Inter-American Development Bank

Why business as usual will not achieve SDG6 in LAC

The promise of wastewater reuse, green infrastructure and small business around WASH:

Conclusions from World Water Week 2016

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Water and Sanitation Division

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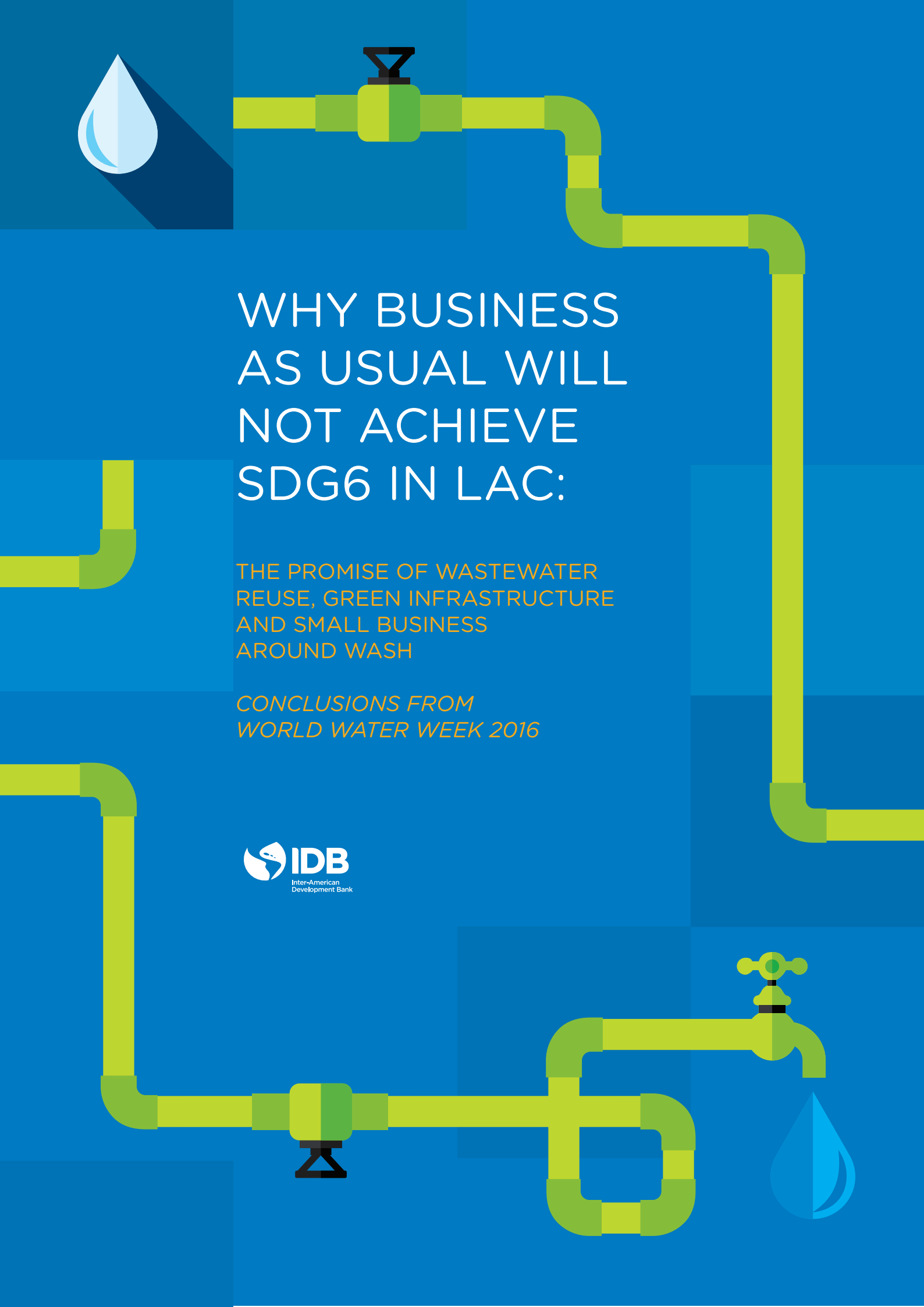

WHY BUSINESS AS USUAL WILL NOT ACHIEVE SDG6 IN LAC:

THE PROMISE OF WASTEWATER REUSE, GREEN INFRASTRUCTURE AND SMALL BUSINESS AROUND WASH

CONCLUSIONS FROM WORLD WATER WEEK 2016

IDB
Inter-American Development Bank

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Executive Summary

Sustainable Development Goal #6 (SDG6) includes ambitious and comprehensive targets aiming for universal coverage of water, sanitation and hygiene (WASH) services and safe management and treatment of fecal sludge and wastewater, among others. In Latin America and the Caribbean (LAC), achieving SDG6 by 2030 will require significant effort and investment: at least US$ 14 billion annually will need to be mobilized solely to cover the capital costs associated with expanding and improving services.[1] Despite much progress made towards increasing improved WASH coverage in LAC, there is still much work and investment needed, and the transition from an MDG framework to that of the SDGs will likely be a sobering "reality check" for the region with respect to the true scope, quality and challenges associated with achieving universal WASH coverage and sound water resource management.

For example, by 2015 under the MDGs, the LAC region had achieved 95% coverage of improved water services, and 83% improved sanitation service coverage. However, under the more aspirational and stringent SDG6 targets for "safely managed" water and sanitation services, those coverage figures are reduced to 65% (water) and 23% (sanitation), implying at least 220 million people lack access to safely managed water services, with potentially more than 480 million lacking access to safely managed sanitation.

Conventional and business-as-usual approaches and strategies to WASH service delivery will not be adequate to meet the increased challenges under SDG6. To effectively fulfill and sustain SDG6 by 2030, adoption and mainstreaming of innovative models for expanding, improving and sustaining WASH services will need to be employed across the region. Given the scope, ambition and diversity of the SDG6 targets, LAC country governments will not be able to achieve them on their own, and will need to explore and develop synergistic collaboration models between government, civil society and private sectors.

As part of World Water Week (WWW) held in Stockholm in August 2016, the IDB organized, in coordination with several partners,[2] a set of three sessions (referred to as "Eye on LAC") highlighting the new challenges accompanying SDG6 targets for the region. These sessions discussed three key strategies for addressing those challenges effectively:

1. The need for circular economic models in the WASH sector, and the role that treated wastewater reuse could play in helping countries and cities increase their water security.
2. The need for "Green" WASH service infrastructure as a complement and/or alternative to "Grey" infrastructure, and the role it could play in increasing water security and reducing investment needs.
3. The need for increased business and private sector participation around WASH services, and the role private sector actors could play in filling gaps that government financing and service delivery models cannot meet.

This paper summarizes the discussions, findings and conclusions reached from those WWW sessions,[3] and provides recommendations on how the non-conventional strategies highlighted in those sessions will help the LAC region meet SDG6 by 2030.

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1 When Operation and Maintenance (O&M) expenses are also included, this figure climbs to approximately $20 Billion annually over the next 13 years. Please see (Hutton & Varughese, 2016) for further information.

2 Key partners include: IRC, The World Bank Group/World Bank, One Drop, Water For People, WaterAid, Development Bank of Latin American (CAF), FEMSA Foundation, The Nature Conservancy, ADERASA (Asociación de Agua Potable y Saneamiento de las Américas), African Minister's Council on Water (AMCOW), Asian Development Bank (ADB), and the Global Water Partnership. Please see Annex 2 for further details on partners.

3 At all sessions combined: 430 people participated in-person in Stockholm, and over 800 people viewed remotely either through live-streaming during the event or at some point shortly after.

Circular Economies and Wastewater Reuse

Within the WASH sector, the idea of circular economies involves shifting the viewpoint of wastewater away from "waste," and exploring methods for its re-utilization post-treatment. Some key potential benefits of this re-utilization include nutrient recovery for agricultural purposes, energy recovery via biogas generation, and potential water resource recovery through the use of treated wastewater as a potential water input for agricultural, industrial, and even household needs. Some key next steps that can be taken to accelerate more adoption of circular economy-based treatment models in LAC include:

- Recognize that Wastewater is a Resource, not Waste
- Integrate Resource-recovery Models in all Levels of Planning
- Improve Fragmented Institutional Relationships
- Establish Consistent and Appropriate Legislative Frameworks
- Better Define Context-specific and Relevant Water Quality Parameters
- Enforce Water Quality Standards
- Promote Technological Innovation
- Foster Financial Innovation

Linear economies will not be enough to effectively resolve the SDG6 challenge by 2030, and the wastewater sector will need to explore, grow and mainstream circular economic models so that the LAC region can more efficiently and sustainably respond to SDG6-related wastewater management challenges going forward.

Green Infrastructure

In the context of WASH-related infrastructure, green infrastructure (or natural infrastructure) seeks to more effectively imitate and "build with" nature to achieve better climate adaptation, reduced heat stress, increased biodiversity, improved air quality, sustainable energy production, healthier soils, and other quality of life improvements in addition to cleaner water. Additionally, given that much of LAC is currently "water stressed"—a challenge which will likely grow given increasing populations and climate change-related events—investing in green infrastructure can help enhance water security across the region through improving the quantity and quality of available water resources. Some key benefits to the incorporation of more "green" elements in infrastructure design include:

- Overall Cost Reduction
- Resilience
- Improved Water Quality, Quantity and Biodiversity
- Flood Control and Erosion

A focus on a green approach as the default starting point for any new WASH infrastructure design or rehabilitation of existing systems will help mainstream its importance into overall WASH sector development going forward. Overall, business as usual with respect to continued investment in grey infrastructure has not resolved the challenge to date, especially with respect to water security, and will not be able to sustainably resolve the challenge going forward, particularly given the scope of challenges that will likely come with continued economic growth and environmental degradation, as well as increased unpredictability of climate change-related events.

Private Sector and Business Opportunities in Water and Sanitation

Currently, the default option across LAC with respect to the provision of WASH services is for the government and public sectors to lead the way. This presents a missed opportunity: there are many instances where private sector involvement can accelerate and potentially better sustain improved access to WASH services under SDG6, but in many cases they are not being incentivized appropriately or encouraged to engage. While there are differences between countries, the volume of people without basic services represents a key market opportunity for the private sector to engage with households, water committees, and municipalities, among other actors, in the provision of a range of water and sanitation goods and services, including water system rehabilitation and expansion, post-construction and technical support services, household sanitation infrastructure, latrine pit and septic tank emptying, fecal sludge management including waste transport and treatment, and possibly within the market for sales of composted human waste through reuse as fertilizer. For example, it has been conservatively estimated that across LAC there is a potential market of up to US$ 15 billion for the construction of improved household sanitation infrastructure, and over US$ 1 billion annually for the provision of waste collection and transport services. Given the market size and theoretical revenue available: hundreds, and likely thousands, of jobs could potentially be created across the region if the private sector were able to capitalize on this market opportunity, especially in the sanitation sector. To support this growth, there is much room for engagement from financial services markets as well, primarily in the provision of loans or other financial alternatives to households or communities.

Strategies and approaches that rely primarily on government and the public sector have not been sufficient to extend WASH services to everyone across LAC, and similarly will not be adequate to meet SDG6. To help with this challenge, the public sector will have to take steps to better enable and encourage the private sector to become more engaged in the WASH sector, no longer assume that government and the public sector should be the "default" option for leading the expansion of WASH services, and improve overall collaboration between public and private actors in extending, improving and sustaining WASH services.

Conclusions

Despite some differences between these three approaches, given that the primary goal is to broaden the diversity of conventional approaches so as to bring more innovative ideas into the mainstream, the overall recommendations can be generalized and are fairly applicable and consistent across all three areas:

- Institutionalize Non-Conventional Approaches
- Increase Inter-institutional Communication and Coordination
- Establish Innovative Financial Models
- Increase Investment for Innovative and Non-Conventional Approaches

It is now 2017, and with just 13 years to go, it is time to accelerate planning and investment allocation towards achieving SDG6 in LAC. Simply channeling more investment towards conventional approaches will not be sufficient; the region needs to establish policies that encourage increased private sector participation, more green approaches to infrastructure development, and a better incorporation of models rooted in circular economies. Without this focus, and with growing populations and potential climate change-related events, challenges will only grow more complex and onerous to manage, and conventional solutions even less able to resolve them effectively and efficiently.

2. Introduction

All countries in Latin America and the Caribbean (LAC) have agreed to "Ensure availability and sustainable management of water and sanitation for all" by 2030 through the adoption of Sustainable Development Goal #6 (SDG6). SDG6 includes ambitious targets that aim to establish universal access to safe and affordable drinking water, sanitation and hygiene (WASH) services, safe management of water resources, water-use efficiency, protection of ecosystems, community-level management and international cooperation.[4] In LAC, these targets represent a significant challenge, requiring much investment and effort to effectively meet them by 2030. Furthermore, given the scope, ambition and diversity of the SDG6 targets, LAC country governments will not be able to achieve them effectively by 2030 using conventional, business-as-usual strategies and approaches to WASH service provision—they will need to go beyond traditional public sector WASH delivery models, and identify ways to innovate, explore and develop synergistic collaboration models between government, civil society and private sectors.

Each year, key leaders, practitioners and other representatives from the global WASH sector convene in Stockholm, Sweden, for the World Water Week (WWW) conference. In 2016, this event was held from August 28-September 2, during which the Inter-American Development Bank (IDB), in coordination with several partners and co-conveners, was responsible for organizing "Eye on LAC," a set of three sessions focused on WASH-related challenges and opportunities for the region. Specifically, these three sessions primarily discussed non-conventional, creative and innovative approaches for more effectively and efficiently meeting SDG6 addressing WASH challenges in LAC, namely: (1) Circular economic models for water and wastewater reuse; (2) Green infrastructure and its potential to enhance and sustain WASH services; and (3), Encouraging appropriate and increased private sector and business involvement in the WASH sector. [5]

"Based based on coverage data tracked by WHO/UNICEF's Joint Monitoring Programme (JMP) to assess progress towards the Millennium Development Goals (MDGs), IDB reports that across the LAC region, 5.4% (representing approximately 34 million people) do not have access to improved, safely managed drinking water sources; and 17% (representing approximately 106 million people) do not have access to improved sanitation. However, when SDG6 criteria around "safely managed" services are incorporated, these figures grow to 35% (approximately 220 million people) who lack safely managed water services; and 77% (approximately 480 million people) who do not have access to safely managed sanitation.[6] On its own, simply extending access to those who remain unserved represents a significant challenge to address over the next 13 years. This challenge will almost certainly increase in scope given the introduction of the aforementioned SDG6 targets, parameters, and more ambitious global norms relating to the accessibility, availability, quality and—eventually—affordability of water, sanitation and hygiene (WASH) services;[7] along with sound management of water resources and ecosystems.

The purpose of this paper is to systematize findings and conclusions from discussions held during these three sessions at WWW 2016, in which 430 people participated in-person in Stockholm, and over 800 people viewed remotely either through live-streaming during the event or at some point shortly after. A particular focus will be placed on how the utilization of these three non-conventional strategies will be essential to helping achieve SDG6 in LAC

4 Please see Annex 1 for complete details of targets falling under SDG6; Targets 6.1 and 6.2 of SDG6 focus on access to water, sanitation and hygiene services specifically.

5 Please see Annex 2 for details on each "Eye on LAC" session, including session objectives, abstracts, and the co-convening partners responsible for organizing each session in coordination with IDB.

6 Please see (Joint Monitoring Programme (WHO/UNICEF), 2017) for more detailed information on SDG6 monitoring frameworks and coverage data: https://www.unicef.org/publications/index_96611.html

7 SDG6 indicators have been devised primarily to assess the potential sustainability of WASH services--accessibility, availability, affordability and quality of services are all important elements that contribute to the longevity, resilience and sustainability of WASH services.

effectively and efficiently by 2030. The first section of the report presents SDG6 in detail, including a discussion of the specific challenges associated with each target; the sections that follow summarize key findings, conclusions and preliminary recommendations around the three innovative approaches discussed during WWW. The concluding section then provides recommendations for actions that can be taken in the LAC region for encouraging greater experimentation around these approaches, and translating successful pilot experiences more efficiently and systematically into the mainstream so that progress towards SDG6 can be made as efficiently, effectively and sustainably as possible.

The primary audience for this report is intended to be development practitioners, public and government sector representatives, and/or any other stakeholder interested generally in challenges and opportunities around the achievement of SDG6 in the LAC region, as well as those interested in specific discussions and conclusions reached from LAC-related sessions at WWW. To analyze findings and establish the conclusions presented in this report, the authors participated in all relevant sessions during WWW 2016, including a review of any relevant literature as appropriate. It is beyond the scope of this paper to suggest specific country-level recommendations for achieving SDG6; the primary objective of this report is to discuss overarching and preliminary recommendations for expanding and sustaining WASH coverage in LAC.

3. A New Challenge: Parameters accompanying SDG6 and the implications for LAC

Prior to the SDGs, the world planned and tracked development through the MDGs, which were goals set to be realized by 2015. The indicators used to track progress towards the WASH MDG target focused only on the types of drinking water and sanitation facilities used by households, and did not consider inequalities in the accessibility, availability and quality of services provided.[8] With the SDGs, the original MDG target of halving the proportion without services is now replaced with the goal of achieving universal WASH service coverage by 2030 (SDG#6—Please see Annex 1 for a complete list of all SDG6 targets and indicators). While aiming for universal coverage on its own is quite an ambitious shift, the SDGs also bring increased but necessary comprehensiveness with respect to the entire landscape and ecosystem surrounding WASH service provision. Beyond simply the use of an improved type of water or sanitation infrastructure, SDG6 Targets 6.1 and 6.2, and associated indicators, address the accessibility, availability, quality and affordability of safely managed drinking water (Target 6.1), sanitation and hygiene (i.e. hand washing facilities with soap and water) services (Target 6.2). Additionally, the adoption of SDG6 implies that the overall coverage of services meeting the new criteria for 'safely managed services' is likely to be significantly lower than coverage based on the previous MDG indicator for use of 'improved' drinking water and sanitation facilities (See Box 1).

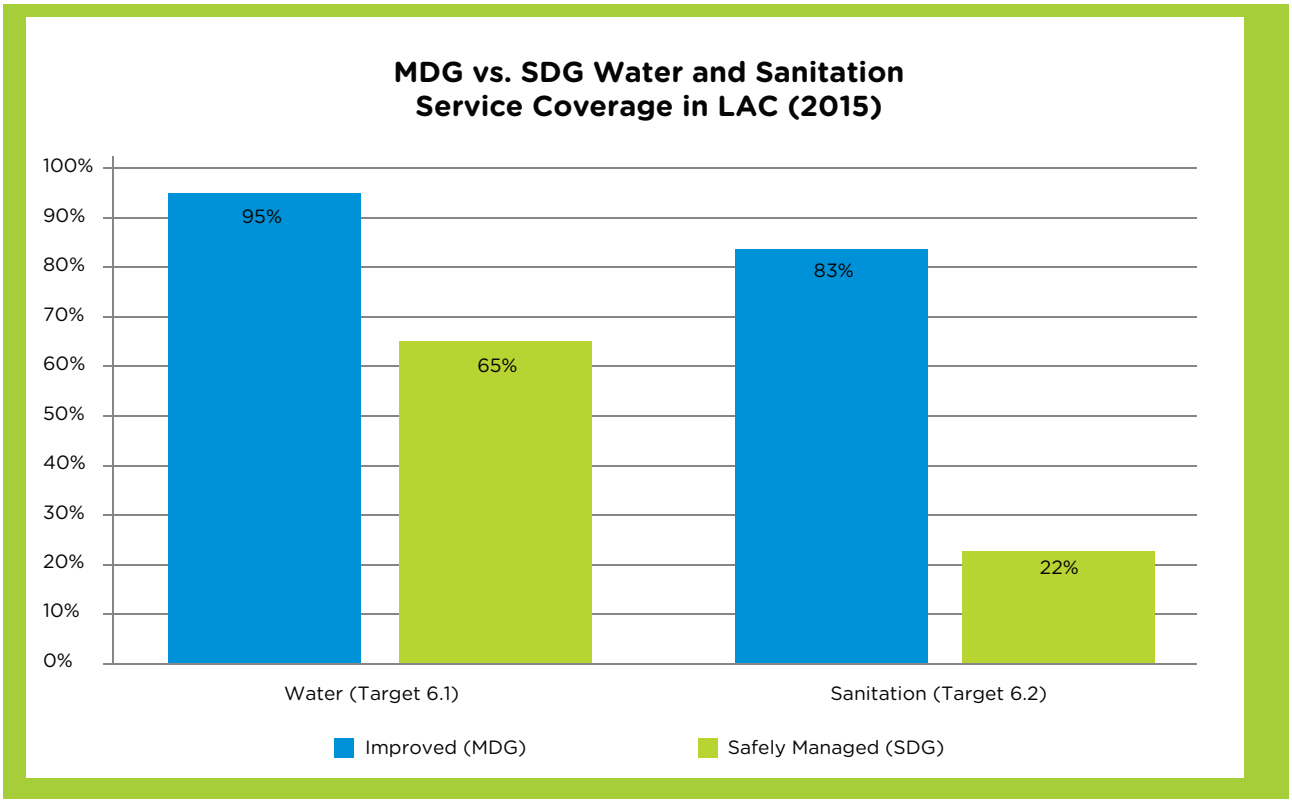
8 Specifically, the primary MDG indicator related to WASH services was the population using improved (basic, shared, or improved) drinking water and sanitation facilities. As an example, with respect to sanitation services, the MDG framework was in large part focused on use of a particular type of sanitation-related infrastructure (e.g. an improved household latrine, sewer network, etc.), with assessments regarding service "quality" being primarily focused on the attributes of the sanitation infrastructure itself, and whether those attributes would lead to a sanitation system or solution being classified as improved, shared or unimproved. Similarly for water services, the MDGs were in large part focused on use of a particular type of water system, and quality attributes (e.g. piped water, or other improved or unimproved system) were judged based primarily on the type of infrastructure. With respect to access targets, MDGs were focused on halving the proportion of those without access, and as such many countries in LAC were able to achieve the MDG in their country. Similar to global progress, in LAC more countries were able to achieve the MDG for water than for sanitation. At the regional level, LAC achieved the goal of halving the proportion of the population without water services in 1990 by reaching an overall average coverage close to 95%. Regarding sanitation, at the regional level, LAC was unable to achieve the MDG of halving the proportion of the population without sanitation services. However, despite missing the established MDG of reaching 83.7% sanitation coverage in the LAC region by 2015, the advances were still quite significant, with the region falling short of the MDG by only half a percentage point (Garzón & Sturzenegger, 2016).

Box 1: Differences Between MDG and SDG Coverage Parameters

To illustrate some of the implications of the shifts between an MDG framework to that of SDG6. please see the table below describing the different water and sanitation service levels that the JMP (WHO/UNICEF) will use to assess global progress towards SDG6 by 2030. Under the MDGs, progress was measured based on the proportion of people who had access to and utilized improved water/sanitation services (please see: http://www.wssinfo.org/definitions-methods/watsan-categories/ for specific criteria used for defining "improved" water and/or sanitation access). Given the elevated aspirations under SDG6, as well as a more comprehensive understanding of the key elements underpinning accessible and sustainable water and sanitation service delivery, the JMP (WHO/UNICEF) has augmented their assessment protocol to track SDG6 progress via a ladder-based paradigm, with universal access to *safely managed* water/sanitation services being the pinnacle that countries should strive for.

WATER		SANITATION	
Service Level	**Definition**	**Service Level**	**Definition**
Safely Managed	Drinking water from an improved water source that is located on premises, available when needed and free from faecal and priority chemical contamination	Safely Managed	Use of improved facilities that are not shared with other households and where excreta are safely disposed of in situ or transported and trusted offsite
Basic	Drinking water from an improved source, provided collection time is not more than 30 minutes for a round trip, including queuing	Basic	Use of improved facilities that are not shared with other households
Limited	Drinking water from an improved source for which collection time exceeds 30 minutes for a round trip, including queuing	Limited	Use of improved facilities shared between two or more households
Unimproved	Drinking water from an unprotected dug well or unprotected spring	Unimproved	Use of pit latrines without a slab or platform, hanging latrines or bucket latrines
Surface Water	Drinking water directly from a river, dam, lake, pond, stream, canal or irrigation canal.	Open Defecation	Disposal of human faeces in fields, forests, bushes, open bodies of water, beaches or other open spaces, or with solid waste
Note: Improved sources include: piped water, boreholes or tubewells, protected dug wells, protected springs, and packaged or delivered water.		*Note: Improved facilities include flush/pour flush to piped sewer systems, septic tanks or pit latrines; ventilated improved pit latrines, composting toilets or pit latrines with slabs.*	

In LAC, while progress made towards the MDGs by 2015 was laudable, when elements of *safely managed* services are incorporated into 2015 coverage statistics, the figures paint a different picture of the true scope of the challenge facing the region going forward (please see figure below). Specifically, although under the MDG framework the LAC region achieved 95% coverage of improved water services in 2015, when aspects of *safe management* are incorporated, that figure drops to 65%--although a high proportion (96%) of LAC has access to (at least) basic water services. With respect to sanitation the challenge is even greater: while under the MDG framework 83% of LAC had access to improved sanitation in 2015, only 23% of the population technically has access to *safely managed* sanitation. In overall numbers, this implies that more than 220 million



While the targets under SDG6 are aspirational and allow for countries to establish more specific national targets based on their own context, UN member states have agreed to a list of global SDG6 indicators (See Figure 1), which will be used to benchmark and compare progress cross countries.[9]

9 The primary agency responsible for establishing indicators and monitoring frameworks, as well as tracking global progress towards SDG targets 6.1 and 6.2, is the WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation. The JMP was also responsible for tracking WASH indicators under the MDGs. Note that the JMP is only responsible for tracking progress under Targets 6.1 and 6.2 of SDG6; indicators for Targets 6.3-6.6 will be reported and tracked by other UN agencies under the UN Water Initiative and the Integrated Monitoring Initiative (GEMI) established in 2014. For further details, please see: http://www.unwater.org/what-we-do/monitoring-and-report/. For more detailed information of all SDG stakeholders, leads and a complete list of all global SDG indicators, please see the Inter-agency Expert Group (IAEG) United Nations SDG website at: https://unstats.un.org/sdgs/iaeg-sdgs/. As of early 2017, the JMP was currently consulting countries on the availability of national data and will publish baseline national, regional and global estimates for SDG indicators 6.1 and 6.2 in mid-2017. These indicators are meant to be illustrative at this stage; please do not consider them final until the JMP has officially released the final approved indicator set. Original source of table: (Slaymaker & Properzi, August 31, 2016, with some modifications to provide more detail). For more detailed information on all SDG targets and indicators, please see: https://unstats.un.org/sdgs/indicators/indicators-list/, and http://www.wssinfo.org/sdg-baselines.

Figure 1: SDG6 Indicators and Agencies Responsible for Tracking Progress

Source: table taken from Slaymaker & Properzi, 2016, with detail added from: https://unstats.un.org/sdgs/indicators/indicators-list

No.	SDG 6 Global Indicators	Custodian
6.1.1	Proportion of population using safely managed drinking water services	WHO, UNICEF
6.2.1	Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water	WHO, UNICEF
6.3.1	Proportion of wastewater safely treated	WHO, UN-Habitat, UNSD
6.3.2	Proportion of bodies of water with good ambient water quality	UNEP
6.4.1	Change in water-use efficiency over time	FAO
6.4.2	Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	FAO
6.5.1	Degree of integrated water resources management implementation (0-100)	UNEP
6.5.2	Proportion of transboundary basin area with an operational arrangement for water cooperation	UNESCO, UNECE
6.6.1	Change in the extent of water-related ecosystems over time	UNEP
6.a.1	Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan	WHO, UNEP, OECD
6.b.1	Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management	WHO, UNEP, OECD

Beyond the increased complexity around monitoring SDG6, the actual implementation of policies and strategies necessary to achieve SDG6 will require significant resources. Given the increased complexity around SDG6, and the global transition currently underway from the MDGs to the SDGs, it is now the critical time to begin structuring policies and investments to achieve SDG6 by 2030.

In addition to Targets 6.1 and 6.2, other targets within SDG6 point to similarly ambitious challenges: Target 6.3, incorporating aspects of water quality mentioned above, and related to wastewater management, seeks to (by 2030) "…improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally." As such, this target is not only focused on household or institutional wastewater generated from bathroom or other sanitation facilities, but also industrial waste discharged into the environment. In 2004 in LAC, only 13.7% of wastewater from the 241 million connected to a sewer network was adequately treated before being discharged into the environment.[10] In some LAC countries, up to 75% of households—and across the region roughly half of all households—are not connected to a sewer network, implying a potential deficit in knowledge around household sanitation waste disposal and treatment practices for over half of the LAC population.[11] With respect to investment, to achieve universal coverage of basic sanitation across the LAC region,

10 See: (Jouravlev, 2004) and (Organization for Economic Co-operation and Development (OECD), 2011). Current figures on wastewater treatment are difficult to come by, but some sources estimate that currently 30% of wastewater is adequately treated to "some level", with some countries in the region having made enormous strides with respect to wastewater treatment over the past couple of decades. For example, in Chile, wastewater treatment increased from 42% in 2002 to 94% in 2012. (Martin-Hurtado & Nolasco, 2016)

11 See (Rojas, 2012) for further information about sewerage coverage and onsite sanitation in LAC.

approximately $2.4 billion will need to be mobilized annually to cover capital costs. To move beyond basic sanitation to universal coverage of safely managed sanitation services including wastewater treatment will require nearly $7 billion annually, implying that solely the costs of safely managing fecal waste and wastewater treatment would likely need at least an investment of US$ 4.5 billion annually in the LAC region.[12] While these numbers are approximate and do not incorporate additional O&M costs that will be needed, it is clear that significant diagnostic and infrastructure investment will be needed to meet Target 6.3 and mitigate the challenges accompanying the prevalence of inadequate treatment and/or unsafe wastewater disposal in many LAC countries.

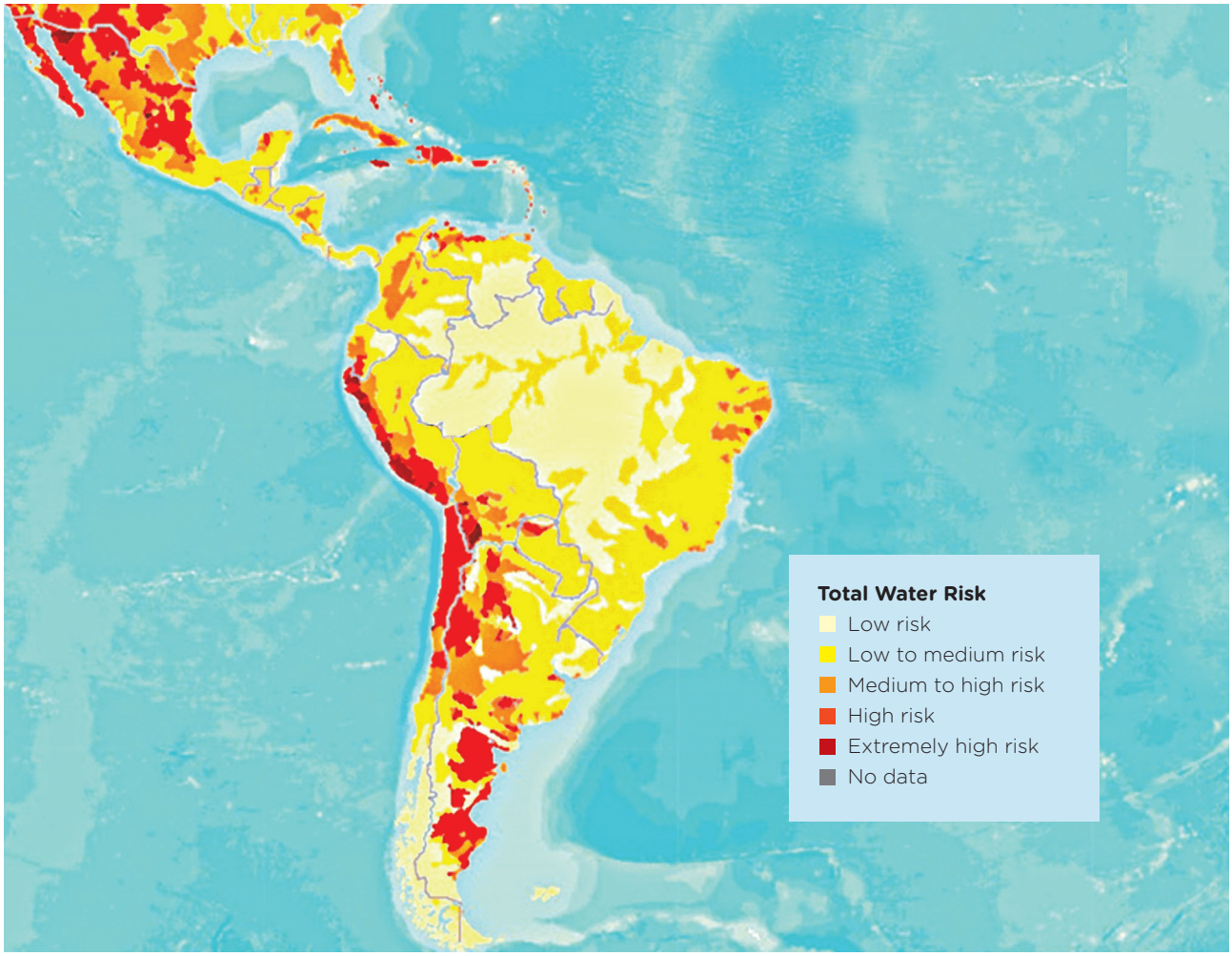
Target 6.4 is related to water "stress" or scarcity, and the efficiency of water use, with evaluative methodologies that strive to better understand a country's economic dependence on water resources, a diagnostic of bottlenecks and inefficiencies in water resource utilization, and an improved understanding of the relationship of human-focused demand for water in the context of the greater overall ecosystem from which that water is being extracted. It is estimated that there are 18.5 billion m^3/year of available renewable water resources in LAC, representing 34% of the total available renewable water resources worldwide.[13] With a population (in 2017) representing approximately 8.6% of the world's total, populations living in the LAC region would appear to be disproportionately wealthy in terms of available water resources when compared to the rest of the world. Despite this, water resources available per capita are not necessarily consistent across the region (See Figure 2), and certain areas of LAC (e.g. arid regions of western South America, southern Argentina, and central Mexico, among other areas) face higher levels of water stress than other areas more abundant in water resources, such as the greater Amazon River basin. Moreover, any utilization of the abundance of available resources, in any sector, is contingent on the strength of the resource management structures and frameworks in place.

12 (Hutton & Varughese, 2016)

13 (Mekonnen, Pahlow, Aldaya, Zarate, & Hoekstra, 2015).

Figure 2: Water Stress and Risks in the LAC Region

Source: World Resources Institute (WRI), 2014.



Target 6.5 is focused primarily on water resource management, including a focus on trans-boundary agreements. While some progress has been made on water resource management in the region, the abundance of per capita water resources availability has to some degree inhibited the development of robust management structures, leaving LAC countries with much work to do prior to 2030 to establish frameworks—internationally cooperative when appropriate—for sound water resource management. Beyond the management of water resources specified in Target 6.5, Target 6.6 is related to the monitoring of water-related ecosystems, with a more in-depth look at conservation, bio-diversity, and the establishment of national-level indicators and benchmarks for overall ecosystem health.[14]

It is estimated that meeting SDG6 Targets 6.1 (access to safe and affordable drinking water), and 6.2 (access to adequate and equitable sanitation and hygiene) in LAC will cost approximately US$ 14 billion annually only in capital costs.[15] Moreover, as more underserved households attain WASH service access, capital investment needs will diminish; but the overall amount of resources needed to cover the operation and maintenance (O&M) expenses needed to sustain

14 Targets 6.a and 6.b under SDG6 are less directly related to water and sanitation coverage and/or resources, and more related to supporting functions—such as institutional arrangements and key stakeholder participation—that are crucial to establishing and sustaining water and sanitation services and sound resource management.

15 It can be very challenging to forecast the potential costs of extending WASH services given the amount of undetermined factors; these estimates are conservative figures based on average costs of service implementation and management consistent to the region, and are only focused on Targets 6.1 and 6.2. Achieving the other targets under SDG6 will almost certainly require a greater degree of investment. Please see (Hutton & Varughese, 2016) for further information on the costs associated with meeting SDG6 in the LAC region and globally.

these expanded services will increase.[16] Between 1990-2015, on average US$ 4.063 billion dollars was spent annually in the region on WASH services,[17] implying an average shortfall of at least US$ 10 billion annually to meet the capital costs associated with fulfilling SDG6 Targets 6.1 and 6.2 by 2030 in LAC. Given that by 2029 it is estimated that O&M costs will outweigh capital expenses by a factor of 1.6 for safely managed WASH services,[18] the amount of investment needed including both capital and O&M costs could approach, if not exceed, US$ 20 billion annually. This represents a significant gap in investment, and business-as-usual practices implemented over the last few decades will not come close to being sufficient to meet these challenges by 2030.

Overall, like the entire world, LAC will face a significant challenge in meeting and sustaining all targets under SDG6 by 2030. The targets are much more comprehensive and ambitious in scope than the MDGs, with an important focus given to the entire water and sanitation supply-chain. Business-as-usual will certainly not be enough to achieve SDG6 by 2030. Given the scope of the challenge, it is not necessarily a question of more investment being provided by governments and the development sector, but a paradigm shift is needed to incorporate more creative and innovative approaches to water resource management and WASH service delivery. The sessions from "Eye on LAC" at WWW explored three potential alternative and innovative approaches to help LAC countries achieve SDG6 targets more effectively and efficiently:

1. The need for circular economic models in the WASH sector, and the role that treated wastewater reuse could play in helping countries and cities increase their water security.
2. The need for "Green" WASH service infrastructure as a complement and/or alternative to "Grey" infrastructure, and the role it could play in increasing water security and reducing investment needs.
3. The need for increased business and private sector participation around WASH services, and the role private sector actors could play in filling gaps that government financing and service delivery models cannot meet.

The sections that follow discuss these three approaches, summarize some of the key conclusions from "Eye on LAC" WWW sessions related to these approaches, and provide preliminary recommendations for next steps.

16 Similar to capital costs, accurately forecasting O&M expenses can be challenging, as they depend on a number of factors including technology type, demographic setting (e.g. urban, peri-urban, or rural), and a country's general income level, among other factors. Globally, to achieve Targets 6.1 and 6.2 of SDG6, it is estimated that investment in O&M will need to gradually increase from approximately $18 Billion (as of 2016) to approximately $129 Billion in 2030. Not all of these O&M costs will be the responsibility of governments or other actors; households will need to contribute a significant amount. However, this global increase in O&M needs over the next 13 years is also reflective of the challenges facing the LAC region, underscoring the importance of considering the financing of O&M costs in addition to capital costs as WASH services are extended. Please see (Hutton & Varughese, 2016) for further details.

17 (Ducci, J, et al, 2015) and (Garzón & Sturzenegger, 2016).

18 (Hutton & Varughese, 2016)

4. Circular Economies: Wastewater as a Resource in LAC

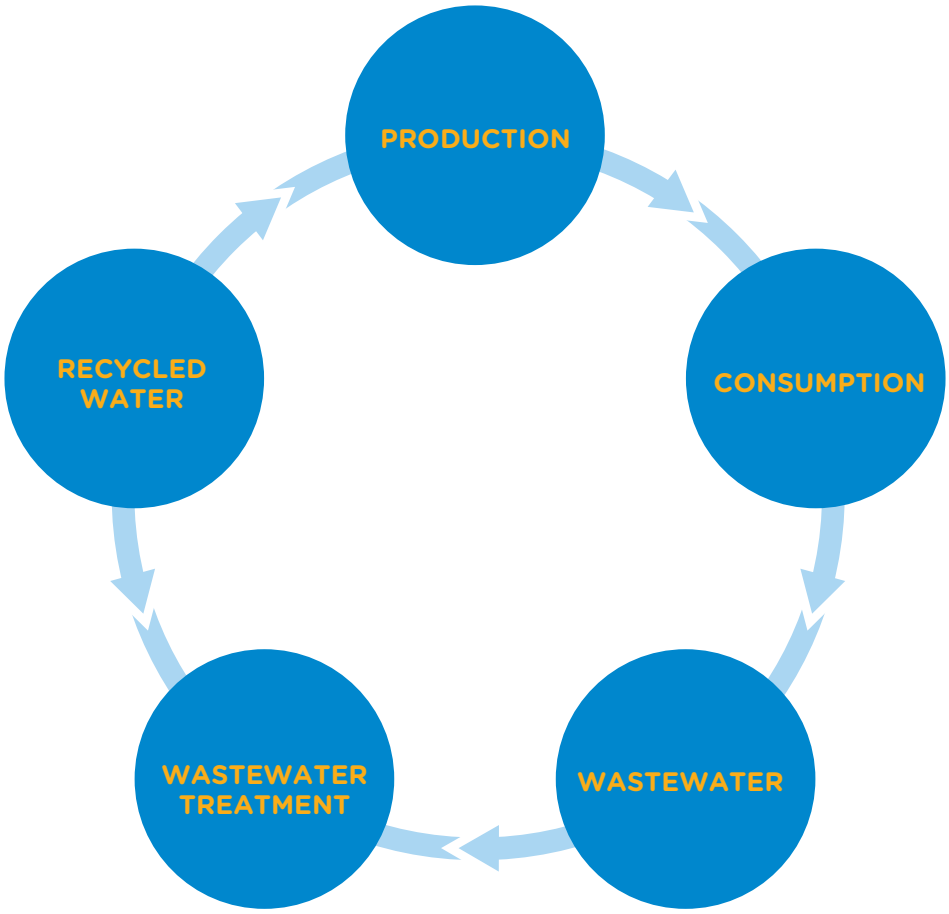
Among other elements, Target 6.3 seeks to "half the proportion of untreated wastewater," implying that wastewater management will be a formidable challenge that LAC will need to face in order to meet SDG6—particularly given that only around 30% of LAC has some form of wastewater treatment. Wastewater is generally defined to be a combination of one or more of[19]:

- Domestic effluent consisting of blackwater (excreta, urine and fecal sludge) and greywater (kitchen and bathing wastewater);
- Water from commercial establishments and institutions, including hospitals;
- Industrial effluent, storm-water and other urban run-off;
- Agricultural, horticultural and aquaculture effluent, either dissolved or as suspended matter.

Most resource-based economic sectors in the world are integrated in some form of a linear economy, involving extraction and economic utilization of resources followed by the disposal of these resources once their utility has been consumed. For example, with water resources, water is often extracted and then utilized for household, agricultural or industrial purposes, then discarded back into the environment (ideally with treatment) as "waste." Evidenced by its name, a "circular "economy is one in which there is a feedback loop of "waste" back into the system again as a "resource." Outside of WASH services, one theoretical example of a circular economy is the intention underpinning glass- or plastic-recycling in much of the world: instead of using an object made from one of these materials and discarding it once finished, it is "recycled" and ideally the "waste" materials repurposed as raw material for utilization as a "resource" in other products.

Within the context of water resources and the WASH sector, the idea of circular economies involves shifting the viewpoint of wastewater away from "waste," and exploring methods for its re-utilization post-treatment. A generic illustration of this model is presented in Figure 3. At the global-level, water cycles are already involved in a circular economy: any water that is currently consumed by humans has already been consumed and recycled a near-infinite amount of times by global hydrologic processes. On a smaller-scale however, the water we utilize, once consumed, is generally inadequate for subsequent human consumption without some form of treatment. The type of consumption of this water usually dictates the treatment necessary, i.e. water used for industrial purposes will have specific treatment needs that differ from wastewater generated from households. Given the challenges around adequate treatment, wastewater is almost always viewed as a "waste" product, evidenced most directly by the etymology of the word itself.

19 Wastewater definitions taken from (Corcoran, Nellemann, Baker, Bos, Osborn, & Savelli, 2010); please note that unless otherwise referenced in this section, all data presented comes from (Martin-Hurtado & Nolasco, 2016).



Given that water resources are finite, linear economic models around water resources can lead to environmental degradation, translating into significant economic costs that could be on the order of 4% of GDP in LAC countries.[20] As economies and populations grow, competition among households, communities, industry, agriculture and/or the energy sectors for water resources will also grow.[21] To meet this increased demand, it is estimated that the LAC region will have to obtain and distribute at least: 30% more water than is currently being distributed for human consumption, 40% more energy, and increase the food supply by 50%.[22] Given this 30% increase in demand for water resources, the LAC region will need to identify new sources and minimize competition among users, and now is the time to begin considering alternative methods for supplementing existing water resources. A key paradigm shift that will help LAC ease pressure on existing water resources is to view wastewater as a potential resource instead of "waste."[23] For example, wastewater is essentially 99% water and less than 1% pollutants and contaminants; as such, "wasting" this available water through disposal post-treatment is a significant missed opportunity to supplement natural water sources and recover energy and nutrients. Some examples of this shift could include:

20 (Martin-Hurtado & Nolasco, 2016)

21 It is estimated that the 140 cities in LAC currently with more than 2 million residents will double their populations in the next 20 years, representing an even more significant growth than larger population centers (i.e. currently greater than 5 million residents), which will only account for 15% of the overall urban growth predicted across the region. (Garzón & Sturzenegger, 2016)

22 Ibid.

23 Wastewater that is "reclaimed" post-treatment can be referred to as recycled, regenerated and/or reclaimed water; this paper will use the term "recycled water" to refer to any wastewater reclaimed post-treatment, however please note that the term is synonymous with other aforementioned terms. (Ibid.)

- **Water Recovery:** Treated wastewater has much potential to supplement existing water resources , particularly for uses (e.g. agricultural, industrial and household use not involving direct human consumption) needing less-intensive treatment than that applied to water used for activities involving direct consumption such as drinking, cooking or bathing.[24] To be cost-effective and leverage potential cost-savings opportunities, this approach will require a much more in-depth understanding of behaviors and typical utilization patterns of water users. Going further and with respect to direct consumption, wastewater could also be treated and rendered potable post-consumption, and then re-circulated back into the system for use as drinking, bathing and/or cooking water.[25]
- **Nutrient Recovery:** Nutrients and organic matter essential for healthy soils and plant growth are very prevalent in wastewater, and can be recovered for utilization instead of disposed of, reducing demand for nutrients that are often unsustainably extracted through artificial fertilizers.
- **Energy Recovery:** Wastewater can also be converted into an energy source through biogas production, alleviating pressure on non-renewable and other energy resources elsewhere.

Key barriers to the implementation of a more circular economy around water resources are not necessarily technical: in large part the know-how already exists for adequate treatment of wastewater, even to achieve a standard necessary for direct human consumption. In Israel for example, as of 2000, 60% of their wastewater was recycled and repurposed for re-consumption,[26] a strategy largely driven by a paucity of domestic water resources. In LAC, there are already successful examples of wastewater reuse, briefly summarized in Table 1.

Table 1: Examples of wastewater reuse in LAC

Atotonilco WWTP, Mexico City	→	Treated wastewater reuse for irrigation
Tenorio WWTP, San Luis Potosi, Mexico	→	Water reuse for energy generation (cooling)
Enlozada-Cerro Verde, Arequipa, Peru	→	Water reuse for mining purposes
Project Aquapolo, Sao Paulo, Brazil	→	Water reuse for Industrial reuse
SANEPAR, Curitiba, Brazil	→	Beneficial use of biosolids
La Farfana WWTP, Chile	→	Selling biogas
San Jerónimo WWTP, Guanajuato, Mexico	→	Saving and selling electricity (potential)
SAGUAPAC, Santa Cruz, Bolivia	→	Saving and selling electricity (potential)

Source : (Martin-Hurtado & Nolasco, August 2016)

24 More than 95% of water currently provided to households is utilized for non-drinking activities such as toilet flushing or food preparation. (Ibid.)

25 Approaches utilizing treated wastewater for direct human consumption will likely require some time and education, as there is currently much understandable aversion to the concept of consuming wastewater, however robust the treatment is.

26 Israel is often viewed as the current global leader with respect to wastewater reuse; see (Friedler, 2001).

Box 2: Regulations that can Inhibit the Growth of Wastewater Reuse Systems

In Cordoba Province, Argentina, new legislation approved in 2014 and implemented in 2015 stipulates that any wastewater treatment plant (WWTP) discharging into any body of water that eventually ends up in a lake (which occurs quite often within this landlocked province) can never exceed an effluent concentration of 10 mg N/l. This implies that the average effluent concentration should not exceed 3 mg N/l, a standard that few WWTPs anywhere in the world can achieve. In Peru, maximum discharge limits imposed on WWTPs are often not aligned or coordinated with the water quality requirements for receiving water bodies. In some instances, such as when receiving water quantity and flow is low and its dilution capabilities are significantly reduced, or if receiving water is already polluted, the receiving water quality standards become almost impossibly stringent for WWTPs to meet, even if WWTPs are otherwise meeting the discharge standards imposed on them. Also in Peru, Law #30045 classifies WWTP sludge as a "dangerous" solid waste, which has to be disposed of in a confined cell within a sanitary landfill. While untreated wastewater certainly has its concerns, the rigidity within this law effectively inhibits the establishment (and financing) of alternative wastewater schemes that involve reuse and resource recovery from sludge. To alleviate some of these issues, more efforts should be made to align water quality and effluent standards on a watershed by watershed basis, better taking into account contextual factors and the potential for resource recovery from wastewater, instead of providing blanket standards that may not be appropriate for all WWTPs and serve to inhibit the growth of more innovative systems involving wastewater reuse. (Martin-Hurtado & Nolasco, 2016)

One thing common to these initial pilots and experiences with wastewater reuse is that they generate some form of financial return and/or cost savings, allowing for a more efficient allocation of WASH resources. However, details surrounding these potential financial returns are often poorly understood and inadequately disseminated, and programs such as these are often supported by individual "champions" rather than a direct policy shift or government-level strategies. In other words, most of the above cases are dependent on an innovator with the independent vision and interest to try something creative and non-conventional, even in the context of institutional and regulatory frameworks that can stifle and inhibit the development and scaling-up of creative, non-traditional approaches. Within the context of norms and frameworks that favor conventional approaches, some of the key challenges to moving forward with circular economies and wastewater reuse in LAC include:

- **An unnecessary emphasis on continued conventional infrastructure construction that often is not financially sustainable:** Throughout LAC, there is much current construction of conventional wastewater treatment infrastructure that is unable to be sustained under current tariff revenue. Oftentimes there is too significant a divide between the agency responsible for building the infrastructure, and the entity subsequently responsible for operating and managing that infrastructure, with not enough emphasis placed on the true costs of sustaining this infrastructure.

- **Poorly Developed Legislation (See Box 2):** Misguided legislation can inhibit the growth of increased adoption of wastewater reuse systems in a number of ways. First, too often the legislation establishing regulations around wastewater disposal parameters and norms is not relevant to the particular context, having either been imported from elsewhere or not taking into account contextual factors such as seasonal fluctuations and local water stress that would make wastewater reuse more appealing and viable. This improperly adapted legislation can lead to inefficiencies with respect to wastewater treatment, management, and the testing of innovative ideas better adapted to particular contexts. Second, there can be a lack of regulations that incentivize gradual improvement of wastewater

treatment: there is often an all-or-nothing approach requiring prohibitively expensive capital investments to carry out improvement, disincentivizing intermediate improvements that would be more affordable and potentially more appropriate for a particular context. Finally, there are often regulations that strongly discourage or directly forbid resource recovery from wastewater. Although these regulations are motivated by understandable public health concerns, they often take restrictions too far and serve to inhibit much-needed innovation and testing of different approaches around wastewater reuse.

- **Reliance on conventional financing:** In LAC, conventional financing mechanisms are often tied to conventional technologies; to accompany technological innovation around wastewater treatment and reuse, alternative financial mechanisms are likely needed until more pilots around innovative models can be successfully tested, validated, and rendered more attractive to traditional and conventional sources of finance.

In addition to many of the regulatory challenges mentioned above, other significant challenges include those deemed as "cultural," i.e. an understandable aversion among households to re-utilize wastewater, or consume products cultivated using wastewater, regardless of the level of treatment provided. There is also resistance and reluctance among water utilities to innovate away from business-as-usual practices that do not currently involve treated wastewater reuse. These concerns and aversions to wastewater reuse are understandable, particularly given the low rates of actual wastewater treatment currently achieved in LAC. However, with increased piloting, education and policy changes, incremental gains can be made illustrating the effectiveness of wastewater treatment, and potential benefits (including long-term cost-savings to both customers and water utilities) involved with circular economies around wastewater. These benefits include:

- **Greater Water Resources Dependability:** Recycled water, or wastewater rendered sanitary and/or potable post-treatment, is a much more consistent source of water, and less dependent on seasonal or weather fluctuations.

- **An Additional Source of Water:** Recycled water essentially provides another water resource, alleviating some of the stress on naturally existing sources currently utilized. Given this, and the greater degree of reliability mentioned in the previous point, recycled water points to a key opportunity for improved water security and mitigating water stress, as mentioned in Target 6.4.

- **Wastewater as a Source of Energy or Nutrients:** Beyond potentially providing an additional water source, wastewater also has much potential for energy production. One of the largest expenses currently facing water and wastewater treatment plants is around the energy required for carrying out treatment. Capturing and utilizing biogas from wastewater has the potential to provide a supplemental source of energy (or a potential source of revenue for treatment plants), ideally reducing costs. There is also much potential for nutrient recovery in wastewater via the application of sufficiently treated wastewater in the agricultural sector.

In addition to the challenges mentioned above regarding policy frameworks, cultural norms, and other factors inhibiting the reuse of treated wastewater, there is also the fundamental and initial challenge that much of LAC still faces around establishing any type of wastewater treatment, whether conventional or new. Roughly half of the entire LAC region does not have adequate wastewater treatment, and as noted before, the investment needed solely to achieve safe management of fecal sludge and wastewater treatment (i.e. move from *basic* sanitation to *safely* managed sanitation) by 2030 could exceed $4.5 billion annually in capital expenses. Growing populations and unpredictable water resource availability due to climate change will compound

this challenge. In this context, there is an excellent opportunity for many countries in LAC to essentially "leapfrog" with respect to innovation and development of viable wastewater treatment systems: instead of moving towards conventional linear economy-based wastewater treatment systems and processes, LAC can focus on the mention of "reuse" directly within Target 6.3, and take a "leap" forward beyond conventional wastewater treatment systems into those more based on circular economies. Some key next steps that can be taken to accelerate more adoption of circular economy-based treatment models in LAC include:

- **Recognize that Wastewater is a Resource:** Recycled water, or treated wastewater, is not only a potential resource of water for human consumption as a supplement to natural sources, but physical elements in wastewater (e.g. nutrients, biogas) have much potential in the energy and agricultural sectors.

- **Integrate Resource-recovery Models in all Levels of Planning.** The importance of recovering resources in elements traditionally deemed "waste," such as wastewater, needs to take much greater priority in all levels of government planning.

- **Improve Fragmented Institutional Relationships:** Currently, there is often a divide between the entities responsible for different elements along the water and wastewater service chain. For example, wastewater treatment plant management may be separated from the entities responsible for the original sourcing and treatment of water, and are almost always somewhat removed from agricultural, industrial and household end-users of water resources. This divide inhibits a holistic view of the entire water-wastewater cycle, and greater coordination between consumers and all agencies responsible for water and wastewater treatment would facilitate planning around circular economies.

- **Establish Consistent and Appropriate Legislative Framework:** Often in LAC, legislative frameworks are more designed towards linear WASH models; if legislative frameworks could be improved to support and encourage the growth of wastewater reuse and circular models, across all sectors, the expansion of circular-economic water models would be greatly facilitated.

- **Better Define Context-specific and Relevant Water Quality Parameters:** While water quality parameters should always be in place to protect health and ensure environmental standards, all too often these parameters are incorrectly applied universally or improperly imported from other countries. Adapting water quality parameters to the specific use of water (whether effluent for discharge in the environment, reuse in agriculture/industry, or standards necessary for direct consumption) would support the growth of a variety of wastewater uses.

- **Enforce Water Quality Standards:** Any refinement of water quality parameters should also be accompanied by increased enforcement of those standards. In much of LAC, there are unnecessarily strict water quality regulations on certain water uses, but they often aren't enforced properly. This lack of enforcement can lead to skepticism and mistrust around water quality among end-users, and greater enforcement of water quality parameters could help alleviate some of the reservations most people currently have to wastewater reuse. To be effective, this enforcement should be consistent, transparent, objective and applied universally to all water and wastewater system operators.

- **Promote Technological Innovation:** Generally, the chief barrier to wastewater reuse is not technological, since in large part the technology already exists. However, more enabling frameworks can be put into place to support increased research and development around technologies focused on wastewater reuse.

- **Foster Financial Innovation:** The majority of financial models that currently sustain wastewater treatment plants are designed around a linear economy, with many of them run under some form of a public-private partnership (PPP). Given the potential financial incentives surrounding resource recovery, more efforts should be made to leverage these PPPs and the potential they have for advancing sustainable circular economy models around wastewater reuse. Overall, more research and documentation of successful financial models supporting circular economies will facilitate increased investment and financial resources available for innovative wastewater reuse models in the future.

Despite the challenges, wastewater reuse and the establishment of water-wastewater systems within a circular-economic paradigm has much potential for LAC. In addition to some of the positive effects this could have on the energy and agricultural sectors, some direct impacts circular economies could have on the WASH specific SDG6 include:

- Target 6.1: As an additional and potentially more reliable "source" of water, recycled water has the potential to support greater service consistency and water-resource availability for establishing universal water access in LAC, and augment any potential imbalances between water supply and demand.
- Target 6.2: While somewhat more indirect, viewing wastewater as a potential resource with economic value could create incentives for bringing more households into the wastewater system, as well as reducing costs of access and utilization of that system.
- Target 6.3: Wastewater reuse has the most potential to address Target 6.3, supporting greater treatment of wastewater and most directly addressing the importance placed on reuse given its direct mention within the target itself.
- Target 6.4: Recycled water has significant potential to address any water scarcity issues, whether current (e.g. the case in Israel), or in the future throughout areas in LAC as populations grow and the climate changes.
- Target 6.5: Viewing water and wastewater through the lens of a circular economy will place greater emphasis on the importance of water (and wastewater) as a resource itself, ideally translating into more robust and holistic models to manage that resource.
- Target 6.6: An increased utilization of recycled water could diminish demand currently placed on natural water sources, implying greater levels of protection to water-related ecosystems.
- Target 6.a: Similar to Target 6.3, wastewater reuse and recycling are directly mentioned in this target; as such any increased utilization of circular-based economies around water and wastewater should contribute to achieving this target, as well as to address the need for increased knowledge and skills capacity around reuse models.

Business-as-usual and the utilization of linear economic models will not be enough to effectively resolve the SDG6 challenge by 2030. Given all of the potential benefits and opportunities for meeting SDG6 targets mentioned above, bringing circular economic models based on water and wastewater reuse to the mainstream will represent a key, and even necessary, strategy for the LAC region going forward.

5. "Green" Infrastructure Around Water and Sanitation in LAC

Wastewater reuse and circular economies are often referred to as environmentally-friendly, or "green" solutions.[27] In other words, circular economies generally involve looking at resource utilization *systems* through a more environmentally-friendly or "green" lens; however, it is also important to focus on the *infrastructure* and other components supporting those systems, and how those elements can be made more "green." While often understood solely in the context of mitigating floods or improved drainage in urban areas, green infrastructure should be viewed more broadly to incorporate numerous additional functions including "upstream" green solutions to protecting and sustaining water resources. Green infrastructure seeks to more effectively mimic and "build with" nature to achieve better climate adaptation, reduced heat stress, increased biodiversity, improved air quality, sustainable energy production, healthier soils, and other quality of life improvements in addition to cleaner water.[28] For the past century or so, most challenges around water and wastewater have been addressed utilizing "grey" infrastructure, e.g. water collection systems, distribution networks, water and wastewater treatment plants, etc., primarily constructed using "grey" concrete. When trying to address WASH challenges, governments have too often invested resources in infrastructure that—aside from "natural" necessary water resources—in large part operates and exists in relative isolation from the natural environment and its corresponding systems.[29] This investment has not been sufficient to meet current WASH service demand while ensuring long-term protection to water-related ecosystems. Going forward, simply increasing investment in grey infrastructure will not only be insufficient to solve current challenges, but could compound future problems associated with growing populations and climate change-related events.[30] Furthermore, the environmental degradation that has accompanied economic and *population* growth in much of LAC has significantly amplified already-existing water quality and quantity challenges, as well as increased threats to overall ecosystem resilience. Continued investment in grey infrastructure will not only be inadequate based solely on population growth, but will fall well short of addressing increased water supply challenges stemming from the environmental degradation[31] that frequently can accompany *economic* growth. It will not be enough for societies in LAC to simply "build" their way out of these challenges; much more emphasis needs to be placed on more holistic infrastructure solutions that leverage and utilize hydrologic and other "green" mechanisms already in place within natural systems.

To further clarify, any green solution proposed would not necessarily be purely "green," as those would only be found in purely natural systems, i.e. without human construction or intervention. What is being proposed would be an incorporation of more green and natural systems within existing infrastructure models, resulting in "grey-green" infrastructure around WASH services. Some key benefits to grey-green infrastructure include:

27 The choice of "green" as an adjective for a particular type of infrastructure is intended to imply an environmentally friendly association with the prevalence of the color green found in natural environments. Similarly, "natural" infrastructure is an appropriate synonym to "green" infrastructure, and the two can be used interchangeably. In contrast, this section and paper will also mention "grey" infrastructure, which would be infrastructure more associated with the colors prevalent in conventional human infrastructure such as cement or concrete.

28 An Internet search will provide numerous definitions of green infrastructure, all similarly aligned around the theme of utilizing mechanisms found in and in harmony with nature to ensure sustainability and resilience against unpredictable changes in the future. Specifically, this definition is paraphrased from the International Centre for Trade and Sustainable Development (www.ictsd.org).

29 It is of course doubtful if anything can exist and operate outside of and in total isolation from natural systems; the key attribute with grey infrastructure is that while it utilizes and needs natural resources as a key input, it doesn't necessarily directly leverage other natural environmental-systems or processes to carry out its operation and function.

30 Mr. Todd Gartner, Senior Associate, World Resources Institute presented the majority of the findings, recommendations and conclusions discussed in this section during WWW. Please see (Gartner, 2016) for additional information.

31 As one example, between 2012-15, Brazil has "lost" roughly 7 million hectares of forest land to development—an area roughly equivalent to the size of Ireland—likely having a significant impact on water resources within the local watershed, and to overall hydrologic systems upon which a significant population in Brazil depend. (Gartner, 2016)

- **Water Quality, Quantity and Biodiversity:** Greener infrastructure has much potential to integrate more effectively with and support local ecosystems, potentially with numerous benefits to water availability, the quality of source water,[32] and the preservation of biodiversity dependent on those ecosystems.

- **Overall Cost Reduction:** If natural systems can be utilized and incorporated appropriately, grey-green approaches to WASH infrastructure are generally viewed as less expensive with respect to capital investment and O&M costs, given that grey-green infrastructure leverages existing natural systems to carry out much of its functions. In addition to these cost savings, grey-green infrastructure, if properly maintained, can also have a longer lifespan than purely grey infrastructure.

- **Resilience:** While grey infrastructure can be viewed as a fairly static element designed for a particular context, the incorporation of green, natural systems—inherently more dynamic and adaptive—should allow for and instill greater adaptability and more resilience to future unpredictability, especially from climate change.

- **Beneficial Effect on Human Populations:** The increased resilience and overall cost reduction associated with grey-green infrastructure will not only translate into benefits for the ecosystem and improved WASH services, but will generate broader benefits across society including greater economic production, quality of life, etc.

- **Flood Control and Erosion:** Grey infrastructure is less adaptive to local environments and more vulnerable to natural processes such as floods and erosion, and does little to help support ecosystems in the face of natural disasters. Grey infrastructure can actually serve to increase erosion and deterioration of ecosystems in some cases. Investing in green infrastructure helps watersheds and ecosystems become more resilient in the face of natural disasters, translating into more sustainable resource management for human populations.

32 In Medellin, Colombia, the city water operator, Empresas Públicas de Medellin, is investing more than $ 8.5 million dollars in the protection of local watersheds, given the impact on source water quality that a healthy natural environment can have. For more information, see: http://blogs.iadb.org/agua/2016/08/17/2979/.

Box 3: Water Funds

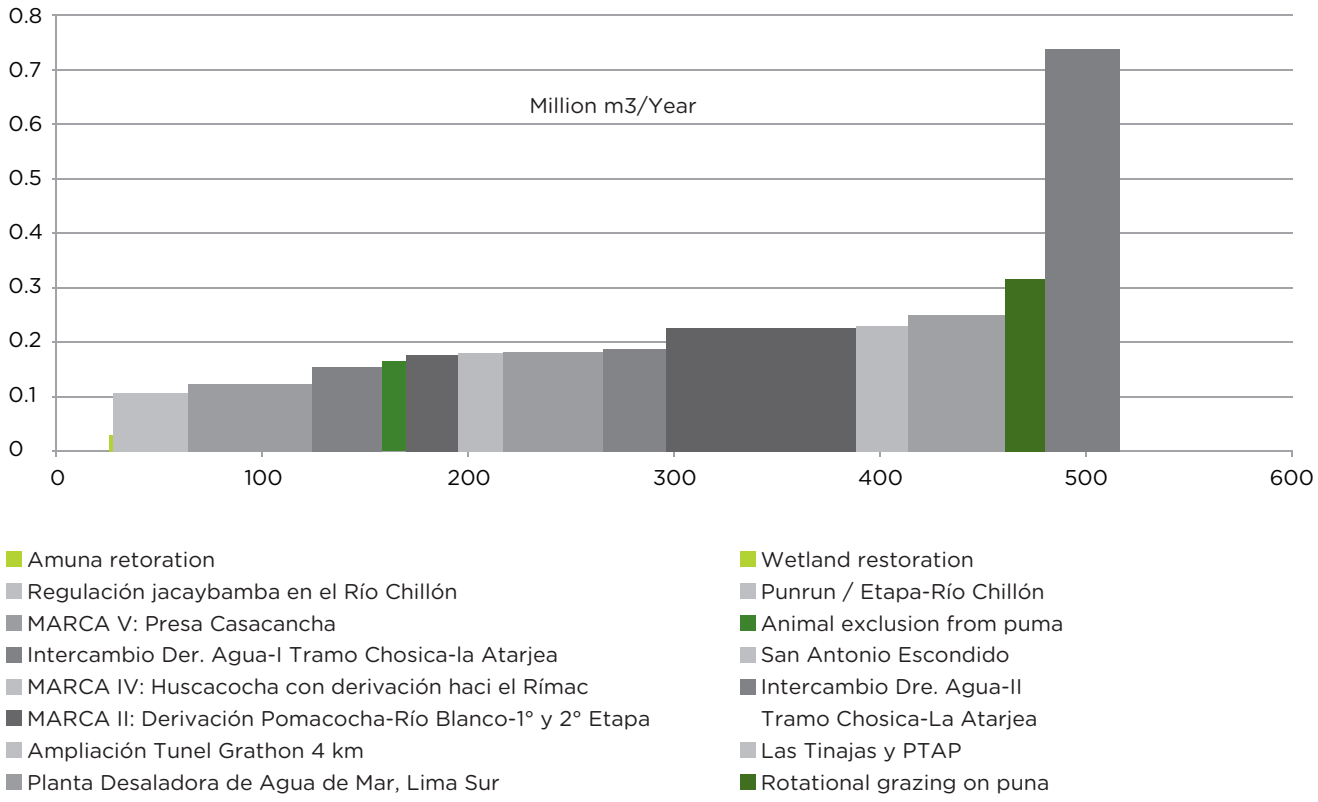
One example of an innovative financial model that prioritizes WASH service sustainability through grey-green infrastructure and ecosystem sustainability is the Latin America Water Funds Partnership established between IDB, FEMSA Foundation, The Nature Conservancy and the Global Environment Facility (GEF). A Water Fund consists of three key mechanisms: (1) A *financial* mechanism for watershed conservation; (2) an *implementation* mechanism for conservation activities and projects; and (3), a *governance* mechanism for watershed planning. Overall, these funds are designed to provide necessary resources for increased grey-green infrastructure models that provide benefits such as improving water quality, regulating the hydrologic cycle, flood mitigation, erosion reduction, improved energy security, biodiversity conservation, coastline protection, livelihood sustainability, and a reduction of capital and O&M costs. As of 2017, 43 Water Fund initiatives have been implemented in 12 countries in LAC, resulting in interventions positively affecting 1.6 million hectares of watersheds and benefitting 40 million people. From a financial perspective, these funds have leveraged more than US$ 120 million. Some challenges going forward include developing financially sustainable Water Funds, designing funds that can have impacts on a larger scale, promoting an enabling environment and norms around green infrastructure, involving and engaging water utilities more directly in the process, generating evidence on the benefits and returns on investment in green infrastructure, and overall development of awareness and institutional capacity surrounding Water Funds. For further information on Water Funds and the associated partnership, please see: (Latin American Water Funds Partnership, 2017) and www.waterfunds.org.

There are already some promising examples of grey-green infrastructure in LAC, and some innovative financial models that prioritize ecosystem sustainability (see Box 3), but these cases are currently viewed primarily as pilot projects or "experiments," somewhat on the margins of conventional approaches and traditional finance. Going forward, as with circular economies, a key challenge will be translating successful pilot experiences around grey-green infrastructure into more mainstream solutions to WASH challenges, so that there are a broad range of grey-green options available to move beyond simply investing in grey infrastructure as the norm. One key action to mitigate this issue would be that WASH related utilities include green infrastructure solutions in their investment plans going forward.

Some key barriers to increased grey-green infrastructure model adoption that need to be overcome include: (1) a general lack of awareness around the potential of grey-green infrastructure among sectors outside of environmental conservation, such as the broader utility, financial, private, corporate, and government sectors; (2) a gap in rigorous evidence demonstrating economic models and potential cost savings related to grey-green infrastructure (Please see Figure 4 for one example of differentiating the cost effectiveness of grey and green infrastructure initiatives affecting the water supply in Lima, Peru); (3) similar to investment in grey infrastructure, there is a shortfall with respect to available finance in general around WASH infrastructure investment; (4) a lack of coordination between different government departments and ministries necessary to implementing a more grey-green approach, e.g., ministries responsible for water resource management are not often coordinating enough with those responsible for land or forest management; (5) a lack of innovative and coordinated financial models—currently the aforementioned ministries and sectors often have their own separate sources of funding and corresponding objectives, often operating with insufficient collaboration with other sectors to provide an effective and holistic way forward; (6) while there are some sources of innovative finance mechanisms (e.g. water credits, green bonds, etc.) available for non-conventional grey-green infrastructure approaches, they are still not enough to address the scope of the problem and more steps need to be taken to attract conventional finance sources to innovative approaches; (7) implementation know-how and "capacity" around green infrastructure is lacking, and there are

not many actors or institutions that have the experience and knowledge necessary to adequately design a green infrastructure project or investment plan; and (8), successful grey-green pilot experiences are often viewed as one-off success stories and have yet to be mainstreamed as viable and even necessary options within the broader WASH service landscape across the region—incorporating grey-green models within WASH regulatory frameworks will encourage increased adoption and implementation of grey-green approaches. All of the above challenges generate a disconnect between conventional grey infrastructure development strategies, and approaches that support the expansion of grey-green infrastructure across the region.

Figure 4: Cost-effectiveness of green and grey strategies for closing the water supply gap in Lima, Peru



Source: Gammie, G. and Forest Trends Water Initiative, 2016.

Investing in and implementing a greener infrastructure agenda is not without its challenges, and it is essential that all trade-offs be understood, acknowledged and discussed frankly. For example, if a "green" flood management scheme is implemented, will this have an unanticipated effect on aquifer recharge? The risk of unintended consequences is not a reason to not move forward, especially given the already known risks inherent in continued investment in strictly grey infrastructure. However, these potential unknown risks underscore the importance of objective and non-biased evaluation of any pilot projects so that grey-green technology can soundly be improved upon. The theoretical "science" behind perfecting green infrastructure will take some time, likely beyond 2030, and it is time to move from theory to practice and experimentation, and onward to scaling-up models that have already shown promise of long-term effectiveness.

It is also important to highlight that, similar to strictly grey approaches to WASH infrastructure, simply adopting grey-green approaches will not provide a universal solution for the entire LAC region, and incorporation of green-related elements should be viewed as one potential tool that can be utilized to address specific challenges in certain contexts, particularly those contexts where high population and/or economic growth has led to increased environmental

stress and degradation. Given this, it is important to understand environmental, socio-economic and other contextual factors of a particular region that would best facilitate and support a more green approach to WASH infrastructure implementation. More robust ecosystem assessment and monitoring frameworks should be implemented to gain an improved picture of watershed risks, land-use patterns, areas vulnerable to erosion, and an understanding of how these elements are changing over time. A more in-depth understanding of a particular ecosystem will greatly facilitate an understanding of the potential and the extent to which natural systems can be leveraged through the incorporation of green infrastructure in a particular area.

An inclusion of green related elements in WASH infrastructure can have positive implications for the achievement of all Targets under SDG6, particularly around ecosystem resilience and the sustainability around any WASH achievements made. Some target-specific benefits to greener WASH infrastructure include:

- Target 6.1: Green infrastructure can provide a more reliable "source" of water by providing greater protection to watersheds, supporting improved service consistency and water-resource availability necessary for establishing universal water access in LAC.
- Target 6.2: Utilizing green approaches to safely managed sanitation will increase the longevity and sustainability of these services through the harnessing of more "natural," less resource-intensive processes, such as through ecological models to sanitation.
- Target 6.3: Greener infrastructure could more effectively, affordably and sustainably treat wastewater and improve water quality.
- Target 6.4: Because of its increased integration with natural processes, green infrastructure has much potential to improve water-use efficiency and reduce water stress.
- Target 6.5: As in Target 6.4, green infrastructure can support improved water resources management, primarily due to natural feedback mechanisms and other benefits related to increased integration with natural processes.
- Target 6.6: Increased integration of WASH services within natural cycles through greener infrastructure will lead to greater levels of protection to water-related ecosystems.

Greener infrastructure provides a viable—and likely necessary—alternative for working towards SDG6 Targets 6.3-6.6 and any element related to overall ecosystem health, resilience, and sustainable relationship between human use of natural resources and the overall environment. Greener infrastructure will help cities and populations become more water-secure and resilient, with the potential to provide cost-effective options for improving water quality, reducing erosion issues, flood mitigation, and potentially decreasing overall capital and O&M expenses around infrastructure and treatment costs. Going forward, to help mainstream more of a green approach, governments and the financial sector should mandate that any WASH infrastructure project first consider a green approach as the *default* starting point in any design; and if that is not appropriate, explain and justify why a more grey approach would be needed in a particular context. Continued investment in grey infrastructure has not resolved WASH challenges, and will not be able to sustainably resolve challenges going forward. If human populations are going to find a way to live sustainably in any region, including LAC, much more consideration has to be given to incorporating green elements and the leveraging of natural systems into the infrastructure that provides the WASH services we all depend on.

6. Promoting Businesses Around WASH Services to Support the Achievement of SDG6[33]

In addition to greener infrastructure and more circular economies around WASH services, there is currently another significant missed opportunity: the private sector. Targets 6.1 and 6.2, around extending and sustaining WASH coverage across the region, have the most potential to benefit from increased private sector and business involvement. Currently, conventional approaches to extend WASH services primarily involve the public sector (e.g. national governments, municipalities, ministries, etc.), the aid sector (e.g. NGOs, etc.), and/or multi-lateral organizations leading the process. Given this, much WASH service expansion is predominantly dependent on the availability of public funds, normally applied via subsidies to cover WASH service capital expenses. The private sector does play a role currently in this approach: they provide materials, construction services, advisory and technical support, among other key functions; however, their role is primarily a passive one waiting on government investment, as opposed to an active one that would drive market growth and WASH service coverage expansion.[34] In other sectors outside WASH, the private sector is extremely efficient at driving market growth when enabled properly through market-based incentives, coupled with sound regulation of those markets. Although there are understandable drawbacks and reservations around complete or exclusive private sector involvement in WASH services, especially around public services where priority should be given to universality of coverage over profits, some key benefits for increased private sector involvement include:

- A more robust and sustainable supply-and-demand relationship between consumers of a WASH good or service, and those providing those goods and services. With governments or the public sector primarily taking the active role in provision of WASH, that relationship is often less sustainable and more dependent on political forces as opposed to market forces that can help drive competition and incentivize appropriate pricing and quality control for end-users.
- Market forces incentivize both sustainability and growth, i.e. private sector service providers are inherently motivated by profit and market forces to seek out new customers, and ensure customers are satisfied with services over the long term. Aside from political incentives that can drive short-term service expansion, these motivations are less inherent with public sector-led approaches.
- In many sectors, the private sector has proven to be a much more efficient expander of service coverage than government can be.

33 Unless otherwise mentioned, much of the data and findings presented in this section come from: (Sparkman & Sturzenegger, 2016), please see that paper for further information: https://publications.iadb.org/handle/11319/7803.

34 The "private sector" in the context of WASH services is understood to include any entity or business directly involved in the provision of WASH related goods and services, including but not limited to sanitation and water system hardware and materials, emptying and cleaning services of on-site sanitation systems, and household water treatment systems, among other goods and services. Somewhat peripherally but also important, the financial private sector also can play a significant role supporting WASH goods and services markets through the provision of credit, loans, or other innovative financial mechanisms benefiting and supporting both consumers and providers of WASH services.

In the WASH sector, some key market opportunities for the private sector to engage in are summarized in Table 2 below:

Table 2: Opportunities and Potential Market for the Private Sector in Water and Sanitation (Table Source: (Sparkman & Sturzenegger, 2016))

WATER SECTOR MARKET OPPORTUNITIES	
Market Opportunities	**Potential Market**
- Provision of piped drinking water to households - Provision of water to households via means other than household connections - Technical Support Services	- Smaller market potential relative to sanitation given higher levels of current coverage. Assuming average household size of 5 members per household: nearly 7 million potential household customers across the region who are potentially interested in improving their water supply services. - Given that only 65% of the LAC region has access to safely managed water services, there are likely many more households who in some form will be incentivized to improve upon their current water services before 2030. - In urban areas where existing utilities have not extended services to the entire urban population, a potential market exists for smaller-scale water service providers (e.g. water kiosks, bottled water, etc.). - According to JMP figures, in 2015, 97% of urban households in LAC had access to improved water services, while in rural areas only 84% have access, implying a larger gap in coverage among households living outside of urban centers. Given this, there are a greater number of potential customers in rural areas around water service provision, although operating costs may be more challenging given that households are more dispersed and potentially more costly to reach. - In addition to WASH goods, technical support services could also be provided by the private sector to community-level water committees, including post-construction support for operation, maintenance, repair, etc. Currently, in most cases either local governments or outside NGOs provide technical support to these water committees, but it often isn't sufficient, and there is room for the private sector to explore offering these services.
- Financial services to the water sector	- There is much room for the financial services sector to explore ways to engage and support water service provision across the entire LAC region, especially in supporting community-level water management committees with innovative financial alternatives for funding water system improvement, repair, expansion, etc. - In addition to water committees, space exists for creative financial models (e.g. bonds, etc.) to support the growth of larger-scale water utilities serving larger markets.
- Water Treatment	- In areas where water is not treated adequately, there are potential market opportunities for household water treatment systems (HWTS), but more work needs to be done to reduce costs and improve distribution channels, particularly in rural areas.

SANITATION SECTOR MARKET OPPORTUNITIES

Market Opportunities	Potential Market
- Initial construction of household sanitation infrastructure (bathrooms, toilets, latrines, etc.), for first-time household customers. - Improvements to existing household sanitation infrastructure.	- - Market opportunity is quite significant, with at least 15 million households currently lacking improved sanitation under MDG definitions. In urban areas, 12% of households do not have access to improved sanitation, 36% do not have access in rural areas. - For on-site sanitation systems, the amount invested can generally range from $50 for the most basic improved dry pit latrine, up to more than $1000 for a full-service pour-flush bathroom with septic tank.[35] Given this, assuming investment needs to be leveraged for 15 million households to acquire improved sanitation facilities, it can be estimated that the potential revenue available to service these customers across LAC amounts to somewhere between $1 billion (very conservatively assuming the least expensive sanitation option), up to $15 billion (assuming more expensive options).
- Fecal Sludge Management (FSM) services such as latrine pit or septic tank emptying and transport of waste to treatment site.	- In some LAC countries, up to 75% of households--and across the entire region at least half of the population--does not have access to sewer networks, implying a large portion of households with on-site sanitation systems. Unless waste is somehow treated on-site through an ecological toilet or otherwise, the majority of these households will need some assistance with FSM. Furthermore, in addition to households without sewer access, given that 77% of households overall do not have access to safely managed sanitation as defined under SDG6, overall there is likely an enormous potential market opportunity to help fill the gap in FSM and other "safe management" services by 2030. - In many urban areas, the private sector is already providing FSM services, but there are still gaps, and opportunities exist in smaller cities and towns, as well as less dispersed rural areas where transport costs aren't insurmountable. - FSM is also a challenging market to quantify given different variables such as pit or septic tank fill-up rates, transport and dumping costs, etc.; however, if it's conservatively assumed that 0.2 cubic meters of sludge is generated per person on an annual basis,[36] with a population of at least 300 million across the region without sewer services, this represents a theoretical demand of 60 million cubic meters of sludge generated annually. Even at conservative estimates of $50 of revenue per cubic meter of sludge emptied, this represents a potential market opportunity of $3 billion annually across the region.

35 For a detailed breakdown of potential unit costs for water and sanitation service improvement by country, please see: (Hutton & Varughese, 2016).

36 Many factors influence sludge accumulation rates in a latrine pit or septic tank, including family size, diet, the extent that water is employed in the sanitation technology, climate, pit/tank wall and floor porosity and filtration rates, etc. All of these factors combined with variability in costs associated with coordination, transport, etc. make a precise quantification of the market for pit or septic tank emptying challenging. Furthermore, this market will also diminish as sewer networks are expanded, but given the slow rates of expansion, should be a significant market for some time, especially in rapidly growing peri-urban areas. This study is grateful to Steve Sugden and TEECs of Malawi for providing general guidance, figures, and caveats for quantifying the market for pit or septic tank emptying services, please see: (Tools for Education & Enterprise Consultants (TEECs) and Water For People, 2011)

- Waste treatment - Sales of composted waste	- A large portion of fecal waste generated in LAC is not treated adequately, especially outside of urban areas. Given that households outside of urban areas are more dispersed, the costs (e.g. coordination, transport, etc.) of centralizing waste for treatment may be too prohibitive for the private sector to enter without public sector support. Potential public-private arrangements (e.g. PPPs) could be feasible, and even necessary, to help overcome some of the costs associated with waste treatment. - Although the market for composted fecal waste sold as fertilizer is still very young and yet to be proven, certain initiatives are showing some promise, pointing to a potential market in the future if composting treatment processes can be optimized and the end-product appropriately marketed.
Financial services to the sanitation sector	- Similar to water, there is much room for the financial services sector to offer credit to households for sanitation improvements, including for on-site sanitation, as well as for investment in materials for connection to an existing sewer network.

There are numerous opportunities for the private sector to become more involved in WASH service provision, both directly and in providing support functions to WASH markets through financial services (See Box 4 for one example). Opportunities available in WASH services are estimated to be in the billions of dollars across the region. For example, in the provision of sanitation services, there is a potential market of up to US$ 15 billion for the construction of improved household sanitation infrastructure, and over US$ 1 billion annually for the provision of waste collection and transport services.[37] Some key steps the public sector and governments can take to better enable the private sector include:

- **Understand and Segment the Market:** Treating all households that currently do not have access to WASH services as the same, and assuming most of them are too poor to invest in WASH infrastructure without assistance, has caused subsidies to be applied and offered too liberally. In economic terms, a lack of market segmentation among those lacking WASH services has often caused the inclusion of households in subsidy-benefits when they don't necessarily need it, while excluding those (i.e. the poorest of the poor) who do. Targeting different approaches and options based on the heterogeneity of the overall market segment of those without services will help minimize market distortion given that subsidies will be better targeted.

37 Conservative estimates, please see (Sparkman & Sturzenegger, 2016) for further details.

Box 4: Water and Sanitation Credit in Peru: Agualimpia

An important experience to highlight around sanitation lending is that of the Peruvian NGO Agualimpia and their partners, where over the last few years over 25,000 in peri-urban areas like Lima have taken out loans for improved sanitation as part of the program. Prior to this program, numerous households faced financial constraints and did not have the money or other financial options available to assist with investment in connecting to sewer networks through improved household sanitation infrastructure such as toilets, pipes, plumbing materials, and other sanitation-related products. To help alleviate this financial constraint, Agualimpia worked with Peruvian Microfinance Institutions (MFIs) to design a sanitation loan product for inclusion within their overall portfolio of financial services, targeting households that were interested in improving their sanitation but were too financially constrained to do so without access to credit. Agualimpia supported their MFI partners to develop the sanitation loan products, including assistance with marketing strategies and messages, linking MFIs with potential customers, and establishing loan terms that were affordable to households, economically viable for MFIs, and did not distort financial markets. Households received loan funds directly, and were able to utilize the funds to invest in sanitation infrastructure that best suited their needs and interests, from providers of their choosing. Throughout the program, Agualimpia verified that households who took out sanitation loans used the funding to invest in improved sanitation, and loan payback rates have been very positive overall. Loan amounts averaged near $3000, often including other home improvement projects beyond just the bathroom. To qualify for a loan, households had to show income over 12 months, be in good standing with the national credit bureau, as well as other requirements. The key success with this program is not only that it far surpassed, by more than ten-fold, the original goal of 2000 households accessing credit to invest in the improvement of their own sanitation, but that MFI partners are continuing to offer loans and seek out new clients, even after Agualimpia has exited the project. This project illustrates a model whereby a previously under-served and economically constrained market segment was able to invest in improved sanitation, and where there is a high potential for additional households outside of the original project to invest in improved sanitation given that the MFIs, on their own, are seeking out new potential customers to offer loans to. Overall, this experience offers an example of how an external entity such as Agualimpia can positively intervene in sanitation markets to initiate a process that will continue to grow on its own and be led by MFIs interested in identifying new customers for sanitation loans, resulting in continued spread of improved sanitation coverage without continuous external involvement. Agualimpia has helped identify a key barrier between households and sanitation services, and the removal of that barrier through MFI participation in sanitation markets has helped households invest in improved sanitation and initiated a sustainable process where the financial private sector will continue to spread service and bridge financial gaps that previously existed between households and sanitation goods and service providers.

Source: (Castro, 2016)

- **Galvanize Household Demand:** Primarily due to the expectation for subsidies but also for financial reasons, demand for improved WASH services is hindered in LAC among the segment that currently doesn't have access. The public sector and local government could take some of the following steps to help generate increased demand and facilitate WASH market growth:

    - **Coordinate Better Linkages Between Private Sector, Financial Institutions, and Potential Consumers:** In the case of water markets, government can foster a relationship between water committees and financial institutions so that committees have access to credit for water system construction, expansion, and/or rehabilitation. In sanitation markets, government can help link households to credit providers that specialize in sanitation loans.

- **Clarify and Enforce Regulations:** Governments and the public sector can clarify regulations with respect to the quality of access that households should have to WASH services, and communicate and enforce those regulations. If a household is currently not meeting regulations, there should be mechanisms in place to encourage them to resolve this issue, either through investing their own money, taking out a loan, or applying for government support through a clear, transparent process. There should be consequences, such as fines, etc., for households or communities not complying with WASH regulations. Having a clear picture around WASH regulations and knowing when one is not in compliance with those regulations should push households towards engaging the private sector to improve WASH services.

- **Understand the Customer:** Market segmentation can help not only identify which households would be most in need to receive a government subsidy, but what different households aspire to regarding WASH services, and with this mind, marketing messages and product design can be tailored accordingly.

- **Support the Growth of Existing Supply Chains:** Aside from very remote areas, the supply-side for WASH services is fairly well developed in LAC, with the main barriers primarily being financial constraints and hindered demand due to subsidy expectation. In addition to addressing the demand side through market segmentation, etc., existing WASH supply chains should be leveraged, strengthened, and enabled to extend to more difficult-to-reach customers. As in most markets, generally improving communication and transportation can extend supply chains and encourage more linkages between households and private sector providers, as well as diminishing some of the costs associated with supplying WASH services to dispersed areas.

- **Provide Technical Support:** The public sector, instead of channeling public WASH funds to subsidize basic infrastructure, can instead work with both the supply and demand side to improve the range of WASH goods and services on offer in the market, so that different market segments have a variety of different options and prices to choose from.

- **Facilitate Access to Finance:** Increased access to financial services such as loans or credit will help WASH markets grow due to the injection of (lent) capital from the financial sector. Government can support this process by helping to establish linkages between households and financial institutions, as well as looking for ways to assist households that aren't able to qualify for loans.

- **Acknowledge the Role of the Private Sector:** In many parts of LAC, it can be difficult to mention the private sector along with WASH without generating images of profiteering and monopolistic tendencies. This is understandable, but what should be promoted is a blend of mutual participation between numerous sectors (public, private, financial, etc.) in the provision of WASH services. The private sector can play an enormous role, but like in other sectors they will have to operate within the context of public policy. Government should encourage private sector participation and provision of WASH services, while playing more of a role to ensure quality control and that situations don't develop where monopolistic tendencies create incentives that hurt consumers.

- **Leverage Information Technologies to Better Link Demand to Supply:** Information systems and monitoring frameworks should be better utilized to understand factors inhibiting a healthy supply-and-demand dynamic between households and service providers. For example, information systems could be used to more time-efficiently link water committees to circuit riders to manage water system challenges, better coordinate waste collection and transport, and/or better understand and quantify specific financial constraints facing customers.

Overall, the public, aid and government sectors will not be able to achieve SDG6 on their own with conventional approaches. While the private sector can play the biggest role in supporting Targets 6.1, 6.2 and to some extent 6.3, their participation in WASH value chains is also very important to overall ecosystem and water resource management under other SDG6 targets. To achieve SDG6 in LAC, the private sector can and must be better enabled to play a key role alongside public and aid sectors; otherwise, progress towards increasing sustainable WASH coverage in the region will continue to be stagnant and fragmented.

7. Conclusions and Recommendations: How to Leverage Circular Economies, Green Infrastructure and the Private Sector to More Effectively and Efficiently Achieve SDG6 in LAC

With respect to achieving the SDG6 in LAC by 2030, two things are very clear: (1) It is an enormous challenge that will require significant resources and effort from all stakeholders and a variety of sectors; and (2), business as usual and conventional approaches used in the past that weren't sufficient to meet the WASH MDGs in all countries throughout the region will certainly not be near enough for achieving SDG6 and its associated targets.

This paper has discussed three key areas of focus that could help the LAC region achieve progress towards SDG6 more effectively and efficiently: circular economies, green infrastructure, and greater enabling of the private sector in WASH markets. These areas shouldn't be the only focus: there are certainly other sectors and ideas worth exploring and a variety of methodologies, strategies, resources and tools will be needed to achieve the scope and ambition of all the targets under SDG6. However, they represent three key strategic areas that should be considered and brought more into the mainstream if LAC is going to be successful in achieving and sustaining SDG6.

Despite some key differences between them, given that the primary goal is to broaden the diversity of conventional approaches so as to bring more innovative ideas into the mainstream, the recommendations can be generalized and are fairly applicable and consistent across all three areas:

- **Institutionalization of Non-Conventional Approaches:** While it will not be possible to automatically institutionalize wastewater reuse, green infrastructure, or greater private sector participation overnight without testing pilot models to validate viability and optimize approaches, more steps should be taken to institutionally acknowledge, at the government level, that business as usual and conventional approaches will not be sufficient, and more innovative experimentation needs to be fostered. Encouraging more innovation and adapting a regulatory framework to allow for more non-conventional approaches will support the growth of the variety of creative approaches needed to meet SDG6. Going further, when evaluating newly proposed WASH infrastructure projects, whether from the public, private and/or aid sectors, proposals should first consider green and/or less wasteful circular economy approaches as a default, with justification rooted in environmental impact analysis being required in cases where conventional approaches should be implemented instead in certain areas. With respect to non-conventional approaches involving the private sector specifically, if the private sector is able to offer WASH services in a more equitable, cost-efficient and environmentally-friendly manner, they should be incentivized and encouraged to do so—public subsidies and investment of public funds should not necessarily be the default option for WASH services.

- **Increase Inter-institutional Communication and Coordination:** Specific insight is needed to understand different regional, national and local stakeholders and institutions responsible for different elements of managing the WASH service delivery chain. Regional-level institutions should support the management of transboundary water resources shared between countries; national level institutions need to help coordinate efforts between different ministries and decision-makers around natural resources that

support WASH services; and at the local level, more reform is needed to instill a sense of priority not only around achieving increased WASH service coverage, but underscoring the importance of adequate water resource management. Many of the models around wastewater reuse, circular economies and green infrastructure involve a much more holistic view of the entire water and wastewater chain, including an important focus on ecosystem management that will involve a number of different stakeholders and decision-makers, at all different levels. The increased comprehensiveness within SDG6 reflects the necessity of implementing a more holistic paradigm, reflected in the encouragement of improved cooperation and community-level participation under Targets 6.a and 6.b. Given this, institutions that had traditionally operated in semi-isolation from one another, such as different government Ministries (water, environment, etc.), will need to act in a much more coordinated manner going forward.

- **Establish Innovative Financial Models:** Given the risk inherent in experimentation, it is understandable that traditional financial markets are reluctant to invest in non-conventional approaches, creating a cycle that continues to prioritize conventional approaches that, while appropriate in many areas, will not be sufficient to meet the targets under SDG6. Governments and/or the aid sector could help establish mechanisms for mitigating the financial risk inherent to investing in innovative approaches so that eventually non-conventional approaches become more mainstreamed, proven, and attractive to traditional sources of finance.

- **Increase Investment:** Simply investing at current levels in non-conventional approaches will not be sufficient; overall investment needs to increase significantly if SDG6 is to be met. Much of this investment could be leveraged further from households and other end-users by establishing a realistic understanding regarding the true costs of establishing and sustaining WASH services.

It is now 2017, with just 13 years to go, it is time to accelerate planning and investment allocation towards achieving SDG6 in LAC. Simply channeling more investment towards conventional approaches will not be sufficient; the region needs to establish policies that encourage increased private sector participation, more green approaches to infrastructure development, and a better incorporation of models rooted in circular economies. Without this focus, and with growing populations and climate change, challenges will only grow more complex and onerous to manage, and conventional solutions even less able to resolve them effectively and efficiently.

Annex 1: Sustainable Development Goal 6, Targets and Associated Indicators

SUSTAINABLE DEVELOPMENT GOAL 6: Ensure availability and sustainable management of water and sanitation for all

Target	Indicator
6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all	6.1.1 Proportion of population using safely managed drinking water services
6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations	6.2.1 Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water
6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	6.3.1 Proportion of wastewater safely treated
	6.3.2 Proportion of bodies of water with good ambient water quality
6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity	6.4.1 Change in water-use efficiency over time
	6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources
6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate	6.5.1 Degree of integrated water resources management implementation (0-100)
	6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation
6.6 By 2030, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes	6.6.1 Change in the extent of water-related ecosystems over time

6.a By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies	6.a.1 Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan
6.b Support and strengthen the participation of local communities in improving water and sanitation management	6.b.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management

Source: https://unstats.un.org/sdgs/indicators/indicators-list/

Annex 2: Eye on LAC Sessions at World Water Week 2016

"Eye on LAC" Sessions and Objectives	Convening Organizations
Session One: **"Water and Sanitation as a Business: Constraints-Opportunities"** **Date: Tuesday, August 30, 2016** **Objectives:** • Learn from relevant good practices/examples from LAC and other regions. • Understand how to generate an enabling environment in LAC that allows viable business models that could make water and sanitation a profitable and sustainable business in the region. **Description of Session:** Providing improved water and sanitation services generates market opportunities for private businesses. The market is huge as 2.4 billion people (about 40% of the world population) lack access to basic sanitation, such as toilets or latrines, and more than 700 million people still use unimproved drinking water sources. Private sector could play a key role in providing these services. This role could involve individual entrepreneurs offering simple products, such as toilets, bathrooms, or the repair and installation of water pipes. It could also involve small and medium size enterprises or even large companies that offer more sophisticated products such as sludge management services. Water and sanitation could be a profitable business. Figuring out how to best make this possible requires understanding the factors that constrain private sector participation. The success of a business will depend, to a great extent, on whether a country provides an enabling environment (infrastructure, access to finance and effective business regulations). Based on good practices and real examples, the goal of this seminar is to understand how to generate this environment in Latin America and develop viable business models that make water and sanitation a profitable and sustainable business in the region.	• IDB • IRC • One Drop • Water For People • WaterAid

Session Two:
"The Circular Economy of Water in Latin America"

Date: Wednesday, August 31, 2016

Objectives:

- Advance a circular economy agenda in the LAC region emphasizing the importance of wastewater reuse.
- Present relevant, successful case studies that can highlight the importance of wastewater reuse as a means of increasing water supply

Description of Session:

Our current linear economic model needs to be changed to alleviate escalating pressures on water resources. The shift to a circular economy model holds much promise as it would replace scarcity with abundance and reduce the resources needed to run our water infrastructure. It would also generate environmental and resource conservation advantages and bring benefits such as long-term job creation, as the circular economy is more labor intensive.

In the water and sanitation sector, municipalities and industries have a duty to optimize their water cycle within the water basin in which they are located, wastewater being the natural starting point for the circular revolution. Taken from a sewer system, wastewater contains calories that are a permanent and renewable source of energy. Impurities in wastewater can be recovered for reuse or conversion, as in the case of valuable chemical compounds that are present in wastewater. However, the organic matter discharged by domestic users may represent the biggest economic potential.

Latin America still has a lot of room for improvement in reusing treated wastewater. This seminar will focus on the importance of advancing this agenda in the region and providing an outlook for the future.

- IDB
- Development Bank of Latin America (CAF)
- World Bank

Session Three: "Towards a Green Infrastructure Agenda"

Date: Tuesday, August 30, 2016

Objectives:

- Discuss leading case studies and opportunities for green infrastructure and nature-based solutions in LAC.
- Define a green infrastructure agenda for LAC.

Description of Session:

Green infrastructure is an approach to water management that protects, restores and mimics the natural water cycle. It entails restoring wetlands or other nature-based solutions, rather than building costly new grey infrastructure. Rivers, streams, wetlands, floodplains, and forests provide critical services such as clean water and flood protection, and should be viewed as essential components of our water infrastructure. In LAC, many forward-looking cities are already embracing this green infrastructure approach, including Santiago, Lima and Medellin. Traditional infrastructure isn't designed to handle the increased floods and droughts that come with global warming. Green solutions give communities the security and flexibility they need. They create jobs in different sectors, including engineering and architectural design, construction and landscaping. Green infrastructure also supports supply chains and the jobs connected to them. We are at a crossroads in how we manage our water. Traditional water infrastructure will continue to play a role, but solves only a single problem and requires a huge amount of resources to build and maintain. LAC must move towards a wiser combination of green and traditional infrastructure to meet the needs of the 21st Century. This seminar will discuss leading cases and opportunities for green infrastructure in LAC.

- IDB
- FEMSA Foundation
- The Nature Conservancy
- ADERASA (Asociación de Entes Reguladores de Agua Potable y Saneamiento de las Américas)

Session Four: "Implementing the water-related SDG: an Inter-regional Dialogue"

Date: Wednesday, August 31, 2016

Objectives:

- Identify challenges faced by different regions in achieving the SDG water-related goal
- Learn how other regions are facing similar challenges
- Generate learning exchanges between regions

Description of Session:

2015 was the target year for achieving the Millennium Development Goals (MDGs). From 1990 to 2012, 2.3 billion people globally have gained access to improved water sources and almost 2 billion to improved sanitation. However, more than 700 million people, mostly in Asia and sub-Saharan Africa, still use unimproved drinking water sources; and some 2.5 billion people unimproved sanitation facilities. The challenge for developing countries is now to commit to and pursue a new set of Sustainable Development Goals (SDGs). Water is central to this challenge. The new water-related SDG triggers a service universalization challenge, but goes beyond access, emphasizing topics such as service quality, wastewater management, water scarcity and use efficiency, integrated water resource management, and the protection and restoration of water-related ecosystems. The Post-2015 development agenda is here. It is time to discuss how we will effectively implement, measure and monitor it. This session will target questions such as: What are the major challenges the region faces for achieving the water-related SDG goal? What are the existing strategies already addressing these issues? What can we learn from other regions? What governance structures are needed to effectively implement, measure, and monitor the new goal?

- IDB
- African Minister's Council on Water (AMCOW)
- Asian Development Bank (ADB)
- CAF
- Global Water Partnership
- The World Bank Group (WBG)

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