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Contribution by IDB

to the CSTD 2022-2023 priority theme on “Ensuring safe water and sanitation for
all: a solution by science, technology and innovation”

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PRIORITY THEME 2: Ensuring safe water and sanitation for all: a solution by science, technology and innovation

United Nations Commission on Science and Technology for Development (CSTD)

To Whom it May Concern,

The [25th CSTD annual session](#) selected “Ensuring safe water and sanitation for all: a solution by science, technology and innovation” as one of the priority themes for its 26th session (2022-23 period). This theme addresses SDG 6 on Clean Water and Sanitation.

Water is a most critical natural resource for human beings while clean water and sanitation is essential for human’s daily life. The latest available data shows that in 2020, 26 per cent of the world population did not have access to a safely managed drinking water service while 46 per cent did not use a safely managed sanitation service. Lack of access to safe water has clear gender impact as the burden of securing water falls disproportionately on women and girls with consequences for their income and educational opportunities. Lack of sanitation also creates specific risks for women and girls’ safety.

A range of technologies provide effective and affordable opportunities to improve the management of water and sanitation. Some are purely technological (e.g., water purification technologies, wastewater treatment technologies and increasing water availability technologies) while others relate to information and data management and sharing (e.g., hydrological observation, data exchange and forecasting).

Under this theme, the Commission will examine the key challenges facing developing countries in providing safe water and sanitation to their population. It will also highlight successful practices in applying science, technology and innovation (STI) to the management of water and sanitation services. Finally, it will explore how to enhance experience and technology sharing among countries to effectively address water and sanitation challenges.

The CSTD secretariat is in the process of drafting an issues paper on the theme to be presented at the CSTD inter-sessional panel meeting on 25 -27 October 2022. In this context, we would like to solicit inputs from international organizations, UN entities and agencies, and regional commissions on this theme. We would be grateful if you could kindly answer the following questions based on your organization’s work at the global, regional, and/or national levels.

- 1. Can you give examples of projects/policies in your organization helping countries improve the management of water and sanitation and provide access to safe water and sanitation for all? What are the main challenges confronted (including the gender dimension) while trying to implement these projects/policies?**

As for the main challenges confronted, please refer to the following documents

Innovation in Water, Sanitation, and Solid Waste: Assessment, Perspectives, and Opportunities for Latin America and the Caribbean

<https://publications.iadb.org/en/innovation-water-sanitation-and-solid-waste-assessment-perspectives-and-opportunities-latin-america>

IDB Water and Sanitation Sector Framework

<https://www.iadb.org/en/sector/water-and-sanitation/sector-framework#:~:text=This%20SFD%20proposes%20that%20IDB,sustainable%2C%20and%20good%20quality%20services.>

Source of Innovation: a facility to foster innovation in the water, sanitation and solid water sector in Latin America and the Caribbean

<https://www.iadb.org/en/project/RG-O1693>

Even recognizing some exceptions and the potential for the adoption of innovative solutions and practices, the rate of innovation¹ and technology uptake in the sector in Latin America and the Caribbean is relatively slow compared to other sectors mainly because of the conservative nature of the industry.² It is observed that, in general, the water, sanitation and solid waste operators in the region do not yet have the tools to analyze the level of advance/predisposition towards innovation and to define clear strategic objectives on the subject, nor guidelines on how to foster a new culture of innovation. This is valid also for other actors in the ecosystem, including policy makers and regulators. Among the main obstacles that hinder the development and promotion of innovation, an IDB study³ identified the following:

- a) *A weak and fragmented demand-side*: the level of innovation among water, sanitation (including hygiene) and solid waste (WSS) service providers throughout the region is marginal in most cases, dropping to even lower levels for those responsible for rural areas. An IDB study revealed that most utilities in the sector in Latin America and the Caribbean (LAC) do not consider or manage innovation as a business process and admit they apply very few innovation practices.⁴ As for the solid waste sector: notwithstanding the improvements and innovations that are being proposed, much is required to scale up their impacts.⁵ Service providers in the sector lack internal incentive mechanisms to promote Research and Development (R&D) activities such as budget allocation, a clear strategy and recognition for staff engaging in R&D activities. Furthermore, joint innovation activities with other stakeholders (open innovation),⁶ such as suppliers, tech centers, and/or entrepreneurs, are exceptional, although there are some signs of higher predisposition to collaborate in pilot projects. All this is compounded by the low capacity of service providers to assess existing innovative solutions and products to improve the provision of WSS services.
- b) *A supply side with little incentives*: the little demand for Research, Development, and Innovation (R&D&I) services from institutions as well as innovative startups (the structural business fragmentation in the WSS), is compounded by the absence of activities that acknowledge, promote and foster innovation from the supply side. In general, WSS stakeholders in LAC lack access to financing mechanisms adapted to the specific needs and characteristics of each step in the R&D&I process. Examples of this include short repayment terms, lofty guarantees, and almost inexistent grace periods for tech centers seeking to purchase equipment. From the perspective of capital growth and acceleration, there is an absence of consolidated incubation and acceleration facilities, and in addition,

¹ The term 'water innovation' appeared for the first time in the published academic literature in 2004. Exploring the dynamics of water innovation: Foundations for water innovation studies. When, U. and Montalvo, C. Journal of Cleaner Production. 2018.

² Although there have been advances, these "do not change the general situation of the region, characterized by low technological intensity and severe deficits in aspects such as human capital, investment in research and development (R&D), technological infrastructure, coordination between institutions and institutional effectiveness." In, Science, Technology, and Innovation in LAC. A statistical compendium of indicators. Science and Technology Division. IDB. 2010.

³ Innovation in Water, Sanitation, and Solid Waste Assessment, perspectives, and opportunities for Latin America and the Caribbean. Minatta, A. and Basani, M. Technical note DB-TN-01974. 2020.

⁴ Innovation in Water, Sanitation, and Solid Waste Assessment, perspectives, and opportunities for Latin America and the Caribbean. Minatta, A. and Basani, M. Technical note DB-TN-01974. 2020.

⁵ What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050. Urban Development. Washington, DC: Kaza, S. et al. World Bank. 2018.

⁶ The era of open innovation. MIT Sloan Management Review. Chesbrough. 2003.

Venture Capital Funds actively seeking to invest in startups in their initial stages are scarce. Also, the limited inclusion and integration of multiple disciplines (e.g., data management, statistics, sociology, industrial design, logistics, etc.) is due, in part, to the lack of common goals and shared language. These characteristics slow down technological developments for innovation and constitutes a major barrier to efficient service provision in the R&D&I centers.⁷

- c) *Poor coordination between the demand and the supply of innovative solutions:* although the contribution of R&D&I to the sector may be very relevant,⁸ in the Region there are very few service providers involved in the generation of R&D&I.⁹ The multiplicity of national, regional, and/or municipal public agencies with different competences and roles¹⁰ hampers their ability to cooperate in the design, approval, and execution of strategies and policies, or to promote R&D&I. Over twenty-five tech centers,¹¹ university departments, and think tanks have been identified as possible innovation *engines* for the sector in LAC,¹² but the region lacks open mechanisms to articulate and promote the interaction among sectoral stakeholders and, in particular, between the demand and supply of innovation.¹³ In practice, service providers and innovators do not talk to each other. In addition, most of the programs supporting the integration of innovation rely only on pilots, but there is no further dialogue with potential investors to achieve economies of scale and a financing muscle that can allow successful innovative solutions to be deployed at scale.
- d) *Poor innovation culture throughout the ecosystem:* the culture of innovation –as occurs with belief systems, habits, values, attitudes, and traditions that foster *innovation*– is crucial to the development of WSS service providers.¹⁴ However, the culture of innovation among service providers in LAC represents less than one-fifth of the international reference threshold value for the sector. Also, most countries do not have or have not completely implemented a legal and institutional policy sectoral framework to foster innovation.¹⁵ Additionally, the nature of the WSS sector, essential for protecting public health, the environment, and local economies,¹⁶ historically resulted in a strong regulation environment, not necessarily open to engaging with and mitigating the risks inherent in innovation

⁷ Modelos de gestión de centros tecnológicos sectoriales: elementos de un análisis comparado, Dini y Tassinari. CEPAL. 2017.

⁸ Research ‘...can make irreplaceable contributions to ensuring the water supply for our population, to the conservation of our ecosystems and the prosperity of our biodiversity, and to the sustainability of our productive and exportation matrix...’. R&D&I National Strategy for the Sustainability of Water Resources. Chile. 2016.

⁹ Innovation in Water, Sanitation, and Solid Waste Assessment, perspectives, and opportunities for Latin America and the Caribbean. Minatta, A. and Basani, M. Technical note DB-TN-01974. 2020.

¹⁰ Water Governability in Latin America and the Caribbean: A multilevel point of view. OECD. 2012.

¹¹ Regarding waste, none are specific; there are no outstanding developments with the exception of some specific case supported by the National Agency for Investigation and Innovation (UCU – Unilever) in Uruguay. 2017.

¹² Innovation in Water, Sanitation, and Solid Waste Assessment, perspectives, and opportunities for Latin America and the Caribbean. Minatta, A. and Basani, M. Technical note DB-TN-01974. 2020.

¹³ The Future of Water and Sanitation Services in Latin America. The challenge of urban area operators. IDB-CAF. 2015.

¹⁴ The New Imperative of Innovation Policy Perspectives for Latin America and the Caribbean. Navarro, J.C., Crespi, G. and Benavente, J.M. IDB. 2016; Three of the five main innovation inhibitors for W&S suppliers are linked to organizational culture. Fostering Innovation Within Water Utilities Water Research Foundation & Water Environment and Reuse Foundation Project #4642. 2017; La importancia de la cultura de la innovación. Factor clave para la competitividad de las empresas. Community of Madrid. 2010.

¹⁵ El marco legal e institucional y la organización industrial. “El futuro de los servicios de agua y saneamiento de América Latina: Desafíos de los operadores de áreas urbanas de más de 300.000 habitantes”. Lentini, E. Discussion paper. IDB-CAF. 2015.

¹⁶ Innovation in the water industry: barriers and opportunities for US and UK utilities. WIREs Water published by Wiley Periodicals, Inc. 2015.

and change. That said, public policy on innovation¹⁷ tends to be a relatively new field and its formulation, development, and assessment are still incipient in many LAC countries.

These obstacles are aggravated by intrinsic gender and inclusion sectoral gaps. Firstly, women are underrepresented in key positions within water and sanitation utilities, despite being essential users and main decision-makers on water use in the home.¹⁸ Also, it is well known that a lack of access to water, sanitation and hygiene affects women, minorities, or marginalized groups disproportionately, due both to biological and cultural factors exacerbated by facets such as ethnicity, social status, sexual orientation, or disability status.¹⁹ Finally, the representation of women in the innovation ecosystem is still incipient. Even though Latin America and the Caribbean is the region with the highest percentage of female entrepreneurship, men-owned businesses are still more prominent²⁰ and statistically companies led by women receive less financial support.²¹

Additionally, evidence presented by the latest Intergovernmental Panel on Climate Change reports indicates that climate change is altering the seasonality of local and regional hydrology and causing greater variance in the probability distribution of precipitation and temperature. In some areas, climate change is also increasing the intensity and frequency of extreme events affecting infrastructure, local communities, and key ecosystem services. Furthermore, climate change is believed to be affecting the trends and characteristics of El Niño and La Niña, potentially altering historical patterns of regional climate systems connected to this cyclical interdecadal event. At the same time, slow onset impacts of climate change such as sea level rise or the steady increase of mean temperature are becoming multipliers of on-going environmental degradation effects, affecting herewith water resources quality. Other impacts in the region include the rapid retreat of tropical glaciers affecting water availability in the Andean region. Altogether, these physical impacts directly affect the reliable provision of water and sanitation services.²²

Complementing the point above, it is worth mentioning that LAC is characterized by abundance of water as a whole. However, since several decades, the population has been migrating to major cities, often resorting to live in irregular developments with limited water availability and quality. Most countries face scarcity and/or a restricted access to water, and even in countries with extensive water resources to supply their population, water distribution is carried in an unsustainable and unconscious way. Progressive degradation of water quality also undermines ecological integrity and the very ecosystems on which the region's population depends. Furthermore, impaired or inadequate water resources management infrastructure coupled with climate change, as well as weak governance in their administration impose significant challenges in the region.

¹⁷ Innovation Policies for Latin America and the Caribbean. Nuevos Caminos. Navarro, J.C. and Olivari, J. (Editors). IDB. 2016.

¹⁸ Women in Water Utilities: Breaking Barriers. World Bank, Washington, D.C. 2019.

¹⁹ Understanding empowerment in water, sanitation, and hygiene (WASH): a scoping review. Dery, F. et al., (2020), *Journal of Water, Sanitation and Hygiene for Development* 10.1, 2020; A guidance note for leaving no one behind. UNICEF 2021; Including Persons with Disabilities in Water Sector Operations: A Guidance. World Bank. 2017.

²⁰ Toward Realizing the Potential of Latin America's Women Entrepreneurs: An Analysis of Barriers and Challenges. Alecchi, B.A. 2020. *Latin American Research Review*, 55(3), 496–514.

²¹ Inversión con un enfoque de género: Cómo las finanzas pueden acelerar la igualdad de género para América Latina y el Caribe, Buckland et al., (2019), BID Invest. 2019.

²² Various authors, Servicios de agua potable y saneamiento resilientes en América Latina y el Caribe. Paltan, H. et al. (2020). Technical note IDB-TN-01988. 2020.

2. Could you share specific examples that have successfully used STI, including frontier technologies (e.g., AI, drones, etc) or other forms of innovation in general in addressing the above challenges?

Recent studies²³ elaborated by the Bank have proved that innovation is already playing a key role in increasing and improving access to more efficient quality water, sanitation, and solid waste services in LAC. This sector presents innovative dynamics that differ from other sectors such as those closely linked to information and communications technology (e.g., fintech, e-health, intelligent transport).

In the WSS sector, the type of sector innovations is generally more incremental than disruptive, and innovation is often vested in the public sector, historically more conservative²⁴ and slower²⁵ when it comes to implementing a proactive culture of innovation. The innovative solutions that have had a larger impact in LAC come as a result of creative combinations of social and organizational solutions with technological innovations.

The potential impact of adopting innovative solutions for service provision is substantial. In general, for utilities, the technological digital transformation of systems and processes can result in a reduction in operating expenses of up to 25 percent.²⁶ The World Economic Forum frames the adoption of digital technologies among industrial sectors within the concept of the Fourth Industrial Revolution and identifies the digital transformation of water management and services as part of this revolution. Advanced technologies can transform the business models required for the provision and maintenance of water, sanitation, and hygiene services and, in doing so, unlock a variety of new economic opportunities.²⁷ The concept of the Internet of Water is being proposed as a priority to share integrated sectoral data in an open way, to facilitate decision-making processes and improve the transparency of the sector.²⁸ In fact, the innovation of the water systems through data science and augmented intelligence techniques are enabling situational awareness or near-real time flow and quality monitoring.²⁹ Within this framework, advanced digital technologies can become a fundamental agent of change in the modernization of WSS infrastructure at a global level.

At the international level, digitalization initiatives in the sector have already resulted in operating gains of up to 25 percent and have reduced water supply failures by around 30 percent and the duration of pipe bursts repairs by 8 percent, also increasing the reliability of data to almost 99 percent³⁰ thanks to the immediacy of precise sensor readings. Similar results have been confirmed by the Bank-financed pilots in Argentina and Brazil. New approaches of *Industry 4.0* are also being developed and implemented in the field of waste management (for

²³ Innovations you didn't know were from Latin America and the Caribbean. Mastrangelo, IDB. 2018; Innovation in Water, Sanitation, and Solid Waste Assessment, perspectives, and opportunities for Latin America and the Caribbean. Minatta, A. and Basani, M. Technical note DB-TN-01974. 2020.

²⁴ Barriers to Innovation in Urban Wastewater Utilities: Attitudes of Managers in California. Kiparsky et. al. Springer Science + Business Media NY. 2016.

²⁵ The adoption of a water technology may require more than 10 years. O'Callaghan, P., Daigger, G., Adapa, L. & Buisman, C., Development, and application of a model to study water technology adoption. *Water Environmental Res.* 90, 563–574. 2018.

²⁶ The Digital Utility: New challenges, capabilities, and opportunities McKinsey & Company, 2018.

²⁷ Harnessing the Fourth Industrial Revolution for Water. Fourth Industrial Revolution for the Earth Series. 2018.

²⁸ Internet of water revisited. Building an Internet of Water. The Aspen Institute, 2017.

²⁹ Improvements in event response times by 20 percent, increases in work reutilization by 25 percent, 15 percent reductions in energy use across the network and other benefits across the water value chain are possible, specifically in the area of asset management. IWA World Water. R. Eggers and other thought leaders at the International Congress. 2018.

³⁰ Water World Digital Twins for Managing Water Infrastructure. [DOI](#). January 4. 2020.

processes related to collection and logistics, machines and waste treatment plants, business models and data tools), with promising results, especially within the context of the circular economy.³¹ Smart recycling or Artificial Intelligence (AI) backed systems are supporting new mechanisms to finance water infrastructure and management.³²

Innovation through the combination of smart metering and the Internet of Things (IoT) is key to develop smart water management systems serving both consumers and water utility companies and fostering sustainability, strengthening processes such as water leak detection, river water quality real-time monitoring, water flow monitoring, short-term water consumption and water demand forecasting.³³ This has been confirmed by Bank-led initiatives and products, such as HydroBID.³⁴

If compared to other developing regions, WSS service coverage in LAC is high, but there are still gaps in access to services, with rural and peri-urban areas lagging. These areas present peculiarities that make service provision more challenging, such as population density – extremely high in some peri-urban areas or slums making it impossible to have grid services, or extremely low for hard-to-reach and dispersed rural spots where the only viable solutions are individual systems such as rainwater harvesting. In addition, most of the population in these areas are among the most vulnerable, with high poverty rates.

Also, technical, and social innovation can play a key role in achieving universal access to safely managed services in LAC. Everyone must be reached, and for doing so, innovative technologies and business models are flourishing to provide services in a safely managed and affordable manner. Technical innovations such as an off-grid solution that uses the power of the sun to extract a volume of water from the air that can be deployed in hard-to-reach communities in very dry areas, are being developed by innovators and piloted both in LAC and globally.³⁵ Also, innovative approaches such as business models designed for the base of the pyramid can make these services affordable for the most vulnerable,³⁶ as social behavioral change programs can ensure an appropriate use of water services that have proven to be successful in reaching the most vulnerable.

Recognizing this potential, some utilities in recent years have invested in innovation and, in some cases, created new dedicated departments for research and innovation. This is the case of top-end service providers in the region such as the Companhia de Saneamento Básico do Estado de São Paulo (SABESP, in San Paulo, Brazil), the Empresa Pública Metropolitana de Agua Potable y Saneamiento (EPMAPS - Agua de Quito, Ecuador) and Agua y Saneamiento Argentinos SA (AySA, in Buenos Aires, Argentina) which, following international examples,³⁷ have fostered a new culture that encourages employees to identify emerging technologies, undertake scientific research, and ultimately make transformational changes.³⁸

³¹ Digitalization and intelligent robotics in value chain of circular economy-oriented waste management. A review. Waste Management 95:476-492. Sarc, R. et al. 2019.

³² When the fourth water and digital revolution encountered COVID-19. Poch, M. et al., (2020). Science of The Total Environment, Volume 744, 20 November 2020, 140980.

³³ How can innovation theories be applied to water technology innovation? O'Callaghan, P. Journal of cleaner production Volume: 276. ISSN: 0959-6526. 2020.

³⁴ Step by step guide. HydroBID Manual. Nalesso, M. y Coli, P. 2018.

³⁵ See for example: <https://www.source.co/>

³⁶ See the example of SOIL, a startup providing sanitation services through a container-based sanitation system to poor populations in Haiti.

³⁷ International examples include Singapore's National Water Agency (Singapore), DC Water – District of Columbia Water and Sewer Authority (USA), Mekorot (Israel) and Sydney Water (Australia).

³⁸ **These paragraphs summarise the result of an IDB study, as presented in the document: Source of Innovation: a facility to foster innovation in the water, sanitation and solid water sector in Latin America and the Caribbean** <https://www.iadb.org/en/project/RG-O1693> Please refer to it accordingly.

In Brazil, just to give an example, SABESP launched Pitch SABESP, a public call which select innovative solutions that contribute to the water and sanitation sector and to address the challenges faced by the company, both to provide services and to maximize management efficiency. In doing this, SABESP wants to attract innovative solutions to improve the quality of customer services and the daily operations. The selected solutions will have their projects tested in the company. Besides being a regional point of reference in terms of innovation management, which is reflected by the multiple activities pushed forward by its innovation laboratory, it is worth mentioning that SABESP won the first edition of the Ideas into Action IDB award (international award that recognizes the best practices in innovation within the water and sanitation utilities in the region), and in the second edition it received the recognition as best utility in terms of innovation management. SABESP won with its circular economy program, through which it managed to obtain methane biogas from the waste treatment process, using the biomethane as fuel for a fleet of over 100 vehicles. In addition, through a process of implementation of hydrolysis in the solid phase of fecal sludge, the program has expanded beyond gas generation, converting the sludge generated by separating water from solid waste into a product suitable as fertilizer.

In Argentina, AySA, with its Innovation, Transformation and Data Science Management, is carrying out an ambitious innovation and digitization agenda with technological pilots and activities that aim to speed of the utility's digitalization process (with the support of the IDB). Also thanks to the application of the AquaRating tools related to innovation management, key activities have been identified to consolidate the company's trajectory towards innovation, including, among others, the strengthening of the corporate governance structure towards innovation, as well as the need to improve the level of culture towards innovation, creativity, idea management and innovation management in general.

Among other things, AySA applied a non-intrusive satellite method developed by Asterra for the identification and control of water losses. In the pilot area where it was applied over 5,000 km of pipes, 1,105 points with high potential for leaks have been detected, generating savings of 2,000,000 m³ per year and increasing leak detection efficiency by 138%.

In Ecuador, EPMAPS has been implementing and developing projects with cutting-edge technology such as AI (artificial intelligence), Machine Learning, use of drones to control deposits, among others, to strengthen an ecosystem of business innovation and digitization. This migration and technological adaptation required the consolidation of projects with different stakeholders and the incorporation of technological surveillance processes. AI techniques have also been employed in produced water forecast, resilient models and dimensioning of the expansion in the peripheries to optimize the process and to offer practical solutions to future water stress. Applications of AI and Machine Learning is also expected to reduce the operational expenditures of the water treatment process by decreasing the cost and optimizing chemicals usage. EPMAPS, using the continuous monitoring system "AguaQuitoPeriférica", geographically models the possible future scenarios to be considered for planning the demand for the service. This is done using geographic artificial intelligence techniques, presented in an environment based on geographic information systems (GIS) at the neighborhood level, providing favorable conditions for multi-criteria analysis and decision-making at the technical and management levels. The system is inherently built to last; in the next phase (2022), it will be fed by space platforms such as NASA and Google Earth Engine. "AguaQuitoPeriférica" considers a spatial (geographic) approach in combination with driving factors that include the habits, traditions and realities of the inhabitants of Quito and its parishes; it is possible to estimate more real, precise and comparable approximations. Finally, EPMAPS has been building a loosely interconnected network of stakeholders that coevolve capabilities around a shared set of technologies, knowledge, or skills, and work cooperatively and competitively to develop new pilot projects, experimental designs and high-impact

technological transformation projects will be consolidated in an innovation laboratory to rapidly articulate co-creation with the innovation ecosystem and strengthen a culture of innovation.

Other countries in the region are piloting innovative technologies that may escalate in the near future. Among the several examples, it is worth mentioning:

- The use of drones for monitoring cyanobacteria and in general the quality of water in small aquatic environments or specific areas along the coasts and lakes, which has been piloted in Uruguay
- The use of digital twin to simulate past, present and future scenarios, forecasting network behavior and anticipating and planning contingency plans, piloted in a utility in Peru.

Additionally, technical cooperation operations and projects are currently being financed, through Source of Innovation and/or IDB loans, to foster an innovation culture within service providers; develop, adapt and adopt new processes and technologies; improve communications within the ecosystem, create new spaces for dialogue between demand and supply, create new tools to facilitate and accelerate the adoption of innovative solutions.

Nowadays, most of the investment loans financed by the IDB include innovation activities. Most of these activities are a continuation of pilots that have been financed through technical cooperation operations. In general, these include remote sensing, treatment technologies [both water and sewerage], automation of water networks, among others. A recently approved project for AySA includes a component on management of water systems (non-revenue water reduction). This component was designed using the lessons learned from a previous pilot which resulted in a set of processes and technologies adapted to the utility's particular context. Other examples include components that will finance pilots and the scaling up of such pilots. These particular activities are centered on smart water technologies for the most part.

3. Can you provide examples of policies/projects/initiatives specifically aimed at strengthening national STI capabilities to address these challenges?

Perhaps the most poignant example of an initiative that specifically aims to strengthening national and utilities' STI capabilities is Source of Innovation (described in details below), an alliance of the IDB Group with external partners to promote the development and adoption of innovative solutions in the water, sanitation, and solid waste sector, to achieve smart, inclusive, and sustainable services, with a focus primarily on service providers in Latin America and the Caribbean, but that also seeks to build capacity at the sector level.

Within this initiative, successful examples of impact and scaling up are already emerging:

- The winning teams from the first edition of the e-Hackathon in 2020 are already legally established and are working within the regional market.
- Several utilities, such as AyA in Costa Rica, has initiated a transformation process thanks to the implementation of the AquaRating innovation tools.
- As mentioned above, AySA, the water and sanitation utility in Buenos Aires, will institutionalize and consolidate innovation ideas and strategies developed through AquaRating and an e-hackathon within the framework of an IDB loan to be approved in 2022.
- In Chile, Essbio, the second biggest water company in the country, will adopt the solution developed through AGUA GO, the e-hackathon contest organized by HidroIngenia Foundation with the support of Source of Innovation.
- SADM, the water utility of Monterrey, Mexico, applied an innovative non-intrusive satellite method that resulted in leak detection and swift intervention in problem areas,

increasing leak detection efficiency by 28%. After the pilot phase, the technology company was contacted by SADM to escalate the solution.

It is worth mentioning that Source of Innovation is currently financing the development of a tool to facilitate the inclusion of “innovative approaches and strategies” for decision-maker entities, at the national and municipal level.

In the next section we present additional details on the scope and impact of “Source of Innovation”, and share information on case studies and initiatives that are strengthening STI capacities in the region.

4. Could you share case studies of regional/ international cooperation that have strengthened STI developing countries’ capacities in managing water and sanitation and improve their access for all?

Among the several activities aimed at strengthening national STI capabilities, it is worth mentioning:

a. Source of Innovation

Source of Innovation is an alliance of the IDB Group with external partners to promote the development and adoption of innovative solutions in the water, sanitation, and solid waste sector, to achieve smart, inclusive, and sustainable services, with a focus on service providers in Latin America and the Caribbean.

The objective of Source of Innovation is to generate the conditions for the development and integration of innovative solutions in the water, sanitation, and solid waste sector so that quality access to these services and their benefits are within reach of the entire population in Latin America and the Caribbean. Source of Innovation focuses on four components:

- Strengthening the demand for innovative solutions - empowering service providers by providing them with tools, methodologies, and opportunities to test innovative solutions.
- Strengthening the supply for sectoral innovation - identifying and supporting in a dynamic and interactive way the supply of innovative solutions and products developed by the private sector and the innovation ecosystem.
- Promote the formation of alliances between emerging companies and entrepreneurs, service providers and investors, strengthening the regional innovation ecosystem and its key players, as well as creating and strengthening spaces for dialogue.
- Foster a culture and environment conducive to innovation in the water, sanitation and solid waste sector, facilitating a cultural shift towards innovation in the sector in Latin America and the Caribbean.

Source of Innovation is funded by the Government of Switzerland through its [State Secretariat for Economic Affairs \(SECO\)](#), by the [FEMSA Foundation](#), and is supported by the [Government of Israel](#). The initiative is also complemented by direct contributions from IDB Lab and the Water and Sanitation Division, and coordinates directly with the Aquafund, the fund created with IDB capital and to which a wide range of public and private sector partners contribute.

Its implementation is co-led by the Water and Sanitation Division and [IDB Lab](#), the Bank’s innovation laboratory, and involves the Knowledge and Innovation Department (KIC), the Office of Outreach and Partnerships (ORP), IDB Invest and the Competitiveness, Technology and Innovation Division (CTI).

Source of Innovation is also supporting the organization and implementation of several awards, open calls and contests to stimulate the supply of STI and create spaces where supply and demand can interact.

The open calls and contests target several actors within the ecosystem:

- (i) entrepreneurs and startups (with the [IDB-FEMSA Award](#));
- (ii) public utilities (with [The Ideas into Action Award](#)); and
- (iii) young entrepreneurs (with the [e-hackathon](#)).

The IDB-FEMSA Award, granted by INE/WSA and the FEMSA Foundation, recognizes each year the most innovative solutions with proven results to overcome deficiencies and challenges in the water, sanitation and solid waste management sectors. The prize has been awarded since 2009 to creative and innovative ventures, products, initiatives, or services that already have positive and demonstrable impacts and results in those sectors.

The Ideas into Action Award has two categories: • The innovation excellency category recognizes innovative projects developed and implemented by companies that operate water and/or sanitation services in Latin America and the Caribbean. • The “challenges” category facilitates the matching between the challenges faced by companies operating water and/or sanitation services in the region with pilots. For the 2020-21 challenge edition, the piloting of the solutions identified were financed by the Government of Israel. For the 2021-22 edition, the award for the winning team is financed by Source of Innovation and includes the opportunity for a delegation from the winning utility to participate in a five-day visit to Companhia de Saneamento Básico do Estado de São Paulo (SABESP), in Sao Paulo, Brazil, to learn about its innovation management model. The award also includes the implementation of the AquaRating innovation tool for the winning utility.

The e-Hackathon on water and sanitation in informal settlements in Latin America and the Caribbean brings together young entrepreneurs and experts selected from the region in a process of co-creation and open innovation that seeks fresh and new solutions to the challenge of providing basic services in those communities. The second edition, held in March 2022, was organized directly within the framework of Source of Innovation.

b. STI for water security in LAC

Advances in science and technology can play a major role in the service of water security in LAC, especially in terms of the availability of data on water quantity and quality and, more broadly, the monitoring of the water cycle and the development of tools that transform this data into reliable, publicly accessible information to support decision making and planning. A few examples of projects and initiatives that aim at strengthening national STI capabilities are listed below:

- **Water Reserves Program in Mexico:** Mexico’s National Water Reserves Program with the cooperation of the IDB, WWF, CONAGUA, and the Fundación Gonzalo Río Arronte, has implemented an ambitious program to develop maps and characterize hydrographic basins intended for the integrated planning and management of groundwater and surface water. The ultimate goal is to achieve water security through long-term planning and monitoring of water quantity and quality, with emphasis on maintaining ecological flows and biological diversity while meeting supply needs. Moving from traditional sectoral management approaches, the program is based on the creation of a working relationship with civil society and the openness to active participation in water management by other entities in the environmental sector.

- **Curitiba's flood plain:** Based on the proposition that natural floodplains and associated wetlands can be used to reduce river sediment and nutrient concentrations, the Brazilian city of Curitiba adopted a multifunctional approach to integrate the floodplain of the Iguaçu River into the urban master plan. Thus, a large part of the floodplain was transformed into a linear park and conservation area capable of reducing flood risk downstream; wetlands were also constructed to treat river water and stormwater from surrounding neighborhoods. Wetlands trap nutrients and sediments and can serve as a pretreatment technology to reduce the cost and increase the quality of domestic water treatment. It is an excellent example of the urban ecosystem services approach in the WS plans with collateral benefits: water supply, removal of contaminants, food production, microclimate control, carbon sequestration, recreational opportunities, and biodiversity habitat.
- **HydroBID:** An integrated and quantitative online system to simulate hydrology and water resources management in the LAC region, under different scenarios (e.g., climate change and its effects on water availability and hydroclimatic events, land use, population growth) which allows to evaluate the quantity and quality of water, inform infrastructure needs, and the design of strategies and adaptive projects in response to these changes. The information generated by this tool has been used to inform policy making in several countries, inform the designs of resilient infrastructure, not only WSS, but hydric infrastructure to palliate high water availability fluctuations (exacerbated by CC), as well as roads, dams, urban infrastructure.

HydroBID brings together three tools: HydroBID Warm, HydroBID Alloc, and HydroBID Flood. It supports activities aimed at the integrated management and planning of hybrid resources, adaptation, mitigation and preparation for extreme events, and infrastructure design. Additionally, it supports the preparation and execution of resilient and sustainable investment programs with a multisectoral vision.

HydroBID Wam (Water Assessment Model) is an information and hydrological simulation system (rain-runoff) at the basin level developed to support decision-making, planning and analyzing the impact of extreme events (droughts) and adaptation strategies. HydroBID Wam includes a database that contains information on hydrographic basins throughout Latin America and allows the generation of information on water availability, including the study of climate change impacts, changes in land use, water quality and the generation of sediments.

HydroBID Alloc (Allocation Model) is a water supply optimization model that is integrated into HydroBID wam and allows for a detailed analysis of the effect of multisectoral water demands on water availability in basins (technical and economic value), being a tool solid for water planning and the development of investment plans. HydroBID Alloc incorporates nodes of demand, infrastructure (reservoirs, diversions, water treatment plants, wells) and allows the effect of system efficiency, unaccounted-for water and reuse to be analyzed.

HydroBID Flood (Flood Model) is a 2D hydrodynamic model with a hydrological component developed to carry out detailed studies of hydraulic dynamics. The model has the capacity to analyze fluvial, pluvial and coastal flooding, contamination plumes, erosion and deposition processes and allows the incorporation of infrastructure. HydroBID Flood is a useful tool to support infrastructure design (canals, bridges, reservoirs, drainage systems, treatment plants), design early warning systems, support flood preparedness and mitigation activities, conduct environmental impact assessments, analyze threat, vulnerability and economic evaluation of floods.

For more information: <https://www.iadb.org/en/water-and-sanitation/hydrobid>

c. Regional cooperation that strengthens STI capacities in the water sector: Latin American Water Funds Partnership (Alianza Latinoamericana de Fondos de Agua)

Latin American Water Funds Partnership is a financial and institutional mechanism that promotes public and private sector participation in the conservation of watersheds to improve urban water security through innovative approaches such as nature-based solutions (NbS). Jointly launched by the IDB, the Fundación Fomento Económico Mexicano S.A.B de C.V. (FEMSA), The Nature Conservancy (TNC), and the Global Environmental Facility (GEF), the partnership aims to provide technical and financial assistance by creating and strengthening Water Funds as an innovative hydrographic basin protection tool. Partnership achievements over its ten years include:

- 26 Funds operating in Brazil, Colombia, Costa Rica, Dominican Republic, Ecuador, Mexico, Peru, etc.
- More than 105,000 families who have begun to receive benefits
- Leveraged more than US\$240 million for green infrastructure investments

In order to enhance the capacity of local stakeholders at scale, the partnership is strengthening the STI aspects in phase 3 (Alianza 3.0, starting from 2023) and will build a knowledge platform using advanced digital technology for NbS which integrates knowledge, accelerators, and communities of practice. It is expected to enable users to gain STI skills, build and test business models and launch their own initiatives with enhanced decision-making capacities. In addition, the partnership is scaling NbS and creating measurable impact in priority water funds by providing scientific knowledge, policy expertise, and financial innovation to operational water funds to address gaps in science and technology, as well as policy barriers

d. AquaRating

AquaRating is a diagnosis and business intelligence tool that emerged from a collaboration between the IWA (International Water Association) and the IADB (the Inter-American Development Bank), with the intention of fostering the strengthening and improvement of water and sanitation companies and, by extension, the services these companies provide, as well as citizens' quality of life. It began to be implemented at the end of 2016 and since then has generated a process of continuous evolution in terms of its focus, its ways of operating and with respect to its available products.

AquaRating has been applied in 30 countries on five continents in its Standard version, in 115 different water and sanitation companies (16 of them have applied the tool more than once), 30 transformation and improvement plans (which include innovation and digitalization elements). It is available in Spanish, English and Portuguese and translations have been made for local applications into Mandarin Chinese, Arabic and Mongolian.

AquaRating has evolved to respond more effectively to the demands and needs presented by the companies that have used it. It has enhanced its ability to transform data and information provided by companies, into action recommendations for an efficient and sustainable improvement.

Since the first version of the Standard was put into service, with its focus on reliably and comprehensively characterizing the management and performance of any water and

sanitation company, there have been new versions that have included updates and new tools and methods to facilitate responses to the main demands of agents interested in AquaRating.

To address the most current needs of companies, the so-called Focused Analyzes have been developed (40 of such analysis have been applied to utilities to date), which provide specific diagnoses and in greater detail than that contemplated in the Standard, with the consequent identification of opportunities and intervention priorities for improvement. At present, Focused Analyses are available to

- Water loss management,
- Positioning against climate change,
- business integrity,
- Gender and diversity.

In addition to the aforementioned “Focused Analyses”, those linked to Innovation and the assessment of risks to business continuity should be highlighted. These two issues are so relevant to ensuring the sustainability, efficiency, and resilience of water and sanitation systems, that they far exceed the scope of the rest of the focused analyses. All these analyzes have been applied intensively in the last two years, already counting with more than 40 applications in the region.

On innovation, in particular, AquaRating provides 3 tools: one to gauge the company’s culture towards innovation; another to capture the performance of the utility on innovation and one to facilitate the development of an innovation strategic plan, which also includes structure to include clear activities to strengthen STI capabilities.

- <https://publications.iadb.org/es/analisis-focalizado-gestion-de-la-innovacion-en-empresas-prestadoras-de-servicios-de-agua-y>
- <https://publications.iadb.org/publications/spanish/document/Sistema-para-la-evaluacion-de-la-cultura-innovadora-En-empresas-prestadoras-del-servicio-de-agua-y-saneamiento.pdf>
- <https://publications.iadb.org/es/un-pilar-para-la-transformacion-sostenible-quia-para-la-elaboracion-de-planes-de-innovacion-en>

An additional tool on digitalization readiness will be added soon.

AquaRating counts on a digital platform, that can be easily access by water and sanitation utilities around the world. For more information: <https://aquarating.org/en/>

e. SaniBID

SaniBID RedBasica is a free digital platform that aims to assist in the design and sizing of sewage collection networks, with tools for designing condominial systems. It works as a plugin to the free and open-source geographic information system, QGIS. The software was originally developed for the Inter-American Development Bank (IDB), the Spanish Agency for International Development Cooperation (AECID) and the Latin America Investment Facility - European Union (LAIF) for the purpose of education and to promote free access to modern tools for the design of sewage systems, with adapted functions for the design of Condominial sewerage systems.

f. InvestmentMap

An initiative that promotes, through digital platforms, the transparency of public spending, public investment and public contracting in Latin America and the Caribbean.

InvestmentMap is an initiative of the Inter-American Development Bank (IDB), financed by the Transparency Fund (AAF), whose donors are Norway, Canada, Italy, Sweden and

Mastercard. It also receives technological support from Microsoft in the application of analytical tools and cloud services.

The initiative is led by the Innovation for Citizen Services Division (ICS) of the IDB in conjunction with the governments and local entities of the countries. It can be applied to all sectors, including the water and sanitation sector.

For more information: <https://www.iadb.org/en/reform-modernization-state/initiatives-investmentmap>

g. Open Innovation collective [with key partners]

In the last few years, the IDB supported several open-innovation calls and activities. Among the most consolidated at the national level, it is worth mentioning the collaboration between the IDB Lab and the Uruguayan National Agency for Research and Innovation, through a program structured to improve public services by incorporating new knowledge and technology, to direct adopt innovation and strengthen STI capacity. For more information: <https://innovacionpublica.anii.org.uy/>

Please indicate contact person(s) responsible for projects/policies and international collaboration in this context in case we need clarification on the inputs.

Sergio Campos SCAMPOS@iadb.org

Marcello Basani marcellob@iadb.org

Please send your responses and any further inputs on the theme to the CSTD secretariat (stdev@unctad.org) by 31 July 2022.