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 was prepared in response to feedback following the first global data drive of 2017 to provide context and basic information about the indicator and is targeted at a non-technical audience. It is a companion to the Step-by-Step methodology (link) 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 on the **Indicator 6.3.2 Support Platform.**

The United Nations Environment Programme (UNEP) is the custodian agency for SDG indicator 6.3.2 and the Global Environment Monitoring Programme for Freshwater (GEMS/Water) is the implementing partner. All of the Goal 6 indicators are coordinated by UN Water under the Integrated Monitoring Initiative for Goal 6 (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. The core components of the methodology reflect pressures that are relevant 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 quality is suitable to support sustainable development, despite the fundamental importance and multiple uses of freshwater. The data collected for indicator 6.3.2 help to fill these gaps in 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[1] can provide guidance and support to initiate data collection with a view to reporting SDG indicator 6.3.2in the near future.

METHODOLOGY CONCEPTS

Below is a summary of key concepts that provide the basis for the indicator methodology. Central to its success is the maintenance of the balance between global comparability and national relevance. This is achieved by prescribing the measurement of standardised basic core components (Level 1), whilst providing sufficient flexibility to adapt the methodology to meet national and local conditions (Level 2).

[1] https://www.ucc.ie/en/gemscdc/

Level 1 and Level 2 Monitoring

Level 1 monitoring maintains the global comparability of the indicator by using simple to measure characteristics of water that represent pressures that are relevant everywhere. The impacts from 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*	●	●	●	Measure of salinisation and helps to characterises the water body
Nitrogen*	**Total oxidised nitrogen** *Total nitrogen, Nitrite, Ammoniacal nitrogen*	●	●		Measure of nutrient pollution
	Nitrate**			●	Health concern for human consumption
Phosphorous*	**Orthophosphate** *Total phosphorous*	●	●		Measure of nutrient pollution
pH status	**pH**	●	●	●	Measure of acidification and helps to characterises 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 1 is limited in scope and, although it provides good information, 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, e.g. heavy metals, or approaches other than the basic physical and chemical methods used in Level 1. These approaches may include biological or microbiological methods, satellite-based Earth observation techniques, or citizen scientist initiatives. 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. Satellite-based Earth observation techniques analyse the colour and reflectance of images of the surface of water bodies at various wavelengths captured from satellites. 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 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.

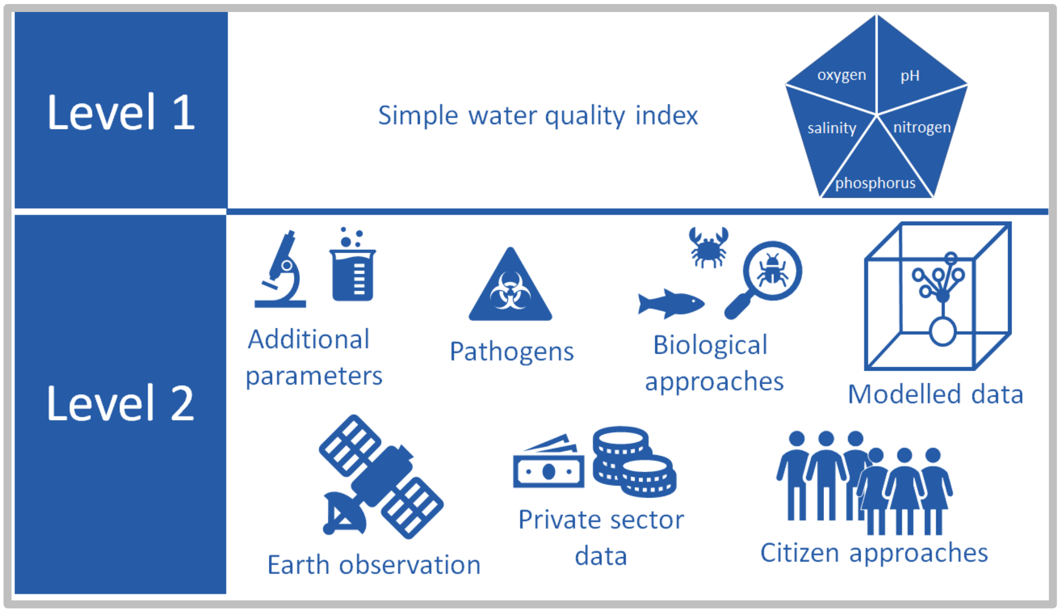

Figure 1: Example of Level 1 and Level 2 data sources that can be used for SDG indicator 6.3.2 reporting

The Target-Based Approach

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 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 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 to be found on the **Indicator 6.3.2 Support Platform.**

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[2] 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.

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

Reporting Basin Districts and Water bodies

Countries are asked to report at the river basin level. These are referred to as **Reporting Basin Districts** (RBDs) because, 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 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.

Classification of Water Quality

To classify whether a water body is of “good ambient water quality” or not, a threshold is applied where 80 per cent or more of monitoring values meet their targets. This is then applied in turn to the RBD, and then to the national level to generate the national indicator score. To demonstrate how this works in practice, Figure 2 below shows how a national score of 50 per cent was generated from three RBD scores of 50, 10 and 90 per cent. Each RBD score was in turn calculated from numerous water body scores. In this simple example, each RBD contained 20 water bodies, each water body contained four monitoring stations, and each monitoring station was monitored four times.

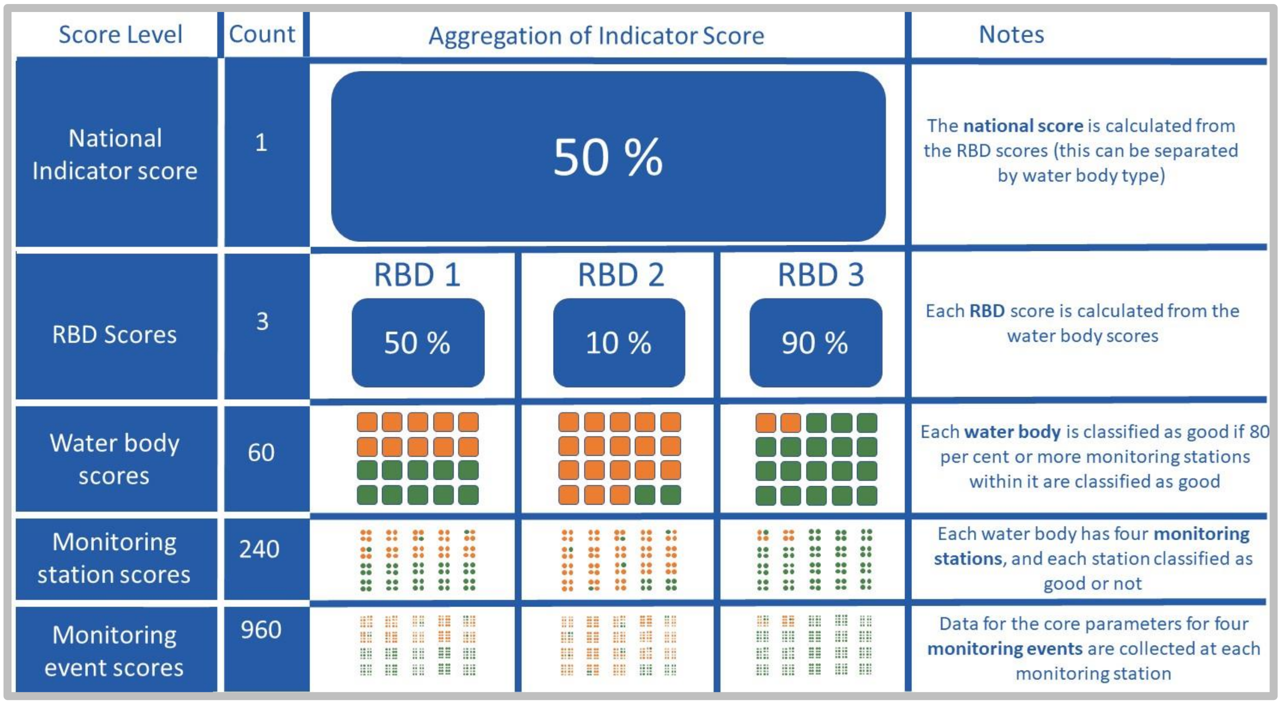

Figure 2: Example of how individual monitoring scores are aggregated sequentially to monitoring events, to water body scores, to river basin scores and finally to a national score. Scores above the 80% "good quality" threshold are indicated in green and "not good" results are given in orange.

Real-world examples are never this straightforward, but it demonstrates how 960 monitoring events (note that each one includes five analyses) can be aggregated to a single national score. Furthermore, if this information is presented using a map as shown in Figure 3, it can provide much more information on where water quality is good and where it is not.

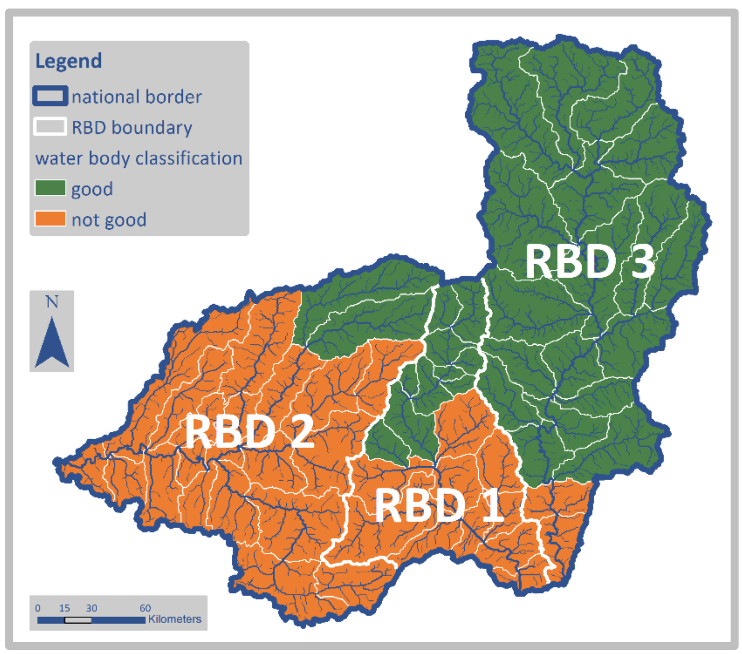

Figure 3: Example showing how the information at water body level may appear at RBD and national scale

CONFIDENCE RATING

The **Confidence Rating** tool is designed to communicate the strengths or limitations of a reported Level 1 indicator score. It helps to provide confidence that an indicator score accurately reflects the condition of a country's freshwaters (Figure 5). Each country decides and controls whether this tool is shown in association with their indicator score.

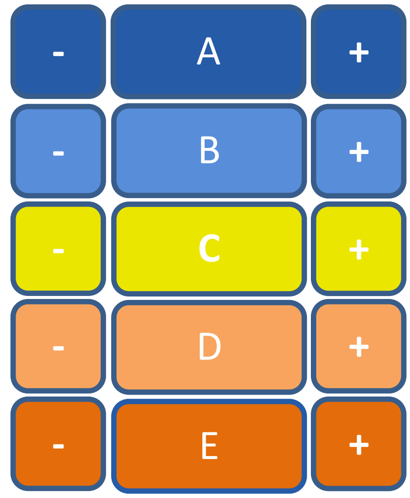

Figure 4: Confidence Rating Scorecard. The rating is based on criteria that relate to how accurately an indicator score is likely to reflect reality. A+ is the highest, and E- is the lowest

Grades from A to E are generated on behalf of countries by GEMS/Water based on the metadata supplied along with report submission. Metadata are the extra pieces of information that help determine how an indicator was calculated. This includes information such as the number of samples collected, where and when the samples were collected from, and the analyses performed on the samples.

Countries used vastly different quantities of data when they reported for the first SDG indicator 6.3.2 data drive in 2017. A country that uses a large number of data values would be assigned a higher rating than a country that uses very scarce data. An indicator score generated using thousands of data values is likely to be more accurate than a score that uses very few. Also, as highlighted above, Level 1 reporting cannot reflect all pressures on water quality and the Confidence Rating can be used to reflect this. For example, if a substance that is known to be harmful to human health is naturally occurring in a region, but has not been included in the Level 1 calculation, a minus would be assigned to the indicator because the score has been generated without inclusion of this parameter. An RBD might have a high proportion of water bodies that are of good quality, but this "good" classification has been assigned without this particular harmful compound being included. In this circumstance, and if the analytical capacity is present in the country, analysis of this harmful parameter should be included and reported as Level 2.

The rating can be applied at multiple levels. At the highest level it can be applied to the national score, but it can also be applied to an RBD. For example, if a country has five RBDs, and only one was fully assessed, then the assessed one could be given an A rating, whereas the national indicator score would be given a lower rating because only part of the country was fully assessed. Table 2 below lists the criteria of the Confidence Rating tool and how these affect the rating given.

Table 2: Confidence rating criteria used in the calculation

Confidence Rating Criteria	Rating
Number of core parameter groups measured	A = 5 / 5 through to E = 1 / 5
The proportion of the country/river basin monitored	A = 81 - 100%, B = 61 - 80%, C = 41 - 60%, D = 20 - 40%, E = <20%
The frequency of data collection	A = minimum of 4 per year for surface waters, and once for groundwaters B – E = sliding scale based on submission metadata
Timeframe of data	A = Data from all three years preceding data drive (i.e. 2017, 2018 and 2019) B – E = sliding scale based on submission metadata
If compounds known to be harmful are present in the water body	**Minus** rating applied if there is a substance known to be harmful that is not included
Whether site-specific or typology-specific target values have been applied	**Plus** rating applied if specific targets rather than national targets have been used.

The Water Quality Scorecard

The Water Quality Scorecard is a tool that graphically shows which of the five core parameter groups met, or did not meet, their target values. Similar to the Confidence Rating, this is an optional tool that is generated on behalf of countries, which can choose whether or not to use it. A scorecard can be generated at the RBD or country level, or alternatively by water body type, e.g., for all river water bodies. It is generated from an analysis of the number of measurements that meet target values for each parameter group. In the example shown in Figure 5, the measurements taken in RBD A, met target values more than 80 per cent of the time for all five parameter groups, whereas for RBD B, the measurements of oxygen, nitrogen and phosphorus failed to meet target values 80 per cent of the time. Displaying the data in this way shows which of the five core parameter groups is failing most often. In this example, the poor water quality of RBD B may be caused by excess nutrients and oxygen depletion. A different RBD may be experiencing different water quality issues, such as salinization or acidification, and therefore these parameter groups would be coloured orange. This tool provides more information because it goes further than simply saying a RBD is of 'poor water quality'; it communicates *why* and, importantly, helps to identify the most appropriate management measure. Excess nutrients may derive from agriculture or domestic wastewater effluents whereas salinization may be caused by over abstraction from aquifers and salt water intrusion along coastal zones, and where different management strategies would be needed!

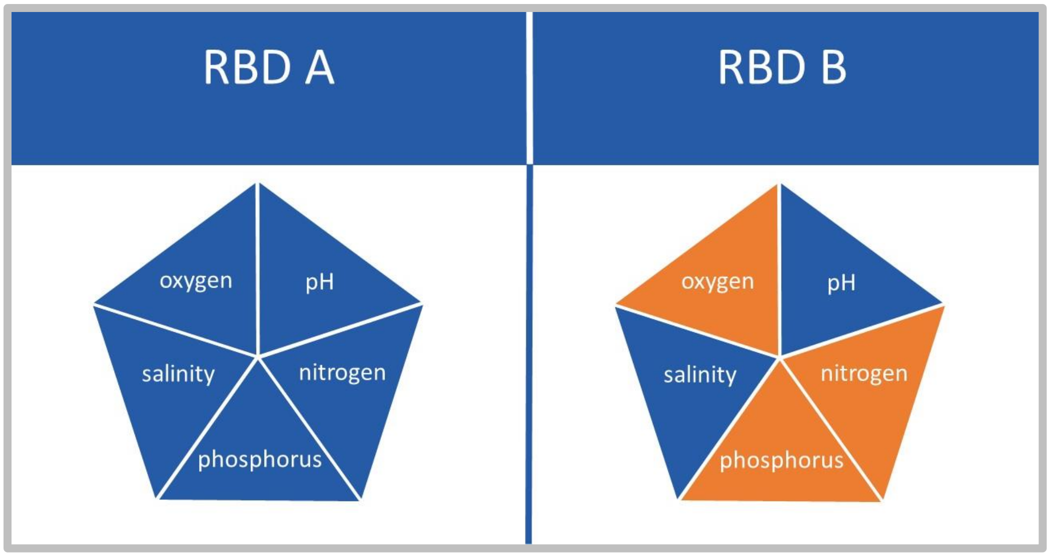

Figure 5: An example of a water quality scorecard example for two RBDs with RBD A meeting targets for all parameter groups whereas RBD B failed to meet targets for oxygen, nitrogen and phosphorus.

The Reporting Process for SDG Indicator 6.3.2

Details of the reporting process can be found on the **Indicator 6.3.2 Support Platform**. Below is a summary of the main points.

Countries are not requested to submit water quality data values. They are asked to submit summary data to a prescribed template, together with extra information that describes exactly how the indicator was calculated, such as how many data values were used, which water bodies were monitored, and how often analyses were performed. This extra information provides UNEP with insight into how the indicator was calculated.

Countries can choose either to calculate the indicator themselves using this template along with the guidance and support provided https://communities.unep.org/display/sdg632) or, alternatively, they can send their water quality data to UNEP (sdg632@un.org), and the indicator score will be calculated and returned to them for validation prior to final submission to UNEP.

The Level 1 Reporting Template can be found here at https://communities.unep.org/display/sdg632. This template captures the same information as the 2017 data drive. Level 2 reporting will remain separated from Level 1 and will only be requested by UNEP following the submission of a Level 1 report. This optional Level 2 report is based initially on a questionnaire response that seeks clarification on the water quality information available and the assessment approaches used in a country. During this Level 2 phase, global water quality products, such as outputs from satellite-based Earth observations will be provided and countries can choose whether to include these products in their Level 2 indicator 6.3.2 report.

The Level 1 score will be reported by UNEP to the United Nations Statistical Division. The Level 1 and Level 2 scores, along with additional information received, will be used by UNEP for regional and global assessments and displayed on their data portals. This is summarised data and does not include the measured water quality data. In addition to the national and RBD indicator scores, reports may also show the Water Quality Scorecard and Confidence Rating if a country approves their use.

FURTHER INFORMATION

The second global data collection for SDG indicator 6.3.2 opens in April and closes in October 2020.

The **SDG indicator 6.3.2 Support Platform** is the location of technical documents and FAQs, and provides data submission instructions. This portal can be accessed at https://communities.unep.org/display/sdg632.

For all queries in relation to reporting SDG indicator 6.3.2 contact the UNEP team at sdg632@un.org.