

Advancing the circular economy in Latin American and Caribbean cities

Evaluation of Bogotá's circular economy strategy

SEI report
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The streets of Bogotá: cycle path, steps and pedestrian platforms © Mario Arango / iStock / Getty Images Plus

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Summary

This study presents an evaluation of Bogotá's circular economy (CE) strategy, identifying current gaps and opportunities and providing insights within the broader regional perspective for Latin America and the Caribbean (LAC). The CE presents significant opportunities for LAC, including reducing resource consumption, mitigating environmental impacts, and creating jobs, contributing to sustainable urban development. Recommendations for Bogotá and other LAC cities include enhancing waste management infrastructure, fostering public-private partnerships, and building capacities for better waste handling and recycling practices. We highlight the critical role of informal waste workers in Bogotá's CE transition, recommending improved recognition, support, and integration into formal waste management systems. We also advocate for a holistic CE approach using the 10-R framework, addressing multiple sectors and promoting sustainable consumption and production practices.

Abbreviations

CE	Circular economy
EPR	Extended producer responsibility
LAC	Latin America and the Caribbean
SME	Small and medium-sized enterprise
WPO	Waste picker organization

1. Introduction

The circular economy (CE) model is gaining momentum globally. While a variety of CE definitions have emerged (see Kirchherr et al., 2017), the concept is commonly described as an alternative to the current dominant linear economic model. Its core principle revolves around “designing out” waste and pollution, keeping products and materials in use, and regenerating natural systems (Ellen MacArthur Foundation, 2015), while addressing multiple Sustainable Development Goals simultaneously (Schröder, 2020).

Particularly in the context of cities, the CE presents vast opportunities: cities consume over 75% of natural resources, accumulate 50% of global waste and emit up to 80% of greenhouse gases (Ellen MacArthur Foundation, 2017). In cities, the CE can capitalize on the spatial and economic proximity between stakeholders and resources to close material loops (Chen, 2021) and thereby decouple urban development from resource consumption (Gravagnuolo et al., 2019).

In Latin America and the Caribbean (LAC), the CE has gained increased interest, for instance, with the launch of the Circular Economy Coalition for Latin America and the Caribbean (2021) as well as with the implementation of national CE strategies, including in Colombia (2019), Uruguay (2019), Peru (2020), Chile (2021), and Ecuador (2021). Cities in LAC are implementing CE strategies, including Bogotá (Colombia) and Buenos Aires (Argentina). In the shared vision of the Coalition, more than 80 public policy initiatives for the CE in the region have been identified (Circular Economy Coalition for Latin America and the Caribbean, 2022).

The overarching aim of this study is to support the advancement of Bogotá’s CE strategy in alignment with the city’s own ambitions and thereby support the CE transition in other cities in LAC. We focus on the city level because cities have a substantial possibility to reduce material and energy footprints (UN Habitat, 2020), and cities are settings where policy implementation is experienced firsthand.

This report, conducted for the Federal Ministry of the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV), takes a holistic CE approach that includes the 10-R framework (see Potting et al., 2017), in which circularity strategies are ranked based on their environmental benefits and where “refusing consumption” presents the largest benefit. We consider a variety of sectors as relevant for a CE transition, ranging from agriculture to transportation, for example (see Table 4 for a comprehensive overview). In summary, our study presents the following approach:

1. an evaluation of Bogotá’s CE strategy, considering current gaps and opportunities;
2. a comparison of Bogotá’s CE strategy with other capital cities in the region, with a focus on Buenos Aires;
3. the development of recommendations to support the implementation and next steps towards advancing Bogotá’s CE strategy and CE in other cities in LAC.

In the following section, we provide some contextual background to the CE in LAC and introduce a framework for circular cities that has guided the analysis in this study. Next,

we present our evaluation for Bogotá's CE strategy as well as a comparison of CE priorities in Buenos Aires on a few key areas. Through the analysis of relevant city documents, key expert interviews and a review of policy documents and scientific literature, we identified gaps and opportunities, presented in Section 3 (see the Annex for a detailed description of our methodology). The final section provides some concluding remarks.

1.1 Circular economy in the Latin American and Caribbean region

The LAC region is one of the most rapidly growing and most urbanized regions in the world, with more than 80% of its population currently living in cities (IDB, 2015). Characterized by high population densities in cities and an emerging middle class, waste management is increasingly complex. Eight of the world's largest waste dumpsites are located in LAC, with 60% of waste deposited in inadequately controlled landfills (Stamm et al., 2021). Growing municipal waste production and its mismanagement present multiple impacts, including environmental impacts such as greenhouse gas emissions, ocean plastic accumulation and nitrogen pollution (Chen et al., 2020) but also a major impact on public health (Giusti, 2009).

The region is rich in natural resources and biodiversity. At the same time, it has a surplus in export of natural resources, contributing to their overexploitation (Stamm et al., 2021), with a 94% decline in biodiversity since 1975, which is greater than any observed in other regions in the world (Circular Economy Coalition Latin America & the Caribbean, 2022).

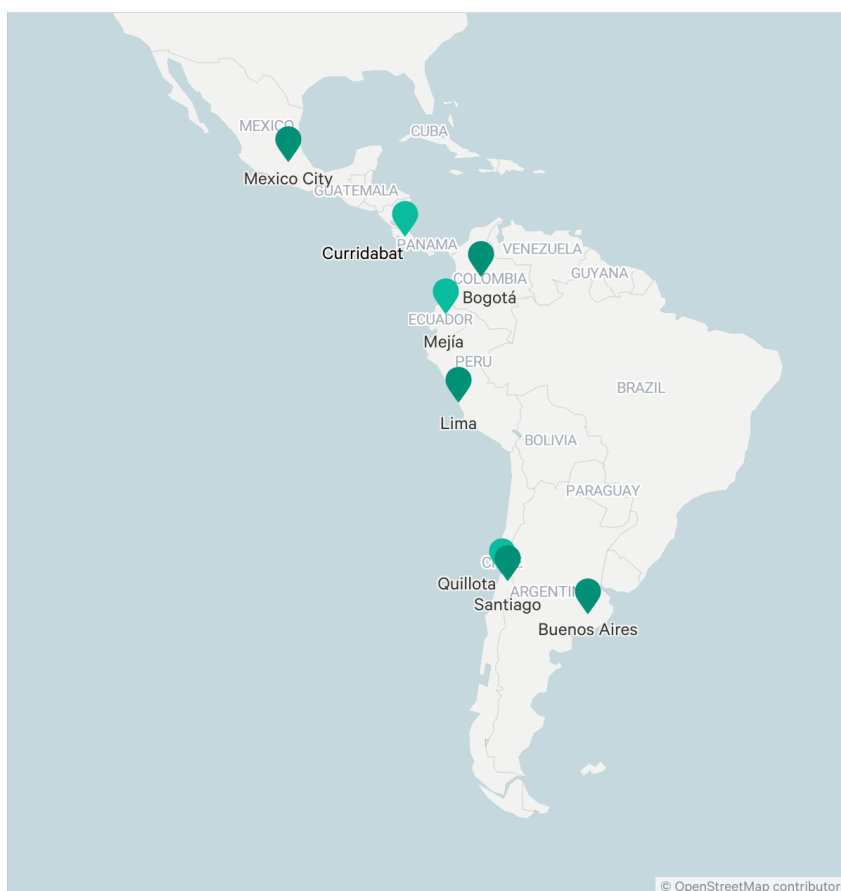
In this context, the CE presents a wide range of opportunities for the region, including three areas of interest highlighted by others working in the region, as follows.

A decrease of resource consumption is possible by 50% in LAC cities, while at the same time reducing poverty and building resilience against the vulnerability of global value chains, depletion of natural resources and the exacerbation of social inequalities (Schröder et al., 2020; UNEP, 2021a). Biodiversity loss in the region could be reduced with CE (Ellen MacArthur Foundation, 2021). The creation of jobs in a CE is estimated at a net total of 4.8 million in the region by 2030 (ECLAC & ILO, 2018).

Colombia was the first country in the LAC region to introduce a national CE strategy. The country's CE strategy presents a path towards sustainable development, and the ambition is "to become a leader in the implementation of the CE in the region by 2030" (Government of the Republic of Colombia, 2019, p. 35). Prioritized material flows in the national CE strategy include: industrial materials and consumer products, materials from packaging, biomass, energy flows, water and construction materials.

In Figure 1, we highlight where CE ambitions have advanced in cities in the region by mapping those that have signed the Declaration of Circular Cities of Latin America and the Caribbean (ECLAC, 2023). Here we note an initiative by the UN (Economic Commission for Latin America and the Caribbean – ECLAC) and other strategic partners (e.g. GIZ, EU) to advance the CE transition in the region. The first signatories joined in 2021; additional cities joined the declaration in 2022. Signatories include Argentina (Buenos Aires), Chile (Quillota, Santiago), Colombia (Bogotá), Costa Rica (Cudirrabat), Ecuador (Mejía), Mexico (Mexico City) and Peru (Lima).

Figure 1. Map of signatories of the Declaration of Circular Cities of Latin America and the Caribbean. Source: Own illustration, adapted from ECLAC, 2023



Note: Dark green symbols highlight capital cities while the light green ones illustrate other signatories, e.g. districts within cities and cantons.

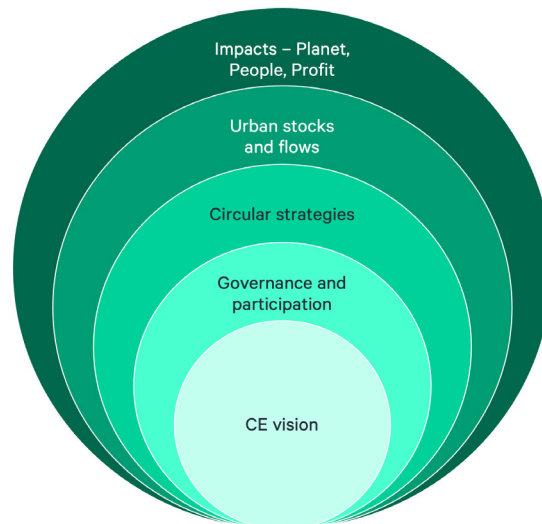
As identified by Vanhuyse et al. (2021), there is a scarcity of scientific literature on the CE for cities in the LAC; the authors identified 178 studies on circular cities between 2010 and 2020, with only 17 of these studies focused on the CE in LAC cities. One study covered Buenos Aires (see Becerra et al., 2020) and no studies focused on Bogotá. In addition, the LAC studies present a narrow focus and are concentrated around waste management, recycling and the role of informal waste sector workers (Vanhuyse et al., 2021). This knowledge gap underscores the necessity to advance the CE in the region, moving beyond waste management and involving a broader range of actors.

1.2 Framework for assessing and supporting CE in cities

The lack of data and tools to monitor and evaluate the level of circularity at the city level presents one of the main challenges towards the implementation of successful CE strategies (Papageorgiou et al., 2021). As part of the Urban Circularity Assessment Framework (UCAF) project, funded by Vinnova, the Swedish innovation agency, a framework was developed to support urban policymakers in advancing their CE

ambitions (Vanhuyse, 2023). The framework considers five interlinked components through which CE at a city level can be evaluated, including: (1) the city's CE vision; (2) CE governance and participation in the city; (3) the city's CE strategies; (4) urban stocks and flows; (5) impacts on people, planet and profit, the so-called triple bottom line (Figure 2).

Figure 2. Conceptual circular cities framework for assessing circularity.



Source: Vanhuyse (2023)

A city's CE vision stands at the centre and presents the starting point of the transition process, feeding also into the selection of prioritized sectors, stakeholders and strategies. The framework stresses the need for a long-term and holistic vision (see Calisto Friant et al., 2020; Paiho et al., 2020). Under governance and participation, the second component, a wide range of stakeholders are considered,, including local governments but also industry, academia, civil society, and transnational and supranational organizations. Generally, CE strategies (the third component) should be deployed based on the city's priorities and needs. They can capture a sectoral focus using, for example, NACE, the statistical classification system for the EU (see European Commission, 2010). Another approach is to consider the 10-R strategies, ranging from "refusing consumption" to "recovery of energy from waste" (Potting et al., 2017). The fourth component focuses on urban stocks and flows and aims to link the strategies selected in the CE with spatial aspects, including how materials, energy, money and information flow in the city. The fifth component includes the impacts on the planet, people and profit, considering societal impacts of a CE transition. More details on the framework, including two case studies for Sweden, are available in Vanhuyse (2023); an application in LAC is forthcoming (Rezaie & Vanhuyse, in review).

2. Evaluation of Bogotá's CE strategy

The city of Bogotá has demonstrated ambitions to advance the CE transition, and different city officials are currently developing public policy towards sustainable consumption and production with a focus on the CE (City of Bogotá, 2021; Secretary of Environment, 2023a). Some of the current policies and strategies to advance the CE include the most recent District Development Plan, the Climate Action Plan, and the Land Management Plan for Bogotá.

In 2023, different secretaries, such as those of Environment, Economic Development and Habitat, were highlighting their efforts to formulate a public policy for sustainable consumption and production, with a focus on the CE transition in the city. Figure 3 illustrates policies that support the transition to a CE in Colombia, including policies at the national as well as at the local level (referring to the city of Bogotá – *Distrito Capital, Bogotá D.C.*).

Figure 3. Policies advancing the CE in Bogotá at national and local level.

National		Local	
	National Policy for Cleaner Production: 1997		Public Policy for Sustainable Production: 2003
	National Policy for Sustainable Production and Consumption: 2010		District Development Plan: 2020 – 2024
	National Green Growth Policy: 2018		Climate Action Plan for Bogotá: 2020 – 2050
	National Development Plan: 2018 – 2022		Green Growth Policy for Bogotá: 2021 – 2030
	National Circular Economy Strategy: 2019		Land Management Plan: 2022 – 2035
	<i>Renewal of National Policy for Sustainable Production and Consumption: Emerging</i>		<i>Public Policy for Sustainable Consumption and Production: Emerging</i>

Source: Own illustration, adapted from (Rezaie & Vanhuyse (in review))

In sections 2.1 and 2.2, we present the results from the in-depth evaluation of Bogotá's CE ambitions (Figure 4) complemented with insights from Buenos Aires (Figure 5). Our analysis is based on a systematic review of policy documents and scientific literature as well as expert interviews with representatives from the city of Bogotá and Buenos Aires. It is structured according to the five components of the circular cities framework: (1) urban CE vision, (2) governance and participation, (3) CE strategies and sectors, (4) urban stocks and flows, and (5) the triple bottom line.

2.1 Bogotá's CE strategy

Like the national CE vision for Colombia, the CE in Bogotá is described as a tool towards sustainable development in the framework of the 2030 Agenda. For instance, in one of the main CE initiatives for the city, the CE is described as a “tool to support the development of an urban ecosystem that is sustainable, regenerative, restorative and at the same time, creates prosperity and a resilient economic system for its inhabitants” (Secretary of Environment, 2022b, p. 2). The CE emerged from the city's Green Growth Policy, which highlights the CE as one of three prioritized pathways towards green growth with the CE focusing on efficient use of natural resources, energy and materials in the production of goods and services (Secretary of Environment, 2021).

Even though the city and its actors present high ambitions with regards to a CE transition, we could not identify a clearly defined or holistic vision that is shared by all stakeholders. So far, the CE vision appears to be scattered in different city plans and driven by different actors with different agendas. This was also highlighted by the four interviewed experts. Particularly, new agendas and priorities with each change of local government were discussed as one of the main obstacles in connection to the city's CE vision by the experts.

The main actors driving the CE transition in the city are public, namely the Bogotá's Secretary of Environment, the Secretary of Habitat and the Secretary of Economic Development. Driven by the CE ambitions and priorities set in the national government, the CE is adopted on the territorial level (see territorial development plans), including several Colombian cities (e.g. Cali, Bogotá and Medellín). The Secretary of Economic Development initiated some of the first CE initiatives in Bogotá, inspired by the productivity- and business-driven focus in the national CE strategy. Other initiatives are led by the Secretary of Environment, with a climate change-driven agenda, and Habitat, with a focus on waste and water management. Public service providers play a key role as well, such as the entity that manages municipal waste (*Unidad Administrativa Especial de Servicios Públicos – UAESP*) and Bogotá's water and wastewater company (*Empresa de Acueducto y Alcantarillado de Bogotá – EAAB*).

Besides the public sector and public service providers, private actors represent another main stakeholder group that is part of the transition, including some first initiatives for collaboration and capacity building. Private sector actors from the national level, for instance, the National Association for Entrepreneurs (*Asociación Nacional de Empresarios de Colombia – ANDI*), a network of entrepreneurs (*Compromiso Empresarial para el Reciclaje – Cempre*), and the National Training Service (*Servicio Nacional de Aprendizaje – SENA*), took part in the development of the CE strategy.

The role of academia is rarely highlighted, and challenges in engaging with citizens and civil society organizations have been articulated by the experts in the city. Particularly, the role of informal waste workers has been recognized by different actors. Even though the city is in the process of formalizing the sector, to date, the engagement with informal waste workers has been described as complex and challenging. Through both the expert interviews with the city representatives and our scientific literature review, we have identified these challenges (see Section 3.2 for further insights).

Bogotá also is part of different supra- and transnational networks. This engagement presents an opportunity to position the city as a CE frontrunner and engage in learning exchange within and beyond the region.

Several city plans define the pathways for the implementation of CE initiatives in the city. In the fourth chapter of the District Development Plan (2020–2024), “eco-efficiency”, recycling, waste management and inclusion of waste sector workers have been stressed under the CE. The city’s Climate Action Plan considers the CE as a tool to contribute to the city’s overall ambition to become climate-neutral and resilient by 2050. In this context, the CE focus is to implement a new model to use organic waste and recyclable materials.

The initiative *Bogotá Circular* is one of the most recent and main initiatives in the city. It is a multi-stakeholder platform to accelerate the CE transition in Bogotá. It includes a variety of actors, ranging from private and public sectors and including the national level. All key experts from the city of Bogotá whom we interviewed described *Bogotá Circular* as an example of a functioning cross-sectoral and multi-stakeholder collaboration. Under *Bogotá Circular*, accelerator projects include initiatives for better consumption and production processes in the textile industry (*Red Moda Circular* and *Regenera y Compras Circulares*). The objectives are to stimulate production chains, reduce the consumption of natural resources, promote green growth through the transition to circular business models, and generate less waste (Secretary of Environment, 2023b).

Under *PRO-RedES*, an initiative for corporate responsibility and sustainability (*Proyectos de Responsabilidad Empresarial y Sostenibilidad – PRO-RedES*), circular business models are stressed. The aim of the initiative is to build capacities towards circular business models that allow for the reduction of waste generation, as well as extending the lifespan of valuable resources and materials and regenerating natural systems (Secretary of Environment, 2022a).

In 2023, the three secretaries worked together on the formulation of a public policy for sustainable consumption and production with a focus on the CE. That development illustrates efforts to harmonize current CE approaches and develop a shared strategy.

An estimate of urban stocks and flows that tracks material and energy flows in Bogotá would fill a gap in knowledge that would forward this work; such tracking would most likely show that a focus on waste reduction, particularly organic waste as well as construction and demolition waste, would have high potential for a CE strategy. Another arena with high potential is energy recovery from waste-to-energy processes. Considering current estimates for greenhouse gas emissions per sector in the city, transport emissions account for 48% of the total amount, highlighting the importance of tackling emissions from the transport sector (Global Covenant of Mayors for Climate & Energy, 2022). However, a baseline analysis will be needed to quantify current flows and provide a comprehensive evaluation of potential impacts.

Finally, the formulation of the impacts of CE on people, planet and profit is at an early stage. The CE has been highlighted as a tool to contribute positively to the city’s climate change ambitions and climate-neutrality targets; however, specific impacts

have not been further specified. Regarding social impacts, the role of informal waste workers has been stressed (e.g. in the District Development Plan for Bogotá), and the city is in the process of formalizing the waste sector; however, the sector has been described as a major challenge for the city's CE transition by the experts.

Typically, the CE transition is driven by businesses and technological solutions; nevertheless, in the case of Bogotá, the engagement with businesses and the realization of potential profits from green and circular businesses and related new employment are at a nascent stage. For instance, opportunities for new jobs, including the quality of these jobs, should be further explored. Another obstacle that has been highlighted by the experts is the need for financing and investments to advance technologies in the context of CE solutions.

Figure 4 showcases the findings on Bogotá's CE strategy and process against the circular cities framework. Notably, information can be a tool, for example, to raise consumer awareness to support businesses partaking in the CE efforts.

Figure 4. Evaluation of Bogotá's CE strategy and process.

Urban CE vision	Governance and participation	CE strategies and sectors	Urban stocks and flows	The triple bottom line
CE as a tool towards sustainable development	Government: - Drivers at national level - Secretary of Environment, Economic Development, Habitat, and Planning - Public service providers Industry: - Engagement with businesses - Public-private partnerships - Chamber of Commerce Transnational and supranational networks: - CE Coalition for LAC - CE Declaration for LAC, ECLAC - EMF, ENEL, ICLEI, C40 cities	Manufacturing (textiles): R3. Reuse, R4. Repair, R8. Recycle e.g., <i>Red Moda Circular</i>, <i>Regenera y Compras Circulares</i> – accelerator projects under the initiative <i>Bogotá Circular</i> Water and waste management; construction and demolition waste: R2. Reduce, R8. Recycle, R9. Recover e.g., strategies under the <i>District Development Plan</i> and <i>Climate Action Plan</i>	Goods – reduced material flows e.g., waste reduction, including textile, construction and demolitions waste Energy – energy recovery through waste to energy Information – consumer awareness campaigns and support for businesses e.g., circular business guide	Planet – reduced climate change impacts anticipated People – role of informal waste workers and creation of new jobs considered Profit – green and circular businesses foreseen

Source: Own illustration, adapted from Rezaie and Vanhuyse (in review)

Note: This map is a snapshot of data collected through spring 2023.

From our evaluation of Bogotá's CE ambitions and current CE plans, we could identify some gaps and challenges in advancing the CE transition in the city. For instance, regarding the CE vision, the formulation of a shared vision will be required to ensure that the CE vision is supported by all actors and will be carried out beyond the legislative periods of the local government representatives. Additionally, the alignment of current policies to support a CE transition have been stressed by the experts. The engagement with stakeholders and their participation are mainly focused on public actors from different city secretaries and the private sector. In addition to encouraging

stronger participation by civil society and particularly a systematic approach for the integration of waste workers, we suggest expanding the diversity of public actors. For instance, the Secretary of Education could play an essential role in increasing awareness and educational programs for citizens, particularly in the context of household waste separation and in information flows.

The city has presented ambitious strategies (e.g. Rethink, Reduce, Reuse); however, so far, these strategies are not clearly articulated in concrete actions. We identified a stronger focus on the reduction, recycling and recovery of different types of waste. The sectoral focus is presented in alignment with the national strategy, including manufacturing for better productivity and the use of materials, minimizing construction waste, and first attempts to tackle organic waste. The need for more advanced strategies to reduce and process organic waste has been stressed by the experts. Particularly, technologies for better waste management and recycling strategies are required, as well as investments to facilitate improved CE.

2.2 Comparison with Buenos Aires

Buenos Aires, the capital of Argentina, joined the Declaration of Circular Cities of Latin America and the Caribbean in 2021 (ECLAC, 2023) and presents substantial opportunity for the CE (Astaburuaga et al., 2022). The city's main motivation to join the declaration emerged from a commitment to tackle climate change, resulting in a focus on the city's waste management. In November 2021, the city passed a policy to develop and promote a CE and has been working towards the implementation of a workplan, including the identification of CE opportunities, the prioritization of value chains, thematic roundtables and engagement with the private sector to support the articulation of a CE strategy (City of Buenos Aires, 2023b).

The Ministry of Public Space and Urban Hygiene, which is responsible for the city's Zero Waste plan, has been driving the CE ambitions. Other public actors include the Ministry of Economic Development and the Ministry of Education. The city efforts so far have also stressed engagement with private actors and citizens and to a small extent with academia.

The city presents CE initiatives in the waste sector, with the overall goal of reducing final disposal of waste through a set of measures aimed at reducing waste generation, selective separation, recovery and recycling. The aims of the city were to double the amount of recyclable materials by 2023 compared to 2019 and to increase household separation from 40% to 80% (ECLAC, 2023). Under the city's waste management plans, the initiative *BA Recicla* has been implemented, an initiative to promote better waste management and recycling practices (City of Buenos Aires, 2023a). Linked to the city's recycling plan, the city's Circular Economy Network is one of the most recent initiatives. Working towards the development of a CE strategy is described as a space to promote and position the CE, strengthen the awareness of Zero Waste goals, support the implementation of CE transitions, and facilitate the scale for the transition.

Considering urban stocks and flows in the city, we identify a potential for a reduction of materials (waste) and increased energy efficiency. However, a baseline analysis of current flows would be required for a full assessment.

Like Bogotá, the CE for Buenos Aires is viewed as a tool to contribute to the commitments to tackle climate change and carbon dioxide emissions, especially for better waste management practices. The city appears to have a strong focus on social impact considerations and particularly the role of waste workers. Under the collaboration with larger enterprises and smaller businesses, the expected impacts are new markets for circular business models and profits.

Figure 5. Evaluation of Buenos Aires CE ambitions.

Urban CE vision	Governance and participation	CE strategies and sectors	Urban stocks and flows	The triple bottom line
CE towards reaching the climate ambitions	Government: - Ministry of Public Space and Urban Hygiene, Economic Development, Education, Environment - Public agencies Industry: - Engagement with businesses - Chamber of Commerce Transnational and supranational networks: - CE Coalition for LAC - CE Declaration for LAC, ECLAC - EMF, ENEL, ICLEI, C40 cities	Waste and wastewater management: R2. Reduce 8. Recycle, R9. Recover e.g., <i>Plan Basura Zero, BA Recicla</i> Manufacturing: R2. Reduce, R8. Recycle e.g., <i>Circular Economy Network</i>	Goods – reduced material flows e.g., waste reduction Energy – energy recovery through waste to energy Information – campaigns to increase citizen awareness	Planet – reduced climate change impacts anticipated People – role of informal waste sector workers considered Profit – new markets and circular businesses foreseen

Note: This map is a snapshot of data collected through spring 2023.

The CE plans in both cities show many similarities, for instance in their focus on waste management, as well as on material and energy flows. The public sector plays an important role for both cities, leading to the incorporation of their views in the design of each city's CE strategy – here, we note the importance of multi-level governance and aligning initiatives at national and international levels to accelerate the implementation of CE strategies, but also to ensure there are no goal and policy conflicts. In both cities, the role of the informal sector is recognized, and the sector poses a challenge for municipal and national government levels around the integration and formalization of the sector. Both cities also touch on circular business models, i.e. the profit side of the triple bottom line, yet detail on how to achieve this is lacking. Compared to Bogotá, we see a narrower vision in Buenos Aires: in other words, the drive for a CE in Buenos Aires is more focused on climate ambitions and not more widely on sustainable development.

3. Recommendations to enhance the CE transition in LAC

The application of our framework identified gaps and opportunities, described above; below, we present recommendations for the transition towards the CE in LAC. First, we highlight several enablers for a CE transition in the region in Section 3.1. Then, in Section 3.2., we focus on specific challenges related to the role of informal waste workers, given the importance of the informal sector in the region (ILO, 2019). It has also been highlighted by the local experts in our interviews as one of the main challenges towards a CE transition in their respective cities¹.

3.1 Recommendations for cities in LAC

Table 1 contains an overview of the recommendations from our analysis of policy documents that we included based on predefined inclusion and exclusion criteria. As explained in our methodology (see Annex), the scope of our literature analysis includes regional documents for LAC as well as literature that presents a specific focus on our two case study cities, Bogotá and Buenos Aires. We organized our findings according to the five components in the circular cities framework designed by Vanhuyse (2023).

We developed categories based on the literature on circular cities and the enablers that have been highlighted for a transition (Ellen MacArthur Foundation, 2019; Rezaie et al., 2022; Vanhuyse, 2023); however, existing literature on circular cities presents a focus on European cities (Vanhuyse et al., 2021). Therefore, we added new categories as they emerged in the literature for LAC, aiming to tackle aspects particularly relevant for cities in the region. Our recommendations are organized around the following categories, which present enablers for the transition towards a CE in LAC cities and beyond:

1. Urban CE vision and strategies
2. Collaboration and stakeholder engagement
3. Awareness raising and capacity building
4. Legislative framework and regulation
5. Financial instruments
6. Innovation, technology and digitalization
7. Data, monitoring and evaluation.

Most recommendations focus on waste and water management, particularly wastewater and food waste, while other sectors were considered less often (e.g. construction or transportation; for a full overview of sectors that can be considered in an urban CE transition, see Annex). The findings from our analysis of policy documents align also with current CE perspectives in the region, predominantly focusing on better waste

¹ Finance has also been identified as a barrier for the successful implementation of the CE (Ellen MacArthur Foundation, 2020; GiZ & Frankfurt School, 2022; UNEP Finance Initiative, 2020). Yet, as limited academic literature is available on this topic for LAC, our scoping study looking specifically at investment needs for LAC did not yield enough material for a separate discussion. Instead, we summarized recommendations more broadly in Section 3.1 and Table 1.

management and recycling practices. At the same time, our findings align with the needs expressed in the interviews, to expand current perspectives and seize opportunities, for instance, with regards to organic waste. We provide a summary of each category below.

Urban CE vision and strategies: The CE vision should be co-created and shared by different actors across the city and include both short-term but also long-term goals, considering the particularities of the city context and its peri-urban areas. Better planning in different city administrations can facilitate the implementation of CE strategies, as well as the establishment of a shared CE definition and understanding. This will support the development of metrics to monitor and evaluate the city's CE process, communication and collaboration across stakeholders and, in the end, support informed decision-making processes.

Collaboration and stakeholder engagement: As highlighted in the circular cities framework, the collaboration of a broad set of actors is needed for a CE transition in cities. However, in the policy documents for the LAC region, collaboration with civil society and academia has not been sufficiently discussed, while the role of businesses and industry is highlighted. Particularly in the context of LAC cities, the integration and coordinated collaboration with recycling cooperatives is essential. In addition, the need for both vertical and horizontal collaboration is also addressed, meaning actors from different levels such as national, regional and local governments, but also inter-organizational collaboration across different sectors, for instance.

Awareness raising and capacity building: This category links to collaboration and engagement with stakeholders; however, here the importance is placed on civil society and educational campaigns to increase awareness and the commitment to a CE transition, supported by the whole society. Especially in the context of LAC cities, the role of organic and food waste has been discussed, as well as how consumers can contribute to better practices. Another enabler in this context is the use of digital tools, for instance using digital platforms to share food surplus. The role of restaurants has also been stressed in the context of food waste. Additionally, capacity-building measures have been highlighted, particularly in the agriculture and construction sectors.

Legislative framework and regulation: For more favourable legislative practices, the regulation of hazardous substances and environmental safety has been highlighted. Calls have been made for higher standards for recycling and repairing, required to reduce waste and enhance reusable materials. Extended producer responsibility (EPR) schemes should be implemented or enforced where already in place. The focus on better design practices plays an important role, and eco-design principles should be mandated to support durable, repairable and recyclable products. In addition, administrative barriers and poorly designed policies present obstacles to stimulating better practices in the business sector. For instance, support could help small and medium-sized enterprises (SMEs) in overcoming existing barriers towards adopting circular business models.

Financial instruments: Our analysis of policy documents highlights the need for investments, for instance, within waste and wastewater infrastructure. Both finding new financial instruments as well as encouraging governmental subsidies for CE solutions have been stressed by governments and various actors.

Innovation, technology and digitalization: Under this category, particularly the promotion of green technologies for preventing, reusing and recycling food waste have been discussed. For instance, these could include innovative digital solutions, such as applications and mobile platforms for food-sharing, intelligent labelling, dynamic pricing and product traceability. The use of emerging technologies should be encouraged, including thermal preservation, solar-powered cold storage, waste-to-energy processes, composting, and recycling to tackle food waste.

Data, monitoring and evaluation: Data-driven decision-making planning will be crucial for a successful CE transition. In this context, clear quantitative targets to understand material and energy flows as well as impacts on quality of life are required.

Table 1. Overview of policy recommendations for a CE transition in Latin American and Caribbean cities, including specific recommendations for Bogotá, Colombia

Category	Recommendations
Urban CE vision and strategies	Co-creating a shared vision • Develop a long-term CE vision across the city, collaboratively created with all sectors. Define clear outcomes and targets, breaking down the vision into interim stages. Address possible barriers and unique city characteristics to ensure effective planning and implementation. • Implement a transparent system to convey circular performance to citizens, stakeholders and policymakers and to enable transparent disclosure. • Develop roadmaps with specific indicators and targets for measuring circularity, including waste reduction, raw material use, recycling rates, environmental impact, social well-being and governance. • Develop a place-based approach, adapt and acquire knowledge from CE plans of other cities, considering the different contexts within Bogotá. Tailor the vision to address unique challenges and opportunities in urban centres and peri-urban areas, ensuring an achievable and impactful CE strategy. • Consider contextual and cultural factors when formulating CE policies. For example, prioritize electrifying public transport in Bogotá due to the reliance on the bus rapid system (TransMilenio), rather than promoting a vehicle sharing economy. • Consider behavioural aspects when designing policies, for instance, factors related to food waste, such as citizens' knowledge, values, income and cultural practices. • Integrate CE strategies into urban planning, alongside decarbonization and resilience strategies to leverage synergies to maximize efficiency. Establish a shared understanding of CE • Establish a common understanding of CE initiatives through standardized definitions, taxonomies and classification systems. This will promote clearer communication, collaboration and informed decision-making. • Develop a comprehensive analysis framework that evaluates multiple scales of analysis, including organizational characteristics, value chain characteristics and the business context, to provide insights of the impact of CE initiatives. • Examine the compatibility, scalability, and long-term viability of CE initiatives within the broader business ecosystem while taking into consideration of risks associated with traditional business.

Category	Recommendations
Collaboration and stakeholder engagement	Engagement with civil society - Consider the inclusion of urban recycling cooperatives when implementing EPR schemes to ensure that the policy design minimizes social and political costs while maximizing efficiency and willingness to pay. - Analyse successful approaches for peer learning and replication, with a focus on SMEs, local food vendors and community-based service providers in the informal sector. Private sector engagement - Collaborate with the business sector to enhance manufacturing processes, reduce costs and promote low greenhouse gas emissions. - Support widespread installation of energy production systems and make them more attainable. - Recognize the importance of private sector participation in waste-to-resource projects within wastewater management. Facilitate collaboration to leverage private sector expertise, technology and best practices. - Collaborate with industry and regulators to develop circular metrics and indicators that can efficiently measure and evaluate CE initiatives. - Facilitate collaboration among food processors, distributors, retailers and food-service providers to implement voluntary agreements, retailer-supplier contracts and closed-loop circular models. - Support partnerships that reduce food waste throughout the supply chain and promote sustainable waste management practices. Engagement with academia - Support partnerships with academia to develop CE strategies and provide knowledge-sharing platforms. Analyse supply chains to identify opportunities for circularity and advocate for the CE beyond city boundaries. - Establish Urban Living Labs as platforms for collaboration between citizens, businesses and policymakers. These labs will serve as spaces for co-creation, experimentation and knowledge sharing. Vertical and horizontal collaboration - Facilitate collaboration between cities and stakeholders to share best practices, knowledge and lessons learned in addressing consumer food waste. - Coordinate actions across multiple governance levels, including the central government, municipalities and the agricultural sector to streamline food transportation and avoid interruptions to minimize food waste. - Collaborate with national initiatives and implement pilot projects to enhance recycling, in particular for electronic waste (e-waste).
Awareness raising and capacity building	Awareness raising and educational campaigns: - Enhance consumer awareness about the environmental and social consequences of unsustainable food consumption and provide guidance on actions to reduce personal food waste, for example appropriate food storage and processing methods. - Promote sustainable consumption and lifestyles to stimulate demand for sustainable food products, services and innovations. - Inform and motivate citizens of the benefits they gain from reducing food waste. - Recognize the effectiveness of grassroots initiatives in changing people's perceptions and behaviours related to food waste. - Support awareness-raising campaigns through social media, education and training programs, and digital platforms. Use digital platforms for sharing surplus food and reducing food waste. - Explore innovative approaches to changing people's behaviour regarding food waste. For example, link food waste reduction with food donations, urban farming and campus events. - Reevaluate the local gastronomic culture, promote the consumption of seasonal products, and encourage sustainable use of natural resources. Capacity building - Support stakeholders and build capacities to facilitate effective food waste reduction. Provide training, and financial support to farmers to help them increase their productive capacity and harvest the produced food faster. - Capacity building and re-training in the architectural sector are imperative, e.g. within material passports and Building Information Modelling (BIM), as well as improved training, mechanization levels and recycling practices. "Material passports" refers in this context to a documentation system that records and tracks material used in a construction project. Similarly, BIM stands for a program that provides the user with a digital representation of the physical and functional aspects of a building or infrastructure. - Provide capacity-building efforts to decision-makers to enhance their understanding of the importance of resourcefulness and the benefits of waste management and wastewater management.

Category	Recommendations
Legislative framework and regulation	Facilitate CE regulations - Regulate hazardous substances and eliminate hazardous substances from products to ensure consumer and environmental safety. - Set higher standards for recycling and repair to reduce waste and enhance the reuse of valuable materials. - Implement EPR schemes, holding producers accountable for the impact of their products throughout their lifecycle, encouraging designs that foster recycling and resource recovery. - Mandate eco-design principles to promote the development of durable, repairable and recyclable products. - Develop technical standards for water reuse and biosolids that are flexible and fitted to local conditions. - Create a consistent enforcement mechanism for standards to build public trust and encourage resource recovery investments. - Implement ISO standards related to waste treatment for guidance and consistency. Remove legislative obstacles and align policies: - Evaluate existing policies and practices to ensure they align with the goal of reducing food waste and make necessary adjustments to remove any perverse effects. - Simplify administrative procedures to encourage retailers and businesses to donate food to reduce food waste. - Simplify administrative processes by simplifying authorization processes to facilitate the adoption of circular practices by businesses, especially SMEs. - Align regulatory frameworks from other sectors relevant to wastewater resource recovery to avoid perverse effects.
Financial instruments	Investments within waste management infrastructure - Promote the adoption of sustainable and efficient infrastructure design practices that are resource-efficient and capable of recovering valuable resources. - Invest in infrastructure that specifically target reduction of food waste, for example investments in waste collection, composting and recycling facilities. Explore new finance opportunities and business models - Explore new finance opportunities such as subsidized finance, equity investments, and crowdfunding debt instruments, green bonds, blended finance, and equity funds. Create financial tools and funds that specifically support circular projects. - Support the development of innovative financing and sustainable business models in the sanitation sector, for example, efficient subsidies during the transition period. Support financial and business models that capitalize on the potential for resource recovery and reuse in wastewater treatment plants, improving the sector's financial viability. Governmental incentives and subsidies - Local governments should champion national support for favourable rates for repair, refurbishment and retrofitting. - Use public expenditure to boost demand for sustainable products and services. - Encourage governments to assign priority to public purchases from small producers, especially for perishable products. This will support local businesses, reduce food waste, and help distribute food to vulnerable populations. - Implementing a gradual increase in the landfill usage fee over time will incentivize municipalities to explore alternative waste management strategies, such as waste reduction initiatives and investments in recycling infrastructure. - Implement cross-subsidies from tariffs on fresh water to allow the price of reused water to be set low enough to facilitate the market to grow. Moreover, water tariffs should reflect the real value of treated water. - Use economic regulation to stimulate and create competition in the bioresource market.
Innovation, technology and digitalization	Promote green technologies and digitalization to reduce food waste. - Foster the adoption and implementation of green technologies for preventing, reusing and recycling food waste (e.g. innovative digital solutions such as Internet of Things (IoT) applications and mobile platforms for food-sharing, intelligent labelling, dynamic pricing, and product traceability). - Encourage the use of emerging technologies, including thermal preservation, solar-powered cold storage, waste-to-energy processes, composting and recycling, to tackle food waste. - Utilize technological and communication innovations for local marketing, ensuring short market circuits, allowing farmers to connect with nearby markets and communities to reduce food waste. - Support the establishment of productive alliances between family farming producers and companies that can market their products through developing technology solutions to enhance product marketing, improve supply, increase product availability, or initiate the digitalization of small producers through e-commerce. - Provide support to family farming through innovation programs and post-harvest infrastructure that improve food preservation, especially for staple foods in order to minimize losses associated with rural storage or transport. - Create mobile transport applications (apps) that reduce logistical problems in food distribution. - Develop strategies to overcome barriers that hinder the widespread adoption of green and digital technologies for food waste reduction. This includes facilitating access to these technologies, securing investment and financial resources, building capacity and skills to effectively deploy and manage such technologies and lastly build out infrastructure improving Internet Connectivity in Rural Areas.

Category	Recommendations
Data, monitoring and evaluation	Data-driven decision-making and planning. - Establish quantitative targets to follow material and energy flows, quality of life, and resilience. Collect and share open data on air quality, public transport, citizen services, and other relevant aspects of the CE transition. - Develop official data systems to measure and analyse consumer food waste at the city level. Examine the economic, social, and environmental costs of food waste and collect data to identify future trends and monitor progress in achieving Sustainable Development Goal (SDG) targets related to food waste reduction. - Conduct comprehensive assessments of water quality and quantity at the basin level to support informed decision-making. This will allow the optimization of the deployment of facilities and sanitation programs, considering the location, timing and phasing of treatment infrastructure. - Establish access to accurate and internationally comparable data on resource consumption, waste generation, and recycling rates. This data will support informed decision-making and enable monitoring of progress towards CE goals. - Update or generate indicators that measure increased transparency, reliability, traceability and accountability in measuring food loss or waste throughout the entire value chain. - Resolve the current data gap by improving data collection and research efforts. Consolidate existing fragmented data and collect additional data where needed, especially related to recycled and traded materials. - Optimize waste collection frequency based on actual needs, conduct a careful assessment of waste generation patterns and adjust collection schedules accordingly to reduce operational costs and improve resource allocation. Monitoring for improved waste management - Establish a comprehensive materials flow system to monitor the quantities and transformations of raw materials throughout the extraction-production-usage-disposal/recycling cycle to facilitate efficient resource use and promote recycling. - Guarantee metrology, certification, and accreditation of test labs to prevent toxic substance contamination in compost used as fertilizer for food production. - Quality infrastructure bodies should oversee air and water quality in waste incineration processes and landfills. Well-managed landfills offer opportunities for biogas projects, which require gas quality measurement and emission monitoring. - Accredit conformity assessment bodies to ensure their capabilities align with the intricate responsibilities associated with waste management. This will enhance the credibility and reliability of the assessment process.

Sources: Enel and Arup (2022), FAO and CEPAL (2020), IDOS (2022), Pegels et al. (2020), Rodrigues and Franco (2020), Stamm et al. (2021), UNEP DTU (2021), UNEP DTU Partnership (2019), Van Hoof et al. (2023), World Bank Group (2019)

3.2 Perspectives on informal waste sector

Globally, more than 60% of all workers are in the informal economy (ILO, 2020). Among them, waste pickers make up 1–2% of the workers in low- and middle-income countries. In LAC alone, over four million people depend on the informal recycling economy for their livelihoods (Valencia et al., 2023). Despite this significant number, waste pickers' contributions to the CE remain poorly understood (Guabiroba et al., 2023). In the case of Colombia, the total number of waste pickers in the country is uncertain due to poor quality of data in most cities. Yet estimates are that by 2019, the number was around 30 000–60 000 (Gómez-Maldonado et al., 2023).

Informal recyclers play a significant role towards achieving the Sustainable Development Goals and the CE with regard to waste management (Gutberlet, 2019; Gutberlet et al., 2021; Gutberlet & Oloko, 2022; Valencia et al., 2023). Waste pickers engage in retrieval of a wide array of materials from households, including paper, cardboard, plastics, metals and glass, among other materials, resulting in substantial recycling rates. While quantified data on material retrieval is often limited in quality across materials and cities, estimates suggest that the informal waste sector plays a substantial role in reclaiming the majority of recyclable materials (Gutberlet & Carenzo, 2020). For instance, studies have suggested numbers such as 11% in Colombia, 6% in Argentina and 1.4% in Brazil (Guabiroba et al., 2023), underscoring the significant contribution of waste pickers in diverting recyclable materials from the waste stream.

The establishment of waste picker organizations is promoted in low- and middle-income countries to combat the informality of selective waste collection systems. These organizations provide opportunities for community development by improving working conditions for independent waste pickers. When these organizations are integrated into the governance framework of a CE, they play a pivotal role in enhancing recovery of recyclable materials and facilitating the establishment of sustainable waste management systems. Yet achieving this level of sustainability remains a challenge in most low- and middle-income countries: various impediments to the progress of the system include in particular how local governments can effectively collaborate and integrate the informal waste sector into their waste management systems (Guabiroba et al., 2023).

Nevertheless, our literature review also shed light on instances of “exemplary collaboration” between the informal waste sector, local government, waste generators, business, universities and citizens (as detailed in Table 6 in the Annex). These collaborations have shown the potential to enhance recycling rates (lower Rs) and stimulate behavioural change, such as refusal and reduction (higher Rs).

However, in Colombia, despite regulatory advances (see, for example, ILO, 2019, which covered the Cooperative Association of Recyclers of Bogotá), several challenges dominate, including: (1) little decrease in the informality of recyclers; (2) divergence in income and opportunities between men and women in the sector; (3) administrative, financial and technological barriers inhibiting compliance by waste picker organizations (WPOs) with formalization requirements and incentivizing the recyclers; (4) insufficient development of sorting and recovery facilities; and (5) poor waste management practices by households (Gómez-Maldonado et al., 2023).

Table 2 provides an overview of recommendations related to the informal waste sector in Colombia and selected LAC countries structured into four categories:

1. Shifting narratives – recognizing the value and expertise of informal waste workers
2. Enabling instruments – importance of infrastructure, regulatory policies and economic incentives
3. Enhancing capacity of waste pickers for sustainable waste management
4. The importance of social protection, safety and empowerment.

These categories are described in more detail below.

Shifting narratives – recognizing the value and expertise of informal waste workers:

Address the underlying problem of waste pickers’ contribution being undervalued in the context of a CE. Despite being a skilled workforce with demonstrated efficiency in reclaiming discarded waste materials, their environmental, economic and social benefits are often overlooked. Recommendations include launching awareness raising campaigns, highlighting the value of recycling cooperatives, recognizing waste pickers as environmental stewards that foster community participation, and engaging waste pickers and relevant stakeholders in decision-making and policy formulation.

Enabling instruments – importance of infrastructure, policies and economic

incentives: Effective waste management systems rely on strong enabling instruments. Key recommendations focus on the enabling instruments of creating an effective waste management system. These recommendations highlight the importance of enhancing infrastructure, such as sorting and recovery facilities, and addressing challenges associated with inadequate waste management practices in households. Furthermore, the recommendations emphasize the importance of establishing fair contracts and partnerships to ensure equitable waste management practices.

Enhancing capacity of waste pickers for sustainable waste management: Capacity barriers faced by waste pickers can be addressed through various measures. These recommendations emphasize, for example, the importance of capacity building in management practices, including leadership, decision-making and conflict resolution. Additionally, recommendations highlight the need to overcome administrative and technological barriers, including the provision of support by cooperations to ensure compliance with corporate waste management policies. Furthermore, there is a recognized necessity for enhancing skills and capabilities in waste management techniques and recycling technologies.

Social protection, safety and empowerment: The emphasis is on recognizing waste collection as a legitimate profession and enhancing health and safety standards for workers. Additionally, the recommendations call for increased social support, including access to essential services such as daycare.

Table 2. Overview of recommendations related to the informal waste sector in selected LAC cities

Category	Recommendations
Shifting narratives – recognizing the value and expertise of informal waste workers	• Utilize media communication and have regular community clean-up activities run by waste pickers to highlight the importance of waste pickers. • Acknowledge the cost advantages that recycling cooperatives have due to their flexible and simplified cost structure compared to large private companies. This recognition will incentivize executives to explore partnerships with cooperatives as an alternative for waste management services. • Expand the scope of validated metrics beyond profit rates to include indicators such as recyclability rate and harvested water. • Recognition of informal waste sectors care for the environment by measuring their impact in provision of the triple bottom line. • Recognize waste pickers as environmental stewardships fostering community participation in separating organic waste at the source. • Support grassroots initiatives led by waste pickers by providing resources, capacity-building programs and funding opportunities to enable these initiatives. • Introduce participatory models in policy formulation, planning and implementation, while recognizing their skill and knowledge and the social and environmental services they provide to cities. • Local governments need to sit down with waste pickers organizations and plan for educational interventions where there is a continuous planned dialogue with waste picker groups and other key stakeholders and where these meetings have regular and transparent reporting of decisions taken. • Local governments need to put out documents such as waste management plans for public consultation and invite the community regularly to presentations providing reports on inputs, outputs and outcomes. • Recognize the value of grassroots and the key role they have in broadening the range of materials transferred back into circular loops as the business-as-usual has not been able to do. • Encourage research collaborations between WPOs and research centres to identify solutions for recycling materials that are currently not accepted by the industry, and which leads to accumulation of unrecycled materials in waste picker centres. • Support initiatives that test and implement innovative processes to transform unrecyclable materials, utilizing waste pickers' knowledge and expertise. • Encourage knowledge sharing between waste pickers and the recycling industry to improve understanding of material composition and recyclability challenges. • Acknowledge that waste pickers provide valuable and essential grassroots knowledge and expertise on how to broaden the CE framework.

Category	Recommendations
Enabling instruments – importance of infrastructure, policies and economic incentives	• Include requirements for contract quotas for low-income and autonomous worker associations and for transparent review processes. • District authorities should tackle underlying issues such as lack of incentives, overemphasis on high-technology fixes, and weak remuneration schemes. • Facilitate dialogue between service providers, government entities, and businesses to encourage the development of mutually beneficial service contracts. • Strengthen waste picker organizations and regional networks, to enhance their representation and negotiation power in respect to their service contracts. • Establish contracts or working agreements between municipalities and WPOs, including financial support, to promote the social and economic inclusion of these workers. These financial resources can be allocated to strengthen the organizations, investing in equipment, capacity-enhancing measures, and improving working conditions. Financial support also provides security and stability to the WPOs. • Collect data to quantify the contribution of waste pickers in order to address fair remuneration for waste pickers. • Invite waste picker organizations into the dialogue to establish fair contractors for the pay service of collection and separation of recyclable waste. • Establish robust monitoring systems to follow compliance with waste picker contracting policies. Implement regular assessments and inspections to ensure that municipalities are engaging waste picker cooperatives as mandated by law. Enforce penalties or incentives based on compliance levels to incentivize waste picker contracting policies. • Implement policies that shape value chains that are both circular and inclusive, for example by implementing EPR, Reverse Logistics mechanisms (including deposit refund systems) and city contracts for selective waste collection and recycling. • Implement funding and support directed to waste pickers, especially from private large generators (avoiding big business to “free ride” on public policy). • Advocate for individual agreements between cooperatives and industry partners to allow waste picker groups to have more control over how they spend the funds. It is important to recognize that different cooperatives have diverse priorities, and tailor agreements accordingly. • Ensure sufficient remuneration for waste pickers and recycling organizations engaged in organic waste management. • Develop a tariff framework that incentivizes selective collection and treatment of organic waste. • Provide financial incentives, better prices and purchasing conditions, to stimulate the selling of recyclable waste collected by informal waste pickers to WPOs. • Local government should bear the costs of collection during the structuring and financial stabilization of WPO. • Support agreements that include financial incentives such as payment for collection of the material recovered or incentives for waste avoided in design. • Companies should employ repairers in cities and pay for services when they fix their products. • Cities or organizations should support and reward zero-waste practices such as tax reductions. • Local municipalities should establish a charging system for the provision of selective waste collection services such as a fee or tariff. By doing so local governments can generate revenue to fund infrastructure, equipment, transportation and maintenance. • Invest in ecopoints to reduce the cost of selective waste collection and allow for preliminary sorting, facilitating the recycling process and increasing the quality of collected materials. • Invest in a well-designed selective collection system that prioritizes organic waste separation at the source. • Facilitate partnerships with universities to support the development of selective waste collection systems with studies and analyses. • More communications and collaboration to improve disposal and separation of waste at household level is imperative, this can be achieved by facilitating active participation from residents, administrators, and waste picker and cleaning staff. • Spread the selective waste collection program on websites, at schools, on the radio, in order to raise awareness among the population and encourage active participation in proper waste separation. • Provide information by visiting residents on how to do correct packing of recyclable waste. • Consider implementation of collection of fines and payments when residents do not comply with proper disposal of waste. • Establishing agreements between municipal governments and WPOs so operation is carried out in an integrated way. The partnership can strengthen the capacity of WPOs, avoid duplication of efforts and reduce available resources to meet the demand for selective waste collection and promote collaboration among the different actors involved in waste management. • Include waste pickers in the decisions that are made about points for Collection of Materials. • Develop a comprehensive plan for solid waste management with stakeholder participation, allowing for consideration of different perspectives. • Address policy misalignment between internal and external plans, establish policies that favour waste treatment by generating synergy between the actors involved in all links of the chain. This can be done through including households and residential units, waste pickers and conventional waste management schemes to identify their risks, relevance and effectiveness. • Implement and reinforce EPR returnable systems by companies and source separation from households. • Guarantee a returnable system that is functional, accessible and effective for all to reduce the burden on the waste pickers. • Assessing the needs of the waste picker population to formally integrate waste pickers into the city’s waste management system. For example, utilizing community-based assessments, participatory budgeting and planning or other forms of private public partnership meetings.

Category	Recommendations
Enhancing capacity of waste pickers for sustainable waste management	• Develop training programs that cover essential management skills tailored to the needs of collective businesses, including areas such as leadership, decision-making, conflict resolution, communication, self-management and transparency for all members regarding both information and bookkeeping. • Provide support to waste pickers with low educational levels and organizational challenges, enabling their active involvement in waste management processes. • Providing support to WPOs so they can correctly report information such as the quantity of materials collected, sales made, and expenses incurred. By accurately documenting this information, WPOs can gain a better understanding of their operations, identify improvement opportunities, and make data-driven strategic decisions for enhanced accountability and transparency in resource management. • Allocated funding and support to waste picker networks and their social movements, and their peer-to-peer learning activities in environmental education. • Develop capacity-building programs to enhance the skills and capabilities of waste picker cooperatives including waste management techniques and recycling technologies. • Corporations should provide technical support to waste picker cooperatives to ensure their compliance with corporate waste management policies. • District authorities should develop training programs that accompany and assist waste pickers in their formalization processes addressing specific needs of unorganized waste pickers and small organizations, providing financial, technical and physical support to become more competitive. • Promote democratic decision-making within waste picker cooperatives. This will facilitate collective redefinition of priorities and create a sense of ownership and empowerment among cooperative members. • Promote the autonomy and empowerment of waste picker organizations. Supporting the principles of solidarity economy, including self-management, shared decision-making, and empowerment of individuals. This approach helps overcome the complexities and contradictions faced by waste picker cooperatives, striking a balance between individualism and community, competition and collaboration, and autonomy and interdependence. • Capacity-building programs should provide tailored assistance that caters to the unique challenges faced by unorganized waste pickers and small organizations, recognizing their differences. These programs should focus on the lack of financial resources, technical expertise, and physical infrastructure that are required for formalization. • Encourage the connection between WPOs and national associations representing recyclable waste pickers. These associations can provide technical support, legal guidance and training, contributing to the professionalization and organization of waste pickers. • Provide technical support and legal guidance in order to support waste picker cooperation access legal benefits to enable them to operate in a safer and more efficient manner.
Importance of social protection, safety and empowerment	• Waste pickers should be supported by government and non-governmental organizations with immediate relief in the form of food assistance, cash grants and personal protection equipment during difficult crises or financial hardship. • Facilitate active participation of waste picker cooperatives in public policy through council meetings in order to address the lack of social assistance support. • Establish a comprehensive policy framework, strategies and funding mechanisms for the decriminalization of waste picking and facilitate integration. • Examination of practices and by-laws that oppress and discriminate against waste pickers. • Set up national and local registries of excluded workers to ensure they access social assistance support while respecting the autonomy of waste pickers. • Address gender inequality through capacity-building initiatives and educational opportunities. • Design social security services schemes for previously informal workers. Create affordable daycare services, schedule flexibility. • There is a need for recognition of the social and environmental damage that informal waste workers have had to endure. To rectify this there is a need to create inclusive plans for dumpsite closure that include waste pickers in new waste management systems. • Utilize a rights-based approach as a fundamental tool to balance the principle of free competition and the arguments that advocate for the inclusion of waste pickers using a market-based logic driven by supply and demand. • Providing waste pickers with personal protective equipment such as gloves, masks, protective eyewear, and appropriate footwear, are essential to protect workers from occupational hazards and accidents. • Conduct inspections to ensure that waste pickers are correctly using this equipment. Effective monitoring contributes to protecting workers' rights and decent working conditions. • Invest in proper infrastructure with adequate hygiene and occupational safety conditions.

Sources: Barford and Ahmad, 2021; Becerra et al., 2020; Carenzo, 2022; Duarte et al., 2020; Espinosa-Aquino et al., 2023; Gómez-Maldonado et al., 2023; Guabiroba et al., 2023; Gutberlet, 2021, 2019; Gutberlet et al., 2021; Gutberlet and Carenzo, 2020; Gutberlet and Oloko, 2022; Hartmann et al., 2022; Kain et al., 2022; Neville and Tovar Cortés, 2023; Parra and Abizaid, 2022; Rodríguez et al., 2020; Sing, 2019; Valencia et al., 2023; Zapata Campos et al., 2023

4. Conclusions

Our recommendations for fostering the CE in LAC are based on our work examining current policy efforts, focusing on the city of Bogotá, Colombia. Our assessment of the status of the CE in LAC and Colombia, with comparison to Buenos Aires, gives us a basis to map the CE strategy and process against the circular cities framework (Vanhuyse, 2023). These insights give rise to a list of recommendations for the broad CE strategy for the LAC region, with specific recommendations on the role of informal waste workers.

Overall, our research highlights the need for stronger collaboration and coordination between the different actors, including public and private entities, academia and citizens. A holistic vision of the CE, instead of fragmented approaches, was strongly emphasized in the literature we analysed and in our interviews.

Furthermore, informal waste sectors and a process of formalization (see Table 6 for best practices) are crucial but cannot be the sole focus of the CE: moving up higher in the 10-R framework (towards remanufacturing, repurposing, rethinking) and tackling other sectors aside from waste and energy could unlock substantial potential for material and energy reductions.

Collaboration with businesses could be further strengthened, unlocking the potential of circular business models and new employment opportunities. However, the city of Bogotá will need investments to foster innovation, including redesigning products and services, as well as educational programs to build capacities and increase awareness among citizens. In particular, the transport sector accounts for almost half of the emissions for the city, and strategies for transport and mobility could be incorporated into the city's CE strategy, building synergies between city plans and respective secretaries.

In addition, uncovering the social impacts across a range of categories such as jobs, community cohesion, political participation, rights, and fears and aspirations, i.e., the “people” bottom line, could provide a better understanding of the level of acceptability of certain CE strategies. Finally, unlocking the investments needed and designing business models that make the CE a viable business venture compared to the linear economy are essential.

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Annex: Research methods and materials

1. Overview of research methods

The aim of this study is to support the advancement of the CE in Bogotá and thereby support the transition of other cities in LAC, by understanding:

- How is Bogotá's circularity strategy performing considering current gaps and opportunities?
- How does Bogotá's circularity ambitions compare to the plans of other capital cities in LAC with CE ambitions, such as Buenos Aires?
- Based on the evaluation of Bogotá's CE strategy and regional comparison, which recommendations can we put forward to support the implementation and next steps towards advancing their strategy?

First, we evaluated Bogotá's CE strategy, considering their ambitions and initiatives stated in city documents but also the involvement of different stakeholder groups and the sectoral focus for instance. In the next step, we compared Bogotá's approach with the CE plans of Buenos Aires based on our framework for assessing urban circularity (Figure 1). We included Buenos Aires as a comparative case, given that the city is one of the few capital cities in LAC that signed the Circular Cities Declaration for the region and has an increased interest towards implementing CE solutions in the city. Both cities are in the process of developing strategic documents towards the advancement of a CE in their cities. Aside from city documents, we included insights from expert interviews with city representatives forming part of the city's CE transition in the two respective cities. We finally used different methods to develop our recommendations. In the below, we explain these methods.

2. Document analysis

We reviewed key policy documents, including city plans and strategies in the context of a CE transition, by targeting local and national government webpages. Table 3 provides an overview of the policy documents that we have reviewed. It includes, for instance, Colombia's national CE strategy and different plans and strategies at city level that contribute towards the advancement of the CE in Bogotá. We searched the documents for keywords to understand the city's vision and definition of CE, its governance and participation of different stakeholders, CE strategies and priorities (including sectors and 10-R strategies), considering if material and energy flows or impacts were mentioned related to a CE transition. The documents informed the evaluation of the city's CE ambitions.

Table 3. List of policy documents for Bogotá, Colombia

City	Original title in Spanish	Author, year	Details
Bogotá	Estrategia Nacional de Economía Circular: Cierre de ciclos de materiales, innovación tecnológica, colaboración y nuevos modelos de negocio	Government of the Republic of Colombia, 2019	National circular economy strategy for Colombia
Bogotá	Guía Distrital para la transición hacia modelos de negocio circular	Secretary of Environment, 2020	Guide to support circular businesses
Bogotá	PRO-redES Boletín 2020	Secretary of Environment, 2020	Brochure for circular economy initiative PRO-redES
Bogotá	Red Moda Circular	Secretary of the Environment, 2020	Brochure about circular textiles initiative as part of Bogotá Circular
Bogotá	Plan de Desarrollo Distrital 2020-2024	Secretary of Planning, 2020	Circular economy part of the plan in program 27 and 38
Bogotá	Plan de Acción Climático Bogotá 2020–2050	Secretary of Environment, 2020	Circular economy under waste management

Table 4 provides an overview of our coding framework for the analysis of the city documents but also for the expert interviews. It is based on the circular cities framework by Vanhuyse (2023) and considers five interlinked components in the contexts of a circular cities transition. It is based on a holistic understanding of a CE, including a variety of actors, sectors and strategies.

Table 4. Coding framework for city documents and interviews based on UCAF framework (Vanhuyse, 2023)

Category	Details
Urban CE vision	What are the aims and goals of the urban CE vision and are they: • Holistic • Long-term • Shared • Based on city needs and priorities
Governance and participation	Inclusion of a diverse actors, including: • Public actors, include public service providers and various governance levels • Industry • Academia • Civil society and citizens • Transnational and supranational organizations

Category	Details
CE strategies and sectors	Which strategies are included (based on the 10 R-strategy framework): • R0. Refuse • R1. Rethink • R2. Reduce • R3. Reuse • R4. Repair • R5. Refurbish • R6. Remanufacture • R7. Repurpose • R8. Recycle • R.9 Recover Which of the following sectors are prioritized (based on the NACE codes): • A. Agriculture, forestry, fishing • B. Mining and quarrying • C. Manufacturing • D. Electricity, gas, steam and AC supply • E. Water supply, sewerage; waste management and remediation • F. Construction • G. Wholesale & retail trade • H. Transport and storage • I. Accommodation and food service • J. Information and communication • K to N. Financial, real estate, administrative services • O. Public administration and defence • P. Education • Q to U. Other activities
Urban stocks and flows	Which of the following stocks and flows are affected by the strategies: • Goods • Services • Energy • Money • Information
The triple bottom line (impacts)	Which of the following impacts are considered and how: • Planet – the nine planetary boundaries • People – seven social impact categories, adjusted from Vanclay (2003) • Profit – four economic viability indicators, including CE contribution to GDP, CE business performance, CE innovation, CE business infrastructure and attractiveness

Source: Vanhuyse (2023)

3. Expert interviews

During May and June 2023, we conducted expert interviews with key stakeholders in the city of Bogotá and Buenos Aires. The aim was to contextualize and validate the findings from the document analysis and gain insights into the implementation process and status of the cities CE strategies. We conducted four interviews with public representatives from different Secretaries in Bogotá and one interview with a representative from Buenos Aires. All experts form part of the CE transition in their city and contribute to the development of the city's CE strategy. The interviews were semi-structured. All interviews were conducted in Spanish. The interviews with representatives from Bogotá were conducted in person, while the interview with the expert from Buenos Aires was conducted virtually. We recorded, transcribed and translated the interviews. The interviewees received a consent form in advance. The

insights from the interviews were anonymized and then integrated into our analysis. As described in the previous section, the circular cities framework (Vanhuyse, 2023) was supporting the conceptualization and analysis of the interviews. Additionally, during a visit to Bogotá in May 2023, we conducted field visits to waste workers' organizations to gain a better contextual understanding.

4. A scoping review of policy documents

Building on the mapping done by Vanhuyse et al. (2021), we carried out different searches, first compiling a corpus with policy documents that entailed recommendations for transitioning towards a CE in the region and then addressing the topic of the informal waste workers.

Using Overton, a database for policy documents, we started with generic searches on the CE in LAC and then narrowed down to the CE in Bogotá and the CE in Buenos Aires. We reviewed a total of 90 articles on title and abstracts, retaining 21 articles for full text analysis. After the full text assessment, 10 articles fulfilled the criteria, including, for instance, on regional scope, language, and including concrete recommendations. Table 5 provides an overview of our inclusion and exclusion criteria.

Table 5. Overview inclusion and exclusion criteria

Category	Inclusion	Exclusion
Population	• Search engine policy documents: Overton • Search engine academic: Building on evidence map by Vanhuyse et al. (2021) and targeted searches on Google Scholar • Specific information collected from city webpages	Other search engines
	Studies and scientific articles with policy recommendations	Studies without policy recommendations (screening for this criterion at full text level)
	Latin America and the Caribbean; Argentina, Buenos Aires; Colombia, Bogotá	Other regions or countries than the ones specified
	• English (for academic searches) • English, Spanish (for city documents)	• Non-English (for academic searches) • Non-English, Non-Spanish (for city documents)
	Publications or working papers; academic articles; official policy documents	
	2013 – 2023	Before 2013
	Studies on the topic of circular economy, including relevant sectors for a circular economy transition, such as waste management; specific priorities for the cities such as waste workers and financial instruments for a CE transition	Anything not including concrete circular economy strategies
Intervention		

To supplement the findings from the Overton search, an additional search was performed on Google Scholar. The purpose was to gather recommendations from scientific journals and grey literature that specifically addressed the informal waste sector as it was highlighted as one of the main challenges to transition towards a CE by all experts. This supplementary search was prompted by the insufficiency of policy documents obtained from Overton. To ensure the accuracy of the gathered information, the search was limited to articles published within the past three years and focused on studies available in English. A total of 44 articles were retained, with 29 articles selected following the title and abstract level screening. Reasons for exclusion

included articles that did not cover the region (LAC), articles in other languages than English, or articles that were unavailable online. The screening of full text level led to the final corpus of 20 articles, with reasons for exclusion the lack of concrete policy recommendations.

5. Best practices towards an inclusive waste sector

Table 6 provides an overview of the best practices we identified during the review of scientific and grey literature in the context of the informal waste sector in LAC. We include only examples which were provided in the selected articles we reviewed and remark that the list is not comprehensive. However, the examples might function as a point of references for the transition pathways in Bogotá.

Table 6. Overview of some best practices in the context of an inclusive waste sector in LAC cities, identified in the scientific literature review

Country, city	Initiative	Description	Reference
Argentina, NA	Reciclando Sueños Cooperative: Transforming Non-Marketable Recyclables through Research and Development	In Argentina, the collaboration between the waste picker cooperative, Reciclando Sueños, together with research institutions, and waste management companies showcase an example of how collaboration can lead to breakthrough innovations in waste management. The partnership focuses on developing knowledge and competencies to tackle the challenge of recycling materials that were previously deemed non-recyclable. By harnessing their expertise and combining it with the cooperative's extensive experience in waste picking, they have successfully transformed various types of waste into marketable materials. Notable examples include expanded polystyrene, multilayered plastics and beer labels.	(Kain et al., 2022)
Argentina, Buenos Aires	Enhanced Waste Management Regulation: Transforming the Framework for Large Generator Companies	In Argentina, new provincial regulations targeting large waste generators have opened up WPOs to establish themselves as sustainable destinations. The framework enables them to provide services to large generators, effectively managing their waste streams. This regulatory change not only contributes to environmental sustainability but also fosters active collaboration among stakeholders, thereby elevating waste management standards across the region.	(Kain et al., 2022; Becerra et al., 2020)
Argentina, Buenos Aires	Building and Expanding Environmental Education Programmes for Female Waste Pickers in Buenos Aires, Argentina	In 2014, a cooperative named Anuillan, together with the Recycling Board of the City of Buenos Aires (DGREC), decided to start an environmental stewardship program with the aim to enhance awareness about waste separation at source. Core activities included data gathering about waste separation practices at the household level, educating the households about recycling, establishing connections between residents and their local waste pickers, and holding informative meetings at schools and other community institutions.	(Gutberlet et al., 2021)
Brazil, São Paulo	Environmental Education Collaboration with Waste Pickers at Fundação Centro Universitario Santo André (FSA)	The collaboration between waste pickers and the university Fundação Centro Universitario Santo André (FSA in São Paulo), serves as a best practice of how waste pickers can fulfil the task of building environmental awareness among the public about recycling, waste reduction, the socio-environmental impact caused by waste and technical know-how on collecting, sorting and transporting recyclable materials.	(Gutberlet et al., 2021)

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