AN INTRODUCTION TO SDG INDICATOR 6.3.2: PROPORTION OF BODIES OF WATER WITH GOOD AMBIENT WATER QUALITY

This document introduces the methodology for SDG indicator 6.3.2. It provides context and basic information about the indicator and it is a companion to the Step-by-Step methodology and is supported by a series of in-depth technical documents and case studies that provide more detailed information on specific aspects of the methodology. These are available through the SDG Water Quality Hub[1].

The United Nations Environment Programme (UNEP) is the custodian agency for SDG indicator 6.3.2 and the Global Environment Monitoring Programme for Freshwater[2] (GEMS/Water) is the implementing programme. All of the Goal 6 indicators are coordinated by UN Water under the Integrated Monitoring Initiative for Sustainable Development Goal 6[3] (IMI-SDG6).

WHAT IS GOOD AMBIENT WATER QUALITY AND WHY IS IT IMPORTANT?

Sustainable development relies on a constant and reliable source of freshwater. At the most basic individual level we rely on these sources to provide water for drinking, for washing and for food preparation. We also depend on these resources for irrigation, for recreation, to assimilate our waste water, for power generation and to support multiple industries. Freshwater ecosystems provide these services, but their ability to continue to do so is under threat. Pressures from human activities, such as the release of untreated effluent and changes to the surrounding catchment area that include agricultural intensification, deforestation and mining, cause damage to these fragile ecosystems.

Good ambient water quality is water of a certain standard that flows in our rivers, lakes and aquifers without causing harm to human or ecosystem health. This explanation sounds straightforward but, in practice, it is complicated to define *good ambient water quality*. Water quality varies constantly over space and time; for example, a measurement in a river one day may be different the next as a result of natural changes. This variability can sometimes make it difficult to determine whether water quality is in its natural state or is impacted by human activity. Also, although water quality criteria to maintain human health are relatively easy to define, aquatic ecosystems are much more diverse, and to define water quality that ensures the protection of the ecosystem is much more difficult. The third part of the problem is that there are thousands of substances that can be measured in freshwaters, and the effects of these on humans and ecosystems and how they interact with each other, is not fully understood.

SDG indicator 6.3.2 provides information on the quality of freshwaters, and how they change over time that can be used to inform management decisions. The core components of the methodology reflect pressures that are relevant

[1] https://sdg632hub.org/
[2] https://www.unep.org/explore-topics/water/what-we-do/monitoring-water-quality
[3] https://www.unwater.org/our-work/integrated-monitoring-initiative-sdg-6

regardless of geography or a country's socio-economic development status. The methodology goes further and provides flexibility to allow nationally relevant water quality issues to be reported where a country has the capacity to do so.

WHY DO WE NEED INDICATOR 6.3.2?

Target 6.3 aims to improve water quality: "*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*". **Indicator 6.3.2 provides the mechanism to determine whether efforts to improve water quality are working.**

Seeing is believing, yet often it is not possible to *see* the quality of freshwater. By monitoring and generating water quality data and by sharing them using reports, maps and data portals, we can *see* which rivers can be used to irrigate our crops, we can see if lakes can support healthy fisheries, and we can see if an aquifer can be used to supply safe drinking water. Monitoring water quality makes the invisible become visible and provides evidence to implement management measures.

In many parts of the world we have little or no information on whether water quality is suitable to support sustainable development, despite its fundamental importance. This data gap was made clear during the 2020 data drive for this indicator when over 75 thousand water bodies were reported on by nearly 90 countries, but unfortunately, just over one per cent of these water bodies (1,300) were in the poorest 20 countries[4]. This indicator helps to quantify exactly how pressing this data gap is and allows us to track progress to improve this over time.

In addition to information about data gaps, the data collected for indicator 6.3.2 help to improve our understanding of the impact of human development on global water quality. These data tell us where water quality is good or polluted, and whether our efforts to improve water quality are successful or not. This is true at the national level, but also globally, regionally and most importantly locally!

WHAT IS NEEDED TO REPORT?

The indicator, at its most basic level, relies on water quality data from *in situ* measurements and the analysis of samples collected from rivers, lakes and aquifers. Water quality is assessed by measuring physical and chemical parameters that reflect natural water quality, together with major human impacts on water quality.

The methodology recognises that countries have different levels of capacity to monitor and assess water quality, with many developed countries operating extensive programmes that collect and report data to existing reporting frameworks. At the other end of the scale, several of the least developed countries currently do not monitor ambient water quality or operate very limited programmes. In the spirit of the SDGs, the methodology is designed to be as flexible and straightforward as possible and aims to ensure that *no one is left behind*.

At a minimum, an ambient water quality monitoring programme is required that is actively collecting water quality data. For countries without such a programme, reporting may not be possible in the short-term. For these countries, GEMS/Water[5] can provide guidance and support to initiate data collection with a view to reporting SDG indicator 6.3.2 in the near future.

[4] https://www.unwater.org/publications/progress-ambient-water-quality-2021-update
[5] https://www.ucc.ie/en/gemscdc/

SDG Water Quality Hub

The new SDG Water Quality Hub, which was created and developed in response to feedback received from indicator country focal points, integrates the indicator reporting process with access to results, and resources to support those tasked with reporting. The target audience of the Hub in the short and medium terms is the indicator focal point network, but in the longer term, as additional functionality is added the Hub will be of value to technical and general audiences.

One of the core functions of the Hub is to streamline the reporting process. Information reported is automatically displayed during the submission process allowing real-time review of the indicator information. This will reduce the need for communication via email between the country and SDG 632 Help Desk. It should be noted that the help desk service will remain available to answer queries as they arise.

In addition, the Hub will provide the central location for UNEP's efforts to package global water quality datasets in SDG 632-ready formats, as well as facilitate networking and peer-to-peer learning between country focal points. New value-added products will also be developed and made available through the Hub. An automatic indicator calculation function is also being planned and will be integrated in the near future.

Methodology Concepts

Below is a summary of key concepts that provide the basis for the indicator methodology.

Level 1 Reporting

Reporting at Level 1 is the mandatory component that ensures the global comparability of the indicator by prescribing the measurement of standardised basic core components.

The indicator methodology at Level 1 maintains the global comparability by using simple to measure characteristics of water that represent pressures that are relevant everywhere. These pressures include nutrient enrichment; oxygen depletion; salinization and acidification. The parameters used to measure these impacts can be analysed in the field and do not require laboratory facilities. These parameters are organised into parameter groups and the justification for their inclusion is shown in Table 1 below.

Table 1: Level 1 parameter groups, suggested parameters (in bold), the relevant water body types and reasons for inclusion in the global indicator

Parameter group	Parameter	River	Lake	Ground-water	Reason for Inclusion / Pressure
Oxygen	**Dissolved oxygen**	•	•		Measure of oxygen depletion
	Biological oxygen demand, Chemical oxygen demand	•			Measure of organic pollution
Salinity	**Electrical conductivity** *Salinity, Total dissolved solids, Chloride*	•	•	•	Measure of salinisation and helps to characterise the water body
Nitrogen*	**Total oxidised nitrogen** *Total nitrogen, Nitrite, Ammoniacal nitrogen*	•	•		Measure of nutrient pollution
	Nitrate**			•	Health concern for human consumption
Phosphorus*	**Orthophosphate** *Total phosphorous*	•	•		Measure of nutrient pollution
Acidification	**pH**	•	•	•	Measure of acidification and helps to characterise the water body
* Countries should include the fractions of N and P which are most relevant in the national context					
** Nitrate is suggested for groundwater due to associated human health risks					

LEVEL 2 REPORTING

Reporting at Level 2 is an **additional option** that provides the flexibility to report on water quality pressures that may be of national relevance.

Level 1 is limited in scope and, although it provides good information, and ensures the essential global comparability of the indicator information generated, it cannot represent all pressures to freshwater quality. Level 2 goes further and provides the flexibility for countries to include information that may be of national concern or relevance. Level 2 reporting may use additional sources of data, such as analyses of other parameters, or approaches other than the basic physical and chemical methods used in Level 1. These approaches may include biological or microbiological methods or Earth observation techniques. These are summarised, but not limited to, those shown in Figure 1 below. Biological approaches include using animals or plants and algae that live in the water. Microbiological approaches may look for the presence or absence of bacteria that are known to be harmful to humans. Earth observation techniques analyse the colour and reflectance of images of the surface of water bodies at various wavelengths. These can be used to measure optically active parameters, such as chlorophyll or turbidity.

Recent developments in information and communications technology have fuelled the growth and popularity of citizen and community-led approaches to data collection. These allow data to be collected using simple kits and can geolocate accurately the data collected using mobile devices. These citizen initiatives may lack the accuracy and precision of laboratory-based analyses, but have the advantage of being able to collect data at many more locations and at a greater frequency than conventional monitoring.

The differences between Level 1 and Level 2 are illustrated in Figure 1, and summarised below.

- **Data Collection** - Level 1 is limited to *in situ* data only. Water quality is either measured at the monitoring location or a sample is collected for subsequent analysis. Whereas Level 2 data can be collected by remote methods such as satellite-based Earth observation or other remote sensing approaches.

- **Data Type** - Level 1 is constrained to the five core physico-chemical parameter groups (oxygen, salinity, nitrogen, phosphorus and acidification), whereas Level 2 can include additional physico-chemical parameters as well as include pathogen, biological or ecosystem approaches to water body classification. Countries may combine one or several additional data types in their Level 2 submission.
- **Data Source** – Level 1 data are constrained to being derived from national monitoring programmes such as those implemented by national agencies responsible for monitoring, but may include other national sources such as academic or private sector organisations or citizen initiatives. Level 2 differs because it provides countries with the opportunity to use these same sources as Level 1, but to also incorporate additional data sources such as those derived from Earth observation or modelled products.

For further information on Level 2 reporting, there is a technical document[6] available through the SDG Water Quality Hub.

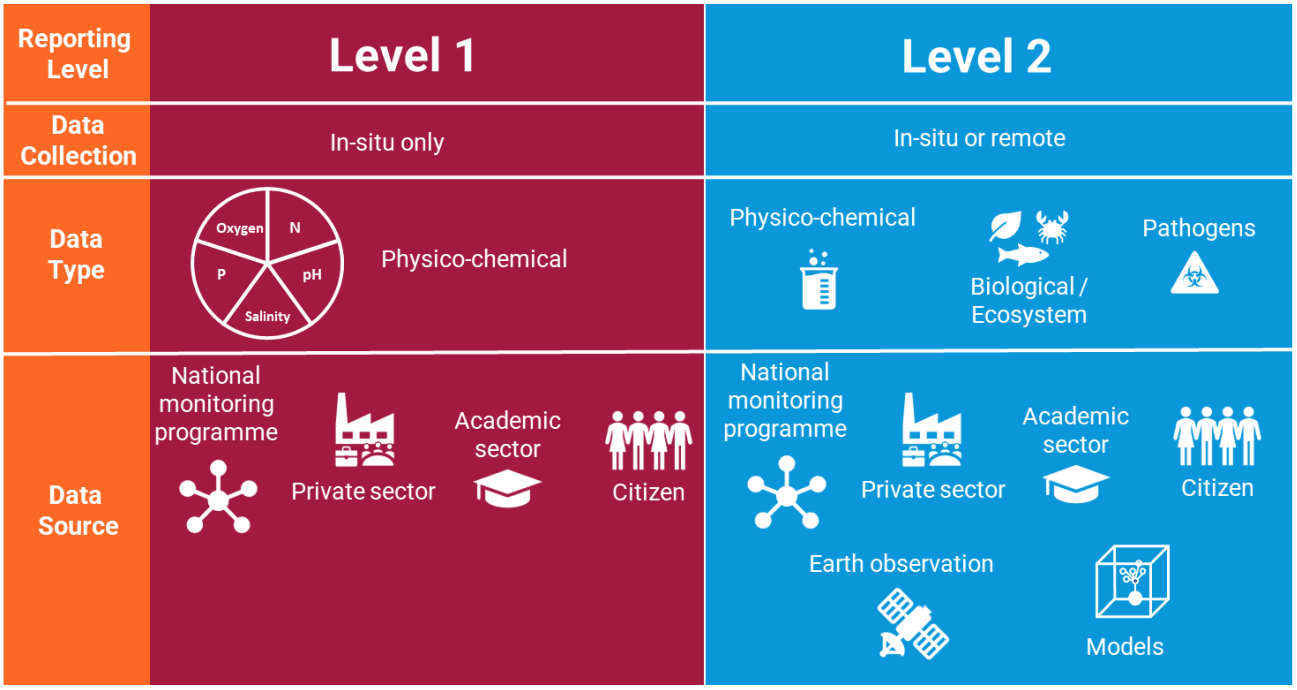

Figure 1: Schematic of similarities and differences between mandatory Level 1 and optional Level 2 reporting in terms of data collection, data type and data source that can be used.

THE TARGET-BASED APPROACH

SDG Indicator 6.3.2 uses a target-based approach to classify water quality. This means that the measured values are compared with numerical values that represent "good ambient water quality". These targets may be water quality standards that are defined by national legislation or they may be derived from knowledge of the natural or baseline status of water bodies.

It is important to recognise that ambient water quality within the indicator 6.3.2 framework is not considered with any particular "use" of water in mind. This is because it is important that the

6 https://communities.unep.org/display/sdg632/Documents+and+Materials?preview=/32407814/106758331/SDG632_TechDoc_Level2_20230418_EN_RevB.pdf

quality of water in our rivers, lakes and aquifers is compared with natural conditions before it is designated for a particular human use.

Targets can be nation-wide values, or alternatively they can be water body specific or even site-specific. The more specific a target, the better it is at identifying potential pollution problems. A full list of target values used in other jurisdictions, and guidance on how to set them, is covered in a specific technical document[7] to be found through the SDG Water Quality Hub.

Cooperation for target setting is encouraged for transboundary waters. If Country A, uses different targets to Country B for the same transboundary water body, the classification of water quality may be different even if the measured water quality is the same. Also, it is important to note that in cases where multiple target values may be relevant for the same water body, it is the most stringent target that should be applied. For example, for nitrate, a standard based on the World Health Organization's drinking water quality guidelines[8] may be much higher than a nitrate standard established to protect ecosystems. In this situation the more stringent ecosystem standard should be applied because this means that both human and ecosystem health are protected.

Reporting Basin Districts and Water bodies

Reporting Basin Districts (RBD), although they are based on river basins, they apply to rivers, lakes and aquifers. Depending on the size of a country, there may be several RBDs within the national borders or, alternatively, the country may be wholly within a single RBD. For large countries, reporting by these hydrological units allows differences in water quality to be made clear for managers and policy makers. The RBD concept provides a practical spatial unit that can be used for management purposes. This is especially relevant for countries that share transboundary waters where strategic efforts to assess and manage water quality are of benefit to all countries.

Many countries have their river basin-based hydrological units already defined. Such units are often used for national reporting on many aspects of water and sanitation. Countries are encouraged to apply these same units for SDG indicator 6.3.2 reporting to ensure that linkages between activities that affect water quality, such as waste water generation and treatment can be linked to water quality.

Water bodies are smaller units that lie wholly within an RBD. It is these smaller discrete units that are classified as being either "good" or "not good" water quality. It is at this local level that impacts of poor water quality are felt, and where actions to improve quality are realised. A water body can be one of three types: (i) a section or a tributary of a river; (ii) a lake; or (iii) an aquifer. Ideally, river water bodies should be delineated to ensure they are homogenous in terms of water quality. This allows the water body to be classified as good or not using fewer monitoring stations. Each lake and aquifer water body may require many monitoring locations to ensure that quality can be classified reliably.

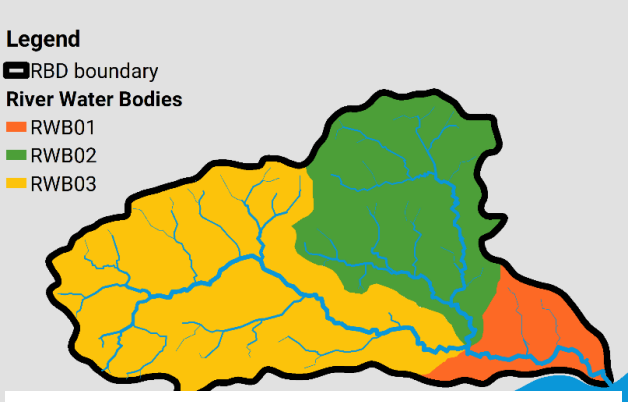

Figure 2: Map showing a single Reporting Basin District with three river water bodies

[7] https://communities.unep.org/display/sdg632/Documents+and+Materials?preview=/32407814/38306400/CDC_GEMI2_TechDoc2_Targetvalues_20200508.pdf

[8] WHO, 2017. *Guidelines for drinking-water quality: fourth edition incorporating the first addendum* 4th Edition., Geneva: World Health Organization.

If, for example, a river is interrupted by a lake in its course, the boundaries between the lake and the river stretches upstream and downstream of the lake would act as boundaries between three individual water bodies. For river networks, water bodies can be delineated based on tributaries or sections of river between two river confluences. Figure 2 shows three separate water bodies within one RBD. Based on the heterogeneity of water quality with the river basin, it may be desirable to delineate smaller water body units.

For groundwaters, a water body is defined as a distinct volume of groundwater within an aquifer or aquifers. Groundwater bodies that cross reporting basin district (RBD) boundaries should be divided at the boundary with each separate portion of the groundwater body being reported separately along with its respective RBD. There is a technical document[9] available on groundwaters that provides more detailed information.

Classification of Water Quality

To classify a water body is of "good ambient water quality" or not, a threshold is applied where 80 per cent or more of monitoring values must meet their targets. To demonstrate how this works in practice, Figure 3 below shows how a national score of 50 per cent was generated. In this simple example, water quality measurements are used to classify water bodies, which in turn can be used to generate either a RBD or national indicator score. This example assumes three RBDs, each with 20 water bodies, with each water body having a single monitoring location that is visited four times, and data for the five core parameters were obtained for each monitoring event.

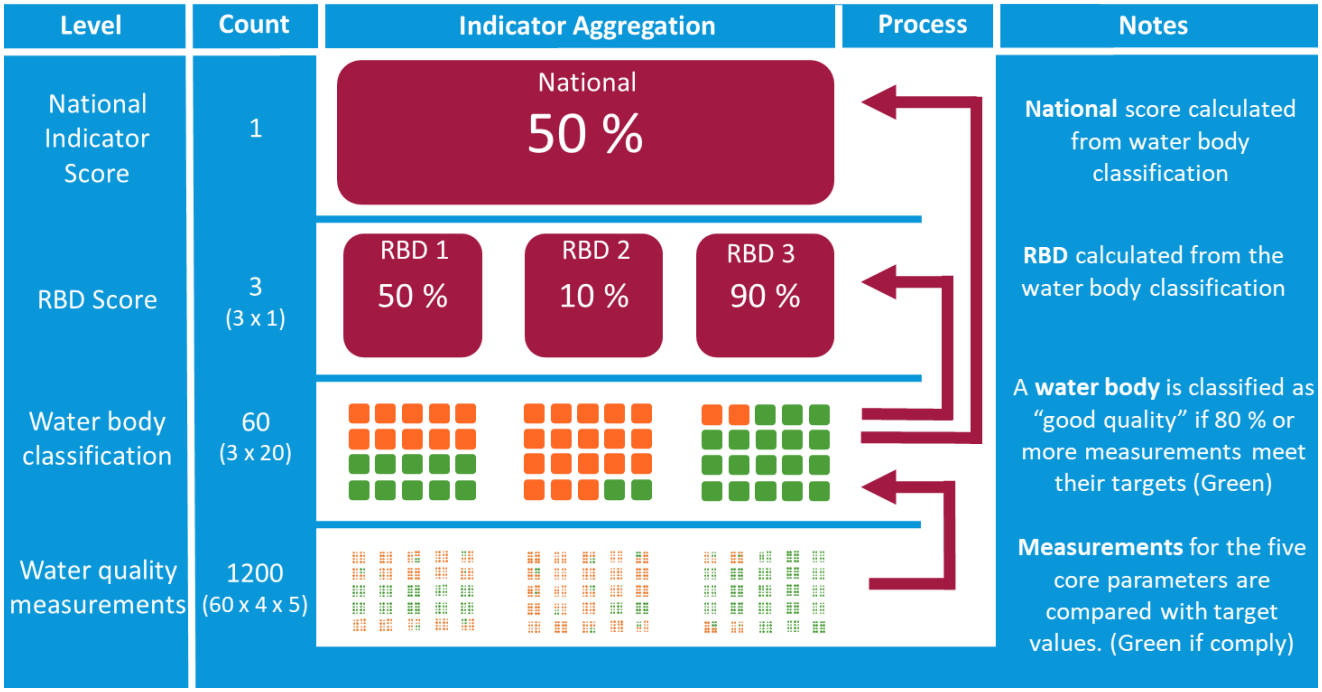

Figure 3: Water quality measurements to indicator calculation at both RBD and national scale

9 https://communities.unep.org/display/sdg632/Documents+and+Materials?preview=/32407814/38306235/CDC_GEMI2_TechDoc3_Groundwaters_20200402.pdf

Real-world examples are never this straightforward, but it demonstrates how 1200 measurements can be aggregated to either a RBD or national score. Furthermore, if this information is presented using a map as shown in Figure 4, it can provide much more information on where water quality is good and where it is not.

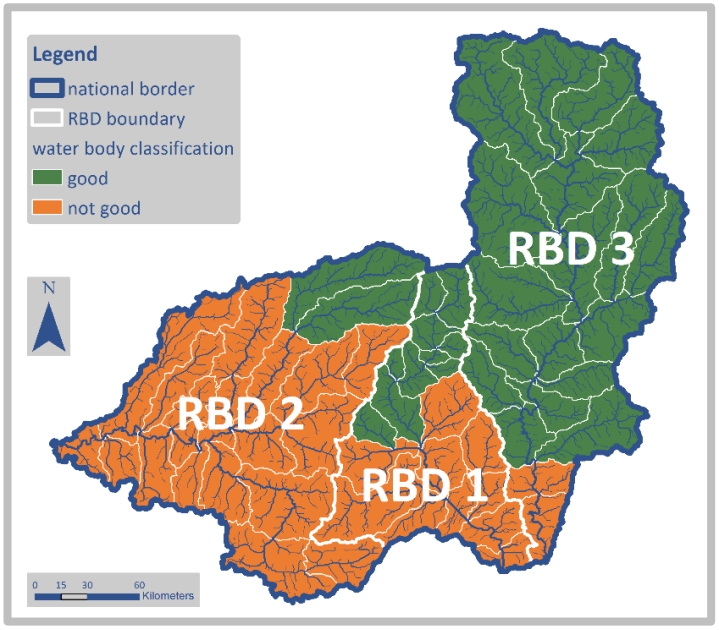

Figure 4 Map showing three RBDs with water bodies classified as either good (green) or not good (orange)

The Reporting Process for SDG Indicator 6.3.2

Reporting on this indicator is achieved through the SDG Water Quality Hub. For a Level 1 submission, the same information is requested as during previous reporting years (2017 and 2020). From 2023 onwards, countries will also have the option to additionally report at Level 2.

There is an opportunity for countries to update previous submissions if their national assessment process has changed or if additional data has become available since last report was submitted. For example, many countries review and update their target threshold values periodically. As a result, this may alter previously submitted indicator scores. To ensure that indicator trend information reflects real-world water quality, rather than a change in the assessment process, then recalculating and resubmitting previous years' submissions using the updated target values is necessary.

For countries that have not reported on this indicator previously, yet have water quality data available, they can complete a separate reporting template for each reporting year as shown in Table 2 below. For example, for the latest reporting year of 2023, data from 2022, 2021 and 2020 should be used in the calculation.

Table 2: SDG indicator 6.3.2 reporting years and and relevant contributary data years

Reporting Year	Data Year								
	2022	2021	2020	2019	2018	2017	2016	2015	2014
2023	●	●	●						
2020				●	●	●			
2017							●	●	●

Level 1 Reporting

A similar Excel-based reporting template of previous data drives is used to collect the indicator information at Level 1. This template which is both downloaded from, and uploaded to the Hub when complete, captures the outputs of the indicator calculation process that is performed by each country, and in addition, information on how the indicator was calculated. This includes information on how many data values were used, the target threshold values, which water bodies were monitored, and how often analyses were performed.

It should be noted that countries are **not** requested to submit water quality data values, although there is an option to do so that is described below. The routine reporting workflow is limited to submission of summary information to the prescribed template. Once the completed template is uploaded to the SDG Water Quality Hub. the information is automatically extracted by the Hub allowing a real-time review of the indicator information before final submission.

As an option for countries seeking support, UNEP GEMS/Water provides an indicator calculation service. Countries can either send their water quality data to the SDG 632 Help Desk or, submit it through GEMS/Water's global water quality database GEMStat, and the indicator can be calculated and returned to the country for validation prior to final submission. This is an iterative process between the country and UNEP that is available as a service upon request.

The Level 1 score at the national scale will be reported by UNEP to the United Nations Statistical Division (UNSD) which is the UN organisation that collates all SDG information. This same national level information will be presented on UN Water's SDG6 Data Portal. The Level 1 and Level 2 information at national and subnational scales, along with additional information received, will be used by UNEP for regional and global assessments and displayed on SDG Water Quality Hub.

Level 2 Reporting

Level 2 reporting can be done in parallel or in sequence to Level 1. Level 2 reporting is separate from Level 1. An Excel-based reporting template, similar to that of Level 1 is used to capture the Level 2 indicator score and information on how this score was calculated. This reporting template along with a technical document that details the procedure and the data requirements is available through the SDG Water Quality Hub.

Further Information

The third global data drive **opens April 2023 and closes in October**. The findings of this data drive will be published in a progress report in 2024. A feedback process designed to improve the implementation of the work around this indicator will conclude in 2025. The outputs of this process will feed into the preparations for the 2026 data drive and future work.

All information about this indicator can be found through the **SDG Water Quality Hub**. This includes information on specific technical aspects of the methodology. These are:

- monitoring programme design;
- the target value concept;
- monitoring and reporting on groundwater; and,
- Level 2 Reporting.

For all queries about this indicator please contact UNEP's SDG 632 Help Desk at sdg632@un.org.