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Advances in monitoring transboundary water cooperation? Reflecting on the development and implementation of SDG indicator 6.5.2

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ABSTRACT

The Sustainable Development Goals (SDGs) indicator framework marks the first time that a specific indicator on transboundary water cooperation (indicator 6.5.2) has been adopted within an inter-governmental process. Achieving the political and technical support for this was not easy. However, through widespread consultation, and by building upon existing practice relating to water cooperation, the indicator was ultimately approved. The 2017 and 2020 reporting exercises demonstrated the robustness and value of the indicator. Having operational arrangements in place is critical to ensuring that transboundary waters are managed in an equitable and sustainable manner. SDG indicator 6.5.2 offers great potential in supporting that effort.

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Introduction

On the 25 September 2015, the 2030 Agenda for Sustainable Development was adopted by the United Nations General Assembly (UN, 2015a). Central to achieving this transformative agenda for people, planet, prosperity and peace are its 17 goals and their associated targets and indicators.

One significant step forward, compared with the Millennium Development Goals (MDGs), was that the Sustainable Development Goal (SDG) on clean water and sanitation (SDG 6) and its associated targets and indicators not only cover access to water and sanitation but also the entire water cycle, including water quality, wastewater treatment, water recycling and reuse, water use efficiency, water scarcity, water-related ecosystems, integrated water resources management (IWRM), international cooperation and capacity-building, and local community participation in water and sanitation management (UN, 2015a, p. 18).

This has added a new dimension to both the measuring and monitoring of the goal. While two indicators measured progress towards the MDGs in relation to water and sanitation, measuring progress towards SDG 6 involves the use of 11 indicators (UN, 2017, p. 11).

For what concerns target 6.5, which calls upon states to implement IWRM at all levels, including where appropriate, through transboundary water cooperation by 2030, two indicators monitor progress: indicator 6.5.1 measures the degree of IWRM implementation through an index; and indicator 6.5.2 measures the proportion of transboundary basin area covered by an operational arrangement for water cooperation.

SDG indicator 6.5.2 is unique in that it is the first time that countries have decided to report on their cooperation on transboundary waters at a global level. And it is even more remarkable that 107 out of the 153 countries sharing transboundary waters reported during the first reporting exercise in 2017 (UNECE & UNESCO, 2018, p. 23), and 129 countries reported during the 2020–21 exercise (UN-Water, 2021).

The purpose of this paper is to critically reflect on SDG indicator 6.5.2 with a view to assessing its contribution to monitoring transboundary water cooperation. In so doing, it will review the process by which the indicator was designed and adopted, and following the experience of the first and second reporting exercises in 2017–18 and 2020–21, the paper will reflect on whether it is fit for purpose. The paper will also consider some of the criticisms of the indicator and evaluate the extent to which any concerns were addressed during its development and its initial application through the first two reporting exercises.

Through its reflection of the reporting exercises, the paper offers an insight from those directly involved in the process on how the benefits of indicator 6.5.2 can be maximized and some of the potential limitations addressed.

The rules of the game: the SDG indicator selection and review process

The process behind the adoption of the SDGs, led by member states, has been described as an extraordinary process, particularly due to the unprecedented participation and contribution from civil society organizations and other major groups (Adams, 2019). However, translating such a transformative agenda into measurable indicators was inevitably a challenge.

Overall coordination of the SDG indicator framework fell to the UN Statistical Commission, which at its 46th session in March 2015 discussed a preliminary set of indicators; offered a roadmap for the development of a global indicator framework; and proposed that the Inter-Agency and Expert Group on the Sustainable Development Goal Indicators (IAEG-SDGs) carry out the process (UN, 2015b).

The intensive negotiations of the indicator framework took less than two years. In addition to the face-to-face meetings of the IAEG-SDGs, the process also included extensive consultations through, for example, questionnaires and WebEx meetings.¹

Throughout its work, the IAEG-SDGs was extremely concerned with the feasibility of data-gathering and its associated costs, which inevitably shaped the number, choice and design of indicators (UN, 2015c). At the same time, the IAEG-SDGs recognized that the implementation of the 2030 Agenda required a data revolution and additional resources for better monitoring and statistical systems. Thus, the selection of the indicators had to

strike a balance between, on the one hand, limiting the number of indicators and ensuring their feasibility and, on the other, properly reflecting the political ambitions of the 2030 Agenda. To this end, the IAEG-SDGs developed key criteria, namely that the indicators should be ‘methodologically sound, measurable, accessible, relevant, timely, internationally comparable, and limited in number’ (UN, 2015c, p. 4).

The IAEG-SDGs also established the so-called ‘tier classification’ as a means by which to screen proposed indicators, particularly in relation to feasibility (UN, 2015d, p. 8). All indicators are classified in terms of three tiers: tier I indicators are those that are conceptually clear, have an internationally established methodology and standards available, and data are regularly produced by countries for at least 50% of countries and of the population in every region where the indicator is relevant; tier II indicators are those that are conceptually clear, have an internationally established methodology and standards available, but data are not regularly produced by countries; and tier III indicators are those where no internationally established methodology or standards are yet available for the indicator, but methodology or standards are being (or will be) developed or tested. During the negotiations, tier II and III indicators were under close scrutiny. Following four meetings of the IAEG-SDGs and extensive consultations, 232 indicators were developed and agreed upon at the 48th session of the UN Statistical Commission in March 2017, and subsequently adopted by the UN General Assembly in July 2017 (UN, 2017, p. 3).²

It is important to keep in mind that the definition of SDG indicator 6.5.2 had to take into account the overall political and technical dynamics and considerations of the IAEG-SDGs.

The development of SDG indicator 6.5.2

The development of SDG 6 indicators was supported by a unique process that was coordinated by UN-Water, the coordination mechanism of UN entities and international organizations working on water and sanitation issues. UN-Water brought together its members to speak with one voice in the IAEG-SDGs negotiations and, in addition, gathered the expertise of its partners.

The adoption of indicator 6.5.2 was not straightforward. An indicator on transboundary cooperation, similar to 6.5.2, was listed in the first compilation of indicators sent out for consultation with member states at the beginning of 2015, prior to the 46th session of the UN Statistical Commission. However, the initial set of SDG indicators, which were considered at the first meeting of the IAEG-SDGs (1–2 June 2015), did not include a specific indicator on transboundary water cooperation (UN, 2015e). Already at the first IAEG-SDGs meeting, UN-Water therefore called for the inclusion of such an indicator (UN, 2016a, p. 86).

In parallel, and within the framework of the UN-Water coordination, the United Nations Economic Commission for Europe (UNECE), which hosts the secretariat of the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention), joined by the United Nations Educational, Scientific and Cultural Organization (UNESCO), set out developing the indicator and its underlying methodology.

In developing the indicator, UNECE and UNESCO relied upon the ‘6.5 Target team’, made up of representatives of the Food and Agriculture Organization of the United Nations (FAO), Global Water Partnership (GWP), Integrated Water Management Institute (IWMI), United Nations Environment Programme (UNEP), United Nations Human Settlements Programme (UN-Habitat) and the World Health Organization (WHO). UNECE and UNESCO also consulted broadly with representatives of member states, regional organizations responsible for data-gathering, renowned international experts and academics (UN-Water, 2014). This consultation enriched and strengthened the methodology.

Another important aspect in the development of indicator 6.5.2 was its relationship with indicator 6.5.1. While indicator 6.5.1 was included in the list of indicators developed after the first meeting of the IAEG-SDGs, several comments pointed to concerns over the robustness of an indicator based on a qualitative survey (UN, 2015f). In general, the IAEG-SDGs did not favour the use of new indexes, not only for the questions they raise in terms of robustness and feasibility, but also due to a concern that a compilation of different indicators may risk less explicit outputs in terms of identifying the issues and the political responses needed to make progress. These considerations and the initial criticisms of 6.5.1 steered the definition of 6.5.2 away from an index approach, so as to ensure that the two indicators for target 6.5 complemented each other.

Support for the inclusion of indicator 6.5.2 grew prior to the second IAEG-SDGs meeting in Bangkok in October 2015. At that meeting, UN-Water argued that its inclusion in the SDG framework constituted a ‘significant increase in the aspiration regarding water management compared to previous international commitments’ (UN-Water, 2015, p. 2). While some countries backed this proposal, others were not supportive of the indicator and its methodology. After the meeting, the indicator was still not included in the IAEG-SDGs list (UN, 2015g). Following further advocacy from UN-Water and supportive member states, the IAEG-SDGs finally included the indicator in its report submitted on 19 February 2016, which was then adopted at the 47th meeting of the Statistical Commission (8–11 March 2016) (UN, 2016b, p. 46).

In parallel, between January and September 2016, the methodologies for the indicators concerning targets 6.3–6.6 were piloted at scale in five countries (Jordan, the Netherlands, Peru, Senegal and Uganda), and in the framework of the UN-Water coordination. The aim of this pilot exercise was to assess the technical feasibility and the institutional set-up needed to implement the indicators. For 6.5.2, the pilot exercise confirmed the feasibility of the indicator and the availability of data, with the exception of information on transboundary aquifers which proved difficult to gather in some countries. Moreover, the pilot helped strengthen the methodology and improve the guidance given to states with a view to assisting states to avoid miscalculations.³

In the second half of 2016, the methodologies for the indicators related to targets 6.3–6.6 were also subject to an expert review by all UN-Water Members and partners and a public open review. These reviews confirmed support for indicator 6.5.2, and a final version of the 6.5.2 methodology was published in January 2017 (UNECE & UNESCO, 2017).

When originally approved by the IAEG-SDGs, indicator 6.5.2 was classified as a tier III indicator, but it was later upgraded to tier II classification at the 5th IAEG-SDGs meeting in March 2017, and in November 2018, after the first reporting exercise, to tier I classification (UN, 2021).

The broad process of consultation and the piloting of indicator 6.5.2 laid an important foundation for its wider application. It arguably explains the positive results produced during the first reporting exercise and set the groundwork for the indicator moving from tier III classification to tier I in a relatively short period.

However, during its development and following its adoption, some experts criticized the indicator or suggested alternative approaches. The following section will therefore review the rationale for the choice of indicator both in light of these critiques and the context in which the indicator was adopted.

The political and technical rationale behind SDG indicator 6.5.2

Key considerations in the design of SDG indicator 6.5.2

Throughout the development of indicator 6.5.2, it was evident that any indicator related to transboundary water cooperation could build upon a significant body of existing work. For example, a lot of work had been done at a global level to identify transboundary rivers, lakes and aquifers. This work started with the *International River Basin Register*, initiated in 1978 by the United Nations Department of Economic and Social Affairs, and later updated by Oregon State University in 1999 and most recently in 2018 (McCracken & Wolf, 2019). Additionally, a significant amount of work has been done in recent years to identify and delineate the world's transboundary aquifers (International Groundwater Research Assessment Centre (IGRAC), n.d.). This work was brought together in 2012–16 through the Global Environment Facility's Transboundary Waters Assessment Programme that sought to provide a 'baseline assessment' of the world's water systems, including aquifers, lakes, rivers, large marine ecosystems and oceans (UNEP, n.d.).

There has also been an extensive effort to gather the texts of agreements and other arrangements that states have entered into concerning their transboundary waters. This work was initiated by a UN General Assembly request in 1959 for the UN Secretary-General to study the legal problems relating to transboundary rivers (UN, 1959, 1963). More recently, Oregon State University (n.d.) has compiled an extensive database of agreements and other arrangements on transboundary waters (see also Burchi & Mechlim, 2005; UNEP, 2002).

Further initiatives go beyond assessing the existence of cooperative arrangements and examine the extent to which cooperation takes place in practice. For example, De Stefano et al. (2010) used five indicators – existence of a water treaty, water allocation mechanisms, mechanisms for managing variability, conflict resolutions mechanisms and a river basin organization – to assess the quality of cooperation. Similarly, the Strategic Foresight Group has developed their so-called Water Cooperation Quotient, which adopts a set of 10 indicators to measure transboundary cooperation, including the presence of an agreement and commission, ministerial meetings, whether there is high level political commitment and any institutional commission is 'actually functioning', as well the existence of activities related to environmental protection and quality control, joint

monitoring of water flows, and joint or coordinated infrastructure projects (Strategic Foresight Group, 2015). More recently, The Economist Intelligence Unit developed its so-called Blue Peace Index, which, through 74 qualitative and quantitative indicators, ‘examines the extent to which countries and basins are managing their shared water resources in a sustainable, equitable and collaborative manner’ (The Economist Intelligence Unit, 2020).

In considering how SDG indicator 6.5.2 could build upon existing initiatives, one key concern was to ensure that the indicator was applicable across a diverse group of countries sharing transboundary waters. An additional key concern was to comply with the technical requirements imposed by IAEG-SDGs, whilst also securing the requisite political support to ensure for the indicator’s approval and widespread uptake. These considerations resulted in the dismissal of more complex and subjective approaches to measuring transboundary water cooperation, as data availability and lack of comparability would have failed the IAEG-SDGs requirements.

In turn, UNECE and UNESCO proposed a relatively simple and factual indicator with a methodology capable of global application across a diverse range of contexts. First, states report on the extent of their territory situated within a basin of a transboundary river, lake or aquifer (UNECE & UNESCO, 2017). As noted above, extensive data on the identification and delineation of transboundary rivers, lakes and aquifers are already available at the global level – although as highlighted in the first and second reporting exercises – knowledge of aquifers remains lacking in many parts of the world (Eckstein, 2017; Sindico, 2020). The indicator then relies on a determination of whether any agreement or arrangement that covers all or part of a transboundary river, lake or aquifer system is ‘operational’. Operationality, rests on four criteria, namely (1) a joint (institutional) body is in place; (2) there are formal meetings (political or technical) between countries at least once per year; (3) a joint or coordinated management plan or joint objectives have been set; and (4) data and information is exchanged at least once per year (UNECE & UNESCO, 2017).

By setting out the four criteria for operationality in such a way, the indicator struck the necessary balance to gain the requisite technical and political support in IAEG-SDGs negotiations. For instance, IAEG-SDGs stressed that indicators must rely upon internationally agreed standards (UN, 2015c). This led to the development of an indicator grounded upon international water law and practice, rather than criteria defined in independent studies. Parts of the indicator deliberately reflect customary international law. The duty to cooperate, for example, requires states to enter into negotiations with their neighbours in good faith with a view to concluding transboundary water agreements or other arrangements and establishing joint bodies (Leb, 2013). The UN global water conventions – the 1992 Water Convention and the 1997 Convention on the Law of the Non-navigational Uses of International Watercourses (Watercourses Convention) – also place a strong emphasis on the need for countries to enter into cooperative arrangements. In the case of the 1992 Water Convention, entering into agreements or arrangements and establishing joint bodies is a clear obligation for its riparian parties; whereas the 1997 Watercourses Convention encourages states to adopt such arrangements or joint bodies. Additionally, many of the central provisions of both conventions encourage states

to act jointly, which indirectly reinforces the importance of having cooperative arrangements and joint institutions in place. More generally, the importance of legal and institutional arrangements to ensure the management of transboundary waters in an equitable and reasonable manner has long been recognized (e.g., Wolf et al., 2003).

However, a strong opinion coming out of the consultation on SDG indicator 6.5.2 was that the indicator should go beyond assessing what is on paper, that is, the presence of agreements or other arrangements, and consider whether commitments are actually implemented. But such an approach posed a dilemma because no internationally agreed standards to measure implementation existed, and transboundary basins vary greatly in terms of their characteristics and uses.

Ensuring that the indicator moved beyond assessing ‘on paper’ cooperation was achieved by the inclusion of the criteria that states must demonstrate that they, at least annually, exchange data and information and establish a joint or coordinated management plan or set joint objectives. The requirement that states regularly exchange data and information finds expression in both UN global water conventions. Such exchange is a critical prerequisite to ensuring that transboundary waters are managed in an integrated manner. Along similar lines, both UN water conventions provide requirements that states adopt joint or coordinated plans or objectives. While the precise nature of this requirement and its status as customary international law might be debated, the value of having such plans and objectives to advance transboundary cooperation cannot be denied (Skoulikaris & Zafirakou, 2019). By embedding these criteria, the indicator is able to measure more than ‘on paper’ commitments; whilst at the same time avoiding having to measure complex, and often subjective or basin specific, outcomes of cooperation.

It should also be noted that reaching consensus on the four criteria was not easy. The political acceptability of each criterion needed careful consideration. For example, in draft versions of the methodology, one of the criteria was defined as the existence of a joint water management plan. This aligned well with the demands of SDG target 6.5 to implement IWRM at all levels. However, responses from the consultation with member states and experts suggested that such a requirement would be overly demanding as only very few states had a joint plan for their transboundary waters. Greater flexibility was therefore incorporated into this criterion to include joint and coordinated plans or joint objectives. While offering greater flexibility, this criterion still monitors whether states have gone beyond the arrangement and adopted additional measures that further cooperation.

What about the quality of cooperation?

One criticism expressed during the development of indicator 6.5.2 was that it fell short of measuring the quality of cooperation. This concern reflected arguments put forward by Zeitoun and Mirumachi (2008), for instance, that pointed out that an arrangement related to transboundary waters may be both a source of cooperation *and* of conflict. Similarly, Hussein et al. (2018, p. 4) use examples such as the 1995 Oslo Agreement between Israel and Palestine, and the 1959 Agreement for the Full Utilization of the Nile Waters between Egypt and Sudan to illustrate that agreements can be ‘skewed in favour

of more powerful states'. Also, Chaisemartin (2020, p. 68) suggests that 'the fact that an arrangement "operates" as per indicator 6.5.2 does not indicate the quality of operationality'.

An alternative approach, as advocated by some experts, was to develop qualitative indicators (Onencan et al. 2019; Hussein et al., 2018; Chaisemartin, 2020; McCracken & Meyer, 2018). Hussein et al. (2018, p. 6), for instance, propose criteria for measuring 'positive cooperation', such as 'government authorities and technical institutions declare satisfaction regarding the quality and quantity of water management, abstraction/allocation', 'there are no pending allegations of misconduct', and 'diplomatic relations are non-belligerent among states'. However, embedding qualitative aspects within the indicator would come at the cost of clarity, measurability and comparability, which were key requirements for the IAEG-SDGs. Individuals and institutions in government may have very different interpretations as to whether they are 'satisfied' with the quality and quantity of water management, and different riparian countries might also come to very different conclusions. This point is not lost on Hussein et al. (2018, p. 5), when they note that 'complex indicators are difficult to measure, and they therefore need to be simplified in order to be able to capture and measure cases in over 190 countries'.

The same reflections apply to the criticism made by McCracken and Meyer (2018, p. 10) that SDG indicator 6.5.2 is not prescriptive on the content of the operational arrangement, which might therefore not cover the core principles and elements of IWRM. However, a prescriptive approach, which adds additional criteria, would run the risk of making the indicator overly complicated, and, assuming that it secured IAEG-SDGs approval, potentially threaten its ability to capture a wide range of treaty contexts.

At the same time, indicator 6.5.2 is not blind to the quality of transboundary water cooperation and the power asymmetries between countries. So-called, 'paper tigers', that is, arrangements skewed in favour of one party or the other (Bernauer, 2002), are unlikely to satisfy the 'in practice' criteria embedded in SDG indicator 6.5.2. For two countries to meet regularly, exchange data and information, and especially to agree to joint or coordinated plans and/or objectives, it would presumably be necessary for both countries to be satisfied with the agreement or arrangement. It is therefore difficult to see how the 1994 Oslo Agreement, as mentioned by Hussein et al. (2018), would satisfy all the criteria for SDG indicator 6.5.2 unless the Israel-Palestine Joint Water Committee met, on average, at least once a year, exchanged data and information at least once a year, and set joint or coordinated plans and objectives.

For what concerns the case of agreements skewed in favour of one or only a few basin states, an important feature of the indicator is that its value can be disaggregated into basin country units. Where all countries in a basin report, data can be analysed at the basin level and discrepancies and comparisons in country reporting may provide useful insights into both the coverage of arrangements within a basin, and the extent to which they are operational within the whole basin or only part of the basin. For instance, in the case of the Nile, not all basin countries would report that the Nile is covered by an operational arrangement on the basis of the 1959 Agreement between Egypt and Sudan.

It should also be underlined that the reporting template offers a further opportunity for countries to provide more detailed information relating to the quality of cooperation. For instance, section II, question 1 of the template, asks countries whether or not an arrangement is in place (UNECE & UNESCO, 2020a). If no

arrangement is in place, countries are asked to explain why not. Where an arrangement is in place, countries are asked about the challenges and achievements in implementing it, and in operating any joint body associated with it. More generally, section IV of the template invites countries to comment on any challenges and achievements in progressing transboundary water cooperation. Answers to these questions within the template are not captured in the calculation of the indicator. However, inevitably an indicator can only point to a situation; it cannot describe its complexity in any detail. Having said that, filling in the reporting template provides countries with an opportunity to explain their indicator calculation, and elaborate on the quality of their cooperation.

Finally, it should be taken into account that SDG indicator 6.5.2 is part of a broader framework and the indicator can be read together with other indicators. For example, the quality and effectiveness of transboundary water cooperation can be monitored over time through the indicators related to water quality and efficiency, or changes in the extent of water-related ecosystems (UN-Water, n.d. a).

Basin area as a unit of measurement

A further concern raised in the development of SDG indicator 6.5.2 is the use of basin area as the primary unit of measurement. McCracken and Meyer (2018, p. 10), for example, suggest that the focus on basin area raises problems when determining what an agreement actually covers. These commentators use the example of the Ganges Water Sharing Treaty, which sets out the allocation of water between India and Bangladesh at the Farakka Barrage, to question whether the entire Ganges basin or the point at the Farakka Barrage, should be taken into account when determining the geographical scope of the treaty. However, in the reporting template, countries do have the flexibility to stipulate whether the entire basin, sub-basin or only part of the basin is covered by an operational arrangement, and calculate the indicator accordingly (UNECE & UNESCO, 2017, p. 11). Ultimately, while the indicator can therefore accommodate different scenarios, countries must interpret the scope of their arrangements. As noted above, this flexibility was introduced following the results of the pilot exercise for new indicators for SDG 6.

A further issue relating to the geographical scope of arrangements concerns potentially overlapping arrangements. By using the example of the Democratic Republic of Congo, McCracken and Meyer point out that the country is party to two operational arrangements: one for the Congo basin as a whole and one for Lake Tanganyika, a sub-basin of the Congo basin (McCracken & Meyer, 2018, p. 10). These authors argue that in such an example the potential for 'double-counting' basin and sub-basin arrangements is evident. However, the methodology for the indicator calculation addresses this issue. As a general rule, states should report operational arrangements at the highest level possible. If there is an operational arrangement for the Congo basin, then the Lake Tanganyika arrangement should be ignored in the indicator calculation. Conversely, if there is no basin arrangement in place, an arrangement that covers a sub-basin, for example, a tributary, or part of a basin can be used to determine that at least some of the basin area is covered by an operational arrangement.

A related challenge concerns reporting on basins where transboundary interactions are potentially minimal and the need to establish an arrangement might therefore be questionable. An example can be seen in the case of the Po River Basin which is mostly situated (94.4%) in Italy, but one of its tributaries, the Ticino River, is shared between Italy and Switzerland. The countries have therefore focused their efforts on establishing a cooperative arrangement for the Ticino River Basin rather than the entire Po River Basin.⁴ Reporting at the level of the Po basin would be misleading and it makes more sense to report at the sub-basin level, that is, the Ticino River sub-basin.

Additionally, the indicator methodology offers flexibility for small river basins, whereby countries may decide whether or not to report on basins in which their share of the basin is less than 1% (UNECE & UNESCO, 2020a, p. 7).

A further challenge related to basin area that the designers of the indicator had to deal with was the scenario where not all basin states are covered by a basin arrangement. For instance, two countries may enter into a bilateral arrangement concerning a river basin shared between three or more countries. Similarly, a basin-wide arrangement may have been adopted, but not all basin states are party to it.⁵ The countries that are party to the arrangement might therefore indicate that the area of the basin within their territory is covered by an operational arrangement despite not all basin states being party to that arrangement. One way to address this issue is to analyse data at the level of basin country units which would show which parts of the basin were covered by an operational arrangement and which were not.

An additional consideration during the development of the indicator was whether an alternative measure for basin area could be employed, such as the population in the basin, river flows or groundwater quantity. However, data to support alternative calculations did not prove to be readily available, nor of sufficient quality to allow the indicator to be measurable, accessible and comparable as requested by the IAEG-SDGs.

The challenge for transboundary aquifers

The use of the basin area as a unit of measurement for indicator 6.5.2 posed a particular dilemma when measuring cooperation over transboundary aquifers, because measuring the surface area of a transboundary aquifer system may not give a full picture of the volume of transboundary groundwater shared between countries, and may misrepresent the overall indicator calculation by either over- or underestimating the significance of any shared groundwater. Also, while global datasets on the extent of transboundary aquifers do exist, thanks to efforts such as UNESCO's International Shared Aquifer Resources Management programme (UNESCO International Hydrological Programme, n.d.), the availability of other information on transboundary aquifers remains very low. Using more sophisticated measures, such as the quantity of available water resources within a transboundary aquifer, would have undermined the indicator's feasibility.

A further concern relates to the potential risk of double counting. For instance, a situation may arise where two or more transboundary aquifers are situated in close proximity, albeit at different depths, and therefore overlap. The methodology has sought to address this issue by stipulating that any double-counting in relation to overlapping

transboundary aquifers should be avoided when the aquifers are hydraulically connected; but in the case of unconnected aquifers the surface area of both aquifers should be calculated (UNECE & UNESCO, 2020b, p. 10).

A similar difficulty is how to aggregate the surface area of a transboundary river basin with that of transboundary aquifers, when the latter are either fully or partially situated within the river basin.⁶ Unlike overlapping aquifers, the methodology for 6.5.2 stipulates that the area of the river basin and of the underlying aquifer system should be counted separately. The indicator seeks to measure cooperation on *all* transboundary waters. The question to ask, therefore, is whether the river basin and the transboundary aquifer are both covered by operational arrangements. In adopting such an approach, it is possible to provide not only an overall indicator value for transboundary waters, but also disaggregated data concerning transboundary surface waters, and transboundary aquifers (UN Statistics Division, n.d.).

A further challenge related to transboundary aquifers is that it is not always easy to determine whether they are covered by a cooperative arrangement. The majority of arrangements deal primarily with river and lake basins, and only a handful specifically relate to transboundary aquifers (Burchi & Mechlim, 2005; Eckstein & Sindico, 2014). However, both the reporting template and the methodology provide flexibility whereby if arrangements cover both surface water and connected groundwater, then connected groundwater can be considered to be covered by the arrangement. Most contemporary arrangements adopt such an approach, whereby a ‘watercourse’ or a ‘river basin’ is defined as including both surface water and connected groundwater.

Data availability remains the biggest challenge in relation to transboundary aquifers. This is also one of the most important findings from the reporting on indicator 6.5.2. For instance, while it was possible to calculate the indicator for river and lake basins for 115 countries that submitted national reports during the first and second reporting exercises, only 94 countries were able to provide the basic data required to calculate the indicator for their transboundary aquifers (UNECE & UNESCO, 2018, p. 30). This shows that there is a critical need to deepen knowledge and understanding concerning the world’s transboundary aquifers. Reporting under SDG indicator 6.5.2 serves an important means by which to address data gaps at the national and aquifer level, and highlight where efforts might be needed to review or validate the existing global assessments. A positive outcome of the 6.5.2 monitoring exercise has been that countries have sought to deepen knowledge of their aquifer systems (UNECE & UNESCO, 2021). For instance, during the first monitoring exercise, only 65 countries were able to provide sufficient data to calculate aquifer component of the indicator, compared with the aforementioned 94 countries during the second exercise.

Why adopt an all or nothing approach?

Another question considered in the design phase of indicator 6.5.2 was whether to include the condition that all four operationality criteria be met, or allow for a partial satisfaction of the criteria to count. For instance, if a country had an arrangement and joint body in place, met and exchanged data at least once a year, but had not adopted a joint or coordinated management plan or joint objectives, could the indicator show that part of the criteria had been satisfied? Ultimately, an all or nothing approach was

favoured whereby operationality was only satisfied once all four criteria were met. Some commentators have criticized such a binary approach on the basis that it fails to recognize cooperation processes that are in place in the absence of formal arrangements (McCracken & Meyer, 2018, p. 9). Hussein et al. (2018, p. 5), for example, identify a number of important activities that are not captured by the operationality requirements, namely, 'pre-cooperation', 'any nonformalized arrangement' and 'informal talks, political statements, analysis of discourse, media and government storytelling, NGOs activities, and civil society actions'.

There were several technical and political reasons why a threshold approach was favoured during the design of the indicator. First, from the technical standpoint, moving towards an index of transboundary cooperation would have raised unsolvable questions over how different criteria should be weighted. For instance, there is no objective means to define how much 'exchange of information' should count compared with adopting 'joint objectives'. Furthermore, with an index, countries wanting to improve their level of cooperation would then need to disaggregate the criteria to be able to identify which actions would need to be put in place, raising the question as to why such criteria were aggregated in the first place.

From the political standpoint, the threshold approach better reflects the ambition of the 2030 Agenda. SDG indicator 6.1.1 measures the population having access to safely managed water services with very clear criteria defining the threshold for what can be considered safe. Similarly, for transboundary cooperation measuring low levels of cooperation, such as simple data and information exchange where the prospect of further cooperation remains uncertain, may provide misleading information on the progress towards the ultimate target of having IWRM implemented at all levels, including at the transboundary level, by 2030. Additionally, and as already stated, it would have been difficult in the IAEG-SDGs negotiations to argue for two indexes for the same target, especially considering the overarching reluctance to include indexes.

How to reflect the complexity and diversity of transboundary water cooperation?

The above issues highlight the importance of having reasonable expectations on what is offered by SDG indicator 6.5.2. Transboundary water cooperation is extremely complex and highly contextualized. As McCracken and Meyer (2018, p. 2) observe, 'various definitions of transboundary water cooperation coexist, which translate into the absence of a single accepted means to measure it'. It is unrealistic to think that one indicator could capture such complexity across the transboundary rivers, lakes and aquifers that are shared between 153 countries. This is particularly true when considering the requirements imposed on indicators by the IAEG-SDGs. In this regard, SDG indicator 6.5.2 is not any different from other indicators across the 17 SDGs. Indicators are designed to communicate a trend in a complex system but need to be considered alongside other indicators or supplementary data in order to provide a complete picture of whether countries are making progress towards a particular goal or target.

In the case of SDG indicator 6.5.2, and as the SDG monitoring process matures, there will be opportunities to consolidate and compare data across a series of indicators to get the full picture of progress to achieve clean water and sanitation for all. Through UN-Water's Integrated Monitoring Initiative, for example, a deliberate effort is taking place

to lay the foundations for such combined analysis (UN-Water, *n.d.* b). These efforts involve custodian agencies exploring how river basins can be reported in a consistent manner across several SDG indicators and at multiple levels, such as 6.5.1 (IWRM implementation), 6.5.2 and 6.3 (water quality). There will also be opportunities to combine data from SDG indicator 6.5.2, with complementary datasets beyond water, such as on poverty, investments or infrastructures, to monitor progress on how transboundary water cooperation has supported development within basins.

Conversely, an overly complicated indicator, even if it could pass the rigorous IAEG requirements, may prove difficult to get off the ground. If states were asked to gather more complex data, there would have been the risk that, first, only partial data might be supplied, and second, countries may not engage with the process.

Another important point to keep in mind when considering the methodology for SDG indicator 6.5.2 is its flexibility to accommodate a wide range of contexts. In the vast majority of cases, riparian countries will enter into some form of formal commitment prior to carrying out any sustained cooperative activities. While this formal commitment may take different forms, for example, treaty, convention, agreement, memorandum of understanding or exchange of letters, it will likely satisfy the SDG 6.5.2 definition of an arrangement (UNECE, 2020, pp. 9–10). Along similar lines, the designers of the SDG indicator were conscious of the need to recognize that institutional structures supporting the implementation of arrangements also take many different forms: from a detailed institutional framework, such as the Zambezi or Danube Commissions, to a simple body with a schedule of agreed periodic meetings of key experts, as foreseen in the cooperative arrangement for the Stampriet Aquifer.

SDG indicator 6.5.2 and related reporting activities

Another important feature in the design and development of the indicator is its relationship with other indicators, in particular SDG indicator 6.5.1, and the reporting process under the Water Convention.

Indicator 6.5.1 seeks to measure the degree of IWRM implementation through a 0–100-point scale (UNEP DHI Centre, *n.d.*). Countries are asked to qualitatively self-assess their progress in IWRM implementation based on four key components: enabling environment; institutions and participation; management instruments; and financing. SDG indicator 6.5.1 asks countries to assess IWRM implementation at the national level and in the country's most important transboundary rivers, lakes and aquifers. Specific questions related to transboundary basins and aquifers cover the existence and implementation of agreements, the establishment of organizational frameworks, the extent to which data and information is exchanged between countries, the degree of financing for transboundary water cooperation, as well as gender objectives at the transboundary level. There are therefore important similarities and differences between the indicators, which were critical to take into account both in the development and monitoring of both indicators. As 6.5.1 only asks countries to assess IWRM within their most important transboundary basins, indicator 6.5.2 offers an important and more comprehensive complement to 6.5.1 by including the entire transboundary basin area within a country. In turn, this more detailed analysis can help to objectively inform the qualitative assessment that countries include on transboundary aspects within their 6.5.1 report.

Another complementary reporting process to SDG indicator 6.5.2 is the reporting mechanism established under the Water Convention at the 7th session of the Meeting of the Parties in November 2015 (UNECE, 2015). Pursuant to Decision VII/2, it was decided that in order to report, parties should complete a questionnaire capturing data on the implementation of the convention at both the national level and for each transboundary river, lake or aquifer that a party shares. To test the template, it was also agreed to start with a pilot reporting exercise in 2016–17, with a deadline for submitting national reports of 15 May 2017.

There are strong synergies between the two reporting processes. In fact, reporting under the Water Convention asks parties to report on the transboundary waters they share, the arrangements and joint bodies that they have established to support the implementation of the convention, as well as on activities implemented in the transboundary basins related to a variety of cooperation matters, including data exchange, the adoption of plans and objectives, joint monitoring, ecosystem protection, extreme events and stakeholder participation. While activities such as data exchange and the adoption of plans and objectives directly align to the criteria in 6.5.2 and allow countries to verify and substantiate the calculation of their indicator, the additional questions posed within the Water Convention template offer countries the opportunity to supplement the information related to the indicator criteria and provide a fuller picture of their cooperative activities.

Given these strong synergies, the two reporting processes were coordinated. This meant that parties to the Water Convention were invited to complete one reporting template, which contained questions for the calculation of SDG indicator 6.5.2, together with questions related to the implementation of their cooperative efforts and the Water Convention at the national level and at the level of all their transboundary basins. A final section of the template asked more general questions about the challenges and achievements of implementing transboundary water cooperation; and also requested information related to the process of completing the template. For the first and the second reporting exercises a similar template was used for other countries not parties to the Water Convention to report under SDG indicator 6.5.2 only.

It should be underlined that of the 107 countries that reported on SDG indicator 6.5.2 in the first reporting exercise, all but eight completed the full reporting template, and of the 129 countries reporting in the second exercise, all but five countries completed the full reporting template, thereby providing a wealth of enriching information on the status of their transboundary water cooperation, beyond the value of the indicator itself.

The process of revision of SDG indicators under the IAEG-SDGs

In 2019, the IAEG-SDGs, pursuant to UN General Assembly Resolution 71/313, initiated a thorough process to review the indicator framework (UN, 2020). IAEG-SDGs defined a number of principles to guide the process, including that ‘the review should take into account investments already made at the national and international levels and should not undermine ongoing efforts’; ‘the revised framework should not significantly impose an additional burden on national statistical work’; and ‘there should be space for improvements, while at the same time ensuring that the changes are limited in scope and the size of the framework remains the same’. In late May 2019, an open call for proposals for

replacements, revisions, additions and deletions was initiated. This led to 251 proposals from countries, international and regional organizations, civil society, academia and the private sector (UN, 2019). Based on such proposals and the criteria defined for the revision, 53 proposals were included in a second open consultation held in August–September 2019 (UN Statistical Commission, 2019). On the basis of the consultation's results and through several rounds of virtual meetings and email discussions, as well as an in-person meeting in October 2019, the IAEG-SDGs agreed on a set of proposals for revision of the indicator framework. These proposals, which were subsequently adopted by the UN Statistical Commission at its 51st session in March 2020, included 36 major changes to the indicator framework in the form of replacements, revisions, additions and deletions, as well as 20 minor refinements (UN Statistical Commission, 2020).

No formal proposals to change SDG indicator 6.5.2 were included within the IAEG-SDGs set of proposals. The 2020 IAEG-SDGs review therefore confirmed that SDG indicator 6.5.2, as formulated, represents the best viable option in the framework of the SDGs monitoring, and that there is general support and satisfaction with it.

Conclusions and proposal for the way forward

This paper reflected on whether indicator 6.5.2 is fit for purpose, and if an alternative indicator would be better suited to monitor transboundary water cooperation within the framework of the SDGs.

The indicator is certainly not without its limitations. As emphasized by the IAEG-SDGs itself, '[t]he global indicator framework is designed to provide a global overview or summary of progress in the implementation of the Sustainable Development Goals and cannot contain all indicators relevant to the Sustainable Development Goals' (UN Statistical Commission, 2018). The same logic can be applied to indicator 6.5.2 which cannot monitor all aspects of transboundary water cooperation.

At the same time, it is difficult to see how an alternative indicator would be able to do any better, whilst also satisfying the IAEG-SDGs requirements that it be conceptually clear, an internationally established methodology and standards is available, and data is produced by countries regularly. It is also questionable whether the majority of countries sharing transboundary waters would have engaged in a complex data gathering exercise that had the ambition to measure all the dimensions of transboundary water cooperation. The official process of revision of SDGs indicators finalized in 2020 confirmed this view.

SDG indicator 6.5.2 is relatively basic and not prescriptive in the data that it asks. However, a trade-off is clearly needed between asking for detailed information, and considering what data is widely available and relevant across a variety of different settings.

Moreover, any proposals for an alternative to indicator 6.5.2 also have their limitations – these limitations were carefully evaluated during the consultations, development and pilot testing of indicator 6.5.2. Many offer the promise of more sophisticated and detailed assessment of transboundary cooperation. However, this promise comes at the cost of data availability and political feasibility. Additionally, more qualitative assessments may run the risk of any outcomes becoming contested or simply not being comparable.

The results of the first and second reporting exercises demonstrate that indicator 6.5.2 is robust enough to capture a range of cooperative contexts and that it is able to furnish the international community with meaningful data on the state and coverage of cooperative arrangements for transboundary waters. This is also substantiated in the transition from tier III to tier I classification by the IAEG-SDGs.

The introduction of SDG target 6.5 and its associated indicators is a major milestone for progressing transboundary water cooperation. While other global political declarations have encouraged states to strengthen cooperation, SDG target 6.5. marks the first occasion where there is a global commitment to do so and through indicator 6.5.2 countries have agreed to be held accountable on it. It is also notable that SDG target 6.5 is the only target that explicitly refers to the need for cooperation over transboundary natural resources, even though many of the other goals will, at least in part, be contingent on effective governance arrangements at the transboundary level. Indicator 6.5.2 can therefore play an important role, not only in relation to water, but also in championing the importance of transboundary cooperation in other areas that deal with shared natural resources and ecosystems.

Looking ahead, there are several opportunities to strengthen indicator 6.5.2 and its use to advance transboundary water cooperation and more broadly progress towards the SDGs.

First, it is critical to improve reporting, from the point of view of the quality of the information reported, the quantity and the use made of it. The guidance offered by the custodian agencies can go a long way to improve countries reports. The commitment by the co-custodians and other engaged actors, such as the GWP, UN regional commissions and other regional organizations, to build upon the experience of the first reporting exercise in order to develop a guide to reporting (UNECE, 2020), and clarify the step-by-step methodology (UNECE & UNESCO, 2020b), and build capacity on monitoring indicator 6.5.2 indicator have already improved its uptake and the quality of reporting in the second exercise. In the second reporting exercise in 2020, 129 countries reported compared with 107 in the first one (representing 80% of the countries sharing transboundary waters and a 20% increase compared with the first exercise) and the indicator could be calculated for 101 of them compared with 67 in the first reporting exercise. Most importantly, all these efforts have increased the political awareness of the need to strengthen transboundary water cooperation, which is a main objective of the indicator.

Second, the importance of clarifying what the indicator can and cannot do is essential to its future success. The indicator certainly should not be seen as a panacea that is capable of capturing all aspects of transboundary water cooperation. However, by asking countries to report on core aspects, such as their arrangements and joint bodies, the indicator does offer an important means by which to monitor progress towards target 6.5 and ensuring accountability on transboundary water cooperation.

Third, the value of the reporting process, and the reporting template, should not be underestimated. The reporting template captures a remarkable amount of official data on a wide range of aspects of transboundary water cooperation. While some of this data is analysed in the Global baseline for SDG indicator 6.5.2 (UNECE & UNESCO, 2018) and in other reports produced by the co-custodians and UN-Water (2021), there are ample opportunities to carry out additional analyses on different aspects of transboundary water cooperation, for example, technical aspects of cooperation; and to present data on

specific basins in greater detail. More might therefore be made of the submitted national reports by scholars and others engaged in research on transboundary water cooperation. Never before has so much official data been available on transboundary water issues at the global level. The efforts by The Economist Intelligence Unit to combine information from the 6.5.2 reporting with other data to build the Blue Peace Index is a clear example of further research and analysis that can build upon the 6.5.2 reporting. Such efforts could go a long way to enhancing our knowledge and understanding of the current status and gaps in progress towards transboundary water cooperation.

It is indeed this latter point which makes both the adoption and continuous monitoring of the indicator critical. As noted by the second reporting exercise, only 24 countries reported that all their transboundary waters are covered by operational cooperative arrangements. The absence of such arrangements is a major bottleneck in ensuring the achievement of SDG 6, and more broadly of the 2030 Agenda for sustainable development. Efforts such as the reporting under SDG indicator 6.5.2 are therefore greatly needed as a means by which to develop shared knowledge and understanding of the current gaps in cooperation, and to bring the international community together, in line with the SDG6 Global Acceleration Framework (UN-Water, 2020), to capitalize upon and consolidate their efforts to address those gaps.

Notes

1. See <https://unstats.un.org/sdgs/iaeg-sdgs/>.
2. The total number of SDG indicators listed in 2017 was 244. However, since nine indicators were repeated under two or three different targets, the number of individual indicators adopted was 232. Following yearly refinements and a comprehensive review of all SDG indicators in 2020, the number of individual indicators is now 231 (see <https://unstats.un.org/sdgs/indicators/indicators-list/>).
3. For example, the most common misinterpretation that emerged during the pilot was that countries mistakenly included calculations for the total area of a basin, when what was required was a calculation of the area of the basin within the country in question. The pilot also pointed to the need to clearly define regularity when referring to data exchange or the frequency of meetings, and to clarify that, where appropriate, calculations could be done at the sub-basin level.
4. The countries adopted the convention concerning the Protection of Italo-Swiss waters against pollution on 20 April 1972.
5. For example, see the 1995 Agreement on Cooperation for the Sustainable Development of the Mekong River Basin. While the agreement covers the entire Mekong River Basin (including areas in China and Myanmar), only the lower riparian countries of Cambodia, Laos, Thailand and Vietnam are contracting parties.
6. For example, see the Stampriet Aquifer system between Botswana, Namibia and South Africa, which while situated under the Orange–Senqu River Basin, is not connected to it.

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