the user. Excluded is wastewater discharged into a watercourse and used again downstream. Recycling within industrial sites is excluded”. For this reason, in the context of SDG 6.3.1 monitoring, UN-Habitat may monitor total wastewater reuse flows and further disaggregate these into treated and non-treated flows when this information is made available.

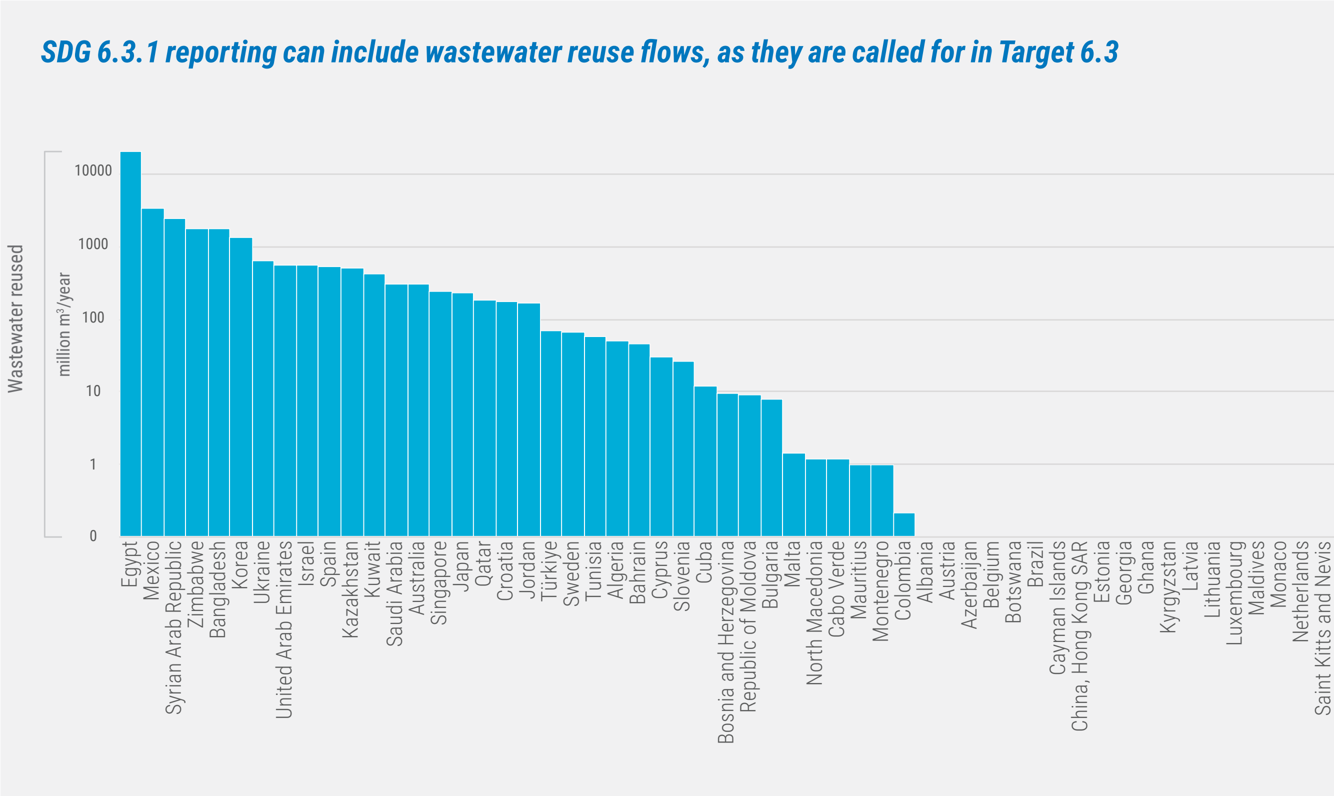


Figure 33. Volume of wastewater reuse reported in million m³/year

Thirty-five countries reported some values higher than zero, whereas 19 additional countries reported a zero value for this variable.

CONCLUSION AND RECOMMENDATIONS ON WASTEWATER REUSE

Demand for freshwater will continue to increase in forthcoming years due to growing demands, while freshwater resources will continue to be threatened due to climate change impacts on the water cycle. As a consequence, promoting safe wastewater reuse could make a significant contribution to finding sustainable solutions to the quantitative and qualitative aspects of the ongoing and forthcoming water crises.

Given the effects of climate change on water resources, wastewater treatment should be part of countries' national action plans, water budgets and investment plans. Planning for wastewater reuse should also be taken into consideration in the early stages of urban planning processes and when designing IWRM plans in the catchment area. There is therefore a future need to: develop specific local/national guidelines and standards for wastewater reuse; harmonize regional standards for nutrient levels in sewerage effluents, across the various potential users; enhance social acceptance of wastewater reuse; and improve the regulations governing the treatment of industrial wastewater according to the pollution type and level (UN-Habitat, 2023).

There is also a need to create smart subsidies and provide incentives to attract the private sector to invest in wastewater reuse technologies and resource recovery and in improving the financial efficiency and sustainability of wastewater utilities. Investing in wastewater reuse and end-product recovery, such as the sale of treated wastewater, biogas, heat and electricity, or nutrients recovered from sewage sludge for fertilizers, can help to reduce the operating costs of wastewater treatment facilities (UN-Habitat, 2023).

Promotion of the safe reuse of treated wastewater should be prioritized in policies and monitored in accordance with the ambitions of Target 6.3. Safe wastewater reuse may also support the achievement of other SDGs by making beneficial use of water, nutrients and energy recoverable from wastewater and adapting to growing (urban) population needs (SDGs 2 & 11), transitioning to a circular economy (SDG 12) and adapting to water scarcity induced by climate change (SDG 13) (UN-Habitat and WHO, 2021).

Wastewater statistics, including on reuse, must be collected and reported to relevant institutions more effectively, to inform national decision-making and attract more finance and support to an area of the water cycle that has been neglected in many parts of the world over the last decades, but which is essential to adapt to climate change impacts on water availability. The inclusion of a variable on wastewater reuse in the framework of the SDG 6.3.1 on global wastewater monitoring could (1) create a momentum to significantly enhance wastewater reuse monitoring worldwide, (2) generate a better knowledge on how much wastewater is reused nationally and regionally and (3) support climate change adaptation and mitigation plans, by helping countries to build resilience for safeguarding livelihoods and economies in response to current and future climate change impacts.

This section therefore strongly supports the inclusion of supplementary reporting on wastewater reuse monitoring, as part of future reporting, in order to address the ambitions of Target 6.3 more exhaustively. Such an amendment could be relatively easily implemented by using the three international databases (UNSD, OECD and Eurostat) that are already used to populate SDG Indicator 6.3.1 with data on the proportion of total, industrial and domestic proportion of wastewater safely treated.

5.2. Domestic wastewater and health

Wastewater that has been inadequately collected and treated poses a variety of risks to human health and undermines progress towards several health targets under SDG 3, notably SDG Target 3.9 on substantially reducing the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination; SDG 3.9.2 estimates that at least 564 thousand deaths globally are attributable to inadequate sanitation services every year. However, this figure likely underestimates the full health impact of domestic wastewater that is not safely treated because only diarrhoeal diseases are considered and only related impacts within the immediate community (and not those downstream). Six overlooked but key areas, in which improvement in wastewater treatment can minimize health risks and accelerate progress towards health-related SDG targets, are highlighted below.

Cholera control. The global incidence of cholera has been increasing dramatically in recent years (WHO, 2024). Twice as many countries are reporting larger, longer and more deadly outbreaks driven by dual pressures of climate change and conflict (WHO, 2023). The underlying cause of cholera is a lack of domestic sanitation and wastewater management. Prevention is better than the cure, as over 100 years of history shows that treating wastewater can eradicate cholera from a country, eliminating the costly burden of treating patients and the need for vaccines. Cholera predictably recurs in hotspots, all of which are characterized by a lack of sanitation and wastewater treatment. Targeting cholera hotspots with investments in both areas can have a major impact in terms of sustainably reducing outbreaks, deaths and costs to health services and to the economy at-large.

Antimicrobial resistance. Antimicrobial resistance (AMR) is a silent pandemic, as rising resistance to antimicrobials means that common infections and routine surgery are once again becoming deadly. An estimated 5 million global deaths were attributable to AMR in 2019 (AMR Collaborators, 2022). Recent studies demonstrate that wastewater is important to AMR emergence (Sambaza et al., 2023). Hundreds of millions of cases of diarrhoea are treated with antimicrobials every year, of which an estimated 60 per cent of cases (and associated antimicrobial exposures) could be reduced through universal access to water, sanitation, c and hygiene and wastewater treatment (WHO, FAO, WOAH, 2020). Improving sanitation (including wastewater treatment) are key to reducing AMR (Collignon et al, 2018).

Food safety and security. WHO estimates that food-borne hazards (primarily diarrhoea and invasive infectious disease agents) caused 600 million illnesses and 420,000 deaths in 2010, 40 per cent of which were children under five years of age (WHO, 2015). Untreated wastewater and sludge are currently widely used for irrigation and fertilizer for food crops. Demand is likely to increase in response to water scarcity and climate change. Safe reuse of wastewater is an increasingly attractive strategy to address food insecurity especially in peri-urban areas where wastewater is a reliable nutrient rich source of irrigation water. Wastewater reuse also contributes to the circular economy; however, safety is the key to minimizing the negative consequences of food-borne disease and reduced productivity due to the accumulation of chemicals harmful to plants in soils. Industrial pollution should be addressed at source (before collection in wastewater collection systems and/or delivery to industrial or urban WWTPs) and adequate treatment employed before reuse.

Vector-borne disease. Mosquitoes are vectors for communicable diseases such as malaria and dengue and like to breed in standing water. Although more commonly observed in clean water, some species are adapting and have been reported in open/partially covered drains. Anopheles stephensi, a mosquito species that can transmit malarial parasites, is now present in many urban settings, setting it apart from the other main mosquito vectors of malaria that primarily breed in naturally occurring water bodies in rural areas. Global incidences of malaria and dengue are high and have the potential to grow as areas further away from the equator become more habitable for host species. Improved drainage, solid waste management and wastewater collection and treatment need to play a more prominent role in vector-borne disease control strategies.

Recreational water quality. Recreational activity at beaches, lakes and rivers is key to human health, well-being and local economies (tourism) providing physical exercise and relaxation. Recreational sites are often located in or near urban centres where water bodies are impacted by wastewater discharges and can overflow during floods, leading to disease outbreaks or rendering sites unusable by the public for recreational water activities. The management of wastewater discharges and overflows is central to maintaining or restoring recreational waters – which can inspire national pride and boost tourism – along with direct health and well-being benefits to site users. For example, Paris has recently taken the opportunity of the 2024 Olympics to identify and treat all sources of wastewater so that the Seine river is swimmable and fishable, leaving a legacy for the population that will long outlast the Olympics.

Protection of water and water infrastructure during and after armed conflict. Protecting water resources and water and wastewater infrastructure during and after armed conflict is crucial for public health, environmental sustainability and the stability of communities. Water and wastewater systems are often targeted or collateral damage during conflicts, leading to disruptions in water supply and sanitation services. These disruptions can exacerbate the spread of waterborne diseases and impede recovery efforts. International humanitarian law, including the Geneva Conventions, underscores the importance of safeguarding water infrastructure. Ensuring the functionality of water and wastewater systems during and after conflicts helps to maintain basic hygiene, prevent disease outbreaks and support the resilience and rebuilding of affected communities. Investing in the protection and rapid restoration of water services is vital for the health and well-being of populations in conflict zones and is a critical component of post-conflict recovery and sustainable development efforts.

6. Conclusion

This latest progress update for SDG Indicator 6.3.1 underscores the challenges associated with progress on safely treated wastewater and its monitoring. Despite the fact that we are half way through the 2015–2030 SDG period, we are still unable to make a global estimate of the fate of wastewater from all sources. However, based on the observed progress to date, it is likely that for the next indicator report in 2027 (following the 2026 data drive) we will succeed in getting additional countries' data, which should thereby represent more than 50 per cent of the world population and 50 per cent of the countries for the proportion of total and industrial wastewater treated (Tier 1).

This report points to an alarming lack of reported statistics on the generation and treatment of total and industrial wastewater, with the consequence that many countries are not aware of the significant risks posed by untreated wastewater in terms of pollution, health risks, affected livelihoods and harm to ecosystems. Efforts must also be made to progressively harmonize the monitoring methodologies for wastewater for all sources and countries supported, to improve the accuracy of their reporting. This lack of knowledge and data also strongly hinders informed decision-making in investment and policy development, both of which are crucial to adapting to the ongoing (and future) dramatic climate change-induced impacts on water resources. In fact, as a result, the guidance needed to adopt a strategic approach to both mitigating and adapting to climate change is not available. Without such information, sustainable socioeconomic development will be limited.

As demonstrated in this report, disaggregated wastewater statistics must be collected and analysed more effectively to enable the "polluter pays" principle to be reinforced and to inform national decision-makers and stakeholders in the water sector, in order to strengthen coordinated policy planning and make informed decisions about water resource allocation and investment that can rapidly realize environmental, social, economic and institutional benefits.

Although safe wastewater reuse is called for in the wording of Target 6.3, it is not yet monitored within the SDG 6 framework. Improving wastewater management, monitoring and reuse is not only fundamental for safe and equitable water uses and for protection of the environment and public health against hazardous pollutants, it also contributes to sustainable development, climate change mitigation and adaptation, as well as peace and security, by increasing freshwater resources and protecting their quality, while reducing the large amounts of energy consumed by the treatment processes and the GHG emissions produced by the wastewater sector. It is therefore recommended that, in future 6.3.1 reporting, every effort be made to quantify reuse practices and trends and their contribution to augmenting water resources, as a driver for increased levels of safe treatment.

Specifically concerning domestic wastewater, performance has been found to be uneven (broad regional disparities) with an overall global estimate of 58 per cent of household wastewater being safely treated. This headline figure is consistent with other efforts to characterize global wastewater generation and treatment (most recently and notably, Jones 2021). Greater attention, prioritization and investments are needed – particularly in select regions and countries with lower performance – to address indicator gaps. Such progress would also serve to improve service levels associated with safely managed sanitation (SDG Indicator 6.2.1). In many cases, the most pressing issue is that wastewater collection infrastructure and facilities (sewers and septic tanks) are simply lacking. In some settings, sewer flows discharged directly into the environment or not sufficiently or safely treated at urban WWTPs are the priorities. Issues of septic tank containment and faecal sludge emptying and treatment are relevant and important in many countries in which sewer networks are not common.

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Annexes

Annex 1: Wastewater terms and definitions relevant to this report.

TERM	DEFINITION
Wastewater[a, b, c]	Water which is of no further immediate value to the purpose for which it was used because of its quality, quantity or time of occurrence. Cooling water is not considered to be wastewater.
Total wastewater generated[a, b]	Total volume of wastewater generated by economic activities (agriculture, forestry and fishing; mining and quarrying; manufacturing; electricity, gas, steam and air conditioning supply; and other economic activities) and households. Cooling water is excluded.
Industrial wastewater[a, c]	Water discharged after being used in, or produced by, industrial production processes and which is of no further immediate value to these processes. Where process water recycling systems have been installed, process wastewater is the final discharge from these circuits. To meet quality standards for eventual discharge into public sewers, this process wastewater is understood to be subjected to ex-process in-plant treatment. Cooling water is not considered here. Sanitary wastewater and surface run-off from industries are also excluded here.
Domestic wastewater[a, c]	Wastewater from residential settlements and services which originates predominantly from the human metabolism and from household activities.
Greywater	Household derived wastewater that has not come in contact with excreta and is typically derived from sinks, drains, laundry machines, or other non-excreta related functions and facilities.
Urban (municipal) wastewater[a, c]	Domestic wastewater or the mixture of domestic wastewater with industrial wastewater and/or runoff rain water.
Urban (municipal) wastewater collecting system[c]	A system of conduits which collects and conducts urban or municipal wastewater. Collecting systems are often operated by public authorities or semi-public associations.
Independent wastewater collecting system[c]	Individual private systems and operations in place to evacuate and collect domestic and other wastewater in cases where a collective/public/urban collecting system is not available or not justified because it would either produce no environmental benefit or involve excessive cost. This includes in particular the transport of wastewater from storage tanks to treatment plants by means of trucks.
Wastewater treatment[a]	Process to render wastewater fit to meet applicable environmental standards or other quality norms for recycling or reuse.

Other (industrial) wastewater treatment[a, b, c]	Treatment of wastewater in any non-public treatment plant, e.g. industrial wastewater treatment plants (IWWTPs). Excluded from "other wastewater treatment" is the treatment in septic tanks. IWWTPs may also be classified under ISIC 37 (Sewerage) or under the main activity class of the industrial establishment they belong to.
Urban wastewater treatment[a, b, c]	Treatment of urban or municipal wastewater in urban wastewater treatment plants (WWTPs). Urban WWTPs are usually operated by public authorities or by private companies working by order of public authorities. Urban wastewater treatment includes wastewater delivered to treatment plants by trucks.
Independent treatment[a, b, c]	Facilities for preliminary treatment, treatment, infiltration or discharge of domestic wastewater from dwellings generally between 1 and 50 population equivalents, not connected to an urban wastewater collecting system. An example is septic tanks. Excluded from here are systems with storage tanks from which the wastewater is transported periodically by trucks to an urban wastewater treatment plant.
Primary treatment[a, b, c]	Treatment of wastewater by a physical and/or chemical process involving settlement of suspended solids, or other process in which the BOD_5 of the incoming wastewater is reduced by at least 20 per cent before discharge and the total suspended solids of the incoming wastewater are reduced by at least 50 per cent.
Secondary treatment[a, b, c]	Post-primary treatment of wastewater by a process generally involving biological treatment with a secondary settlement or other process, resulting in a Biochemical Oxygen Demand (BOD) removal of at least 70 per cent and a Chemical Oxygen Demand (COD) removal of at least 75 per cent. Natural biological treatment processes are also considered under secondary treatment if the constituents of the effluents from this type of treatment are similar to the conventional secondary treatment.
Tertiary treatment[a, b, c]	Treatment (additional to secondary treatment) of nitrogen and/or phosphorous and/or any other pollutant affecting the quality or a specific use of water: microbiological pollution, colour etc. The different possible treatment efficiencies ("organic pollution removal" of at least 95 per cent for BOD_5 and 85 per cent for COD, "nitrogen removal" of at least 70 per cent, "phosphorous removal" of at least 80 per cent and "microbiological removal") cannot be added and are exclusive.
Safely treated wastewater	Wastewater that has been treated and discharged in compliance with relevant standards, or has been treated by processes commensurate with secondary or higher treatment.

[a] **referenced from the Indicator 6.3.1 metadata.**
[b] **referenced from the UNSD/UNEP Environmental questionnaire.**
[c] **referenced from the OECD/Eurostat Inland Waters Environmental questionnaire.**

Annex 2: Description of the five stages of the household wastewater conceptual framework.

1. Generation. Some countries produce statistics on the total annual volume of wastewater generated by households. For those that do not, WHO estimates the annual volume of household wastewater generated based on data for the country's population, domestic water use (litres per capita per day), and the ratio of domestic water use to wastewater produced.[26] Between these two methods, WHO can compute or compile the total volume of household wastewater generated per year for all countries.

2. Collection. Household wastewater is classified as "collected" if greywater and blackwater are conveyed from a household into either an urban or independent wastewater collection system (refer to definitions in Annex 1). Urban wastewater collection systems (a term used by UNSD, OECD, and Eurostat) are collective sewer/sewage networks – referred to herein as *sewers* for brevity. Independent wastewater collection systems include connections to non-sewer infrastructure typically scaled to an individual or small cluster of households – most commonly a septic or holding tank, but may also include conveyance to small-scale decentralized wastewater systems. However, independent wastewater collection systems are referred to as septic tanks in this report, for brevity. Wastewater produced by households with other types of sanitation facilities (such as pit latrines) is not considered to be collected because such facilities do not commonly collect greywater – which constitutes a significant proportion of household wastewater. In principle, greywater flows classified as uncollected by WHO could be collected in dedicated greywater collection and treatment systems (e.g. infiltration systems, gardens, etc.). However, data specific to greywater collection remain very rare. Box 3 presents an example of a programme in India to both promote and monitor greywater-specific management systems.

3. Delivery to treatment. After collection in sewers or septic tanks, household wastewater may be subsequently delivered to treatment facilities or discharged directly into the environment. Treatment facilities may include urban WWTPs or independent treatment facilities (typically septic tanks with leach fields, but also more sophisticated decentralized treatment systems). Sewer wastewater that is not delivered to an urban WWTP may instead be discharged into the environment from: direct discharge end-pipes of the sewer network, combined sewer overflows,[27] or leaking sewer pipes. Septic tank wastewater that is not delivered to treatment may originate from septic tanks that contaminate the surrounding environment (are classified as "*not contained*")[28] or emptied faecal sludges that are disposed of unsafely and/or without treatment. For countries where national data are unavailable for the proportion of sewer wastewater delivered to WWTPs or the proportion of septic tank wastewater contained, WHO uses standard assumptions of 100 per cent and 50 per cent respectively.

26 For countries where national data are unavailable for domestic water use or the ratio of domestic water use to wastewater produced, WHO uses standard assumptions.

27 Sewers that combine blackwater and runoff water and may discharge raw wastewater into the environment during rainfall events.

28 Potentially through overflow, flooding, leaking, breakage or incorrect design (i.e. a septic tank with no proper infiltration system).

4./5. Treatment and discharge. Once delivered to treatment facilities, household wastewater may be treated by various types of technologies and processes – commonly classified as primary, secondary, and tertiary levels based on the highest level of treatment employed at the facility (see Annex 1 for definitions). There may also be relevant regulations or standards with which discharges are legally bound to comply. WHO interprets flows that are compliant with applicable regulations and standards as "safely treated". Countries may monitor one or both aspects of wastewater treatment (by technology or by discharge compliance). WHO gives preference to using data on compliance with discharge standards over data on treatment by technology for the purposes of computing estimates. However, when data on compliance are not available, data on the type of technologies employed are used for the computation of estimates – with treatment by secondary or higher processes considered as proxy for safe treatment. Primary treatment alone is not considered safe treatment in most cases.[29] In some cases, sewer wastewater flows that are delivered to urban WWTPs may not actually receive treatment if facilities are operating over capacity, are temporarily offline or are dysfunctional. Specifically for septic tanks, flows are classified as receiving safe treatment (commensurate with removal efficiencies associated with secondary or higher processes) when they are contained, treated in the tank and discharged through an infiltration system; and where accumulated and emptied faecal sludge are safely disposed of or treated. All of the aforementioned aspects pertaining to sewer and septic tank flows are represented in the conceptual framework and accounted for (either through reported data or assumptions) in country estimates.

29 The only exception being discharges conveyed through a long ocean outfall.

Annex 3: Number of United Nations Member States reporting wastewater statistics (by volumetric and population-based variables) to UNSD/UNEP, Eurostat and OECD questionnaires (data compiled from all sources in April 2024).

		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022*	ANY DATA 2012–2022	ANY DATA 2017–2022
VOLUMETRIC	Total wastewater generated	42	43	45	47	47	45	44	45	41	33	12	59	55
	By agriculture, forestry and fishing (ISIC/NACE 01-03)	27	24	26	26	26	24	26	29	30	25	11	37	33
	By mining and quarrying (ISIC/NACE 05-09)	26	25	25	24	25	24	25	28	30	23	13	35	34
	By manufacturing industries (ISIC/NACE 10-33)	32	29	30	30	30	29	28	31	32	25	11	45	40
	By energy production and distribution (ISIC/NACE 35)	30	26	28	26	26	25	27	27	27	21	12	35	30
	By construction (ISIC/NACE 41-43)	23	22	21	21	23	22	22	27	26	21	10	31	31
	By services (ISIC/NACE 45-99)	26	26	28	27	29	26	28	33	32	28	13	37	36
	By households	33	31	34	37	36	35	32	37	34	30	13	45	42
	Total wastewater treated at urban WWTPs	51	53	54	60	63	61	58	64	52	44	14	75	72
	By secondary or higher treatment (urban WWTPs)	25	26	29	34	34	33	31	36	30	26	0	46	41
	Total wastewater treated at other treatment plants	17	16	18	17	23	21	21	23	21	21	8	26	24
	By secondary or higher treatment (other WWTPs)	10	9	10	10	14	14	13	16	14	14	0	17	16
	Total wastewater treated at independent treatment	20	19	20	18	19	16	18	19	16	16	8	25	21
POPULATION	Percentage connected to sewers	69	64	69	69	69	67	65	65	56	49	22	96	80
	Percentage connected to sewers delivering to urban WWTPs	65	60	64	65	66	65	62	64	52	47	22	83	74
	Percentage connected to sewers delivering to urban WWTPs with secondary or higher treatment	49	46	49	49	50	49	49	52	44	41	22	64	57
	Percentage connected to independent treatment	51	47	53	49	48	46	43	48	35	34	14	68	54

* Data for 2022 have only been reported and published by OECD

Annex 4: Changes over time in country estimates for safely treated household wastewater.

WHO updates its global database of country household wastewater data and computes revised country estimates every two years. The 140 country estimates that were computed by WHO as part of the 2022 update are based on the most recent official data available for the 22 data input variables, with assumptions being employed to fill in data gaps. Each estimate reflects a snapshot of the best and most recently available data. However, this methodological approach does not yet make it possible to directly compare country estimates across reporting periods (i.e. 2022 vs 2020) for all countries because:

- new data are still being reported, found, and compiled;
- previously compiled data are being reinterpreted through country consultations;
- many countries are missing a robust time series for the most important variables in the conceptual framework.

Figure 34 compares the country estimates for 2020 and 2022 and highlights those countries with the biggest differences (those points situated away from the line of parity in the figure)

With some notable exceptions, estimates for safely treated household wastewater are similar between 2020 and 2022

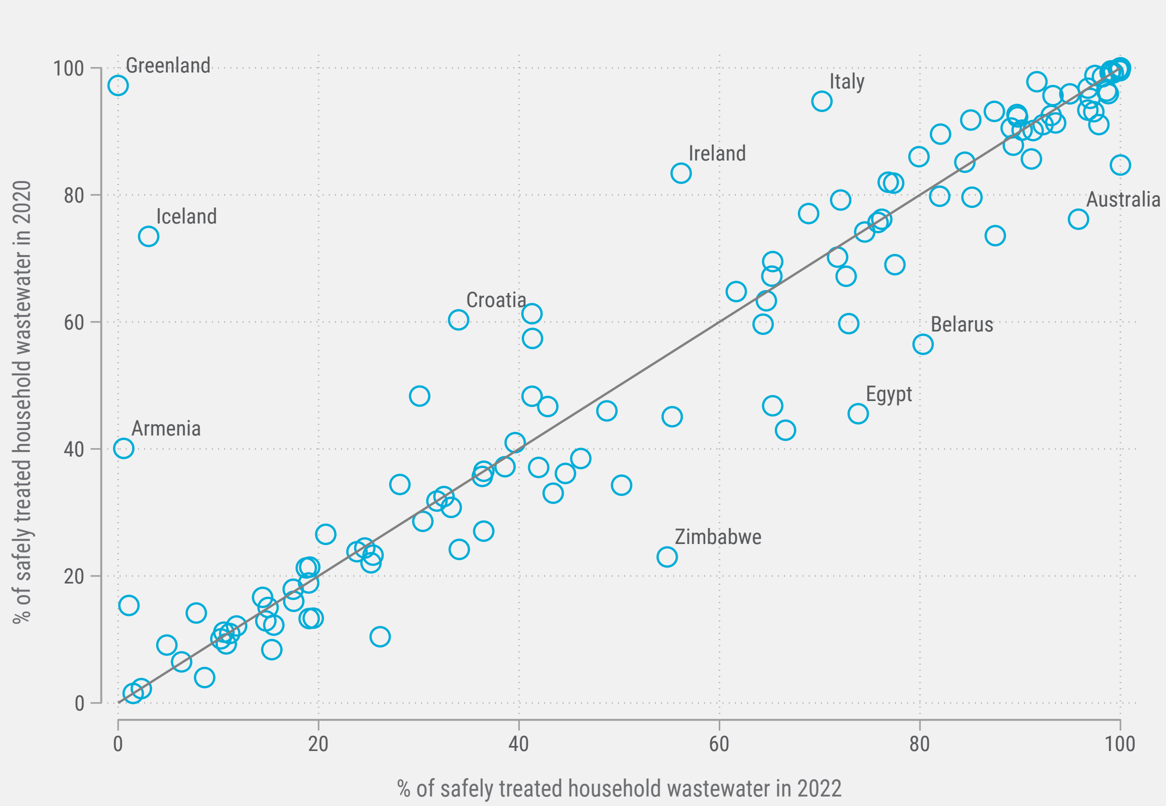

Figure 34. Comparison of 2020 versus 2022 country estimates for household wastewater safely treated

Table 6 describes the rationales for the most extreme temporal variations – which are typically the result of data interpretation issues or new data found and compiled by WHO to enhance the estimates rather than rapid improvements or degradations associated with country performance References therein refer to data sources described in each country's respective country file.

Table 6. Description of the rationales for the most extreme cases of variability between the 2020 and 2022 country estimates.

Armenia	The proportion of sewer wastewater treated to secondary or higher levels was corrected from 54.7 per cent (as reported by ArmSTAT in 2019) to 0 per cent (based on information received during the country consultation in 2023). ArmSTAT confirmed that only primary treatment is employed at urban WWTPs in Armenia, which is not considered safely treated.
Australia	Primary treatment in combination with a long ocean outfall is classified as safely treated for the purposes of household wastewater monitoring. Discussion during the most recent country consultation revealed that a significant fraction of flows treated to primary levels could be classified as long ocean outfalls and would therefore qualify for classification as safely treated.
Belarus	New urban WWTP compliance data were compiled from the National Statistical Committee, indicating that 99.8 per cent of received sewer flows were in compliance with standards. This data point superseded a previously compiled data point indicating that 68 per cent of received sewer flows were treated by secondary or higher processes, resulting in a much higher estimate of the proportion of household wastewater safely treated.
Croatia	Similar to the example of Belarus, data on compliance with discharge standards (38 per cent, in this case relating to the Urban Wastewater Treatment Directive of the EU) were added to the dataset, giving a result significantly lower than the 95 per cent of received sewer flows treated by secondary or higher processes reported by the Ministry of Health for the 2020 estimate.
Egypt	A data point on the proportion of sewer wastewater delivered to treatment was misinterpreted for the computation of the 2020 estimate (57 per cent) and was not used for the 2022 estimate. Therefore, the standard assumption of 100 per cent of sewer wastewater delivered to urban WWTPs was applied for the 2022 estimate, in place of the missing reported data for this variable.
Greenland	The proportion of household wastewater collected in sewers (derived from estimates from the JMP on household sanitation facilities) was revised from 95 per cent to 0 per cent based on new information on household sanitation facilities.
Iceland	The proportion of sewer wastewater that received any treatment was 75 per cent (Statistics Iceland, 2017) for the 2020 estimate but was incorrectly reported as primary treatment with long ocean outfall to OECD. During a country consultation in 2023, national authorities confirmed that actual safe wastewater treatment (secondary or higher, or primary with a long ocean outfall) was 0.17 per cent, resulting in a significant decrease in the estimate of the proportion of wastewater safely treated.
Ireland	As with Croatia, data on compliance (50 per cent) used for the 2022 estimate replaced data on the proportion of sewer wastewater treated by secondary or higher processes (97 per cent) used for the 2020 estimates, significantly reducing the 2022 country estimate.
Italy	New data on the proportion of sewer wastewater delivered to urban WWTPs (80 per cent) were compiled from Eurostat and employed for the 2022 estimate - replacing the standard assumption of 100 per cent used for the 2020 estimate, and resulting in a lower 2022 country estimate.
Zimbabwe	The proportion of household wastewater generated by sewer-connected households was revised from 26 per cent in the 2020 estimate to 62 per cent in the 2022 estimate due to new reported data on total household wastewater generated.

As the household wastewater database is becoming increasingly robust, WHO is planning to revise its methodology to allow for the computation of temporal (time series) estimates. Figure 35 and Figure 36 present several select and notable country-specific time series for particular variables in the conceptual framework for household wastewater. These time series demonstrate the presence of routine monitoring and reporting allowing for reliable trends in household wastewater monitoring to be established for many countries.

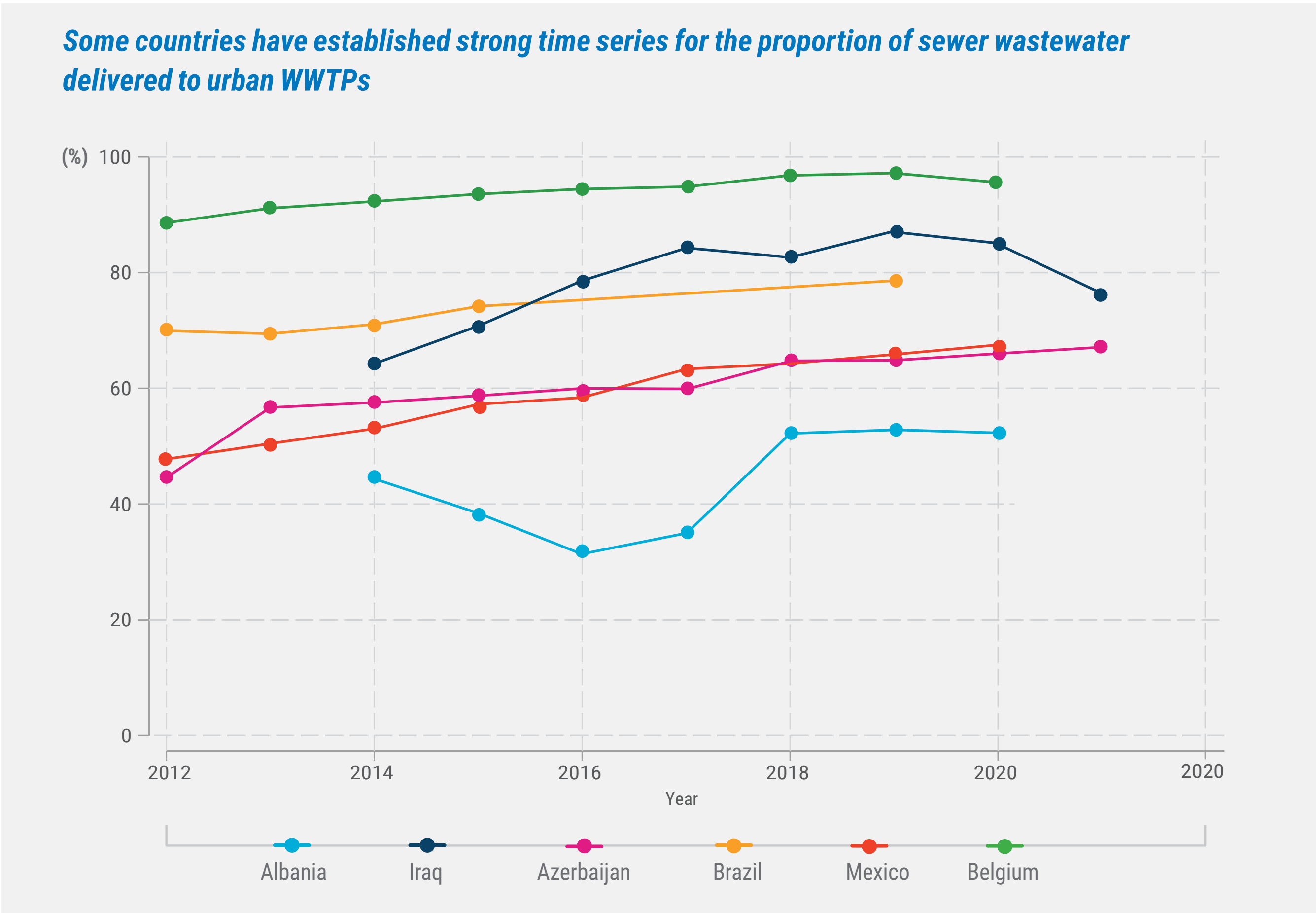

Figure 35. Notable time series for the proportion of household wastewater collected in urban wastewater collection systems and delivered to treatment.

Some countries have established strong time series for the proportion of sewer wastewater delivered to WWTPs and safely treated

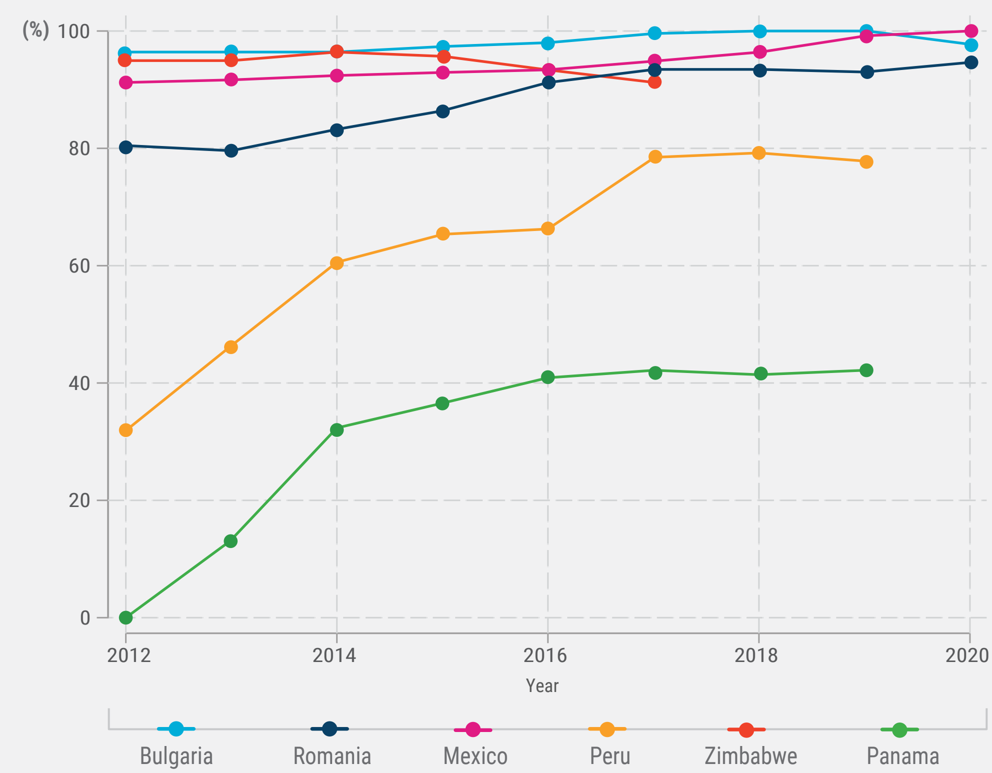

Figure 36. Notable time series for the proportion of household wastewater delivered from sewers to WWTPs and treated by secondary or higher processes.

Annex 5: Volume of wastewater reuse reported in million m³/year, data source and reporting year.

COUNTRY	VOLUME (MILLION M³/YEAR)	SOURCE	YEAR
Albania	0	UNSD	2021
Algeria	50	UNSD	2015
Australia	297	OECD	2021
Austria	0	Eurostat	2021
Azerbaijan	0	UNSD	2021
Bahrain	46	UNSD	2021
Bangladesh	1,734	UN-Habitat	2022
Belgium	0	Eurostat	2020
Bosnia and Herzegovina	9	UNSD	2015
Botswana	0	UNSD	2015
Brazil	0	UNSD	2013
Bulgaria	8	Eurostat	2018
Cabo Verde	1	UN-Habitat	2021
Cayman Islands	0	UNSD	2015
China, Hong Kong Special Administrative Region	0	UNSD	2015
Colombia	0	UN-Habitat	2021
Croatia	173	Eurostat	2018
Cuba	12	UNSD	2021
Cyprus	30	UN-Habitat	2020
Egypt	20,500	UNSD	2015
Estonia	0	Eurostat	2021
Georgia	0	UNSD	2013
Ghana	0	UN-Habitat	2022
Israel	557	OECD	2021
Japan	229	UN-Habitat	2020
Jordan	167	UNSD	2021
Kazakhstan	507	UNSD	2021

COUNTRY	VOLUME (MILLION M^3/YEAR)	SOURCE	YEAR
Korea	1,332	OECD	2014
Kuwait	420	UNSD	2014
Kyrgyzstan	0	UNSD	2017
Latvia	0	Eurostat	2018
Lithuania	0	Eurostat	2021
Luxembourg	0	Eurostat	2021
Maldives	0	UNSD	2015
Malta	1	Eurostat	2021
Mauritius	1	UNSD	2021
Mexico	3,318	OECD	2021
Monaco	0	UNSD	2021
Montenegro	1	UNSD	2012
Netherlands	0	Eurostat	2018
North Macedonia	1	Eurostat	2013
Qatar	185	UNSD	2021
Republic of Moldova	9	UNSD	2021
Saint Kitts and Nevis	0	UNSD	2012
Saudi Arabia	311	UNSD	2019
Singapore	236	UN-Habitat	2022
Slovenia	26	Eurostat	2021
Spain	532	Eurostat	2020
Sweden	65	Eurostat	2020
Syrian Arab Republic	2,392	UNSD	2020
Tunisia	57	UNSD	2014
Türkiye	69	Eurostat	2020
Ukraine	634	UNSD	2021
United Arab Emirates	564	UNSD	2020
Zimbabwe	1,789	UNSD	2021

Annex 6: Country data (total and industrial wastewater).

Country	Year	Data source	Wastewater generated (Million m^3/year)									Wastewater treated (Million m^3/year)		Ratio of wastewater treated (%)	
			Agriculture, forestry, fishing	Mining and quarrying	Manufacturing industries	Production and distribution of electricity (excluding cooling water)	Water collection, treatment, supply	Construction	Services	Private households	Total wastewater	Industrial	Total wastewater	Industrial	Total wastewater
Albania	2021	Eurostat							2.1	71.4	73.5		36.0		49%
Algeria	2017	UNSD											222.3		
Andorra	2019	UNSD									20.2		20.2		100%
Antigua and Barbuda	2021	UNSD			2.4						2.4				
Argentina	2019	UNSD								5354.9	5354.9		1914.4		36%
Armenia	2022	UN Habitat	0.3	44.5	8.5	4.1	146.7	0.2	1.1	20.1	225.5	44.5	112.4	22%	50%
Australia	2021	OECD									2167.8		2148.9		99%
Austria	2021	UN Habitat		7.6	354.3	35.3	74.3	0.1	385.3	656.1	1512.9		1074.0		71%
Azerbaijan	2021	UNSD									442.0	0.0	264.8		60%
Bahrain	2021	UNSD	0.0	5.5	0.4	0.0		0.0	0.4	163.2	169.5	6.2	169.5	100%	100%
Bangladesh	2021	UN Habitat							683.7	1049.8	1733.5		0.3		0.01%
Belarus	2021	UNSD	240.3	27.8	135.8	140.4		46.0	663.9		1254.3	147.8	747.7	42%	60%
Belgium	2018	Eurostat	5.8	52.7	296.0	8.3			88.7	390.4	866.5		960.8		100%
Belize	2021	UNSD											1.7		
Bolivia	2021	UNSD											137.1		
Bosnia and Herzegovina	2021	Eurostat	0.2						15.2	80.2	104.8		38.6		37%
Brazil	2019	UNSD											4594.1		
Bulgaria	2019	Eurostat	50.3	15.2	67.8	9.5		2.5	40.4	228.3	417.8	50.9	542.6	51%	100%
Burundi	2017	UNSD											1.1		
Cabo Verde	2021	UN Habitat											2.0		
Cameroon	2021	UN Habitat			5.0				20.0	50.0	75.0				
Canada	2020	UN Habitat			3113.6						3113.6	2190.8	7881.9	70%	100%
Chile	2020	UN Habitat	631.5	288.6	379.7	0.9		0.0	378.8	756.5	2436.1		1216.0		50%

Country	Year	Data source	Wastewater generated (Million m^3/year)									Wastewater treated (Million m^3/year)		Ratio of wastewater treated (%)	
			Agriculture, forestry, fishing	Mining and quarrying	Manufacturing industries	Production and distribution of electricity (excluding cooling water)	Water collection, treatment, supply	Construction	Services	Private households	Total wastewater	Industrial	Total wastewater	Industrial	Total wastewater
China	2021	UN Habitat											86210.0		
China, Hong Kong SAR	2019	UNSD									1068.9	9.6	1019.9		100%
China, Macao SAR	2017	UNSD											77.0		
Colombia	2020	UN Habitat		118.8	319.1	3.4		1.5	293.2	1945.4	2681.3	151.2	1214.6	34%	45%
Costa Rica	2021	OECD	8.0						48.9	204	421.8	86.9	119.9	64%	28%
Croatia	2021	Eurostat	11.0	1.9	20.1	0.1		5.2	33.2	129.4	200.8	27.3	189.8	100%	95%
Cuba	2021	UNSD	846.1		36.1	5.1		4.0	782.9	850.8	2525.1	69.0	615.0	100%	24%
Cyprus	2020	UN Habitat									35.2		35.2		100%
Czechia	2021	Eurostat	2.1						408.1	333.9	1199.0	167.6	1058.6	37%	88%
Denmark	2021	Eurostat	307.9	0.1	48.2	0.8		0.6	35.9	241.2	332.8				
Dominican Republic	2020	UNSD									952.3		312.7		33%
Ecuador	2020	UNSD									1085.1		323.6		30%
Egypt	2019	UNSD											5114.9		
Estonia	2020	UN Habitat	0.1	0.0	11.0	7.9	1.1	0.0	0.3	103.2	123.6	14.6	117.7	73%	95%
Ethiopia	2021	UN Habitat			50.0			45.0	20.0	32.1	147.1	41.0	86.6	43%	59%
Finland	2021	Eurostat		42.5						303.8	346.3		277.2		80%
France	2020	Eurostat	0.5	94.1	1419.0			0.7	158.3	3156.7	5028.6	1565.2	6515.8	91%	100%
Germany	2019	UN Habitat		217.3	1083.8	56.3	38.0	1.0	197.3	5192.7	6786.3	818.2	10022.9	59%	100%
Ghana	2022	UN Habitat		3.7	4.2		0.7		0.4	2.4	11.4	7.2	10.0	84%	88%
Hungary	2021	Eurostat							76.5	318.6	395.1		528.4		100%
India	2020	UN Habitat								26414.3	26414.3		9807.2		37%
Iran (Islamic Republic of)	2019	UNSD								3893.0	3893.0		1415.1		36%
Iraq	2020	UNSD								1054.7	1185.1		717.3		60%

Country	Year	Data source	Wastewater generated (Million m^3/year)									Wastewater treated (Million m^3/year)		Ratio of wastewater treated (%)	
			Agriculture, forestry, fishing	Mining and quarrying	Manufacturing industries	Production and distribution of electricity (excluding cooling water)	Water collection, treatment, supply	Construction	Services	Private households	Total wastewater	Industrial	Total wastewater	Industrial	Total wastewater
Israel	2020	OECD		3.9	33.0	1.4					562.9				
Jamaica	2022	UN Habitat							59.8	95.2	154.9		154.9		100%
Japan	2020	UN Habitat											15030.0		
Jordan	2017	UNSD			25.7					267.4	293.1		267.4		91%
Kazakhstan	2021	UNSD	95.8	26.1	236.8	4082.7		0.1	31.9	609.0	5082.4	86.4	668.0	2%	13%
Kenya	2017	UNSD		0.6	1617.3			85.4			1775.9		1348.9		76%
Kosovo under UNSCR 1244/99	2019	Eurostat			5.8	3.8			4.3	38.3	53.3		1.0		1.82%
Kuwait	2020	UN Habitat											324.2		
Latvia	2021	Eurostat	43.0	10.9	14.4	1.9		0.1	4.6	101.6	176.5	9.0	113.4	33%	64%
Liechtenstein	2021	UNSD											10.5		
Lithuania	2021	Eurostat	54.5	1.9	31.9	1.4		0.8	57.5	165.7	314.7	5.8	181.2	16%	58%
Luxembourg	2021	Eurostat									91.6		90.1		98%
Malawi	2019	UNSD									35.9		11.7		33%
Malaysia	2019	UNSD									2222.5				
Malta	2020	UN Habitat									28.9		22.7		78%
Mauritius	2021	UNSD											51.1		
Mexico	2021	OECD									13866.0	1772.0	6355.0	25%	46%
Monaco	2021	UNSD	0.0			0.0					5.9	0.0	5.9		100%
Mongolia	2021	UNSD							48.6	26.1	74.7		74.7		100%
Montenegro	2017	UN Habitat									4.2		2.4		56%
Morocco	2019	UNSD											374.8		
Myanmar	2021	UNSD			0.2						0.2	0.1	0.27		100%
Nepal	2020	UN Habitat								1.7	1.7				

Country	Year	Data source	Wastewater generated (Million m³/year)									Wastewater treated (Million m³/year)		Ratio of wastewater treated (%)	
			Agriculture, forestry, fishing	Mining and quarrying	Manufacturing industries	Production and distribution of electricity (excluding cooling water)	Water collection, treatment, supply	Construction	Services	Private households	Total wastewater	Industrial	Total wastewater	Industrial	Total wastewater
Netherlands (Kingdom of the)	2020	Eurostat	37.7	6.7	306.0	2.3		9.0	99.7	769.8	1291.5		1993.5		100%
New Zealand	2020	UN Habitat											547.5		
North Macedonia	2021	UN Habitat			17.6				2.6	83.8	104.1		39.0		37%
Norway	2021	Eurostat											703.0		
Oman	2021	UNSD									108.9		107.9		99%
Panama	2021	UNSD									357.4		194.4		54%
Peru	2022	UN Habitat								1303.0	1303.0		1069.8		82%
Philippines	2021	UN Habitat											121.9		
Poland	2021	Eurostat		304.3	430.5	62.3		0.0	154.4	994.6	2254.8				
Portugal	2020	Eurostat									684.1				
Qatar	2021	UNSD											255.4		
Republic of Korea	2020	OECD		25.8	590.0	52.0		26.5			7335.8		7087.5		97%
Republic of Moldova	2021	UNSD	13.4	2.5	14.0	535.9			117.5		683.3		123.4		18%
Romania	2021	UN Habitat	4.8	45.4		427.0		13.5	396.1	560.9	1806.0	321.1	1314.9	38%	72%
Russian Federation	2019	OECD	4406.9	1365.8	2737.8	715.2		60.5	556.3		37666.2				
Samoa	2020	UNSD	0.0		0.0				0.2		0.16		0.2		100%
Saudi Arabia	2021	UN Habitat									2139.3		1875.2		88%
Senegal	2017	UNSD								23.7	23.7		15.6		66%
Serbia	2021	Eurostat	515.1	14.2	43.4	48.8		1.3	110.2	316.3	1051.2	24.8	82.3	23%	8%
Singapore	2022	UN Habitat									606.0		606.0		100%
Slovakia	2021	Eurostat	0.0	21.5	147.5	2.9		0.0	14.2	398.8	587.2	188.4	589.5		100%
Slovenia	2021	Eurostat	0.1	0.1	34.9	0.0		0.3	7.3	72.4	117.6				
South Africa	2022	UN Habitat									898.3	487.5	2680.8		100%

			Wastewater generated (Million m^3/year)									Wastewater treated (Million m^3/year)		Ratio of wastewater treated (%)	
Country	Year	Data source	Agriculture, forestry, fishing	Mining and quarrying	Manufacturing industries	Production and distribution of electricity (excluding cooling water)	Water collection, treatment, supply	Construction	Services	Private households	Total wastewater	Industrial	Total wastewater	Industrial	Total wastewater
Spain	2020	Eurostat	27.2	21.7	556.5	0.0		0.0	348.2	2150.0	3103.6		4876.0		100%
State of Palestine	2021	UN Habitat									138.0		72.0		52%
Sweden	2020	Eurostat	2.0	46.0	1115.0	9.0		0.0	132.0	569.0	1873.0				
Switzerland	2020	UN Habitat											1350.0		
Thailand	2021	UN Habitat								11006.0	11006.0		13686.0		100%
Trinidad and Tobago	2016	UNSD											85.5		
Tunisia	2021	UN Habitat											288.5		
Türkiye	2020	OECD		173.9	605.6	320.2					6209.4		4388.5		70%
Uganda	2021	UN Habitat								71.8	71.8		30.2		42%
Ukraine	2021	UNSD	279.4	221.1	785.5	1973.3					4686.2				
United Arab Emirates	2020	UNSD											788.1		
United Republic of Tanzania	2018	UNSD									151.8		21.8		14%
Uzbekistan	2019	UNSD									990.5		962.3		97%
Zambia	2021	UN Habitat								44.4	44.4		593.9		100%
Zimbabwe	2017	UNSD			64.3			0.3	1.1	115.9	181.7		97.9		54%

Annex 7: Country data (household wastewater).

COUNTRY	Total household wastewater generated (million m³)	Proportion of household wastewater generated – Sewers (%)	Proportion of household wastewater generated – Septic Tanks (%)	Proportion of household wastewater generated – All other sanitation (%)	Total household wastewater delivered to treatment (million m³)	Proportion of sewer household wastewater delivered to treatment (%)	Proportion of septic tank household wastewater delivered to treatment (%)	Proportion of household wastewater delivered to treatment (%)	Total household wastewater safely treated (million m³)	Proportion of sewer household wastewater safely treated (%)	Proportion of septic tank household wastewater safely treated (%)	Proportion of household wastewater safely treated 2022 (%)	Proportion of household wastewater safely treated 2020 (%)
Afghanistan	809.807	5.8%	16.4%	77.7%									
Albania	56.170	63.2%	4.1%	32.7%	19.647	52.1%	50.0%	35.0%	10.934	28.3%	38.6%	19.5%	13.4%
Algeria	1,296.358	97.8%	1.0%	1.2%	987.666	77.4%	46.1%	76.2%	987.666	77.4%	46.1%	76.2%	76.2%
American Samoa	1.537	56.0%	43.4%	0.6%	1.194	100.0%	50.0%	77.7%	1.191	99.7%	49.9%	77.5%	69.0%
Andorra	3.916	100.0%	0.0%	0.0%	3.916	100.0%	NA	100.0%	3.916	100.0%	NA	100.0%	100.0%
Angola	619.882	26.6%	64.2%	9.3%									
Anguilla	0.556	1.2%	93.9%	4.9%									
Antigua and Barbuda	1.594	2.5%	88.2%	9.3%									
Argentina	1,562.124	58.7%	25.1%	16.2%	972.161	84.6%	50.0%	62.2%	569.989	45.7%	38.5%	36.5%	36.5%
Armenia	110.500	71.7%	2.2%	26.1%	45.836	56.3%	50.0%	41.5%	0.622	0.0%	25.0%	0.6%	40.1%
Aruba	3.600	5.1%	93.9%	1.1%									
Australia	916.110	94.3%	5.7%	0.0%	889.991	100.0%	50.0%	97.1%	877.813	98.6%	49.7%	95.8%	76.2%
Austria	689.230	92.7%	6.3%	1.1%	676.860	100.0%	88.6%	98.2%	676.860	100.0%	88.6%	98.2%	98.6%
Azerbaijan	338.508	62.3%	5.3%	32.4%	150.481	67.1%	50.0%	44.5%	139.938	62.3%	48.2%	41.3%	57.4%
Bahamas	14.118	21.8%	77.9%	0.3%									
Bahrain	51.114	86.5%	13.5%	0.0%	47.675	100.0%	50.0%	93.3%	47.675	100.0%	50.0%	93.3%	95.6%
Bangladesh	5,157.099	13.1%	26.4%	60.5%	1,269.256	100.0%	43.6%	24.6%	903.551	50.0%	41.6%	17.5%	16.0%
Barbados	9.737	3.4%	4.3%	92.3%									
Belarus	281.454	74.6%	12.0%	13.3%	226.512	100.0%	48.6%	80.5%	226.048	99.8%	48.6%	80.3%	56.5%
Belgium	390.400	84.3%	9.2%	6.4%	332.457	95.5%	50.0%	85.2%	332.105	95.4%	50.0%	85.1%	91.8%
Belize	13.843	9.0%	65.7%	25.3%									
Benin	202.360	2.3%	12.3%	85.3%	15.471	100.0%	43.2%	7.6%	2.852	50.0%	2.1%	1.4%	
Bermuda	2.246	5.0%	0.0%	95.0%	0.034	30.0%	N/A	1.5%	0.034	30.0%	NA	1.5%	1.5%
Bhutan	25.384	22.0%	51.2%	26.8%	13.449	100.0%	60.6%	53.0%	10.055	50.0%	55.9%	39.6%	41.0%

COUNTRY	Total household wastewater generated (million m³)	Proportion of household wastewater generated – Sewers (%)	Proportion of household wastewater generated – Septic Tanks (%)	Proportion of household wastewater generated – All other sanitation (%)	Total household wastewater delivered to treatment (million m³)	Proportion of sewer household wastewater delivered to treatment (%)	Proportion of septic tank household wastewater delivered to treatment (%)	Proportion of household wastewater delivered to treatment (%)	Total household wastewater safely treated (million m³)	Proportion of sewer household wastewater safely treated (%)	Proportion of septic tank household wastewater safely treated (%)	Proportion of household wastewater safely treated 2022 (%)	Proportion of household wastewater safely treated 2020 (%)
Bolivia (Plurinational State of)	380.966	58.7%	15.4%	25.9%									
Bonaire, Sint Eustatius and Saba	0.947	0.4%	0.0%	99.7%									
Bosnia and Herzegovina	80.000	55.5%	40.5%	4.0%	55.558	66.2%	80.8%	69.4%	52.244	59.9%	79.3%	65.3%	46.8%
Botswana	78.863	1.7%	5.9%	92.5%									
Brazil	12,735.922	70.7%	13.0%	16.3%	9,832.769	100.0%	50.0%	77.2%	5,528.382	54.3%	38.6%	43.4%	33.0%
British Virgin Islands	1.079	22.6%	74.3%	3.0%									
Brunei Darussalam	15.711	0.0%	99.1%	0.9%									
Bulgaria	228.300	86.5%	13.5%	0.0%	188.052	87.4%	50.0%	82.4%	164.576	76.0%	46.7%	72.1%	79.2%
Burkina Faso	272.245	1.0%	5.9%	93.1%	10.686	100.0%	50.0%	3.9%	7.558	50.0%	38.9%	2.8%	
Burundi	116.714	1.0%	16.6%	82.3%									
Cabo Verde	19.029	20.6%	61.5%	17.9%									
Cambodia	331.718	27.3%	68.1%	4.5%	203.282	100.0%	49.8%	61.3%	155.216	50.0%	48.6%	46.8%	
Cameroon	464.447	2.4%	28.3%	69.3%									
Canada	2,393.143	84.6%	11.4%	4.0%	2,194.529	95.6%	95.6%	91.7%	1,648.640	70.3%	83.0%	68.9%	77.1%
Cayman Islands	2.274	15.1%	67.5%	17.4%									
Central African Republic	42.569	0.6%	0.4%	99.0%									0.6%
Chad	154.635	2.4%	3.3%	94.4%	6.062	100.0%	47.7%	3.9%	3.581	50.0%	34.8%	2.3%	2.3%
Channel Islands	5.755	87.3%	12.4%	0.3%	5.383	100.0%	50.0%	93.5%	5.383	100.0%	50.0%	93.5%	91.3%
Chile	756.481	89.0%	9.3%	1.6%	708.574	100.0%	50.0%	93.7%	674.030	95.0%	48.8%	89.1%	90.5%
China	49,674.242	63.6%	18.1%	18.4%	34,203.975	100.0%	29.3%	68.9%	30,635.271	89.1%	27.8%	61.7%	64.8%
China, Hong Kong Special Administrative Region	295.211	93.5%	0.0%	6.5%	275.904	100.0%	NA	93.5%	268.997	97.5%	NA	91.1%	85.7%

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China, Macao Special Administrative Region	24.359	100.0%	0.0%	0.0%	24.359	100.0%	NA	100.0%	15.909	65.3%	NA	65.3%	69.5%
Colombia	2,130.235	77.8%	16.7%	5.6%	1,834.239	100.0%	50.0%	86.1%	399.887	17.8%	29.5%	18.8%	21.3%
Comoros	20.876	7.4%	7.7%	84.9%									
Congo	127.771	2.1%	24.7%	73.2%									
Cook Islands	0.534	36.0%	36.0%	27.9%									
Costa Rica	204.240	20.8%	77.1%	2.0%	87.788	29.4%	47.8%	43.0%	51.944	16.0%	28.7%	25.4%	23.3%
Côte d'Ivoire	590.814	10.2%	32.1%	57.7%	151.768	100.0%	48.3%	25.7%	99.294	50.0%	36.5%	16.8%	
Croatia	164.890	58.2%	35.5%	6.2%	122.335	96.9%	50.0%	74.2%	56.016	37.2%	34.6%	34.0%	60.3%
Cuba	370.318	66.4%	15.4%	18.2%	133.968	42.9%	50.0%	36.2%	126.043	39.9%	49.1%	34.0%	24.2%
Curaçao	6.652	17.8%	81.8%	0.4%									
Cyprus	97.408	50.0%	45.2%	4.8%	70.752	100.0%	50.0%	72.6%	70.752	100.0%	50.0%	72.6%	67.2%
Czechia	346.000	88.3%	11.7%	0.0%	316.195	96.9%	50.0%	91.4%	315.853	96.8%	50.0%	91.3%	90.1%
Democratic People's Republic of Korea	719.055	54.0%	13.6%	32.4%									
Democratic Republic of the Congo	913.009	1.3%	35.6%	63.1%	169.970	100.0%	48.7%	18.6%	141.809	50.0%	41.8%	15.5%	12.3%
Denmark	244.770	92.4%	7.3%	0.3%	241.812	100.0%	87.2%	98.8%	241.812	100.0%	87.2%	98.8%	95.9%
Djibouti	21.784	9.3%	20.6%	70.0%	4.116	100.0%	46.4%	18.9%	2.426	50.0%	31.4%	11.1%	10.9%
Dominica	2.140	15.6%	72.8%	11.6%									
Dominican Republic	379.326	21.2%	68.9%	9.9%	208.047	100.0%	48.8%	54.8%	150.056	50.0%	42.1%	39.6%	
Ecuador	608.153	69.8%	28.9%	1.2%									31.1%
Egypt	3,813.256	75.6%	21.7%	2.7%	3,296.006	100.0%	50.0%	86.4%	2,815.862	84.5%	46.1%	73.8%	45.5%
El Salvador	209.002	45.9%	24.2%	29.9%									12.9%
Equatorial Guinea	17.954	34.7%	20.0%	45.3%									
Eritrea	58.101	6.8%	11.6%	81.6%									

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Estonia	45.311	84.7%	15.1%	0.2%	41.813	100.0%	50.0%	92.3%	41.813	100.0%	50.0%	92.3%	91.1%
Eswatini	25.495	15.9%	12.2%	71.9%	5.609	100.0%	50.0%	22.0%	4.454	76.1%	44.0%	17.5%	17.9%
Ethiopia	1,503.404	2.2%	5.9%	91.9%	76.649	100.0%	49.9%	5.1%	45.636	50.0%	33.2%	3.0%	
Falkland Islands (Malvinas)	0.125	100.0%	0.0%	0.0%									
Faroe Islands	1.860	0.0%	90.7%	9.3%									0.0%
Fiji	30.985	23.0%	66.3%	10.7%	17.285	100.0%	49.4%	55.8%	12.329	50.0%	42.7%	39.8%	
Finland	302.980	85.8%	14.2%	0.0%	274.236	100.0%	33.0%	90.5%	271.888	99.1%	33.0%	89.7%	92.3%
France	2,774.033	82.1%	17.9%	0.0%	2,583.181	100.0%	61.5%	98.6%	2,582.429	93.7%	61.5%	87.9%	92.5%
French Guiana	9.915	51.9%	39.8%	8.3%	7.117	100.0%	50.0%	71.8%	7.117	100.0%	50.0%	71.8%	70.2%
French Polynesia	10.584	18.9%	79.5%	1.6%									
Gabon	63.955	44.6%	0.0%	55.4%									
Gambia	57.839	1.9%	41.5%	56.6%	12.871	100.0%	49.1%	22.3%	6.100	50.0%	23.1%	10.5%	11.1%
Georgia	125.715	65.2%	3.9%	30.9%	61.969	72.9%	45.8%	49.3%	61.304	72.1%	45.6%	48.8%	46.0%
Germany	5,121.590	96.0%	3.4%	0.6%	5,073.830	100.0%	89.9%	99.1%	5,068.409	99.9%	89.9%	99.0%	99.3%
Ghana	646.027	4.5%	40.3%	55.2%	144.009	100.0%	44.1%	22.3%	76.349	50.0%	23.7%	11.8%	12.1%
Gibraltar	1.144	100.0%	0.0%	0.0%									100.0%
Greece	892.278	86.2%	13.8%	0.0%	830.621	100.0%	50.0%	93.1%	800.211	96.2%	49.0%	89.7%	92.7%
Greenland	1.814	0.0%	40.9%	59.1%	-	NA	0.0%	0.0%		NA	0.0%	0.0%	97.2%
Grenada	4.026	7.4%	64.1%	28.5%									
Guadeloupe	13.851	39.2%	35.2%	25.6%									
Guam	5.996	68.0%	31.3%	0.7%									
Guatemala	561.996	50.9%	11.5%	37.6%									
Guinea	234.438	2.5%	25.2%	72.2%									
Guinea-Bissau	26.972	3.1%	39.4%	57.6%	5.999	100.0%	48.7%	22.2%	5.156	50.0%	44.6%	19.1%	21.4%
Guyana	25.653	3.3%	84.7%	11.9%	11.612	100.0%	49.5%	45.3%	8.331	50.0%	36.4%	32.5%	

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Haiti	94.212	2.6%	38.2%	59.2%									
Honduras	335.286	45.8%	28.7%	25.4%									
Hungary	358.120	84.0%	16.0%	0.0%	319.350	97.9%	43.5%	89.2%	293.846	89.7%	42.0%	82.1%	89.6%
Iceland	29.399	94.1%	5.9%	0.0%	28.534	100.0%	50.0%	97.1%	0.896	0.2%	49.0%	3.0%	73.5%
India	26,414.320	12.2%	37.6%	50.2%	6,084.415	46.4%	46.2%	23.0%	5,471.707	28.0%	46.0%	20.7%	26.6%
Indonesia	7 241.784	1.0%	95.4%	3.6%									
Iran (Islamic Republic of)	3 893.000	38.8%	1.2%	60.0%	982.187	63.4%	50.0%	25.2%	982.187	63.4%	50.0%	25.2%	22.1%
Iraq	3 175.526	30.3%	61.5%	8.1%	1,657.530	76.2%	47.3%	52.2%	1 332.348	76.0%	30.7%	42.0%	37.1%
Ireland	214.619	69.3%	25.4%	5.3%	185.010	98.5%	70.6%	95.2%	120.560	48.8%	70.6%	51.7%	83.4%
Isle of Man	2.954	90.1%	9.9%	0.0%	2.508	88.7%	50.0%	84.9%	2.508	88.7%	50.0%	84.9%	
Israel	343.094	99.2%	0.8%	0.1%	333.987	97.8%	50.0%	97.3%	333.987	97.8%	50.0%	97.3%	93.1%
Italy	2,812.376	98.7%	1.2%	0.0%	2,231.372	79.7%	50.0%	79.3%	1,974.881	70.5%	47.1%	70.2%	94.7%
Jamaica	86.151	26.5%	28.7%	44.8%									
Japan	10,258.153	80.8%	18.0%	1.2%	9,403.538	100.0%	60.5%	91.7%	9,403.538	100.0%	60.5%	91.7%	97.8%
Jordan	267.400	67.0%	30.1%	2.9%	219.402	100.0%	50.0%	82.1%	205.453	93.0%	48.2%	76.8%	82.0%
Kazakhstan	535.820	37.6%	8.6%	53.8%	224.455	100.0%	50.0%	41.9%	194.694	86.0%	46.5%	36.3%	35.7%
Kenya	942.775	12.6%	13.0%	74.5%	179.440	100.0%	49.9%	19.0%	107.113	50.0%	39.1%	11.4%	
Kiribati	2.806	8.9%	68.3%	22.8%	1.165	100.0%	47.8%	41.5%	0.932	50.0%	42.2%	33.2%	30.8%
Kuwait	149.581	100.0%	0.0%	0.0%	149.581	100.0%	NA	100.0%	149.581	100.0%	NA	100.0%	84.7%
Kyrgyzstan	191.736	19.1%	1.0%	79.9%	37.562	100.0%	49.6%	19.6%	36.447	97.0%	48.9%	19.0%	18.9%
Lao People's Democratic Republic	229.645	1.3%	24.1%	74.6%	29.878	100.0%	48.5%	13.0%	23.531	50.0%	39.8%	10.2%	10.1%
Latvia	100.740	79.6%	15.0%	5.4%	88.067	100.0%	52.1%	87.4%	88.067	100.0%	52.1%	87.4%	93.1%
Lebanon	175.689	86.1%	12.4%	1.5%									
Lesotho	33.564	3.0%	2.9%	94.1%									
Liberia	58.343	0.0%	62.2%	37.8%									

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Libya	217.858	75.9%	9.1%	15.0%	175.305	100.0%	50.0%	80.5%	31.400	15.5%	28.9%	14.4%	16.6%
Liechtenstein	1.378	98.7%	1.2%	0.1%									98.1%
Lithuania	58.061	96.8%	0.0%	3.2%	56.175	100.0%	NA	96.8%	56.175	100.0%	NA	96.8%	93.4%
Luxembourg	22.639	98.7%	1.3%	0.0%	22.329	99.3%	50.0%	98.6%	22.329	99.3%	50.0%	98.6%	96.3%
Madagascar	386.417	3.4%	20.4%	76.3%	51.363	100.0%	48.7%	13.3%	41.682	50.0%	44.7%	10.8%	9.3%
Malawi	224.987	4.8%	8.6%	86.6%	20.434	100.0%	49.6%	9.1%	14.244	50.0%	45.6%	6.3%	6.5%
Malaysia	1,957.679	86.4%	13.6%	0.0%	1,825.001	100.0%	50.0%	93.2%	1,748.523	95.5%	49.9%	89.3%	87.8%
Maldives	17.988	68.7%	31.2%	0.1%									
Mali	403.888	3.4%	13.8%	82.8%	40.970	100.0%	48.7%	10.1%	24.726	50.0%	31.9%	6.1%	
Malta	20.550	99.1%	0.0%	0.9%	20.361	100.0%	NA	99.1%	0.221	1.1%	NA	1.1%	15.4%
Marshall Islands	1.213	63.2%	34.4%	2.4%									
Martinique	12.845	46.5%	52.2%	1.3%									
Mauritania	117.869	7.9%	22.7%	69.4%									
Mauritius	45.522	23.2%	6.7%	70.1%	12.098	100.0%	50.0%	26.6%	8.675	69.8%	42.5%	19.1%	13.3%
Mayotte	11.081	59.8%	36.4%	3.8%									
Mexico	4,333.340	84.5%	15.1%	0.4%	2,788.449	67.2%	50.0%	64.3%	2,788.449	67.2%	50.0%	64.3%	59.6%
Micronesia (Federated States of)	2.789	43.0%	52.7%	4.3%									
Monaco	1.278	100.0%	0.0%	0.0%	1.278	100.0%	NA	100.0%	1.237	96.8%	NA	96.8%	96.8%
Mongolia	33.470	27.5%	0.8%	71.7%	9.319	100.0%	47.1%	27.8%	8.750	93.9%	45.4%	26.1%	10.4%
Montenegro	21.640	45.7%	53.0%	1.4%	15.469	100.0%	48.7%	71.5%	11.962	78.8%	36.4%	55.3%	45.1%
Montserrat	0.151	20.4%	79.5%	0.1%									
Morocco	1,124.398	72.6%	19.9%	7.5%	569.196	56.0%	50.0%	50.6%	501.785	48.6%	46.7%	44.6%	36.1%
Mozambique	511.295	2.5%	22.6%	74.9%									
Myanmar	1,322.424	1.3%	33.2%	65.5%	235.262	100.0%	49.6%	17.8%	200.000	50.0%	43.6%	15.1%	
Namibia	62.491	51.9%	3.0%	45.1%									

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Nauru	0.431	23.8%	30.1%	46.1%									
Nepal	808.499	6.6%	75.7%	17.7%	350.491	100.0%	48.6%	43.4%	312.062	50.0%	46.7%	38.6%	37.2%
Netherlands	724.510	99.7%	0.3%	0.0%	722.989	100.0%	40.0%	99.8%	722.989	100.0%	40.0%	99.8%	99.8%
New Caledonia	10.121	33.5%	33.5%	33.1%									
New Zealand	425.463	83.7%	16.3%	0.0%	390.852	100.0%	50.0%	91.9%	359.419	91.6%	47.9%	84.5%	85.1%
Nicaragua	201.818	29.7%	12.6%	57.6%	72.798	100.0%	50.0%	36.1%	64.187	87.0%	46.8%	31.8%	31.8%
Niger	286.824	7.7%	16.3%	75.9%	45.128	100.0%	49.0%	15.7%	24.761	50.0%	29.2%	8.6%	4.0%
Nigeria	3,529.554	17.7%	50.4%	31.9%	1,860.013	100.0%	69.4%	52.7%	1,457.690	50.0%	64.4%	41.3%	48.3%
Niue	0.064	0.0%	99.3%	0.7%									
North Macedonia	83.813	81.8%	10.4%	7.8%	30.054	38.0%	45.6%	35.9%	4.075	3.1%	22.2%	4.9%	9.1%
Northern Mariana Islands	1.651	56.4%	43.5%	0.1%									
Norway	288.230	85.3%	12.9%	1.8%	277.645	98.3%	96.8%	96.3%	218.521	74.3%	96.8%	75.8%	75.7%
Oman	148.127	23.5%	76.1%	0.4%									
Pakistan	6,114.844	38.9%	41.5%	19.6%	3,595.953	100.0%	48.0%	58.8%	2,330.335	50.0%	45.0%	38.1%	
Palau	0.582	94.6%	0.0%	5.4%									
Panama	266.146	34.6%	43.8%	21.7%									
Papua New Guinea	165.230	15.4%	10.4%	74.2%	34.083	100.0%	50.0%	20.6%	8.369	13.7%	28.4%	5.1%	
Paraguay	233.202	7.9%	50.6%	41.4%	76.707	100.0%	49.3%	32.9%	58.644	50.0%	41.8%	25.1%	
Peru	946.786	74.4%	4.9%	20.6%	569.458	77.5%	50.0%	60.1%	460.638	62.4%	45.1%	48.7%	
Philippines	3,461.718	8.6%	81.2%	10.2%	2,724.494	100.0%	86.4%	78.7%	2,305.041	50.0%	76.8%	66.6%	42.9%
Poland	1,002.560	78.7%	0.0%	21.3%	782.844	99.2%	NA	78.1%	775.731	98.3%	NA	77.4%	81.9%
Portugal	470.000	87.4%	12.6%	0.0%	436.328	99.0%	50.0%	92.8%	411.314	93.0%	49.6%	87.5%	73.6%
Puerto Rico	113.964	100.0%	0.0%	0.0%	113.964	100.0%	NA	100.0%	37.049	32.5%	NA	32.5%	32.5%
Qatar	94.429	99.9%	0.0%	0.1%	94.380	100.0%	NA	99.9%	94.380	100.0%	NA	99.9%	99.5%
Republic of Korea	1,811.995	100.0%	0.0%	0.0%	1,803.958	99.6%	NA	99.6%	1,794.838	99.1%	NA	99.1%	99.5%

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Republic of Moldova	91.003	43.8%	11.4%	44.8%	43.864	97.0%	50.0%	48.2%	42.008	92.6%	48.9%	46.2%	38.5%
Réunion	34.074	52.3%	44.3%	3.3%	25.381	100.0%	50.0%	74.5%	25.381	100.0%	50.0%	74.5%	74.2%
Romania	590.330	55.8%	1.5%	42.7%	326.648	97.7%	52.6%	55.3%	177.602	52.8%	41.2%	30.1%	48.3%
Russian Federation	4,066.323	95.2%	0.6%	4.2%	3,882.043	100.0%	50.0%	95.5%	599.232	15.3%	28.8%	14.7%	12.9%
Rwanda	141.723	4.7%	2.0%	93.2%									
Saint Barthélemy	0.384	6.9%	88.3%	4.7%									
Saint Helena	0.186	52.7%	47.3%	0.0%									
Saint Kitts and Nevis	1.646	7.6%	88.3%	4.2%									
Saint Lucia	6.001	5.3%	85.7%	9.0%									
Saint Martin (French Part)	1.113	60.1%	39.9%	0.0%									
Saint Pierre and Miquelon	0.176	38.8%	38.8%	22.5%									
Saint Vincent and the Grenadines	3.513	7.9%	71.5%	20.6%									
Samoa	7.611	9.2%	88.8%	2.0%	3.372	0.0%	49.9%	44.3%	3.262	0.0%	48.3%	42.9%	46.7%
San Marino	1.179	85.0%	15.0%	0.0%	1.091	100.0%	50.0%	92.5%	1.064	97.4%	49.3%	90.2%	90.2%
Sao Tome and Principe	3.738	31.7%	23.5%	44.8%									
Saudi Arabia	2,111.420	72.5%	26.0%	1.5%	1,798.722	99.6%	50.0%	85.2%	1,798.722	99.6%	50.0%	85.2%	79.6%
Senegal	485.668	10.4%	49.4%	40.1%	116.373	44.4%	39.1%	24.0%	37.880	44.4%	6.4%	7.8%	14.2%
Serbia	310.950	57.6%	38.9%	3.5%	118.694	18.1%	71.4%	38.2%	113.426	16.8%	69.0%	36.5%	27.1%
Seychelles	3.597	17.5%	82.3%	0.2%									
Sierra Leone	86.895	2.9%	23.9%	73.2%	16.164	100.0%	65.6%	18.6%	13.323	50.0%	58.0%	15.3%	8.4%
Singapore	268.715	100.0%	0.0%	0.0%	268.715	100.0%	NA	100.0%	268.715	100.0%	NA	100.0%	100.0%

COUNTRY	Total household wastewater generated (million m³)	Proportion of household wastewater generated – Sewers (%)	Proportion of household wastewater generated – Septic Tanks (%)	Proportion of household wastewater generated – All other sanitation (%)	Total household wastewater delivered to treatment (million m³)	Proportion of sewer household wastewater delivered to treatment (%)	Proportion of septic tank household wastewater delivered to treatment (%)	Proportion of household wastewater delivered to treatment (%)	Total household wastewater safely treated (million m³)	Proportion of sewer household wastewater safely treated (%)	Proportion of septic tank household wastewater safely treated (%)	Proportion of household wastewater safely treated 2022 (%)	Proportion of household wastewater safely treated 2020 (%)
Sint Maarten (Dutch part)	1.458	9.7%	45.2%	45.1%									
Slovakia	197.400	69.5%	26.6%	3.9%	162.640	99.4%	50.0%	82.4%	161.810	98.9%	49.9%	82.0%	79.8%
Slovenia	61.700	67.8%	31.4%	0.8%	52.053	99.8%	53.3%	84.4%	40.242	74.4%	47.0%	65.2%	67.2%
Solomon Islands	15.200	12.1%	22.5%	65.4%									
Somalia	296.027	12.2%	9.5%	78.3%									
South Africa	1,736.309	74.3%	3.7%	22.0%	1,350.553	100.0%	95.2%	77.8%	716.957	52.0%	72.3%	41.3%	61.3%
South Sudan	72.687	4.2%	1.7%	94.1%									
Spain	2,410.000	95.7%	0.7%	3.6%	2,118.128	91.5%	50.0%	87.9%	1,925.651	83.1%	47.7%	79.9%	86.0%
Sri Lanka	632.398	1.7%	10.5%	87.8%									
State of Palestine[30]	174.013	55.2%	13.1%	31.7%									63.9%
Sudan	837.798	2.0%	12.3%	85.7%									
Suriname	20.932	2.4%	94.1%	3.5%	9.477	100.0%	45.6%	45.3%	4.988	50.0%	24.1%	23.8%	23.8%
Sweden	565.000	88.7%	10.8%	0.5%	552.373	100.0%	84.4%	97.8%	547.941	99.2%	83.8%	97.0%	95.2%
Switzerland	427.233	99.5%	0.2%	0.3%	424.206	99.7%	50.0%	99.3%	424.206	99.7%	50.0%	99.3%	99.2%
Syrian Arab Republic	681.655	98.0%	1.6%	0.4%									
Tajikistan	233.631	24.6%	4.7%	70.6%									
Thailand	3,598.668	14.4%	82.3%	3.3%	1,221.498	100.0%	23.7%	33.9%	885.636	50.0%	21.2%	24.6%	24.4%
Timor-Leste	37.337	14.5%	36.3%	49.3%									
Togo	101.854	0.6%	60.1%	39.4%	30.553	100.0%	49.0%	30.0%	15.235	50.0%	24.4%	15.0%	15.0%
Tokelau	0.064	0.0%	0.0%	0.0%									

30 WHO reports refer to “occupied Palestinian territory, including East Jerusalem”.

COUNTRY	Total household wastewater generated (million m³)	Proportion of household wastewater generated – Sewers (%)	Proportion of household wastewater generated – Septic Tanks (%)	Proportion of household wastewater generated – All other sanitation (%)	Total household wastewater delivered to treatment (million m³)	Proportion of sewer household wastewater delivered to treatment (%)	Proportion of septic tank household wastewater delivered to treatment (%)	Proportion of household wastewater delivered to treatment (%)	Total household wastewater safely treated (million m³)	Proportion of sewer household wastewater safely treated (%)	Proportion of septic tank household wastewater safely treated (%)	Proportion of household wastewater safely treated 2022 (%)	Proportion of household wastewater safely treated 2020 (%)
Tonga	3.692	3.2%	93.9%	2.9%	1.769	100.0%	47.6%	47.9%	1.122	50.0%	30.7%	30.4%	28.6%
Trinidad and Tobago	53.147	20.3%	74.0%	5.7%									
Tunisia	394.028	66.4%	18.7%	14.9%	287.238	99.2%	37.8%	72.9%	287.238	99.2%	37.8%	72.9%	59.7%
Türkiye	2,811.806	94.5%	0.0%	5.5%	2,203.316	82.9%	NA	78.4%	1,818.539	68.4%	NA	64.7%	63.3%
Turkmenistan	225.334	29.2%	2.1%	68.7%									
Turks and Caicos Islands	0.895	0.0%	97.2%	2.8%	0.427	NA	49.1%	47.7%	0.274	NA	31.5%	30.6%	
Tuvalu	0.365	0.2%	98.5%	1.3%	0.180	100.0%	49.7%	49.2%	0.156	0.0%	43.3%	42.6%	
Uganda	533.663	2.3%	6.7%	91.0%	29.967	100.0%	50.0%	5.6%	19.625	41.8%	40.7%	3.7%	
Ukraine	1,296.087	55.3%	0.9%	43.8%	723.050	100.0%	50.0%	55.8%	651.040	90.0%	47.5%	50.2%	34.3%
United Arab Emirates	327.068	94.3%	1.3%	4.4%	310.571	100.0%	50.0%	95.0%	310.571	100.0%	50.0%	95.0%	95.9%
United Kingdom of Great Britain and Northern Ireland	2,799.191	97.8%	2.0%	0.2%	2,766.440	100.0%	50.0%	98.8%	2,727.904	98.6%	49.6%	97.5%	98.8%
United Republic of Tanzania	1,183.285	1.2%	19.3%	79.5%	112.008	12.4%	48.4%	9.5%	90.749	9.4%	39.2%	7.7%	
United States of America	36,766.180	86.2%	13.5%	0.2%	36,607.419	100.0%	98.4%	99.6%	35,975.785	98.2%	97.4%	97.9%	91.1%
United States Virgin Islands	3.426	39.5%	60.3%	0.2%									
Uruguay	118.745	62.3%	33.2%	4.6%									
Uzbekistan	1,012.341	26.2%	0.4%	73.4%									32.3%
Vanuatu	9.556	0.0%	29.6%	70.4%									
Venezuela (Bolivarian Republic of)	869.300	98.5%	0.8%	0.7%									
Viet Nam	3,381.979	3.5%	85.0%	11.5%	1,545.225	100.0%	49.6%	45.7%	1,350.094	50.0%	44.9%	39.9%	
Wallis and Futuna Islands	0.400	0.0%	78.8%	21.2%									

COUNTRY	Total household wastewater generated (million m³)	Proportion of household wastewater generated – Sewers (%)	Proportion of household wastewater generated – Septic Tanks (%)	Proportion of household wastewater generated – All other sanitation (%)	Total household wastewater delivered to treatment (million m³)	Proportion of sewer household wastewater delivered to treatment (%)	Proportion of septic tank household wastewater delivered to treatment (%)	Proportion of household wastewater delivered to treatment (%)	Total household wastewater safely treated (million m³)	Proportion of sewer household wastewater safely treated (%)	Proportion of septic tank household wastewater safely treated (%)	Proportion of household wastewater safely treated 2022 (%)	Proportion of household wastewater safely treated 2020 (%)
Yemen	688.365	53.6%	33.6%	12.8%	484.502	100.0%	50.0%	70.4%	193.506	31.8%	32.9%	28.1%	34.4%
Zambia	301.377	19.6%	20.2%	60.1%									
Zimbabwe	238.661	62.3%	10.7%	27.1%	142.066	87.1%	49.6%	59.5%	130.745	79.5%	49.2%	54.8%	23.0%

Notes:

NA - Not applicable, because no wastewater is generated by this classification of household sanitation facility

Annex 8: Regional and global data (household wastewater).

REGION	Total household wastewater generated (million m³)*	Proportion of household wastewater generated – Sewers (%)*	Proportion of household wastewater generated – Septic tanks (%)*	Proportion of household wastewater generated – All other sanitation (%)*	Total household wastewater delivered to treatment (million m³)**	Proportion of sewer household wastewater delivered to treatment (%)**	Proportion of septic tank household wastewater delivered to treatment (%)**	Proportion of household wastewater delivered to treatment (%)**	Total household wastewater safely treated (million m³)***	Proportion of sewer household wastewater safely treated (%)***	Proportion of septic tank household wastewater safely treated (%)***	Proportion of household wastewater safely treated in 2022 (%)***	Proportion of household wastewater safely treated in 2020 (%)***
World	267,734.60	56.9%	23.6%	19.5%	169,021.58	95.5%	52.0%	68.3%	154,728.73	81.5%	48.1%	57.8%	55.5%
SDG regions													
Australia and New Zealand	1,341.57	90.9%	9.1%	0.0%	1,280.84	100.0%	50.0%	95.5%	1,237.23	96.6%	48.7%	92.2%	78.8%
Central and Southern Asia	46,072.20	18.5%	32.1%	49.4%	12,557.77	71.8%	46.4%	29.1%	11,053.08	44.8%	45.5%	24.0%	25.5%
Eastern and South-Eastern Asia	84,663.86	53.7%	32.5%	13.8%	53,774.41	100.0%	43.0%	70.2%	53,029.10	91.0%	39.8%	62.6%	65.5%
Latin America and the Caribbean	27,713.34	70.2%	16.6%	13.2%	17,427.56	90.3%	49.8%	72.5%	12,725.08	54.7%	40.0%	45.9%	40.1%
Europe and Northern America	70,003.56	87.4%	10.2%	2.4%	66,342.13	98.1%	88.9%	94.8%	60,535.63	88.8%	87.4%	86.5%	80.4%
Oceania excluding Australia and New Zealand	271.41	18.3%	27.3%	54.4%	59.05	98.0%	49.5%	27.8%	40.30	23.4%	37.9%	14.8%	
Sub-Saharan Africa	18,113.54	16.0%	25.9%	58.0%	4,635.72	97.6%	58.5%	31.7%	3,637.72	52.9%	48.0%	20.1%	27.6%
Northern Africa and Western Asia	19,555.12	68.6%	22.1%	9.3%	12,944.12	88.2%	48.4%	73.8%	12,470.59	77.3%	38.4%	63.8%	62.8%
Other regional groupings													
Least developed countries (LDCs)	19,835.592	9.0%	26.6%	64.4%	3,352.246	97.1%	46.9%	21.8%	346,446.433	44.6%	39.4%	17.5%	22.3%
Landlocked developing countries (LLDCs)	9,774.961	17.5%	15.2%	67.3%	1,389.666	82.9%	49.1%	22.0%	203,616.333	61.1%	43.1%	20.8%	26.9%
Small island developing States (SIDS)	1,932.914	43.5%	32.7%	23.8%	822.926	81.4%	49.0%	56.2%	79,415.798	60.9%	41.4%	41.1%	

REGION	Total household wastewater generated (million m³)*	Proportion of household wastewater generated – Sewers (%)*	Proportion of household wastewater generated – Septic tanks (%)*	Proportion of household wastewater generated – All other sanitation (%)*	Total household wastewater delivered to treatment (million m³)**	Proportion of sewer household wastewater delivered to treatment (%)**	Proportion of septic tank household wastewater delivered to treatment (%)**	Proportion of household wastewater delivered to treatment (%)**	Total household wastewater safely treated (million m³)***	Proportion of sewer household wastewater safely treated (%)***	Proportion of septic tank household wastewater safely treated (%)***	Proportion of household wastewater safely treated in 2022 (%)***	Proportion of household wastewater safely treated in 2020 (%)***
Income groups													
High income	82,214.061	86.6%	12.0%	1.4%	77,725.137	98.7%	80.9%	95.3%	7,552,221.261	95.2%	79.9%	91.9%	90.3%
Upper-middle income	94,548.067	65.1%	19.8%	15.1%	64,476.414	95.5%	35.7%	69.5%	4,995,590.984	71.8%	30.6%	52.8%	54.7%
Lower-middle income	79,495.233	21.2%	41.4%	37.4%	25,786.218	80.7%	53.1%	38.2%	2,639,645.720	58.4%	49.4%	33.2%	31.1%
Low income	10,522.589	16.6%	16.1%	67.3%	1,001.317	100.0%	49.5%	17.8%	244,551.968	36.3%	37.0%	23.2%	

Notes:

* Based on estimates computed for all countries/ territories in the region.

** Based on estimates from only those countries/territories with 6.3.1 household estimates in the region (n=140 for "World").

*** Based on estimates computed for all countries/territories in the region, with regional averages imputed for those without 6.3.1 household estimates (n=140 for “World”).

Presenting the UN-Water Integrated Monitoring Initiative for SDG 6

Through the UN-Water Integrated Monitoring Initiative for SDG 6 (IMI-SDG6), 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.

IMI-SDG6 brings together the United Nations organizations that are formally mandated to compile country data on the SDG 6 global indicators, and builds on ongoing efforts such as the World Health Organization (WHO)/United Nations Children's Fund (UNICEF) Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP), the Global Environment Monitoring System for Freshwater (GEMS/Water), the Food and Agriculture Organization of the United Nations (FAO) Global Information System on Water and Agriculture (AQUASTAT) and the UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS).

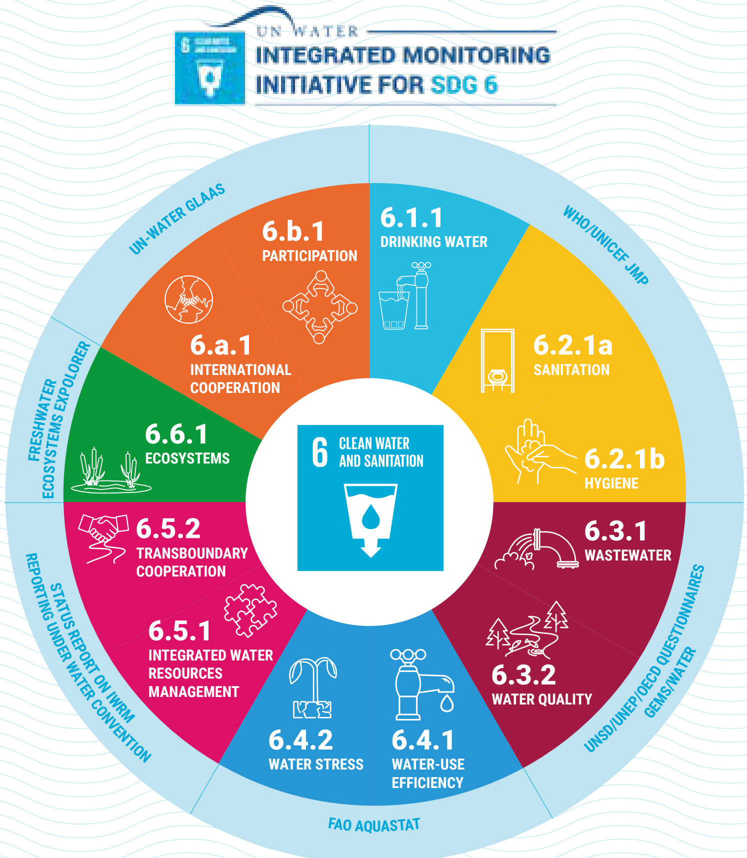
This joint effort enables synergies to be created across United Nations organizations and methodologies and requests for data to be harmonized, leading to more efficient outreach and a reduced reporting burden. At the national level, IMI-SDG6 also promotes intersectoral collaboration and consolidation of existing capacities and data across organizations.

The overarching goal of IMI-SDG6 is to accelerate the achievement of SDG 6 by increasing the availability of high-quality data for evidence-based policymaking, regulations, planning and investments at all levels. More specifically, IMI-SDG6 aims to support countries to collect, analyse and report SDG 6 data, and to support policymakers and decision makers at all levels to use these data.

- **Learn more about SDG 6 monitoring and reporting and the support available:** https://www.sdg6monitoring.org

- **Read the latest SDG 6 progress reports, for the whole goal and by indicator:** https://www.unwater.org/publication_categories/sdg6-progress-reports/

- **Explore the latest SDG 6 data at the global, regional and national levels:** https://www.sdg6data.org



INDICATORS	CUSTODIANS
6.1.1 Proportion of population using safely managed drinking water services	WHO, UNICEF
6.2.1 Proportion of population using (a) safely managed sanitation services, and (b) a handwashing facility with soap and water	WHO, UNICEF
6.3.1 Proportion of domestic and industrial wastewater flows safely treated	WHO, UN-Habitat, UNSD
6.3.2 Proportion of bodies of water with good ambient water quality	UNEP
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	UNEP
6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation	UNECE, UNESCO
6.6.1 Change in the extent of water-related ecosystems over time	UNEP, Ramsar
6.a.1 Amount of water and sanitation-related official development assistance that is part of a government-coordinated spending plan	WHO, 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, OECD

Learn more about progress towards SDG 6

Sustainable Development Goal (SDG) 6 expands the Millennium Development Goal (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.

Monitoring progress towards SDG 6 is key to achieving this SDG. High-quality data help policymakers 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.

The 2030 Agenda for Sustainable Development specifies that global follow-up and review shall primarily be based on national official data sources. The data are compiled and validated by the United Nations custodian agencies, who contact country focal points every two to three years with requests for new data, while also providing capacity-building support. The last global "data drive" took place in 2023, resulting in status updates on seven of the global indicators for SDG 6 (please see below). These reports provide a detailed analysis of current status, historical progress and acceleration needs regarding the SDG 6 targets.

To enable a comprehensive assessment and analysis of overall progress towards SDG 6, it is essential to bring together data on all the SDG 6 global indicators and other key social, economic and environmental parameters. This is exactly what the SDG 6 Data Portal does, enabling global, regional and national actors in various sectors to see the bigger picture, thus helping them make decisions that contribute to all SDGs. UN-Water also publishes synthesized reporting on overall progress towards SDG 6 on a regular basis.

Summary Brief: Mid-term status of SDG 6 global indicators and acceleration needs

Based on latest available data on all SDG 6 global indicators. Published by UN-Water through the UN-Water Integrated Monitoring Initiative for SDG 6.

Progress on household drinking water, sanitation and hygiene 2000–2022: special focus on gender

Based on latest available data on SDG indicators 6.1.1 and 6.2.1. Published by World Health Organization (WHO) and United Nations Children's Fund (UNICEF).

https://www.unwater.org/publications/who/unicef-joint-monitoring-program-update-report-2023

Progress on the proportion of domestic and industrial wastewater flows safely treated – Mid-term status of SDG Indicator 6.3.1 and acceleration needs, with a special focus on climate change, wastewater reuse and health

https://www.unwater.org/publications/progress-wastewater-treatment-2024-update

Based on latest available data on SDG indicator 6.3.1. Published by WHO and United Nations Human Settlements Programme (UN-Habitat) on behalf of UN-Water.

Progress on ambient water quality: mid-term status of SDG Indicator 6.3.2 and acceleration needs, with a special focus on health

Based on latest available data on SDG indicator 6.3.2. Published by United Nations Environment Programme (UNEP) on behalf of UN-Water.

Progress on change in water-use efficiency. Mid-term status of SDG Indicator 6.4.1 and acceleration needs, with special focus on food security and climate change

Based on latest available data on SDG indicator 6.4.1. Published by Food and Agriculture Organization of the United Nations (FAO) on behalf of UN-Water.

Progress on the level of water stress. Mid-term status of the SDG Indicator 6.4.2 and acceleration needs, with special focus on food security and climate change

Based on latest available data on SDG indicator 6.4.2. Published by FAO on behalf of UN-Water.

Progress on implementation of Integrated Water Resources Management. Mid-term status of SDG indicator 6.5.1 and acceleration needs, with a special focus on climate change

Based on latest available data on SDG indicator 6.5.1. Published by UNEP on behalf of UN-Water.

Progress on transboundary water cooperation. Mid-term status of SDG Indicator 6.5.2, with a special focus on climate change – 2024

Based on latest available data on SDG indicator 6.5.2. Published by United Nations Economic Commission for Europe (UNECE) and United Nations Educational, Scientific and Cultural Organization (UNESCO) on behalf of UN-Water.

Progress on water-related ecosystems. Mid-term status of SDG Indicator 6.6.1 and acceleration needs, with a special focus on Biodiversity

Based on latest available data on SDG indicator 6.6.1. Published by UNEP on behalf of UN-Water.

Strong systems and sound investments: evidence on and key insights into accelerating progress on sanitation, drinking-water and hygiene

The UN-Water global analysis and assessment of sanitation and drinking-water (GLAAS) 2022 report

https://www.unwater.org/publications/un-water-glaas-2022-strong-systems-and-sound-investments-evidence-and-key-insights

Based on latest available data on SDG indicators 6.a.1 and 6.b.1. Published by WHO through the UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS) on behalf of UN-Water.

UN-Water reports and other relevant publications

UN-Water coordinates the efforts of United Nations entities and international organizations working on water and sanitation issues. UN-Water publications draw on the experience and expertise of UN-Water's Members and Partners.

United Nations System-Wide Strategy for Water and Sanitation

The United Nations system-wide strategy for water provides a system-wide approach for the United Nations to work collaboratively on water and sanitation. In September 2023, Member States adopted General Assembly resolution 77/334, which requested the Secretary-General to present a United Nations system-wide water and sanitation strategy in consultation with Member States before the end of the seventy-eighth session. The strategy has been developed by UN-Water under the leadership of the UN-Water Chair, as requested by the Secretary-General, and will be launched in July 2024.

Blueprint for Acceleration: Sustainable Development Goal 6 Synthesis Report on Water and Sanitation 2023

The report, written by the UN-Water family of Members and Partners, is a concise guide to delivering concrete results – offering actionable policy recommendations directed towards senior decision-makers in Member States, other stakeholders, and the United Nations System to get the world on track to achieve SDG 6 by 2030. It was released ahead of the discussions of Member States and relevant stakeholders at the 2023 High-level Political Forum on Sustainable Development (HLPF), which includes a Special Event focused on SDG 6 and the Water Action Agenda.

United Nations World Water Development Report

The United Nations World Water Development Report is UN-Water's flagship report on water and sanitation issues, focusing on a different theme each year. The report is published by UNESCO on behalf of UN-Water, and its production is coordinated by the UNESCO World Water Assessment Programme.

SDG 6 Progress Update – 9 reports, by SDG 6 global indicator

This series of reports provides an in-depth update and analysis of progress towards the different SDG 6 targets and identifies priority areas for acceleration. *Progress on household drinking water, sanitation and hygiene, Progress on wastewater treatment, Progress on ambient water quality, Progress on water-use efficiency, Progress on level of water stress, Progress on integrated water resources management, Progress on transboundary water cooperation, Progress on water-related ecosystems and Progress on international cooperation and local participation*. The reports, produced by the responsible custodian agencies, present the latest available country, region and global data on the SDG 6 global indicators, and are published every two to three years.

Progress reports of the WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP)

The JMP is affiliated with UN-Water and is responsible for global monitoring of progress towards SDG 6 targets for universal access to safe and affordable drinking-water and adequate and equitable sanitation and hygiene services. Every 2 years, the JMP releases updated estimates and progress reports for WASH in households (as part of the progress reporting on SDG 6, see above), schools and health care facilities.

UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS)

The GLAAS report is produced by WHO on behalf of UN-Water. It provides a global update on the policy frameworks, institutional arrangements, human resource base, and international and national finance streams in support of water and sanitation. It is a substantive input into the activities of Sanitation and Water for All as well as the progress reporting on SDG 6. The next report will be published in 2025.

UN-Water Country Acceleration Case Studies

To accelerate the achievement of SDG 6 targets as part of the SDG 6 Global Acceleration Framework, UN-Water releases SDG 6 Country Acceleration Case Studies to explore countries' pathways to achieving accelerated progress on SDG 6 at the national level. Since 2022, six case studies have been released from Costa Rica, Pakistan. Senegal, Brazil, Ghana and Singapore. Three new are planned to be released in July 2024 from Cambodia, Czechia and Jordan.

Policy and Analytical Briefs

UN-Water's Policy Briefs provide short and informative policy guidance on the most pressing freshwater-related issues that draw upon the combined expertise of the United Nations system. Analytical Briefs provide an analysis of emerging issues and may serve as basis for further research, discussion and future policy guidance.

UN-Water Planned Publications

- **UN-Water Policy Brief on Transboundary Waters Cooperation – update**

More information: https://www.unwater.org/unwater-publications/

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