Bridging the science-policy-society gap for water management: lessons learnt from the G-STIC International Conferences

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Abstract

This paper discusses the importance of water for the achievement of the Sustainable Development Goals, identifying the need to bridge the science-policy-society gap for water management. Transboundary water cooperation accelerates research and innovation, but also promotes evidence-based policy making through the engagement of stakeholders. A human rights-based approach to water, sanitation and hygiene relies on the valuing of water, including economic accessibility and financing as important tools to end inequalities. The understanding of the complex linkages between water and the remaining domains allows cross-sectoral coherence for decision making with the need for integration of local knowledge to accelerate sustainable development.

The Global Sustainable Technology and Innovation Community (G-STIC) is an organisation launched under the Research and Technology Organisation in Flanders, Belgium (VITO). G-STIC challenges entrepreneurs, researchers, and policymakers to explore innovative approaches, laws, regulations and funding mechanisms for the integration of market-ready technological solutions to achieve the Sustainable Development Goals (SDGs). This provides critical insights for a science-policy-society interface for the development of Science, Technology and Innovation (STI) roadmaps (Bonini, 2020). G-STIC promotes a series of international conferences on several topics, including innovations to achieve clean water and sanitation for all (SDG6). Water is critical for sustainable development and its management requires efficient multi-stakeholder cooperation, being a transversal issue to all challenges of Agenda 2030 (Eichhorn et al., 2020) (Figure 1).

These topics were central in the debates hosted at the G-STIC International Conferences. In Dubai 2022, speakers from across the world discussed about how international partnerships are striving to achieve SDG6. The main conclusion was that many countries are going backwards, precisely due to the lack of a multi-stakeholder approach for decision-making. In Brazil 2023, the conference focused on water, sanitation, and hygiene (WASH). The main bottleneck for WASH implementation remains the need for large-scale investments, transparent financing, and effective governance. Technology is often already implemented, but inspiring behavioural changes is still needed. Thus, policymaking and innovation need to be co-designed with local knowledge. A comprehensive understanding of the intersectoral linkages, as the Water-Energy-Food nexus (de Strasser et al., 2016), describes a multi-stakeholder commitment with efficient cross-sectoral coordination at local, national, and even global levels.

This paper discusses the interface between science, policy, and society for water management, focusing on the lessons learnt from the G-STIC International Conferences and the outcomes of the United Nations World Water Development Reports (UN WWDR).

Figure 1. SDG6 as a central key for all SDGs of Agenda 2030.

Source: UN-Water.

Transboundary Water Cooperation

Water has no borders, and therefore, different countries face common issues with significant impact on social, economic and environmental aspects. The interface between science, policy and society is crucial for bringing innovation closer to development cooperation. It is the steppingstone to build solutions from the local context, share lessons learnt, and inspire future actions. Transboundary water cooperation can be a powerful

tool to enhance peace and security (SDG16), not only for conflict resolution but also prevention (Ho, 2017).

The UN WWDR in 2018 highlights the need for integrating transboundary water cooperation into broader development agendas, but the approaches to accomplish so are not well-defined. This must be recognised through evidence-based policy making supported by reliable data to inform governance decisions. Partnerships for international water cooperation constitute in, their essence, partnerships for the SDGs (SDG17). Successful examples include Water4All European Partnership, India-EU Water Partnership, China-EU Water Platform, AfriAlliance, Green Blue Deal for the Middle East, among others. All of them ambition to accelerate research and innovation for water-related challenges and include stakeholders' engagement to increase impact, bringing science closer to private industry, policy, governance, and society (Figure 2).

Figure 2. "International coalitions reveal the true value of water" (infographic from G-STIC Conference Dubai 2022).

Source: Zsofi Lang Drawings.

Water and Inequalities

Water can be a leverage for ending inequalities (SDG10). The UN WWDR 2021 highlights that women and girls are disproportionately affected by water-related issues, as they still bear the primary responsibility for collecting water in many developing countries. Although water scarcity can exacerbate gender-based violence, well-organised women can be a driving force towards sustainable water management. The gender equality dimension (SDG5) and quality education (SDG4) are underpinning the achievement of SDG6 (de Silva et al., 2017). Young generations have also been showing an important role for these SDGs: they dare to investigate the problems, search for proactive innovative solutions, put them into practice, and speak up to defend everyone's rights.

Inequalities in access to water are also present in decentralised communities such as peri-urban and rural areas. The willingness to pay is often low, but the social benefits have much greater impact in these communities. The UN WWDR 2019 mentions the goal of 'Leaving No One Behind': there are still billions of people who lack basic access to water and sanitation, many of which are among the most marginalized and vulnerable groups of society. Furthermore, the lack of these services can trap people in a cycle of poverty by limiting their ability to earn a living and fully participate in society (SDG1).

The UN WWDR 2021 also stresses the importance of the "value of water". Water is perceived differently by different sectors (e.g., agriculture, industry, urban), users (e.g., urbanized vs. indigenous communities) and regions of the world (depending on factors, e.g., water availability, water quality, ecosystem health). The need for a holistic and integrated approach into the valuing of water in its multiple dimensions is dependent on efficient stakeholders' engagement. This necessitates including policy makers but also civil society as the ultimate user of water resource management plans.

Water, Sanitation and Hygiene

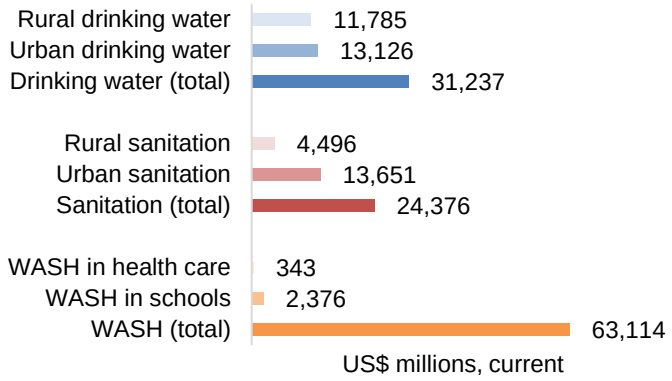
SDG6 encompasses more than the provision of drinking water alone. A human rights-based approach to sanitation and hygiene fully recognizes the dignity of all individuals to have access to basic WASH. However, 75% of countries report that they are unable to meet the targets due to insufficient financing (GLAAS Report 2022) (Figure 3).

Economic accessibility to WASH is an underlining issue of SDG6. Capital investments for infrastructure, operations, and maintenance must go hand-in-hand with transparent financing, governance and political will. Developing structure models for subsidy and water tariffs is highly dependent on the local context. Therefore, effective policy concerning WASH should be coordinated with local knowledge, especially in remote

areas, where decentralized systems might be the most-feasible solution.

Better integration of innovation in this field remains a challenge but valuable insights can be gained by sharing the lessons learnt from WASH projects around the world. In Brazil, several projects for vulnerable slum areas (known as *favelas*) have been focusing not only on technology implementation, but also on raising awareness, identifying the challenges and co-creating solutions with the communities (Bastos et al., 2022). Integrating local and indigenous knowledge often shows that simple solutions can be even more effective than complex engineered solutions. The Latin-American Confederation of Community Organizations for Water Services and Sanitation (CLOCSAS) pursues projects that strengthen knowledge integration at the social level (Dupuits, 2019). In Mozambique, projects funded by the Belgian Development Agency (ENABEL) include technological innovations combined with intra- and inter-sectoral coordination and capacity building in local communities.

Figure 3. Estimated annual WASH plan/strategy costs for drinking water and sanitation.



Source: GLAAS Report 2022 (adapted).

Water-Energy-Food Nexus

The Water-Energy-Food (WEF) nexus aims at providing a better understanding of the complex linkages between sectors and enhancing coherent cross-sectoral governance (de Strasser et al. 2016). On the one hand, water (SDG6), energy (SDG7) and food (SDG2) are separate goals; on the other hand, the interlinkages between these sectors imply that the objectives of Agenda 2030 are also intrinsically connected (Laumann et al., 2022). The main challenge within the WEF nexus remains to be food and water provision powered by sustainable energy (UN WWDR 2020). Water use requires energy (e.g., water abstraction for irrigation, wastewater treatment, distribution of drinking water, desalination, etc). Yet, energy production also requires water (e.g., cooling processes for thermal power generation). Furthermore, reducing water loss and shifting to renewable energy to decrease greenhouse gas emissions can enhance food security for the world's increasing population. The quantification of the ecological footprint of food production, in particular food waste, is another topic in which the WEF nexus can be insightful (Castell-Perez et al., 2017).

The WEF nexus involves the assessment of common risks, balanced decision-making, mobilization of funding, joint actions towards common objectives and impact monitoring. By promoting a paradigm shift away from fragmented interventions, the WEF nexus thus tackles transformative long-term sustainability through the compromise of often-competing interests, simultaneously respecting the boundaries and integrity of the ecosystems (FAO, 2014).

According to the 2022 Global Water Leaders Survey, more than 70% of the surveyed ministers report water challenges to be very important to achieve energy and food security. However, they report lack of integration and prioritization of water issues within governance, as well as financing support. As such, innovation for the WEF nexus must go beyond technological development, and also improve management at the level of economic and policy perspectives through a strengthened science-policy-society interface.

Conclusions and policy recommendations

The water domain does not presently have an entity responsible for the science-policy-society interface, in comparison to the successful example of the Intergovernmental Panel on Climate Change (IPCC). However, the current momentum with the UN Water Conference in March 2023 shows the ambition to achieve a similar structure in the near future. Agenda 2030 recognizes the interconnectedness of the SDGs, highlighting the need for a holistic and integrated approach towards sustainable development.

The policy recommendations provided by this paper for the SDGs under revision during the UN STI Forum are as follows:

- SDG6 (Clean water and sanitation) – Policymakers should adopt a human rights-based approach to WASH, and economic accessibility needs to be accounted to assure that the most vulnerable communities are not left behind.

- SDG7 (Affordable and clean energy) and SDG2 (Zero hunger) – Policymakers should prioritize the WEF nexus and integrate SDGs to achieve multiple impacts.
- SDG17 (Partnerships for the goals) – Policymakers should foster cooperation, capacity building and the sharing of knowledge and resources.

In conclusion, policymakers and governments should prioritize the integration and engagement of all stakeholders, including citizens, private industry, government, and academia within sustainable development to pave the way to a science-policy-society interface that addresses water as a central theme.

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