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Article

Circulatory Pathways in the Water and Wastewater Sector in the Latin American Region

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Abstract: The Circular Economy (CE) is noted as an emerging framework to support sustainable production and consumption agendas. In addition, the CE aims to be a trigger for redefining economic growth pathways as sustainable, inclusive, and sensitive to ecological and environmental agendas, and to focus its operational standards on co-creating societal benefits. Concerning the guiding principles and the standards of practice applied to implement and scale circular economy, this study will provide an overview of water sector-specific circularity roadmaps and strategies in the Latin American Region (LAR). By using a semi-systematic review, document analysis, and qualitative assessment approach, we highlight framings and operational pathways, gaps, and needs within existing practices of circularity in the water sector. The results provide an overview of CE pathways at the national level of selected countries in the LAR, urging those nations to reflect various levels of advancement (low to high) with CE-focused innovations and policy support structures specific to the water and wastewater sectors. Towards the end, the study points to the 'call for action' to integrate outstanding advances and innovations in the circular economy within sectoral mandates for water and wastewater management, making an argument that circularity in the water sector could serve as an accelerator towards implementing the agenda outlined in Sustainable Development Goals (SDGs), and in particular for SDG 6 (water security for all).

Keywords: circular economy; water; wastewater; resource use; Latin America

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1. Introduction

Is it important that the sustainability agenda is multifaceted and reaches not only large regions but broad and geographically diverse sectors and actors? If so, scientific discovery alone is not sufficient. A dialogue between science and society can increase opportunities for the sustainability agenda, and with it the income potential for various stakeholders, communities, and countries. This vision allows practitioners and policymakers to harmonize and prioritize overlapping and complementing agendas. As natural resources are becoming scarce and climate change impacts are escalating, closing resource use and reuse loops and supporting innovative alternatives towards circular societies is becoming increasingly important [1]. In the last decade, the Circular Economy (CE) has emerged as a tool or framework to look beyond the existing measures of production and consumption to redefine growth pathways, including economic, natural, and social capital, with an explicitly focus on co-creating societal benefits. The circular economy is considered a systems solution framework that tackles global challenges such as climate change, biodiversity loss, waste, and pollution based on three principles: eliminating waste and pollution; circulating products and materials (at their highest value), and regenerating nature [2]. For some, it is considered as a concept, while others consider it a framework, but is definitely one of the most recent ways of addressing environmental sustainability [3].

While CE principles offer an opportunity to recognize and capture the full value of water (as a service, an input to processes, a source of energy, and a carrier of nutrients and other materials), so far the water sector in the LAR has not been systematically included in high-level strategic discussions focusing on circularity [4]. In this sense, agencies such as the World Bank, with contributions from the CAF (the Development Bank of Latin America), are promoting CE regarding wastewater and recognizing its inherent value with the development of a conceptualization guide for wastewater treatment projects, promoting a vision of basin-scale water management practices through the circular economy approach.

In 2020, a Global Alliance on Circular Economy and Resource Efficiency (GACERE) was proposed by the European Commission to provide a global impetus for initiatives related to CE transition, resource efficiency, and sustainable consumption and production; in this coalition, Chile, Peru, and Colombia represent the presence of the LAR. Building on the circularity efforts deployed internationally, GACERE members aim to work together and advocate for sustainability at the political level and in multilateral forums, such as at the United Nations General Assembly (UNGA), United Nations Environment Assembly (UNEA), and in G7/G20 meetings and discussions [5].

Per the existing grey information and from the literature, the CE model framework for water-based waste management proposes six actions/strategies (ways) that can serve helpfully in implementing CE principles in the water and wastewater sector; these are (1) a reduction in wastewater generation, including a reduction in water use and pollution at water source; (2) a reclamation (removal), referring to applying of effective technologies for removing pollutants from water and wastewater (sewage); (3) the reuse of treated wastewater as an alternative source of water supply for non-potable usage; (4) recycling: recovering of water from wastewater for potable usage; (5) reusing water-based waste resources for nutrients and energy; and (6) rethinking how to use resources (in this case, water) to create a sustainable economy free of waste and emissions [6].

In light of the above, this study will provide an overview of the CE roadmaps and strategies in the LAR, highlighting the gaps and needs within existing CE practices. In addition, the overview will focus on innovations and advances in the CE within the sectoral mandates of water and wastewater management. At the regional scale, this study will provide a wide-ranging summary of funding and investment trends in the CE water sector. The study also aims to conduct an analysis using a semi-systematic review of the current situation regarding policy formulation, institutional support structures, implementation challenges, and opportunities for the integration of the CE at the sectoral (water and wastewater sector) level for the LAR. This study anticipates that such understanding could help address gaps and needs towards a CE as an acceleration mechanism for achieving the SDGs, in particular SDG 6 targets and indicators, as Target 6.3 which calls for improvements to water quality by reducing pollution, eliminating dumping, and minimizing the release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally [7].

2. Materials and Methods

Given that this topic incorporates several fields of action such as government institutions, society, and academia, to avoid the information bias of traditional semi-systematic review was conducted a semi-systematic review with the objective of mapping the evolution of circularity practices to visualize the LAR CE perspectives in the water and wastewater sectors. For this, a search for scientific information was carried out in these databases, EbscoHost Web, Gale in Context, Scopus, ScienceDirect, and Google Scholar, which incorporate topics of environmental sciences, earth sciences, sciences, technological research, social and business. The keywords used in the search strings were "Circular Economy", "Wastewater", "Water", and "Latin America", and the search criteria considered were review articles, research articles, and book chapters considered in the search period from June

2017 to June 2022, written in English. The documents were selected that mainly referred to the contexts of water and wastewater in Latin America. In addition, gray information obtained from doctoral theses, congresses, and websites of companies, governments, and international organizations that intervened in generating actions on the circular economy was incorporated.

The body of knowledge that was extracted was analyzed to generate a narrative review of the CE´s progress in the region and to examine how circularity innovations are steering transformations in the water and wastewater sectors. The main aspects that were assessed include, but are not limited to, (a) renovation and integration of wastewater treatment plants to convert them into biorefineries; (b) how treated water can support food production; (c) sludge generated by wastewater used as fertilizer in agriculture; (d) the operation of wells and treatment plants for renewable energies; and (e) and the promotion of rainwater harvesting to reduce pressure on other water sources. Additional dimensions that were assessed include the level of participation of stakeholders, viz., government authorities, private enterprises, international-level cooperation, and in academia. Overall, the above-outlined factors were organized into a conceptual framing, to support action research to address site or context-specific problems and challenges facing the integration of the CE into the water sector, as well as supporting research-backed policymaking toward a water circular economy in the LAR.

3. Results

3.1. Framing and Operational Pathways of the CE in the LAR

Unlike the conventional technocratic approach to the CE in Europe, the realities of social issues in Latin America require a different understanding and approach for circularity implementation. Stakeholders in the region are starting to understand the complex relationship between sustainable development and economic growth and explore how CE pathways can provide longevity to the environment and economy in tandem [8]. Figure 1 reflects the historical approaches that the region has adopted to embrace the circularity pathways in the LAR, in particular the interventions and policy support structures.

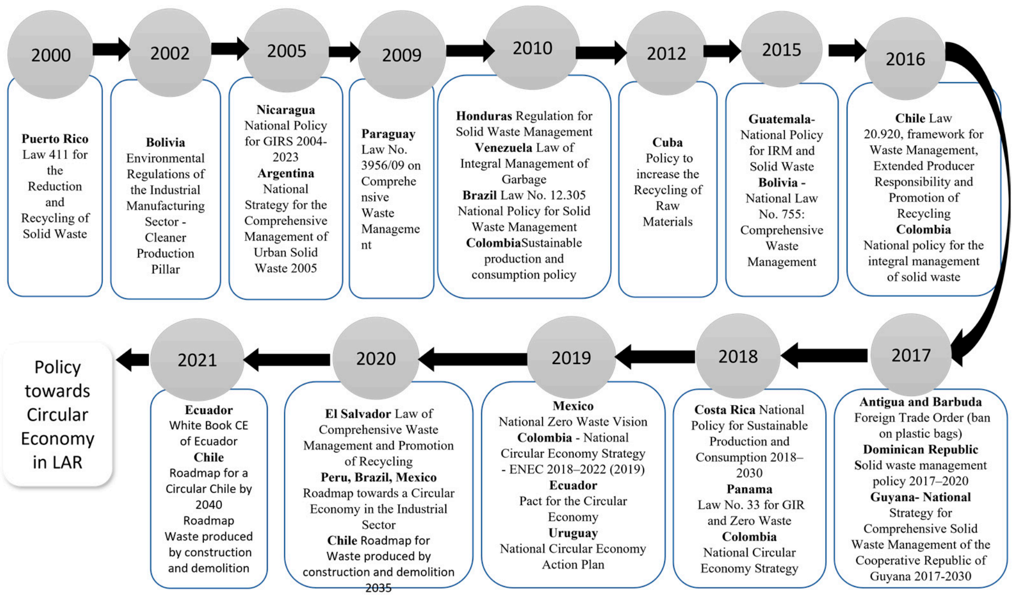

Figure 1. Timeline with the principal policies towards a CE in the LAR (Updated and adapted from [9,10]).

The countries in the region have contemplated the challenges and outlined practices, strategies, and regulations for the transition to a CE. The review of existing CE roadmaps (Brazil, Mexico, Colombia, Ecuador, Peru, Chile) summarized at the national level (Figure 1) serves as a set of high-level documents to articulate how circularity strategies are currently being implemented and the general standards of practice that are integrated into planning and practice. In this study, we reflect on key CE approaches and pathways in selected LAR states.

Brazil, Mexico, Ecuador, Peru, Chile, and Colombia developed their roadmaps for the transition to a CE; they were compiled in 2021 and analyzed to highlight relevant strategies for the water sector the water sector. The following sections show the most relevant aspects of the strategies for the water and wastewater sectors' transition to the CE model.

3.1.1. Circularity Roadmap of Brazil

The objective of the Brazilian roadmap is to design a national development strategy for a circular economy that is shared among actors in all sectors to build knowledge about the CE´s potential, considering territory differences and the country´s local contexts in all sectors, including for water and wastewater. The Brazilian roadmap aims to build knowledge about the CE potentials, considering territory differences and local contexts of the country to create national policies that favor more responsible and sustainable production and consumption trends and patterns. It is anticipated that this circularity roadmap will create financial mechanisms and improve the enabling infrastructures that support CE initiatives *at all levels and scales.* Furthermore, the framework prioritizes supporting Research and Development (R&D) oriented approaches to systemic, cross-sector, socio-technical innovation processes, and strategic intervention areas [11].

The roadmap constitutes six guiding principles:

- Economic development associated with the conservation and restoration of natural ecosystems, including water ecosystems;
- Industry and agriculture competitiveness in global supply chains committed to local sustainable development, including the water–food nexus;
- Research and Development (R&D) and innovation, and professional capacitation considering the impact of resources' complete life cycles for all sectors;
- Urban and regional planning that integrates the economic, social, and environmental dimensions of development for all, noting the crucial need for balancing trade-offs in water use and provisioning systems in such settings;
- The broader adoption of clean and renewable energy in production and commercialization processes. This point directly and/or indirectly links with the water sector and water–energy nexus span;
- Integrated management for a more sustainable and beneficial circulation flow of the resources and waste: water, air, soil, and materials.

3.1.2. Circularity Roadmap of Mexico

The Mexican National Roadmap for the transition to the CE consists of strategic lines and periods based on a two-stage short- and long-term evaluation. The indicators proposed as a baseline are divided into different domains.

- Water: percentage of anthropogenic wastewater;
- Materials: municipal solid-waste generation-percentage of organic waste (food) and solid urban waste;
- Energy and climate change: percentage of renewable energy in the national energy generation matrix, carbon footprint related to energy consumption, and climate change vulnerability index;
- Gender perspective: percentage of managerial positions held by women in industry.

All the above dimensions are directly or indirectly connected with water and wastewater in multiple ways and in various sectors, i.e., municipal, industrial, agricultural, etc. Taking note of these multidimensional aspects, the national roadmap for the transition and adaptation of the CE in Mexico proposes five strategies: (1) reforming governance and public policy measures to support circularity; (2) understanding interconnections between the CE and sustainable management, including the SDG agenda; (3) fitting the CE into sectoral, national and fiscal frameworks in various sectors, including in the water sector; (4) supporting circularity-oriented research, innovation, and entrepreneurship, and (5) interpreting agendas and policies, e.g. understanding how the CE fits/supports/synergizes with the National System of Innovation and Climate Change (SINACC). Additionally, a period of 10 years has been established for the development of the strategic lines, their monitoring and evaluation, and the adjustment of the model [12]. The country´s industrial sector in the identifies opportunities associated with the revaluation of materials that can be reincorporated into the economic cycle through new production processes, the energy use of those who have lost their properties, the industrial symbiosis between different production processes, and even some projects of high urban impact [13,14]. The country aims for the nationally established CE standards of practice to percolate through to all sectors, and clearly to the water sector.

3.1.3. Circularity Roadmap of Chile

The CE agenda in the country is advancing, and the state is well-positioned for sustainable development guidelines based on the various macroeconomic indicators supporting its implementation [15]. The Chilean Ministry of Environment created the "Circular Economy Office" in 2018, and in 2020 developed a strategy to introduce its implementation by 2040 with the proposal "National Roadmap to the Circular Economy for a Chile Without Garbage 2020–2040" [16] and the roadmap for Waste Produced by Construction and Demolition by 2035 [17]. In the above context, the Roadmap for a Circular Chile calls for, by 2040, a comprehensive plan for the implementation of efficient resource use, the acknowledgment of interlinkages, and a nexus being put in place for all sectors directly and indirectly linked to consumption and production value chains. The national agenda is also aiming to drive Chile towards sustainable, fair, and participatory form of development that puts people's well-being first through caring for flora and fauna, responsibly and efficiently managing natural resources (land, water, wetlands, etc.), and by creating a society that uses, consumes, and produces sustainably and consciously, promoting green jobs and opportunities for people and organizations throughout the country to be active stakeholders in implementing circularity pathways [18].

This roadmap constitutes 27 initiatives and a timescale for completion (2022, 2026, or 2030). During the development of these initiatives, four key pillars were conceived, revealing some of the specific opportunities for Chile's circular economy transition, i.e., innovation, culture, regulation, and territories. In Figure 2, shows seven intermediate and long-term goals at the center of this CE national framework that serve as guiding principles; some of them, such as increasing the mandatory recycling rates for sectors in production and supply chains, which also applies to the water sector. In comparison with the CE roadmaps of other countries, Chile's plan outlines standard indicators to assess the comparative advantage of the nation to implement circularity. The roadmap also supports the implementation of existing policies, such as Chile's 2020 action plan for the social, economic, and environmental inclusion of the informal waste sector [19,20].

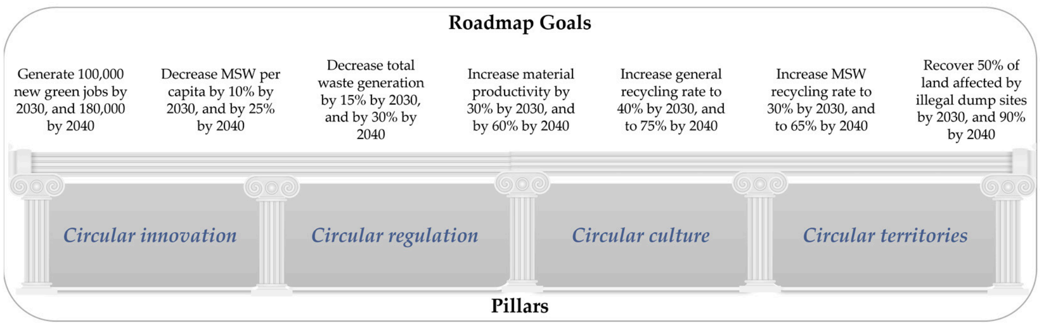

Figure 2. Roadmap for a Circular Chile by 2040.

3.1.4. Circularity Roadmap of Ecuador

In Ecuador, waste management is an exclusive responsibility of municipal administrations [21]. The White Book on Circular Economy in the country defines strategic lines and proposals for actions to achieve circularity, and is divided into four key dimensions that lay out general guidelines for all sectors, including the water and wastewater systems:

- Policy and Financing;
- Sustainable Production;
- Responsible Consumption;
- Comprehensive Management of Solid Waste.

Outlined to be deployed in two phases, the first, "research and workshops with the public and private sector", accounts for the influence and relevance of circularity reflected in the agendas and legislation of the country, the prioritization of macroeconomic sectors, and analysis of waste management. The second, "strategic lines of action", suggests the participation of strategic lines of action in four pillars defined for CE application in the country and comments combining top-down and bottom-up analysis. The process includes elements of divergence, i.e., broadening the focus and identifying best practices, benchmarks, visions of various actors, and convergence, that is, to propose the strategic lines and final actions [22]. The structural components of the circularity vision in the country seem fitting towards mitigating the challenges around recycling, reusing, and rethinking water and wastewater use systems.

3.2. Latin American and Caribbean Regional Coalition on Circular Economy: Spotlight on Five Selected Countries of the Coalition

The countries that are part of the regional coalition on the CE include Colombia, Peru, Costa Rica, and the Dominican Republic, with eight strategic partners: the Inter-American Development Bank, the Ellen MacArthur Foundation, the World Economic Forum, the Konrad Adenauer Foundation, the United Nations Industrial Development Organization, the Climate Technology Centre and Network, and the Partnership for Action on Computing Equipment, and UNEP [23]. The regional coalition envisions providing science-based knowledge on opportunities and co-benefits by fostering an imperative resilient, sustainable, and inclusive economic recovery with best practices through collaborative work between governments, companies, and society. Its plan of action involves promoting eco-design and supporting CE innovation in the region. The coalition´s advancement and investment sector considers current challenges from diverse perspectives, including the challenges that the region faced during the COVID-19 pandemic [24]. Some specific examples and empirical details are provided below for selected coalition countries, while, especially, presenting examples of how these nations are addressing water and wastewater management challenges by applying solutions that stem from the CE.

Country 1: Peru

The country developed a Circular Platform reflecting that the government is committed to regulating and promoting the CE. The Peru CE's Roadmap in the Industry Sector, published through Supreme Decree No. 003-2020- Produce by the Ministry of Environment (MINAM), promotes the signing of Clean Production Agreements (CPAs) and engaging with productive, extractive, or service businesses seeking to improve the production and environmental conditions of their value chains, and overall to create alliances for CE implementation. The agenda includes promoting the minimization of waste, reuse, and recycling, and developing technical standards establishing packaging requirements that minimize environmental impact. Altogether, the roadmap includes short-term (1 year), medium-term (3 years), and long-term (5 years) actions, and four approaches that seek to provide the conditions for companies to progressively migrate to the circular model while optimizing resource use: these are (1) sustainable industrial production; (2) sustainable consumption; (3) use of discarded material and industrial waste management; and (4) innovation and financing. The government has also commits funding to develop specific projects, such as coconut shells as an energy generator (eco carbon), and eggshells converted into calcium-salts [25]. To summarize the CE approach of the country, it can be stated that the guiding structure to integrate CE practice into a specific sector is present and can be referred to while designing a standard of operation for the water sector.

Country 2: Colombia

Columbia, in its role as the president of the Caribbean Regional Coalition on Circular Economy, is steering the CE agenda strategically. The Ministry of Environment and Sustainable Development developed the National Circular Economy Strategy, which outlines an agenda for new economic development by optimizing production efficiency and the consumption of materials, including the continuous valorization of resources, closing the cycles of the materials and generating new models of business and industrial symbiosis [26]. Alongside this, the agenda is reducing the carbon and the water footprint in production and consumption pathways. The management mechanisms include the below-listed dimensions:

- Supporting innovations in regulatory mechanisms and generating a legal framework conducive to technological innovation, entrepreneurship, and investment in CE projects and programs—this point is very relevant for exploring the circularity potential for water quality management;
- Clarifying CE incentives, as this dimension is currently under-reflected in CE operational principles, including in the water sector; therefore, this mechanism holds the potential to scale a 'buy-in' of circularity at the sectoral level;
- Research and training, through existing knowledge networks, and promoting the inclusion of circular economy content in existing programs;
- International cooperation and information, which involves the construction of a CE information system;
- Communication and citizen culture to ensure that society has a common objective in terms of efficiency in consumption and production models, and balanced participation of the public and private sectors.

The underlying pillar of the strategy allows progress in the productive transformation in short-, medium-, and long-term scenarios [26]. Fitch-Roy et al. [27] outline how, in Colombia, the National Circular Economy Strategy is initiating the transition from a linear to a CE, pointing to recycling usable solid waste instead of throwing/burning, as explained by Garcia and Cayzer [28]. The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) partnered with the State, the private sector, and civil society to identify innovative business models in the recycling sector and influence consumer habits. Furthermore, this partnership in the state aims at the integration of recyclers who collect usable materials in Bogotá and Cúcuta into the CE value chains, and at supporting models for formalization and business management with inclusive participation of local stakeholders. The focus on the gender component is a significant point towards an inclusive CE transition in this country. To that context, the pilot programs seek to incorporate into the formal economic circuits of waste recycling a total of 1500 recyclers, of which at least 30% are women [29]. Noting the progress of CE guidelines in various sectors, the country seems to have both the experience and capacity to scale these practices for managing water and wastewater-related challenges.

Country 3: Costa Rica

This country is in a process of developing a CE policy and implementing supporting policy frameworks. Costa Rica institutionally established the Bioeconomy Strategy, an initiative based on existing CE knowledge, ecology, resilience, decarbonization frameworks, and healthy competition for resource use in production and consumption processes. The interventions involved the integration of public and private proposals, investment orientation, the development of incentives, and the articulation of production and the environment: the pathways hold significant value for scaling in the water sector. Faced with a post-pandemic scenario, Costa Rica has set up scenarios for production systems: the challenge of more efficient production (or economic reinvention), and that of maintaining value chains to preserve jobs and livelihoods. This implementation is projected for a 10-year tenure and comprises three phases: impulse, scaling, and consolidation [30]. The guide "Step by Step to Facilitate the Transition of Local Governments Towards a Circular Economy: Case of Costa Rica" presents the importance of the role of stakeholders in the circularity transition, and provides a methodology with the following five step-wise actions plan [31].

Step 1: Conduct a review of the regulatory frameworks and strategic policies, together with the systematization of statistical information of a social, economic, and environmental nature, identifying the existing experiences in the circular economy and actors.

Step 2: Apply the vision and local objectives aligned with the CE to guide the prioritization of sectors of focus through the diagnosis of circularity generated and participation of sectors of focus.

Step 3. Identify circular opportunities in each focus sector by mapping and prioritizing CE opportunities in and for each sector.

Step 4: Identify policy actions to support circularity opportunities, mapping of actions, and prioritization.

Step 5: Develop the roadmap through the determination of business models and investment.

These steps provide a clear direction to shape the design, plan, and implementation process for most sectors, and also the water and wastewater part of it.

Country 4: Dominican Republic

This nation is part of the first steering committee of the initiative that seeks to advance CE at the national scale. The country, in its domestic development plan, incorporated a strategy that envisions responsible citizenship and competitive placing in the global economy, building on the fact that is resource-rich, and its vision to be innovative and sustainable is evident in its national circularity supporting strategy. The interest in water efficiencies such as energy efficiency and renewable energies are integral to the broader definitions of the nation's CE roadmap, highlighting the transformation frameworks outlined for technology application and Industry 4.0 vision towards CE agenda mainstreaming [32].

Country 5: Ecuador

The CE landscape in Ecuador shows that waste management is an exclusive competence of municipal administrations. Solid waste management includes the prevention of residue production, the classification of organic and inorganic waste, the organization of collection and transport, and the recycling and final disposal of materials [22]. The White Book on Circular Economy in the country defines the below-listed four strategic dimensions for action:

- Policy and financing;
- Sustainable production;
- Responsible consumption;
- Comprehensive management of solid waste.

It is divided into two phases; in the first, i.e., 'research and workshops with the public and private sector', the agenda included analysis of the influence and relevance of circularity, along with discourse on state-level legislation, prioritization of macroeconomic sectors, and examination of waste management from December 2019 to June 2020. Consequently, several CE-related contributions were noted that supported the national development plan, as well as the degree of application of CE in all public policies. It was identified that 43% of the public policies evaluated make direct or indirect mention of the concept. The second phase, called "Strategic lines of action", was developed in the period from November 2020 to April 2021, suggesting the participation of strategic lines of action in four pillars defined for the application of CE in Ecuador, executed through a combined top-down and the bottom-up analysis. The process included elements of divergence, meaning a broadening of the focus and identifying best practices, benchmarks, visions of various actors, and convergence; that is, to propose the strategic lines and final actions [23]. The existing approaches to support and promote CE in the country are evolving, maturing, and finding ways to include sectoral processes, including solid waste and wastewater management.

3.3. Regional Review of Water Circular Economy in the LAR

The bibliographic review process to collect information on scientific, technological, social, and economic research provided the results shown in the PRISMA diagram (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), in Figure 3A. In total, 225 articles were compiled with the established search criteria, of which included 130 articles were from magazines, 19 were from book chapters, 11 were books, three were conference proceedings, three were doctoral theses, etc. Duplicate articles (92 articles) were removed, after checking the quality of the literature, that the keywords strictly appeared in the documents, and that the content of the information was relevant to the subject; a total of 56 articles were obtained to review. It is worth noting that the evolution of the development of publications in the last five years (Figure 3B) has been growing, demonstrating the relevance of the topic of "water" and "wastewater" topics on discussions of the circular economy in academic, scientific, and technological fields. The gray information was made up of 36 documents, mainly governmental reports, from the Bank of the World Group, the Ellen MacArthur Foundation, and ECLAC, and actors and institutions that have primary roles in the transition to the global circular economy.

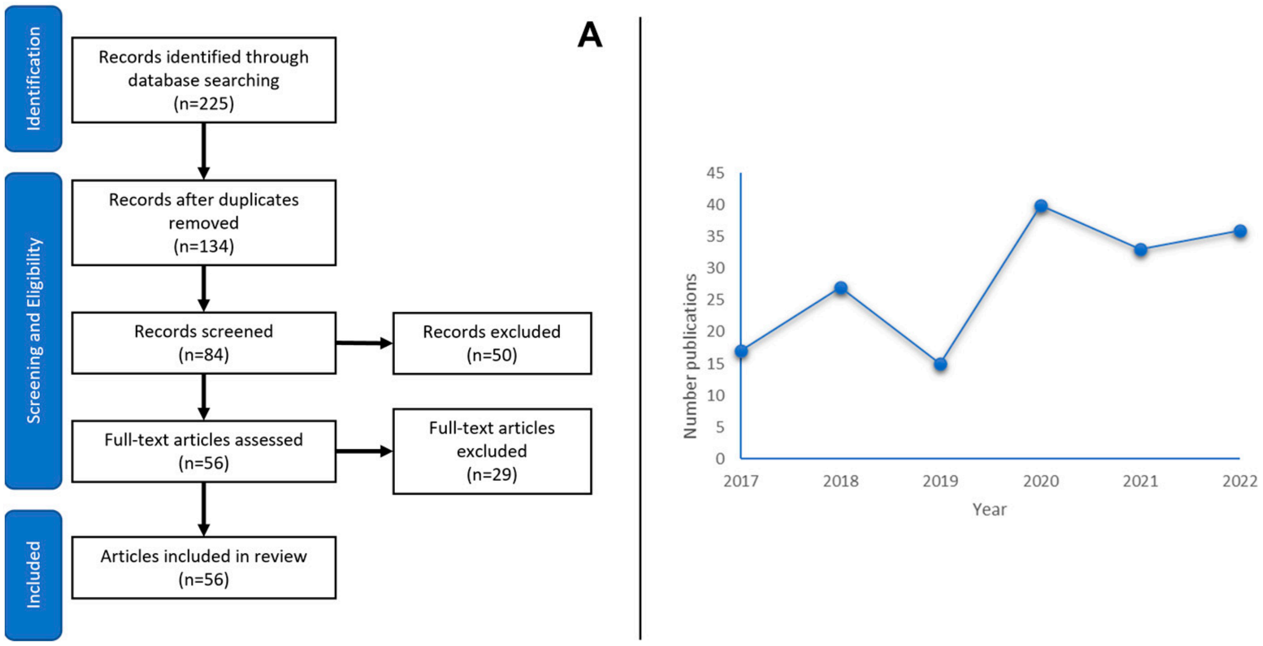

Figure 3. (**A**) PRISMA flow diagram (adapted from Page et al. [20]). (**B**) Evolution of scientific publications in the last five years on the topics of "water" and "wastewater" on CE in the LAR.

For the long-term sustenance of water resources in the region, it is important to develop cost-effective, energy-sensitive, and environmentally reliable solutions that are scalable and sustainable. Betancourt Morales and Zartha Sossa [33] show a review of the existing information and publications in 2020 that suggests that CE in the LAR is often generalized as an economical alternative for waste management. Table 1 overviews how the concept of the CE is integrated into the "water" and "wastewater" sector in the LAR, noting that the CE is gaining attention with the 6Rs strategy (reduce, reuse, recycle, reclaim, recover, and restore) to keep water in circulation for longer and reduce the burden on natural systems [34].

Table 1. CE integrated into the LAR in the "water" and "wastewater" sector by the 6Rs.

Action/Strategy	Area of Study	Description	Objective	Application	References
(1) Reduction in wastewater generation	Sustainability	Energy, water and environmental systems. River management of the urban environment.	Monitoring of Urban River Restoration Index with Flood Risk Index.	Rio de Janeiro-Brazil	[35]
		Blue water footprint.	The trends in BRIC's natural resources (biomass, fossil fuel, minerals and water) consumption.	Brazil	[36]
		Water footprint.	PetStar, collecting and treating rainwater and neutralizing its water footprint.	Mexico	[14]
(2) Reclamation (removal of pollutants)	Sustainability	Methodology for the evaluation of wastewater treatment systems.	Nature-based solutions-wetlands	Mexico and Guatemala	[37]
		Wastewater management strategies.	Wastewater quantity, availability of WWTPs, and the corresponding removal rates for nutrients, suspended solids, and organic matter in the basin of Lake Atitlan.	Guatemala, the Lake Atitlan basin	[38]
		Recycling and reuse.	Policymakers	Brazil and Mexico	[39,40]
	Operation	Tool for wastewater treatment plant operation.	MBR technology	LAR	[41,42]
	Treatment	Microalgae for the treatment of agroindustrial wastewater.	Biologization of industrial processes using the purification capacity of microalgae to decontaminate wastewaters.	Brazil and Argentina	[43,44]
(3) Reuse of treated wastewater	Sustainability	Recycling and reuse.	Global outlook on the state of domestic and industrial wastewater production, collection, treatment and re-use.	LAR	[45–47]
(4) Recycling	Technology	Collect rainwater.	Urban Island, collecting rainwater through a piping system and bringing it to homes, schools, and isolated zones.	Mexico	[48,49]
(5) Recovery of resources as nutrients and energy	Sustainability	To identify appropriate technologies and their environmental impacts.	Application decision-support tools: sanitation planning software (Santiago) and life cycle assessment (LCA).	Wastewater treatment plant (WWTP) in Campo Grande, west-central Brazil	[50]
		Technologies applied in the water and sludge line are presented, covering a broad range of resources.	Widely used and effective strategies applied at pilot- and full-scale settings to valorize the wastewater treatment process.	Peru, Chile, Brazil, and Colombia	[51,52]
		Energy recovery from solid waste and wastewater	Explore the limits for energy generation from waste and wastewater sources should the efficiency of energy recovery be pushed further through development of existing technology.	LAR	[53,54]
		Circular agriculture and foot production.	Transforming the processes into a more efficient system, so inputs, and waste would be minimized; water and nutrients are key factors in the whole chain of food production.	Colombia and Chile	[55,56]
	Technology	Minimize the contamination of coastal land and water	A novel concept that combines aquaculture with the production of macroalgae.	LAR, especially Ecuador	[57]
		Cogeneration - anaerobic digesters.	Convenience of upgrading the covered lagoon solution to a more complete waste bio-refinery that not only focuses in electric power generation but also recovers process heat and biofertilizers as by products.	Brazil	[58]
(6) Rethinking how to use resources	Contamination	Plastics in rural communities.	Reducing plastic pollution-taking care of the water-air-soil nexus, and microplastics analysis.	LAR, Peru	[59,60]
	Technology	Biogas generation in anaerobic digesters.	Advances in technology to induce biogas generation in anaerobic digesters, including pretreatment methods.	Mexico, Colombia and Brazil	[61]
	Sostenibility Technology	Water management of the mining industry.	Challenges of conventional and innovative membrane processes for water management of the mining industry value chain, with specific focus on the remediation of waste aqueous streams and reuse of clean water.	Chile, especially Colombia	[62,63]
	Sustainability	Manufacturing of baseboards made of recycled expanded polystyrene.	The system's potential environmental impacts were assessed by two widely used methodologies, life-cycle assessment and energy analysis.	Mexico	[64]
		Governance Capacity Framework was used as a method to evaluate the governance capacity of the town to implement these systems.	Transformation towards: technological and urban waste and wastewater are governed.	Colombia	[65]
		Circular economy technologies	Agroecosystems provide various ecosystem services, such as the regulation of soil and water quality, carbon sequestration, maintenance of biodiversity and insect pollinators or pest controllers, as well as cultural services.	Brazil	[66]
		Bioeconomy	EC supports activities aimed at developing sustainable and productive agriculture, a competitive and sustainable agri-food sec- tor for a healthy and safe diet, unlocking the potential of aquatic living resources and promoting marine and maritime re- search activities, fostering sustainable and competitive bio-based industries and promoting development.	Colombia, Peru, Chile, Argentina, Uruguay and Costa Rica, Brazil, Paraguay and Uruguay	[67–70]

Research in the past years focusing on circularity in the water sector reflects that, on a macro-level, it includes examined and assessed how industry, countries, and businesses are taking note of existing CE knowledge in the design and implementation of circular economy models toward the management and handling of waste; however, in most instances the solid waste management challenges are often more explicitly considered than wastewater management [71]. To elaborate on the above statement, we identified key initiatives and opportunities for the water sector in the LAR, mainly during the past 5 years, namely those that contribute to improving wastewater management, water reuse, promoting water security, and generating regulations. These initiatives, because of their high importance, have already received significant support and funding commitments for development (more details are in Table 2).

Table 2. Overview of Circular Economy projects and programs in the LAR focusing on the water sector and the scale of investment.

Project Name/Sectoral Focus	Promoter	Year	Country	References
Atotonilco WWTP project/Wastewater Reuse	Mexican Federal Government	2017	Mexico	[72]
Water Security, Circular Economy and Wastewater-to-Resource (WW2R) in Latin America and the Caribbean: Analytical Research and Case Study Implementation/Water and Sanitation, Integral Management of Water Resources	Inter-American Development Bank (IDB)	2019	LAC	[73,74]
Circular Economy in the Gastronomy Sector: An Innovative Food Recovery Model to Improve Lives/Sanitation, Solid Waste, Food Recovery	Inter-American Development Bank (IDB)	2020	Peru	[75]
Optimizing Wastewater Treatment Plants in the Metropolitan Area of São Paulo	SABESP, Inter-American Development Bank (IDB)	2021	Brazil	[76]
Right of Access to Goods: Water for Development (DAPED)	Institute of Scientific and Technological Studies from Quilmes National University (IESCT-UNQ) and the National Institute of Agricultural Technology (INTA)	2014	Argentina	[77]

Circularity in the region is also discussed concerning water crisis settings, building on the fact that critical cases of drought and dry conditions characterize the LAR: in Peru, 40% of its territory, home to >80% of its population, is classified as arid or semi-arid; in Argentina and Mexico, >60% of its territories are classified as arid land. FAO (2017) reports that droughts affect small farmers and drastically affect island lands, and significantly alter the provisions of water conservation and supply–demand dynamics [74]. Thus, it is important to consider that water reuse represents one of the most important alternatives to conventional freshwater sources when dealing with water scarcity and the water-related impacts of climate crises [78]. Moreover, some countries have started to use the CE in the water sector as a pathway to reshape water management systems and regulate the water withdrawal required to level out pressure on water reserves [41].

The reclamation and reuse of wastewater is a priority for countries with significant problems regarding hydric stress/water scarcity. Of the countries in Latin America, Mexico is at the top of the list of countries reusing wastewater, with almost 15 hm3/d; however, this regeneration is happening without additional treatment. Chile, Peru, Argentina, and Colombia are reusing water, although in a lower proportions when compared with Mexico. Bolivia is among the countries with a considerable ratio of water reuse in comparison with is overall withdrawal of water [10].

The rural waste management sector is also highlighted as key to reducing domestic plastic pollution sources at the downstream level. Rural water resources may vary regionally and include surface and groundwater, in addition to processed water in tanks or bottles. The storage, acquisition, and quality of water resources will likely have an impact on the prevalence of plastic contaminants. The rural population in Latin America and the Caribbean region accounts for around 19% of the total population. The countries with the highest percentage of rural population are Guatemala (48%), Honduras (42%), Nicaragua (41%), Paraguay (38%), and Ecuador (36%). In rural communities, the main plastic pollution contamination routes are fed by domestic waste, tourism, agricultural activities, fishing, and regulated waste disposal. These routes are associated with uncontrolled disposal options in underdeveloped rural waste management infrastructures that pollute the soil–air–water nexus. These countries have implemented important public policies regarding the use of plastic, and the impact of such can be noted in the water and wastewater sectors [59]. Some examples are explained to expand on those points.

Case 1: Brazil

In this country, SABESP (Companhia de Saneamento Básico do Estado de São Paulo S.A.) is the state-owned water utility for São Paulo state, and it has been entrusted with the mission of universalizing wastewater collection and treatment by 2033. Consequently, SABESP faces the urgent need to expand its wastewater treatment capacity and improve the quality by using existing plants to receive and treat larger volumes of wastewater. A joint initiative between SABESP and the 2030 Water Resources Group (WRG) of São Paulo aimed to create a program defined as high-priority actions and investments to maximize the treatment capacity of existing infrastructure. The program is part of a CE strategy to reduce the generation of waste and pollution by improving both wastewater treatment processes and the quality of the final effluent. The program will also allow SABESP to adopt a “from waste to resource” strategy and recover and reuse wastewater treatment byproducts (water, energy, and biosolids) in the future. It is noted that a closer look is needed at changes in legislation accompanying CE programs that SABESP’s operations must comply with, as well as with the conditions defined in the environmental operating licenses of the Wastewater Treatment Plants (WWTPs) [76]. Other actions aimed at implementing CE in the management of water resources could include managing the demand for irrigation water and matching crop type to local water availability to improve irrigation efficiency. In addition, there are “closing loop” practices focused on the reuse of wastewater in industrial cycles and crop irrigation, as it is economically advantageous to reuse water in agriculture and the industrial cycle of sugarcane washing [79]. For Brazil, the institutional infrastructure is maturing to support CE adoption in various sectors, including in the water sector. Espirito Santo is another case of study that used nature-based upstream solutions to benefit landowners with payment-for-ecosystem services (PES), from regulatory compliance, and from higher income gained through productive practices through green infrastructure for source-water protection. The Watershed Management and Restoration of Forest Cover project implemented a payment-for-ecosystem services (PES) scheme. At the cost of USD 16.2 million, the project paid upstream landowners to reforest, conserve, restore, and manage their land in ways that curbed erosion and kept sediment loads from being deposited into the watershed. The project also included a USD 7.4 million pilot project to reduce the silt loads hampering operations of the water treatment plant. This is an example of a holistic approach that combined reforestation with better land management. The estimated economic benefits of these interventions range from USD 13 million to USD 18 million, with an internal rate of return ranging from 12.7 percent to 16.8 percent. Estimates indicate that the water utility, CESAN (Companhia Espírito Santense de Saneamento), will save a total of BRL 15.5 million over 30 years in avoided costs for new filtering equipment and maintenance [80].

Case 2: Argentina

Due to the increasing impact of climate change, and other indirect drivers such as territorial conflicts, pressure on freshwater sources and, overall, the challenges of water management, have amplified, thereby directly influencing the quality of human life, agricultural and industrial production, and the process of ecosystem regeneration. In Argentina, 22% of households currently lack access to a safe water network and 41% lack access to the sanitation system, and approximately 8 million inhabitants lack access to drinking water at home. Furthermore, about 448,000 of the households without access to drinking water are structurally poor, and 82% of rural households lack drinking water.

A rural development program for isolated and scattered communities in the province of Chaco, Argentina, was started by the national agency Water for Development (DAPED) in coordination with the Institute of Scientific and Technological Studies from Quilmes National University (IESCT-UNQ), with the support of the Network of Technologies for Social Inclusion (RedTISA), the National Ministry of Social Development and the National Council of Social Policies, and financing from the Science and Technology Ministry. It aimed to design, implement, and manage water via long-term participatory action research (PAR) projects that consisted of the creation of a multi-stakeholder team based on a long-standing collaborative and transformative approach oriented to the generation of practical solutions for social and environmental problems [77]. The strategy used in this program focuses on four aspects:

1. Water for human consumption from rainwater collected in home cisterns;
2. Second usage for water; that is, the greywater produced by personal hygiene activities, washing clothes, and utensils, is reused to flush the toilet;
3. Scaling measures for water conservation and reuse, such as a bio-digester that uses treated water, in combination with that from a well, to water orchards annually;
4. Water for used by animals and plants.

Overarchingly, the nation seems prepared with a working strategy that can serve as a reference for sectoral commitment to adopt and apply circularity.

Case 3: Mexico

For the water sector in Mexico, in 1989, the National Water Commission (CONAGUA) was created by presidential decree as a decentralized agency of the Ministry of Agriculture and Hydraulic Resources. This agency is the only federal authority empowered to manage national waters. Currently, CONAGUA is a decentralized agency of the Ministry of the Environment and Natural Resources, and it is in charge, among other functions, of administering and preserving the national waters of Mexico, establishing national hydraulic policies and strategies, operating the national meteorological service and liaising with agency authorities to work together on actions that benefit the water sector.

In 1992, the National Water Law (NWL) was created, which constituted an important turning point towards integrated water resources management (IWRM). In 2004, an important reform to this Law was carried out to strengthen the IWRM process, establishing a decentralization process of some key functions to municipalities, river basin organizations, and irrigation districts. The NWL includes obligations by CONAGUA to generate the participation of water users in the administration of the system and its services. CONAGUA was then supported by significant investments to improve wastewater treatment plants, replace supply sources, and modernize the technology of the agricultural irrigation system technology. Up to now, 13 river basin organizations have been created, along with 26 river basin councils, that work with 35 river basin commissions, 47 river basin committees, COTAS (Technical groundwater committee), and 39 local clean beach committees [73], all of which constitute the actors of the Basin Commission.

The integration of water in the CE models is aimed at addressing wastewater reuse after treatment and plugging this process into IWRM implementation. Toward this, some case studies in Mexico, such as the CE pathways, include CE innovations for wastewater treatment in the Presa Guadalupe [81]; CE and water supply for lodging companies in Acapulco, Guerrero [82]; CE in the tourism sector in Puerto Vallarta [83]; and CE Good Practices in City Energy Efficiency [84]. The involvement of the CE in boosting the operational efficiency of the water sector reflects that Mexico has the potential to apply the

CE framework to water and wastewater management goals and targets [85]. However, it is also noted that the federal government must commit to the transition of the wastewater treatment policy in supporting circularity mandate at multiple levels-municipalities, stakeholders, and water users.

Some regions in the country have decided to manage water at the subnational level, strengthening the decentralization process, such as in Baja California, Nuevo León, Tabasco, Oaxaca and Querétaro, San Luis Potosí, it can be interpreted that CE strategies have to be planned and adopted at that scale [13]. The state government receives economic incentives for the operation of wastewater treatment plants, and they are trying to convince some farmers to use treated wastewater [79]. From the private sector perspective, companies in Mexico seek the benefits of integrating circularity frameworks water into their operations processes. For example, Audi México, to conserve natural resources while creating sustainable economic value for its market product, created 25,000 blind pits to recharge the aquifer in the town of San José Ozumba and replaced the extraction of water from wells through the development of a lagoon to capture rainwater (surface area 7 hectares, and storage volume of 175,000 cubic meters) to satisfy the demand of 100,000 m^3. In addition, the water used in its industrial and sanitary processes is treated in a biological plant located in the same facility, favoring its reincorporation in the production processes [85].

For CE application in the wastewater sector, the Atotonilco treatment plant contributes to the sustainable use of water in the Metropolitan Area of the Valley of Mexico. It is the largest 261 wastewater treatment plant in the LAR, and one of the largest in the world. This plant, depending on the origin and end-use of the wastewater, takes advantage of all the by-products and irrigates several hectares of production area in the Mezquital Valley; the sludge produced by the plant's processes is used to generate thermal energy and electricity, and biosolids are produced that can be used for the improvement of soils in forest areas and for agricultural uses [72]. However, the adoption of the CE in Mexico is still low, except for sectors that, due to their dynamic operations, have advanced in following international CE standards, such as the automotive or paper industries, as well as some industrial branches of global corporations that are trying to address the competitiveness and profitability of their companies, while creating social value.

Case 4: Chile

The country incorporates CE in the water sector as prolonged drought and rainfall deficits are becoming common and frequent, and a significant drop in groundwater levels and average flows of surface water, along with the retreat of glaciers, is sounding the water stress alarm [19]. A biofactory project was launched in 2017 as a pioneer in circular solutions for wastewater treatment in Santiago and the sector in general by promoting a paradigm shift from treatment to resource management, from a linear approach to a circular one. Herein, biofactories extract and supply new and valuable resources, such as electricity, natural gas, fertilizers, agricultural or clean water, from what was previously considered waste. The company's goal is to be zero waste, energy self-sufficient, and carbon neutral in its three wastewater treatment plants in Santiago by 2022 [86]. Furthermore, the General Water Directorate (DGA) evaluated a pilot study in the Rapel river basin in a joint effort with Fundación Chile based on socioeconomic and environmental indicators to establish the areas in which water consumption can follow sustainability guidelines. The evaluation of water consumption included all production sectors, such as domestic, forestry, agriculture, mining, energy, and industrial, towards a comprehensive vision of improving sustainable water management [87].

Case 5: Peru

In addition, the creation of the National Water Authority (ANA in Spanish) and the enactment of Law 29338, the Water Resources Law created in 2009, along with the incorporation of sustainable technical standards in the supply–demands landscape (mostly of the private sector) of the water sector triggered good practices in the management of water resources since it went from an agrarian to multisectoral-modern vision. ANA instituted the Blue Certificate to certify companies that show efficient and less polluting standards in their operations. This action prompted an opportunity to boost CE in the water cycle and related operations [10,88]. This intervention helped Chili River to recover and benefit the city and its residents as the agreement between Cerro Verde, a mining company near Arequipa, and SEDAPAR, the municipal water utility, was brokered. The mining company agreed to take responsibility for designing, financing, building, and operating a wastewater treatment plant to handle about 95 percent of the city's wastewater and to use some of the treated water for its mining processes and discharge the rest into the river to be used downstream by farmers. In tandem, the mining stakeholders with this agreement secured the rights to expand its operations, while the municipality could save costs and focus on building and operating wastewater treatment plants [89]. Another case of study is in the south of Peru, where 560,880 panels were installed to develop a CE process to obtain water from the atmospheric humidity, anticipating that the production of clean water could serve to create green spaces in the dry/desert environment with the use of clean energy, and thus, with this technology, closed loops systems can be put into action [90].

Case 6: Bolivia

As we note circularity trends and patterns from the LAR, the water sector-focused CE intervention in Bolivia is mainly focusing on the reuse of wastewater at the regional level between the collaboration of the municipal government and industry. In Bolivia, in Cochabamba, for example, wastewater is extensively used in urban and peri-urban agriculture. Both vegetable and fodder crops are irrigated with polluted water, and diluted or partly treated municipal and industrial sewage containing high concentrations of pathogens, heavy metals, and salts [91]. In the country, the Municipality of Cliza was aware of the discharge of wastewater collected from the urban center (population of 10,000 people) directly into the Cliza River and decided, then, to implement a wastewater treatment plant. However, the settlements around the area opposed the construction because it would generate bad odors and diminish the value of their land. Noting that CE intervention can be sustainable over the long term if conflict with the community is resolved harmoniously, the Municipality and the NGO AGUATUYA proposed the implementation of a new treatment system capable of producing water that could be used for crop irrigation without creating odor or mosquito problems. A community of farmers provided the land needed (approx. 8000 m^2) in exchange for the right to use the treated water for irrigation. The Municipal system, built with the support of the Swedish International Development Cooperation Agency, currently treats and reuses 100 percent of the wastewater generated in the urban center for irrigation [92]. Another CE example of wastewater is in El Alto city, where urine, feces, and graywater are separated at the household level. The urine is reused as liquid fertilizer, composted feces are reused as solid fertilizer, and greywater is reused after treatment to replenish wetlands and irrigate greenspaces [93]. For Bolivia, these examples are setting a reference and pace for national, regional, and international commitment to support, fund, and scale CE practices, demonstrating the potential for addressing environmental restoration and social impact.

4. Discussion

The Circular Economy has emerged as a response to the current unsustainable linear model of "take, make, consume, and waste". The transition from a linear model to a CE requires a clear and inclusive economic justification to project the rate of return on investment [94]. However, so far the water sector has not been systematically included in high-level circular economy strategy discussions. However, interest in the water sector is growing. The COVID-19 pandemic has revealed significant shortcomings in the linear economy, calling for the need for new and innovative public initiatives and programs. We reiterate that the CE offers an alternative framework for a more resilient and inclusive economic model for the region through technology, and guarantees both added value and sustainability [95–97]. As noted by Savino et al. [98], the adequate management of waste is important and requires the backing of institutions responsible for managing them at the local level. In addition, the generation of a suitable body of law, with feasible and effective regulations that are easy to apply while avoiding overlaps between different agencies, and professionalizing the sector through appropriate training and creating information systems, designed not only for reporting purposes but also for effective decision-making and monitoring, is crucial. The above-stated points apply to wastewater systems [99,100], although we believe that context-specific solutions should be designed, taking note of national and local settings and socioeconomics. The first step to developing a CE-pro developing wastewater treatment plant is to optimize the operations of the infrastructure already installed so that plants can reach maximum performance with the minimum capital and operational expenditure. It is suggested that existing infrastructure could be considered before investing in new plans and designs, as integration is key to better 'buy-in', scaling, and optimizing the cost-benefit equation, as well as identifying nature-based upstream solutions, as in the case of the Greater Vitória Metropolitan Region in the State of Espirito Santo, Brazil.

As the World Bank Report states, CE trends in the water sector in various countries in the LAR have showed that long-term planning promotes and supports IWRM and the integrated implementation of SDGs [4]. In many countries in the LAR, the policy of delegating water-related services to companies at the municipal level has been criticized in recent years for being a short-term governance strategy, and it is advised that the CE could address the need for participatory and inclusive elements in water governance. Additionally, building on existing best practices at the regional and national level could add value towards the implementation of the circularity agenda; take, for instance, the program from Brazil that informs the logic underlying traditional expansion strategies, focusing instead on priority actions and investments to identify and eliminate bottlenecks and maximize efficient treatment processes in each plant [101].

This study shows, from the timeline with the principal policies towards CE in the LAR, that governmental regulations also require focus on the reclamation and reuse of wastewater to increase water resources by paying particular attention to the risks for human health, the recovery of nutrients, or highly added-value products valorization of sewage sludge, and/or the recovery of energy [10]. Some countries, such as Mexico, are leading in the LAR; however, considering another region, such as the European Union, 18 out of 27 countries are already reusing reclaimed wastewater at some level, and many wastewater treatment plants have reached energy self-sufficiency by producing up to 150% of their energy requirements. Almost all of them have solid legislation or guidelines with limits or restrictions in the use, according to quality water parameters. The point is that discussion is needed to identify context-specific strengths, gaps, and needs and channel efforts to systematically address them by boosting financial, technological, and human capacities.

5. Conclusions

This study examines the framings and operational pathways for circularity in the water and wastewater sector in the LAR, which could be used as a guideline for similar studies in Africa and Asia as resilience lenses. We anticipate that the examination of patterns, trends, opportunities, and barriers of CE at multiple scales can help to boost an understanding of interlinkages and will support regional and national policies towards the integration and implementation of the SDGs in the LAR. It is clear that regional, national, and context-specific (socioeconomic, sociocultural, and socio-political aspects) strategies should be put in place to support circularity, aligning CE principles with the SDG agenda, such as SDG target 6.3 on water quality management reducing pollution, including the release of hazardous chemicals and materials and decreasing the proportion of untreated wastewater, and considerably increasing recycling and safe reuse globally. For each county, and the specific/sectoral context in the LAR, circularity models and practices have to be adjusted to fit the local needs; for instance, in Mexico, the areas of opportunity identified to promote the CE transition include investment in technology transfer, as well as mechanisms that allow the exchange of knowledge between sectors and stakeholders that already apply CE principles with others that are intending.

The CE provides a systemic and transformative approach to delivering water supply and sanitation services in a more sustainable, inclusive, efficient, and resilient way. Therefore, in each county and regarding the specific/sectoral context in the LAR, circularity models and practices have to be adjusted to fit the local needs. Areas of opportunity identified in this study promote the CE transition by technology transfer, as well as mechanisms that allow the exchange of knowledge between sectors and stakeholders already applying CE and others that are intending to. Overall, our assessment elucidates the need to factor the interlinkages and nexuses between multiple sectors, for instance, while designing and operating the CE agenda for a specific sector such as water and wastewater management. In addition, financial pledges to achieve sustainability could be cognizant of the role of the CE in achieving SDG goals and targets.

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References

1. Kennedy, S.; Linnenluecke, M.K. Circular economy and resilience: A research agenda. *Bus. Strategy Environ.* **2022**, *31*, 2754–2765. [CrossRef]
2. Bocken, N.M.P.; Olivetti, E.A.; Cullen, J.M.; Potting, J.; Lifset, R. Taking the Circularity to the Next Level: A Special Issue on the Circular Economy. *J. Ind. Ecol.* **2017**, *21*, 476–482. [CrossRef]
3. Foundation, E.M. What Is a Circular Economy? 2023. Available online: https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview (accessed on 22 February 2023).
4. Anna, D.; Rodriguez Diego, J.; Amadei Carlo, A.; Midori, M. Water in Circular Economy and Resilience (WICER). Technical Report, International Bank for Reconstruction and Development. 2021. Available online: https://openknowledge.worldbank.org/bitstream/handle/10986/36254/163924.pdf (accessed on 22 February 2023).
5. European Commission. Global Alliance on Circular Economy and Resource Efficiency (GACERE). 2021. Available online: https://ec.europa.eu/environment/international_issues/gacere.html (accessed on 22 February 2023).
6. Smol, M.; Adam, C.; Preisner, M. Circular economy model framework in the European water and wastewater sector. *J. Mater. Cycles Waste Manag.* **2020**, *22*, 682–697. [CrossRef]
7. Sparkman, D.; Sturzenegger, G. *Why Business as Usual Will Not Achieve SDG6 in LAC*; Technical Report IDB-TN-1301; Inter-American Development Bank: Washington, DC, USA, 2017. [CrossRef]
8. de Miguel, C.; Martínez, K.; Pereira, M.; Kohout, M. Economía circular en América Latina y el Caribe: Oportunidad para una recuperación transformadora. In *Documentos de Proyectos (LC/TS.2021/120)*; Comisión Económica para América Latina y el Caribe (CEPAL): Santiago, Chile, 2021.
9. Chatham House. The Royal Institute of International Affairs. Circulareconomy. Earth, 2022. Available online: https://circulareconomy.earth/ (accessed on 22 February 2023).
10. Guerra-Rodríguez, S.; Oulego, P.; Rodríguez, E.; Singh, D.N.; Rodríguez-Chueca, J. Towards the Implementation of Circular Economy in the Wastewater Sector: Challenges and Opportunities. *Water* **2020**, *12*, 1431. [CrossRef]
11. Fernandes, A.G. *Guidelines for the Formulation of a National Roadmap towards the Circular Economy in Brazil*; Technical Report RFP/UNIDO/7000003530; Americas Sustainable Development Fundation: Oranjestad, Aruba, 2020.
12. Muñoz-Melendez, G.; Delgado-Ramos, G.C.; Diaz-Chavez, R. Circular Economy: Recent Trends in Global Perspective. In *Greening of Industry Networks Studies*; Springer Nature: Singapore, 2021; pp. 497–523. [CrossRef]

13. Delegation of the European Union to Mexico. Market Opportunities on Circular Economy in Mexico, 2021. Available online: https://www.rvo.nl/sites/default/files/2021/04/Market-opportunities-Circular-Economy-Mexico_1.pdf (accessed on 22 February 2023).
14. Dieleman, H.; Martínez-Rodríguez, M.C. Potentials and Challenges for a Circular Economy in Mexico. In *Greening of Industry Networks Studies*; Springer International Publishing: Berlin/Heidelberg, Germany, 2018; pp. 9–24. [CrossRef]
15. Sepulveda, C.A.; Shultz, C.J.; Peterson, M. Toward Sustainable Development for Emerging Economies: Statistical Capacity Indicators in Chile and the Andean Region. In *Marketization*; Springer: Singapore, 2020; pp. 235–258. [CrossRef]
16. Ministerio del Medio Ambiente. Hoja de Ruta Nacional a la Economía Circular para un Chile sin Basura 2020–2040. Technical Report, Gobierno de Chile, 2020. Available online: https://economiacircular.mma.gob.cl/wp-content/uploads/2020/12/Propuesta-Hoja-de-Ruta-Nacional-a-la-Economia-Circular-para-un-Chile-sin-Basura-2020-2040.pdf (accessed on 22 February 2023).
17. Cornejo Martínez, C.A. Reducción de los desechos plásicos en Chile: Elementos para profundizar nuestra regulación. *Rev. Derecho Ambient.* **2020**, *14*, 97–125. [CrossRef]
18. Ministerio Vivienda y Urbanismo. Roadmap for Waste Produced by Construction and Demolition 2035. Technical Report, Gobierno de Chile, 2020. Available online: https://construye2025.cl/rcd/wp-content/uploads/2020/08/HDR-PAGINA_RCD_200825.pdf (accessed on 22 February 2023).
19. Ministerio del Medio Ambiente. Roadmap for a Circular Chile by 2040. Technical Report, Gobierno de Chile, 2021. Available online: https://d1bf23g64f8xve.cloudfront.net/sites/default/files/2022-03/RoadmapforaCircularChileby2040.pdf (accessed on 22 February 2023).
20. Ellen MacArthur Foundation. Chile's CircularEconomy Roadmap: Collaboration for a Shared Action Plan. In *Universal Circular Economy Policy Goals*; Ellen MacArthur Foundation: Cowes, UK, 2021.
21. Burneo, D.; Cansino, J.M.; Yñiguez, R. Environmental and Socioeconomic Impacts of Urban Waste Recycling as Part of Circular Economy. The Case of Cuenca (Ecuador). *Sustainability* **2020**, *12*, 3406. [CrossRef]
22. Centro de Innovación y Economía Circular. Libro Blanco de Economía Circular de Ecuador. Technical Report, Ministerio de Producción, Comercio Exterior, Inversiones y Pesca, 2021. Available online: https://www.produccion.gob.ec/wp-content/uploads/2021/05/Libro-Blanco-final-web_mayo102021.pdf (accessed on 22 February 2023).
23. van Ast, L. (Ed.) *Financing Circularity: Demystifying Finance for Circular Economies*; United Nations Environment Programme Finance Initiative: Geneva, Switzerland, 2020. Available online: https://www.unepfi.org/wordpress/wp-content/uploads/2021/03/UNEPFI_767DemystfyingFinanceCircularity-2020-2.pdf (accessed on 22 February 2023).
24. Platform for Accelarating the Circuar Economy. Latin America and the Caribbean Circular Economy Coalition. 2018. Available online: https://pacecircular.org/latin-america-and-caribbean-circular-economy-coalition (accessed on 3 February 2023).
25. Alvarez-Risco, A.; Estrada-Merino, A.; Rosen, M.A.; Vargas-Herrera, A.; Del-Aguila-Arcentales, S. Factors for Implementation of Circular Economy in Firms in COVID-19 Pandemic Times: The Case of Peru. *Environments* **2021**, *8*, 95. [CrossRef]
26. Gobierno de Colombia. Plan nacional para la Gestión Sostenible de los Plásticos de un Solo Uso, 2021. Ministerio de Ambiente y Desarrollo Sostenible. Available online: https://www.minambiente.gov.co/wp-content/uploads/2022/02/plan-nacional-para-la-gestion-sostenible-de-plasticos-un-solo-uso-minambiente.pdf (accessed on 22 February 2023).
27. Fitch-Roy, O.; Benson, D.; Monciardini, D. All around the world: Assessing optimality in comparative circular economy policy packages. *J. Clean. Prod.* **2021**, *286*, 125493. [CrossRef]
28. Garcia, C.L.; Cayzer, S. Assessment of the circular economy transition readiness at a national level. In *The Circular Economy and the Global South*; Routledge: Abingdon, UK, 2019; pp. 113–133. [CrossRef]
29. Hirsch, S. Supporting the Transition to a Circular Economyin Colombia. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH 2020. Available online: https://www.giz.de/en/downloads/Factsheet_PREVEC_en.pdf (accessed on 22 February 2023).
30. Economic Commission for Latin America and the Caribbean. Costa Rica launches National Bioeconomy Strategy, 2020. Available online: https://www.cepal.org/es/notas/costa-rica-lanza-estrategia-nacional-bioeconomia (accessed on 22 February 2023).
31. Mercado, L.; Rivera, D. *Guía paso a Paso para Facilitar la Transición Hacia una Economía Circular Desde los Gobiernos Locales: Caso de Costa Rica*; Centro Agronómico Tropical de Investigación y Enseñanza: Turrialba, Costa Rica, 2021. Available online: https://repositorio.catie.ac.cr/handle/11554/11166 (accessed on 22 February 2023).
32. Comisión Económica para América Latina y el Caribe. Avances Hacia una Economía Circular en América Latina y el Caribe: Desafíos y Oportunidades para Lograr un Estilo de Desarrollo más Sostenible y Bajo en Carbono | Evento | Comisión Económica para América Latina y el Caribe. 2021. Available online: https://www.cepal.org/es/eventos/avances-economia-circular-america-latina-caribe-desafios-oportunidades-lograr-un-estilo (accessed on 3 February 2023).
33. Betancourt Morales, C.M.; Zartha Sossa, J.W. Circular economy in Latin America: A systematic literature review. *Bus. Strategy Environ.* **2020**, *29*, 2479–2497. [CrossRef]
34. Mbavarira, T.M.; Grimm, C. A Systemic View on Circular Economy in the Water Industry: Learnings from a Belgian and Dutch Case. *Sustainability* **2021**, *13*, 3313. [CrossRef]
35. Mikulcˇic', H.; Baleta, J.; Klemeš, J.J. Sustainability through combined development of energy, water and environment systems. *J. Clean. Prod.* **2020**, *251*, 119727. [CrossRef]
36. Wu, R.; Geng, Y.; Liu, W. Trends of natural resource footprints in the BRIC (Brazil, Russia, India and China) countries. *J. Clean. Prod.* **2017**, *142*, 775–782. [CrossRef]

37. Avellán, T.; Nagabhatla, N.; Jalan, I.; Liao, D. Integrating circularity to achieve sustainability: Examples of various wastewater treatment systems. In *Circular Economy and Sustainability*; Elsevier: Amsterdam, The Netherlands, 2022; pp. 21–35. [CrossRef]
38. Ferráns, L.; Caucci, S.; Cifuentes, J.; Avellán, T.; Dornack, C.; Hettiarachchi, H. *Wastewater Management in the Basin of Lake Atitlán: A Background Study*; United Nations University Institute for Integrated Management of Material Fluxes and of Resources (UNU-FLORES): Dresden, Germany, 2018. [CrossRef]
39. Freedman, J.; Tseng, J.; Meeker, M.; Vallero, M. Perspective on Latin America, Brazil and Mexico. Technical Report, General Electric, 2016. Available online: https://watereuse.org/wp-content/uploads/2015/01/Addressing_Water_Scarcity_in_LAM.pdf (accessed on 22 February 2023).
40. Flores, C.A.C. Context Matters: Water Governance Assessment of the Wastewater Treatment Plant Policy in Central Mexico. Ph.D. Thesis, University of Twente, Enschede, The Netherlands, 2017.
41. Mannina, G.; Badalucco, L.; Barbara, L.; Cosenza, A.; Di Trapani, D.; Gallo, G.; Laudicina, V.A.; Marino, G.; Muscarella, S.M.; Presti, D.; et al. Enhancing a Transition to a Circular Economy in the Water Sector: The EU Project WIDER UPTAKE. *Water* **2021**, *13*, 946. [CrossRef]
42. Macedonio, F.; Drioli, E. Circular economy in selected wastewater treatment techniques. In *Membrane Engineering in the Circular Economy*; Elsevier: Amsterdam, The Netherlands, 2022; pp. 101–122. [CrossRef]
43. Reno, U.; Regaldo, L.; Gagneten, A.M. Circular Economy and Agro-Industrial Wastewater: Potential of Microalgae in Bioremediation Processes. In *Valorisation of Agro-Industrial Residues—Volume I: Biological Approaches*; Springer International Publishing: Berlin/Heidelberg, Germany, 2020; pp. 111–129. [CrossRef]
44. García-Martínez, J.B.; Sanchez-Tobos, L.P.; Carvajal-Albarracín, N.A.; Barajas-Solano, A.F.; Barajas-Ferreira, C.; Kafarov, V.; Zuorro, A. The Circular Economy Approach to Improving CNP Ratio in Inland Fishery Wastewater for Increasing Algal Biomass Production. *Water* **2022**, *14*, 749. [CrossRef]
45. Jones, E.R.; van Vliet, M.T.; Qadir, M.; Bierkens, M.F. Spatially-explicit estimates of global wastewater production, collection, treatment and re-use. *Earth Syst. Sci. Data Discuss.* **2020**, *2020*, 1–29. [CrossRef]
46. Hernández-Sancho, F.; Bellver-Domingo, Á. Economics and Innovative Financing Mechanisms in a Circular Economy. In *Unconventional Water Resources*; Springer International Publishing: Berlin/Heidelberg, Germany, 2022; pp. 281–297. [CrossRef]
47. Lamizana, B.; Mahjoub, O.; Caucci, S.; Mafuta, C.; Guenther, E.; Cisse, G.; Andersson, K.; Hernández-Sancho, F. *Unconventional Water Resources*; Chapter Municipal Wastewater; Springer: Berlin/Heidelberg, Germany, 2022; pp. 131–155. [CrossRef]
48. Díaz-Peña, L.d.C.; Tinoco-Castrejón, M.A. The Urban Solid Wastes Management in Cuautlancingo, Puebla, Towards a Circular Economy: Social and Economic Impacts of CE to the Region—Innovative Business Models. In *Towards Zero Waste*; Springer Nature: Cham, Switzerland, 2019; pp. 105–119.
49. Pacheco, M. Harvesting rainwater: An adaptation strategy for peace and the climate crisis. In *International Rainwater Catchment Systems Experiences*; IWA Publishing: London, UK, 2020; pp. 83–92. [CrossRef]
50. Lima, P.d.M.; Lopes, T.A.d.S.; Queiroz, L.M.; McConville, J.R. Resource-oriented sanitation: Identifying appropriate technologies and environmental gains by coupling Santiago software and life cycle assessment in a Brazilian case study. *Sci. Total Environ.* **2022**, *837*, 155777. [CrossRef]
51. Duque, A.; Campo, R.; Rio, A.; Amorim, C. Wastewater valorization: Practice around the world at pilot-and full-scale. *Int. J. Environ. Res. Public Health* **2021**, *18*, 9466. [CrossRef]
52. Venegas, C.; Sánchez-Alfonso, A.C.; Vesga, F.J.; Martín, A.; Celis-Zambrano, C.; González Mendez, M. Identification and 840 Evaluation of Determining Factors and Actors in the Management and Use of Biosolids through Prospective Analysis (MicMac 841 and Mactor) and Social Networks. *Sustainability* **2022**, *14*, 6840. [CrossRef]
53. Gómez-Sanabria, A.; Höglund-Isaksson, L.; Rafaj, P.; Schöpp, W. Carbon in global waste and wastewater flows—Its potential as energy source under alternative future waste management regimes. *Adv. Geosci.* **2018**, *45*, 105–113. [CrossRef]
54. Kumar, G.; Kim, S.H.; Lay, C.H.; Ponnusamy, V.K. Recent developments on alternative fuels, energy and environment for sustainability. *Bioresour. Technol.* **2020**, *317*, 124010. [CrossRef]
55. de Miguel, A.; Wolters, W. *Water Management in the Context of Circular Agriculture: Colombia*; Technical Report BO-43-003.01-017; Netherlands Ministry of Agriculture: The Hague, Netherlands, 2019.
56. Godoy-Faúndez, A.; Rivera, D.; Aitken, D.; Herrera, M.; El Youssfi, L. *Circular Economy in a Water-Energy-Food Security Nexus Associate to an SDGs Framework: Understanding Complexities*; Springer: Singapore, 2021; pp. 219–239. [CrossRef]
57. Carvalho Pereira, J.; Lemoine, A.; Neubauer, P.; Junne, S. Perspectives for improving circular economy in brackish shrimp aquaculture. *Aquac. Res.* **2022**, *53*, 1169–1180. [CrossRef]
58. Sánchez, A.; Silva, Y.; Kalid, R.; Cohim, E.; Torres, E. Waste bio-refineries for the cassava starch industry: New trends and review of alternatives. *Renew. Sustain. Energy Rev.* **2017**, *73*, 1265–1275. [CrossRef]
59. Mihai, F.C.; Gündog˘du, S.; Markley, L.A.; Olivelli, A.; Khan, F.R.; Gwinnett, C.; Gutberlet, J.; Reyna-Bensusan, N.; Llanquileo-Melgarejo, P.; Meidiana, C.; et al. Plastic Pollution, Waste Management Issues, and Circular Economy Opportunities in Rural Communities. *Sustainability* **2022**, *14*, 20. [CrossRef]
60. Alvarez-Risco, A.; Rosen, M.A.; Del-Aguila-Arcentales, S. A New Regulation for Supporting a Circular Economy in the Plastic Industry: The Case of Peru (Short Communication). *J. Landsc. Ecol.* **2020**, *13*, 1–3. [CrossRef]
61. Volschan Junior, I.; de Almeida, R.; Cammarota, M.C. A review of sludge pretreatment methods and co-digestion to boost biogas production and energy self-sufficiency in wastewater treatment plants. *J. Water Process Eng.* **2021**, *40*, 101857. [CrossRef]

62. Santoro, S.; Estay, H.; Avci, A.H.; Pugliese, L.; Ruby-Figueroa, R.; Garcia, A.; Aquino, M.; Nasirov, S.; Straface, S.; Curcio, E. Membrane technology for a sustainable copper mining industry: The Chilean paradigm. *Clean. Eng. Technol.* **2021**, *2*, 100091. [CrossRef]
63. Barco, P.; van Hoof, B. Implementation and Scalability of Circular Practices in the Leather Tanning Industry: Evaluation of a Colombian Tannery. In *CSR, Sustainability, Ethics &amp Governance*; Springer International Publishing: Berlin/Heidelberg, Germany, 2022; pp. 263–280. [CrossRef]
64. de Souza Junior, H.R.A.; Dantas, T.E.T.; Zanghelini, G.M.; Cherubini, E.; Soares, S.R. Measuring the environmental performance of a circular system: Emergy and LCA approach on a recycle polystyrene system. *Sci. Total Environ.* **2020**, *726*, 138111. [CrossRef]
65. García Aguilar, M.C. Assessing the Governance Capacity to Implement Resource-Oriented Sanitation and Waste Management Systems in Urban Areas of Latin America and the Caribbean. Master's Thesis, Swedish University of Agricultural Sciences, Uppsala, Sweden, 2020.
66. Cuadra, S.V.; Heinemann, A.B.; Madari, B.E.; Assad, E.D.; Oliveira, P.P.A.; Angelotti, F.; GIONGO, V.; VICTORIA, D.d.C.; Pereira, L.G.R.; Gondim, R.S. Climate change and Brazilian agriculture. In *Sustainable Development Goal 13*; Embrapa: Brasília, Brazil, 2020.
67. Lainez, M.; González, J.M.; Aguilar, A.; Vela, C. Spanish strategy on bioeconomy: Towards a knowledge based sustainable innovation. *Bioeconomy* **2018**, *40*, 87–95. [CrossRef]
68. Hodson-de Jaramillo, E. Bioeconomy: A sustainable future. *Rev. Acad. Colomb. Cienc. Exactas Fis. Nat.* **2018**, *42*, 188–201. [CrossRef]
69. Camacho, G.R. Biofuels in the Framework of a Circular Economy. In *Constructing a Green Circular Society*; Munjur, E.M., Jaana Sorvari, P.O., Eds.; Faculty of Social Sciences, University of Helsinki: Helsinki, Finland, 2017; p. 152.
70. Rodriguez, A.; Henry, G.; Trigo, E.J. *Latin America's Developing bio-Economies: Concept Note for a Regional Panel Discussion*; German Bioeconomy Council: Berlin, German, 2018.
71. Martínez Cerna, L.; Henríquez Aravena, A.; Freire Castello, N.; Rodríguez Urrutia, R. *Economía Circular y Políticas Públicas: Estado del Arte y Desafíos para la Construcción de un Marco Político de Promoción de Economía Circular en América Latina*; Konrad-Adenauer-Stiftung e.V. (KAS): Bonn, Germany, 2019.
72. World Bank. *Wastewater: From Wasteto Resource: The Case of Atotonilco de Tula, Mexico*. 2018. SKU W17108. Available online: https://documents1.worldbank.org/curated/en/922441521175520658/pdf/124331-WP-19-6-2018-13-5-41-W.pdf (accessed on 3 February 2023).
73. Schröder, P.; MacEwen, M.; Albaladejo, M.; Ribas, P.A.; Tilkanen, J. The Circular Economy in Latin America and the Caribbean. 894 Chatham House. 2020. Available online: https://www.chathamhouse.org/2020/09/circular-economy-latin-america-and-caribbean (accessed on 3 February 2023).
74. Lentini, E. *Building a Water Security Agenda for Latin America and the Caribbean 2030*; Corporación Andina de Fomento: Caracas, Venezuela, 2022.
75. Cordova-Buiza, F.; Paucar-Caceres, A.; Quispe-Prieto, S.C.; Rivera-Garré, A.P.; Huerta-Tantalean, L.N.; Valle-Paucar, J.E.; de León-Panduro, C.V.P.; Burrowes-Cromwell, T. Strengthening Collaborative Food Waste Prevention in Peru: Towards Responsible 899 Consumption and Production. *Sustainability* **2022**, *14*, 1050. [CrossRef]
76. World Bank. Water in Circular Economyand Resilience (WICER): The Case of São Paulo, Brazil. World Bank, Washington, DC. SKU W21027. 2021. Available online: http://hdl.handle.net/10986/36245 (accessed on 3 February 2023).
77. Becerra, L.; Carenzo, S.; Juarez, P. When Circular Economy Meets Inclusive Development. Insights from Urban Recycling and Rural Water Access in Argentina. *Sustainability* **2020**, *12*, 9809. [CrossRef]
78. Voulvoulis, N. Water reuse from a circular economy perspective and potential risks from an unregulated approach. *Curr. Opin. Environ. Sci. Health* **2018**, *2*, 32–45. [CrossRef]
79. Dziedzic, M.; Gomes, P.R.; Angilella, M.; Asli, A.E.; Berger, P.; Charmier, A.J.; Chen, Y.C.; Dasanayake, R.; Dziedzic, R.; Ferro, F.; et al. International circular economy strategies and their impacts on agricultural water use. *Clean. Eng. Technol.* **2022**, *8*, 100504. [CrossRef]
80. Browder, G.; Ozment, S.; Rehberger Bescos, I.; Gartner, T.; Lange, G.M. Integrating Green and Gray: Creating Next Generation Infrastructure. 2019. Available online: http://hdl.handle.net/10986/31430 (accessed on 3 February 2023).
81. Flores, C.C.; Bressers, H.; Gutierrez, C.; de Boer, C. Towards circular economy—A wastewater treatment perspective, the Presa Guadalupe case. *Manag. Res. Rev.* **2018**, *41*, 554–571. [CrossRef]
82. Cruz Vicente, M.A.; Agatón Lorenzo, D. La economía círcular y el suministro de agua para las empresas de hospedaje en Acapulco, Guerrero; México. Revista Observatorio de la Economía Latinoamericana 2019. Available online: https://www.eumed.net/rev/oel/2019/08/empresas-hospedaje-mexico.html (accessed on 3 February 2023).
83. Cornejo-Ortega, J.L.; Dagostino, R.M.C. The Tourism Sector in Puerto Vallarta: An Approximation from the Circular Economy. *Sustainability* **2020**, *12*, 4442. [CrossRef]
84. Energy Sector Management Assistance Program. Good Practices in City Energy Efficiency: Monclova, Mexico—Monclova & Border Frontera Drinking Water System, 2010. Energy Efficient Cities Initiative. World Bank: Wash-ington, DC, USA. Available online: https://www.esmap.org/node/664 (accessed on 3 February 2023).
85. Instituto Mexicano para la Competitividad. Guía para la Creación de Organismos Metropolitanos de Agua Potable y Saneamiento en México, 2014. Embajada Británica en México. Available online: https://imco.org.mx/guia-para-la-creacion-de-del-organismos-metropolitanos-de-agua-potable-y-saneamiento-en-mexico/ (accessed on 3 February 2023).

86. Escenarios Hídricos 2030—EH2030. *Gobernanza Desde las Cuencas: Institucionalidad para la Seguridad Hídrica en Chile*; Fundación chile: Santiago, Chile, 2021. Available online: https://fch.cl/wp-content/uploads/2021/10/Resumen-Ejecutivo-Gobernanza-desde-las-Cuencas.-EH2030.-Noviembre-2021.pdf (accessed on 3 February 2023).
87. Herrera, C.; Godfrey, L.; Urrutia, J.; Custodio, E.; Jordan, T.; Jódar, J.; Delgado, K.; Barrenechea, F. Recharge and residence times of groundwater in hyper-arid areas: The confined aquifer of Calama, Loa River Basin, Atacama Desert, Chile. *Sci. Total Environ.* **2021**, *752*, 141847. [CrossRef]
88. Autoridad Nacional del Agua. Experiencia de Gestión del Agua en el Perú es Vista con Mucha Expectativa en Ámbito Internacional—Gobierno del Perú. 2019. Available online: https://www.gob.pe/institucion/ana/noticias/136701-experiencia-de-gestion-del-agua-en-el-peru-es-vista-con-mucha-expectativa-en-ambito-internacional (accessed on 3 February 2023).
89. Ancaya-Martínez, M.d.C.E.; Tataje, F.A.O.; Flórez-Ibarra, J.M.; Velásquez, R.M.A. Generation of clean water in dry deserts based on photo-voltaic solar plants. *Ain Shams Eng. J.* **2022**, *13*, 101801. [CrossRef]
90. Huibers, F.P.; Moscoso, O.; Durán, A.; van Lier, J.B. The use of wastewater in Cochabamba, Bolivia: A degrading environment. In *Wastewater Use in Irrigated Agriculture: Confronting the Livelihood and Environmental Realities*; CABI Publishing: Wallingford, UK, 2004; pp. 135–144. [CrossRef]
91. Aguatuya. Ingeniería + Gestión del Agua. 2022. Available online: https://aguatuya.org/ingenieria/gestion-de-reisudos-solidos (accessed on 3 March 2022).
92. Mehmeti, A.; Canaj, K. Environmental Assessment of Wastewater Treatment and Reuse for Irrigation: A Mini-Review of LCA Studies. *Resources* **2022**, *11*, 94. [CrossRef]
93. Silveti, D.; Andersson, K. Challenges of Governing Off-Grid "Productive" Sanitation in Peri-Urban Areas: Comparison of Case Studies in Bolivia and South Africa. *Sustainability* **2019**, *11*, 3468. [CrossRef]
94. Juárez-Dehesa, J.I. La economía circular en el sector hídrico: Experiencias de éxito en las empresas. In *Economía Circular en el Sector Hídrico*; Impluvium: Ciudad de México, México, 2019.
95. Cuya-Velásquez, B.B.; Alvarez-Risco, A.; Gomez-Prado, R.; Juarez-Rojas, L.; Contreras-Taica, A.; Ortiz-Guerra, A.; de las Mercedes Anderson-Seminario, M.; Del-Aguila-Arcentales, S. Circular Economy for Food Loss Reduction and Water Footprint. In *Circular Economy: Impact on Carbon and Water Footprint*; Alvarez-Risco, A., Muthu, S.S., Del-Aguila-Arcentales, S., Eds.; Springer: Berlin/Heidelberg, Germany, 2022; pp. 65–91. [CrossRef]
96. Ministry of the Environment and Water. An Agenda of Action. Technical Report 41, Stockholm Environment Institute, 2017. Available online: https://cdn.sei.org/wp-content/uploads/2018/04/j5928-sei-annual-report-180424-web-2-smallest.pdf (accessed on 3 February 2023).
97. Krysovatyy, A.; Zvarych, R.; Zvarych, I.; Reznikova, N.; Homotiuk, V. Circular economy as an anti-crisis method for global economy recovery under Covid-19: Employment and tax shift effect. *Procedia Environ. Sci. Eng. Manag.* **2021**, *8*, 463–472.
98. Savino, A.; Solórzano, G.; Quispe, C.; Correal, M.C. *Waste Management Outlook for Latin America and the Caribbean*; United Nations Environment Programme: Nairobi, Kenya, 2018.
99. Coloma Brotons, J. Condominial Water and Wastewater Systems: Examining the Elements and Successful Examples of the Estero de Paco Pilot Project. 2019. Available online: https://events.development.asia/system/files/materials/2019/06/201906-condominial-water-and-wastewater-systems-examining-elements-and-successful-examples-estero-de.pdf (accessed on 23 February 2023).
100. Ghafourian, M.; Nika, C.E.; Mousavi, A.; Mino, E.; Al-Salehi, M.; Katsou, E. Economic impact assessment indicators of circular economy in a decentralised circular water system—Case of eco-touristic facility. *Sci. Total Environ.* **2022**, *822*, 153602. [CrossRef] [PubMed]
101. Schroeder, P.; Anggraeni, K.; Weber, U. The Relevance of Circular Economy Practices to the Sustainable Development Goals. *J. Ind. Ecol.* **2018**, *23*, 77–95. [CrossRef]