

TECHNICAL NOTE N° IDB-TN-02804

Regional Material Flow Assessment

Municipal Solid Waste EVAL for Latin America and the Caribbean 2023

Authors:

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Inter-American Development Bank
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Cataloging-in-Publication data provided by the
Inter-American Development Bank
Felipe Herrera Library

Regional material flow assessment: municipal solid waste EVAL for Latin America and the Caribbean 2023 / Pablo Andrés Alarcón Montero, Salvador Acosta Acevedo, Magda Carolina Correal Sarmiento, Carolina Piamonte Vélez, Juan Alfredo Rihm, Linda Breukers, Lourdes Berselly Durón Suárez, Guillermo González Caballero, Carlos Hernández, Carlos Eduardo Sagasti Rhor, Arcelia Rojas Gutiérrez.

p. cm. – (IDB Technical Note ; 2804)

Includes bibliographical references.

1. Refuse and refuse disposal-Latin America. 2. Refuse and refuse disposal-Caribbean Area. 3. Circular economy-Latin America. 4. Circular economy-Caribbean Area. 5. Sustainable development-Latin America. 6. Sustainable development-Caribbean Area. 7. Recycling (Waste, etc.)-Latin America. 8. Recycling (Waste, etc.)-Caribbean Area. I. Alarcón Montero, Pablo. II. Acosta, Salvador. III. Correal, Magda Carolina. IV. Piamonte, Carolina. V. Rihm, Alfredo. VI. Breukers, Linda. VII. Durón, Lourdes. VIII. González Caballero, Guillermo. IX. Hernández, Carlos. X. Sagasti, Carlos. XI. Rojas, Arcelia. XII. Inter-American Development Bank. Water and Sanitation Division. XIII. Series.

IDB-TN-2804

JEL Code: Q53, E01

<http://www.iadb.org>

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Regional material flow assessment:

MUNICIPAL SOLID WASTE FOR LATIN AMERICA AND THE CARIBBEAN EVAL 2023



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flow assessment:**
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LATIN AMERICA AND THE CARIBBEAN
EVAL 2023**

The Water and Sanitation Division of the Inter-American Development Bank was responsible for the production of the publication.

External collaborators:

Editorial review: Bettina Fallik and Claudia M. Pasquetti.

Layout: KÖNIG Marketing Group.

Text to cite this document:

Alarcón, P., S. Acosta, L. Breukers, M. Correal, L. Durón, G. González, C. Hernández, C. Piamonte, A. Rihm, A. Rojas and C. Sagasti. 2023b. Regional material flow assessment: municipal solid waste for Latin America and the Caribbean. Washington, DC: IDB. Available in: <https://dx.doi.org/10.18235/0004841>.

Content

Acronyms	07
Acknowledgements	08
Foreword	09
1 Executive Summary	10
2 Introduction	14
3 Methodology	16
4 Advance in the management of municipal solid waste through data and statistics	20
5 An increasing supply of municipal solid waste in the region	23
6 Take on the challenge of increasing the recovery of municipal solid waste in Latin America and the Caribbean	37
7 Intensify efforts to eliminate municipal solid waste flows sent to the environment	41
8 Improve the management of municipal solid waste, a key aspect in Latin America and the Caribbean to tackle climate change in the short term	43
9 The Sustainable Development Goals and the commitment to improve the flow of materials and municipal solid waste management to advance towards the circular economy	49
10 Proper management of municipal solid waste, motor for the intensive generation of green jobs	56
11 Closing the municipal solid waste management gap in the Caribbean	59
12 Financial sustainability, a fundamental requirement to improve the competitiveness of municipal solid waste management	61
13 Conclusions and recommendations	65
14 Next steps for the Solid Waste and Circular Economy Hub	67
References	69

Tables

Table 1.

Per capita generation of municipal solid waste, population and total generation of municipal solid waste, degree of urbanization and GDP per capita in Latin America and the Caribbean, 2021	25
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Figures

Figure 1. Material flow: municipal solid waste	18
Figure 2. Availability of information and proportion of municipal solid waste sent to controlled facilities in Latin America and the Caribbean (in percentage)	22
Figure 3. Total generation of municipal solid waste by country and subregion in Latin America and the Caribbean, 2021 (million tons per year)	24
Figure 4. Per capita generation of municipal solid waste in Latin America and the Caribbean, 2021	27
Figure 5. Countries with a growing trend in the per capita generation of municipal solid waste	28
Figure 6. Generation of municipal solid waste per capita, annual total by country and GDP per capita, Latin America, 2021	29
Figure 7. Municipal solid waste generation and GDP in the Caribbean, 2021	30
Figure 8. Municipal solid waste generation intensity in relation to GDP in Latin America, 2021	31
Figure 9. Generation of municipal solid waste and degree of urbanization in Latin America, 2021	32
Figure 10. Generation of municipal solid waste and degree of urbanization in the Caribbean, 2021	33
Figure 11. Comparison of municipal solid waste generation and GDP per capita, Latin America and the Caribbean versus other regions of the world, 2021	34
Figure 12. Comparison of municipal solid waste generation and degree of urbanization, Latin America and the Caribbean versus other regions of the world, 2021	35
Figure 13. Utilization of municipal solid waste in Latin America and the Caribbean, 2021 (percentage of generation)	38
Figure 14. Recovery of municipal solid waste in Latin America and the Caribbean, 2021 (percentage of generation)	40
Figure 15. Flows of municipal solid waste towards the environment and with an unidentified destination in Latin America and the Caribbean, 2021 (percentage of generation)	42
Figure 16. CO ₂ eq emissions from the solid waste sector, 2015-18 (MtCO ₂ eq/year)	44
Figure 17. Proportion of methane in total emissions from the solid waste sector in Latin America and the Caribbean, 2010-21 (MtCO ₂ eq/year)	45
Figure 18. Methane emissions from the waste sector in Latin America and the Caribbean, 2021 (MtCO ₂ eq/año)	46
Figure 19. Methane emissions per capita in Latin America and the Caribbean, 2021 (kgCO ₂ eq/person-year)	47

Figure 20. Collection coverage in Latin America and the Caribbean, 2021 (percentage of generation)	51
Figure 21. Indicator 11.6.1: Amount of municipal solid waste managed in controlled facilities in Latin America and the Caribbean, 2021 (percentage of generation)	53
Figure 22. Indicator 12.5.1: National recycling rate in Latin America and the Caribbean, 2021 (percentage of generation)	55
Figure 23. Jobs generated in the waste sector per 1.000 inhabitants	57
Figure 24. Subregional differences in integrated solid waste management: Destinations of Latin America and the Caribbean, 2021 (percentage of generation)	60
Figure 25. Review of the financial sustainability of integrated solid waste management in specific countries	62
Figure 26. Cost of integrated solid waste management versus proportion of municipal solid waste sent to controlled facilities, 2021	63

Acronyms

- AIDIS** Interamerican Sanitary and Environmental Engineering Association
(for its acronym in Spanish)
- LAC** Latin America and the Caribbean
- IDB** Inter-American Development Bank
- DANE** Colombian National Administrative Department of Statistics
(for its acronym in Spanish)
- EUROSTAT** European Statistical Office
- IMF** International Monetary Fund
- GHG** Greenhouse gases
- GMP** Global Methane Pledge
- SDG** Sustainable Development Goals
- PAHO** Pan American Health Organization
- GDP** Gross Domestic Product
- EPR** Extended Producer Responsibility
- MSW** Municipal Solid Waste
- SEEA** System of Environmental-Economic Accounting
- SEMARNAT** Mexican Secretariat of Environment and Natural Resources
(for its acronym in Spanish)
- EU** European Union

Acknowledgements

This publication is derived from the results generated under the Water and Sanitation Sector Framework of the Inter-American Development Bank (IDB), approved in December 2021, and implemented by the IDB Water and Sanitation Division (INE/WSA), directed by Sergio I. Campos G.

The study was prepared by Pablo Andrés Alarcón Montero, Salvador Acosta Acevedo and Arcelia Rojas Gutiérrez, under the direction and coordination of Magda Carolina Correal Sarmiento (INE/WSA) and the technical collaboration of Carolina Piamonte Vélez, Linda Breukers, Lourdes Durón Suárez, Guillermo González Caballero, Carlos Hernández, Juan Alfredo Rihm and Carlos Sagasti.

The content of these pages has been enriched due to the contributions of Sergio I. Campos G., Carolina Alcalá Juárez, Doris Melissa Barandiaran Salcedo, Marco Antonio Cevallos Varea, Natalia Espínola, Paula Guerra, María Eduarda Gouvea Berto, Javier Grau Benaiges, Kleber B. Machado, José Francisco Manjarres Iglesias, Silvia Ortiz, Jorge Rubén Oyamada Kroug, Germán Sturzenegger and Manuela Velásquez Rodríguez from IDB; and to the contributions of the external reviewers Atilio Savino, president of the Association for the Study of Solid Waste, of the technical team of the National Administrative Department of Statistics of Colombia (DANE for its acronym in Spanish), through Pilar Andrade Medina, of the Ministry of the Environment and Natural Resources of Mexico (SEMARNAT for its acronym in Spanish), of the National Institute of Statistics of Mexico (INEGI for its acronym in Spanish), led by Martín Wilson, and to Gustavo Solórzano Ochoa, Gustavo Martínez and Virginia Pardo.

Additionally, thanks are extended to the following institutions of the countries that participated in the construction process of this publication: the Ministry of Environment and Sustainable Development of Argentina; the Bahamas Ministry of Environment and Natural Resources, the Bahamas Department of Environmental Health Services, the Department of Environmental Planning and Protection and the Bahamas National Institute of Statistics; the Barbados Ministry of Environment and Natural Beautification and the Barbados Sanitation Services Authority; the Belize Solid Waste Management Authority; the Ministry of Environment and Water of Bolivia; the Brazilian Ministry of Environment; the Ministry of the Environment of Chile and the Undersecretary of Regional Development of Chile; the Superintendency of Home Public Services of Colombia and the National Administrative Department of Statistics of Colombia; the Ministry of Health of Costa Rica; the Ministry of Environment, Water and Ecological Transition of Ecuador, the National Institute of Statistics and Censuses of Ecuador and the Association of Municipalities of Ecuador; the Ministry of Environment and Natural Resources of El Salvador; the Ministry of Environment and Natural Resources of Guatemala; the Guyana Bureau of Statistics; Propublic Sam from Haiti; the Secretariat of Natural Resources and Environment of Honduras and the National Institute of Statistics of Honduras; Jamaica's National Solid Waste Management Authority; the Ministry of Natural Resources and Environment of Nicaragua; the Urban and Home Cleaning Authority of Panama and the Ministry of the Environment of Panama; the Ministry of the Environment and Sustainable Development of Paraguay; the Ministry of the Environment of Peru, the Ministry of Environment and Natural Resources of the Dominican Republic and the Trust for the Comprehensive Management of Sustainable Solid Waste of the Dominican Republic; the Ministry of Spatial Planning and Environment of Suriname, the Ministry of Public Works of Suriname, the Ministry of Regional Development and Sports of Suriname, the National Institute for Environment and Development of Suriname and the General Statistical Office of Suriname; the Ministry of Planning and Development of Trinidad and Tobago and the Central Statistics Office of Trinidad and Tobago, and the Ministry of Environment of Uruguay.

The production of this publication was financed with resources from the Regional Technical Cooperation RG-T3882 Digitization of information and measurement of the performance of solid waste management within the framework of the circular economy, the SDGs and climate change of the IDB.

Foreword

The current global trajectory of municipal solid waste management suggests that this sector will become an activity deeply based on and driven by information and data, according to The Future of the Waste Management Sector (ISWA, 2021). At the same time, it is a fundamental sector for future economic models, based mainly on decarbonization, circularity and the recovery of products, materials, chemicals, and energy.

In this ecosystem of data and sectoral relevance, a valuable opportunity arises for the incorporation of innovation and digital transformation processes, and even artificial intelligence, in the measurement, processing and publication of statistics on solid waste management. These statistics will be essential to forecast, plan, make decisions, promote public policies, optimize management models, evaluate the impact of actions, and assess sectoral evolution.

At an international level, it has been shown that generating high-quality statistics on waste management requires clear and widely accepted definitions, as well as an understanding of the flows and management of materials throughout their life cycle, according to the European Waste Statistics Framework published by the United Nations Economic Commission for Europe (UNECE) in 2021. Added to this is the impact caused by public policies related to the sector, which, being increasingly oriented to prevention and dematerialization, augment the need for reliable indicators on the generation, recovery, and solid waste destination, as well as the life cycle of materials and products.

Against this backdrop, the Inter-American Development Bank (IDB) developed the Solid Waste and Circular Economy Hub for Latin America and the Caribbean (HUB), as a regional public consultation system with open data and statistics on material flow management. The objectives of the Hub are: to harmonize indicators and information between nations through international standards, to facilitate coordination between national statistical offices and other sectoral institutions, to monitor compliance with the Sustainable Development Goals (SDGs) and to monitor the transition towards a low-carbon circular economy.

In this way, the first bulletin of Regional Material Flow Assessment: Municipal Solid Waste **EVAL 2023**, emerges, focused on the 26 IDB borrowing member countries, which covers 14 municipal solid waste management (MSW) indicators to characterize the state of the sector in the region from the perspectives of data availability, supply and utilization of materials, greenhouse gas (GHG) emissions generated in the waste sector, progress in SDGs 11.6 and 12.5 and aspects associated with sectoral competitiveness. This document updates the EVAL 2010 data for the sector and opens the door to the following periodic bulletins, which will progressively add new indicators and waste flows, in accordance with sectoral and Latin American and Caribbean (LAC) trends and priorities.

The Solid Waste and Circular Economy Hub will allow the Bank to provide better guidance and technical and financial assistance to the countries of the region, in conjunction with the sectoral guidelines for solid waste management and progress towards the circular economy, to accelerate transformation and sector improvement.



Sergio I. Campos G.

Head of the Water and Sanitation Division
Inter-American Development Bank



1. Executive Summary

Focused on achieving a disruption to close the gap in availability, quality, and frequency of information on the waste management sector, the Solid Waste and Circular Economy Hub for Latin America and the Caribbean ^[1] is a regional public consultation system with sector data that is updated periodically. Its objectives are to harmonize information between nations, facilitate coordination between national statistical offices and other sectoral institutions, provide a perspective on some of the Sustainable Development Goals (SDGs) fulfillment and monitor the transition towards a low-carbon circular economy.

The first bulletin of the Regional Material Flow Assessment: Municipal Solid Waste hereinafter called **EVAL** (for the Spanish acronym) 2023, was carried out based on data from the 26 borrowing member countries of the Bank, with an approach by subregions: Latin America and the Caribbean. Information available from national statistical offices and other sectoral institutions was used, as well as that provided and validated together with their representatives.

The collected data went through an editing process, which allowed the construction of the “Harmonized input baseline”, which contains information from 1998 to 2020 by country for the different Hub indicators. Subsequently, the “Harmonized baseline at the exit for the year 2021” was integrated, through a process of imputation of those variable values required for the indicator’s calculation.

The **EVAL 2023** was developed in accordance with the international standard of statistics compiled in the Central Framework of the System of Environmental Economic Accounting (SEEA), with the objective of measuring the physical flows of municipal solid waste (MSW) and residual products, between the environment and the economy, and thus determine the traceability of materials at a regional level.

The collection, processing and validation of the countries’ information was used to calculate the 14 indicators of the Waste Hub, which includes: per capita generation, collection coverage, inadequate final disposal, accumulation in sanitary landfills, recycling of materials, composting, anaerobic digestion, co-processing, thermovalorization, greenhouse gas (GHG) emissions from the sector, revenues from fees or tariffs, cost of management and job creation.

The findings of this regional evaluation corroborate that, **to advance in MSW management, it is necessary to improve the availability of data and statistics** , and confirm the impact of this on the quality level of MSW management. Given this panorama, it is essential to close the gaps in accuracy, data reliability and frequency of generation, considering the use of innovation and digital transformation processes to reduce costs and deadlines in the generation, collection, validation, and publication of information.

The available information also indicates that **MSW supply is increasing and remains on an upward trend in the region** . Indeed, in 2021 MSW production in Latin America and the Caribbean (LAC) amounted to 230 million tons, which is equivalent to an average per capita generation of 361 kg/person-year. In turn, historical data show that this indicator presents a growth trend. Furthermore, this evaluation corroborates that MSW generation in LAC increases in proportion to economic growth and urbanization rate.

For all the above, it is a priority to take on **the challenge of increasing the recovery of MSW in LAC** , especially if it is considered that, for 2021, only 4,39% of the MSW generated was recovered, and that the predominant utilization of MSW is the accumulation in sanitary landfills, which covers 46,06% of the total supply of materials, followed by MSW flows emitted to the environment (40,83%), while MSW collected with an unidentified destination represents 8,72%.

^[1] See www.hubresiduoscirculares.org; www.circularwastehub.org.

In LAC predominates the recycling of materials as main form of recovery, which represents 3,85% of MSW generation (supply), followed by lower percentages associated with composting and co-processing; no recovery through anaerobic digestion or thermovalorization is reported.

As a result of the above, one of the main challenges for LAC is to increase the current MSW recovery rates, whose potential is concentrated in the flows of organic materials, as well as containers and packaging, which together represent more than 80% of the available offer in weight.

In a complementary manner, it is relevant to **intensify efforts to eliminate MSW flows sent to the environment**, considering that in 2021, 25,57% of the MSW generated ended up in inadequate final disposal sites, followed by 15,25% that was not collected, and 8,72% whose destination could not be identified.

Additionally, this **EVAL 2023** shows that certain countries still present delays greater than 40% in regard to collection coverage, with the consequent health impacts that this reality entails. The uncertainty created by partial information on the destination of certain flows of collected MSW – which sometimes exceeds 50% of what is generated – prevents the traceability of leak points of materials such as plastics, which affect river, coastal and maritime ecosystems.

Given this scenario, it becomes important to close inadequate final disposal sites and intensify actions to provide solutions adapted to the context of the rural population, as well as optimize the level of service provided to the urban population, in which case it must move from provide basic services to achieve improved services articulated with the circular economy.

Improving MSW management is a key aspect in LAC to address the problem of climate change in the short term. In this sense, it was evident that, for 2021, GHG emissions from the waste sector in the region totaled 345,48 million tons of CO₂eq, of which 97% corresponds to methane, a phenomenon that confirms the predominant role of this gas for the region. In this regard, some low-cost actions to improve MSW management in the region that would prevent or mitigate methane emissions are the following: i) limit the final disposal of organic waste; ii) recover and valorize the organic fraction through composting in homes, at the community level or in municipal or regional facilities, or by anaerobic digestion with the valorization of biogas; iii) carry out the active capture of biogas in sanitary landfills and in the technical closure of inadequate final disposal sites, and iv) reduce and prevent food losses (in production processes) and waste (in consumption processes).

On the other hand, **the commitment to accomplishing the SDGs require the region to improve the flow of materials and the management of MSW, to advance towards the circular economy.** In this sense, it is relevant to highlight that the proportion of collected materials (84,75% on average as of 2021 in LAC) that are managed in controlled facilities, in accordance with the definition of Indicator 11.6.1^[2] is 50,46%, followed by uncontrolled installations,^[3] with 40,83%, while 8,72% of the MSW generated cannot be categorized due to lack of information about their destination.^[4]

^[2] For the purposes of **EVAL 2023**, it is assumed that the controlled facilities are those where the recovery of municipal solid waste (MSW) and its accumulation in sanitary landfills is carried out.

^[3] For the purposes of **EVAL 2023**, it is assumed that uncontrolled facilities correspond to flows to the environment, which include inadequate final disposal and uncollected MSW.

^[4] Flow of materials with an unidentified destination is equivalent to the collected MSW whose traceability was not possible.

In addition to closing the collection coverage gap for certain countries in the region, the level of service provided must be measured and increased, using the metadata scale of SDG Indicator 11.6.1, which contemplates frequency, regularity, and proximity of the collection points. Additionally, to improve MSW management in LAC, it is necessary to increase the flow of materials to controlled facilities for recovery and adequate final disposal, maintaining and raising their level of control (which must go from basic to improved or total, in accordance with the categories defined in SDG 11.6.1), and ensuring control especially in the operation and functioning stage.

Adequate MSW management can constitute an engine for the intensive generation of green jobs; in this regard, this **EVAL 2023** estimates that in LAC there are on average 1,24 direct jobs related to the sector per 1.000 inhabitants. However, these figures do not yet include accounting for the participation of the informal sector, indirect jobs or details on gender and diversity, due to the limited availability of statistics on the subject.

According to what was previously detailed, it is essential that the expectation of increasing jobs for the sector includes the promotion of decent working conditions, as well as reducing the vulnerability of nearly two million grassroots recyclers who collect and recover a large part of the region's MSW.

Closing the MSW management gap in the Caribbean subregion represents one of the greatest challenges for LAC, especially if the characteristics of the island territories are considered and the influence of tourism activities and associated services on the gross domestic product (GDP) of some of the nations that comprise it.

The supply of MSW materials per capita in the Caribbean is 139% higher than the average for the Latin American subregion. This condition is maintained in the case of the generation of methane emissions per person, since the Caribbean releases, on average, 1,46 times more GHG emissions per capita than the average for the LAC continental zone

In relation to the MSW flow, in 2021, 88,35% of the materials generated in the Caribbean were released as flows to the environment or sent to uncontrolled facilities (2,34 million and 0,7 million tons destined for inadequate final disposal or not collected, respectively), a condition 220% more adverse than in Latin America. In contrast, the subregion recycles 0,5% of MSW as the only form of recovery, that is, no relevant composting, anaerobic digestion or other forms of recovery are observed.

The Caribbean requires measures to prevent and minimize MSW generation, as well as the intensity of its rate per person, mainly in tourism activities and associated services; to this end, measures to control single-use plastics and Extended Producer Responsibility (EPR) systems for containers and packaging are appropriate, in addition to initiatives aimed at preventing and reducing food waste.

Financial sustainability is a primary requirement to improve MSW management; in fact, there must be revenues that ensure operational and financial sustainability, and in this way, make sure that actions are executed, produce the expected benefits, and remain over time.

This regional evaluation shows, as of 2021, a positive correlation between MSW management costs and management quality understood as MSW flows managed in controlled facilities.

In this sense, it is a priority to increase and diversify the sources of sectoral revenue to go beyond taxes and tariffs, as well as public budgets, contemplating alternatives such as those derived from the sale of recyclable materials, recovered nutrients or energy, climate sector resources; the financing of recycling chains through EPR mechanisms, and thematic, green, or social impact bonds.

Finally, the consolidation of the Solid Waste and Circular Economy Hub for Latin America and the Caribbean and the following editions of the EVAL requires regional commitment and cooperation with the participation of key actors for the collection and transmission of data in a systematized manner, under quality criteria, in accordance with procedures and interaction mechanisms, and means for information flow.

The Hub is an opportunity for the harmonization of the regional knowledge base among key actors, with the aim of reducing gaps in the availability of information, harmonizing the indicators and statistics of the countries, and achieving – within the region – the coordination necessary to socialize the results, while establishing a community of practice, in continuous collaboration with international organizations and statistical authorities from other regions of the world.

The Solid Waste and Circular Economy Hub ensures the continuity of the measurement, processing, and publication of open data on solid waste management and the flow of materials in the circular economy, crucial tools for decision making, estimating the impact of carried out actions and the sectoral evolution assessment.

2. Introduction

Among the challenges faced by municipal solid waste (MSW) management in the Latin American and the Caribbean (LAC) region, the availability of accurate, reliable, and timely data and statistics is of great relevance (Correal et al., 2023a). Indeed, information is a strategic and indispensable resource, which allows knowing the state of the sector at a given time, monitoring and evaluating progress, tracing trends, and identifying areas for improvement and optimization, as well as building and implementing public policies, structuring projects and design financing solutions.

During the past decade, a series of global and regional initiatives took place to address this challenge, such as the Report of the *Regional Evaluation of Solid Waste Management in Latin America and the Caribbean* (usually called EVAL 2010) (Tello Espinoza et al., 2010), the report *Situation of solid waste management in Latin America and the Caribbean* (Grau et al., 2015), the *What a Waste 2.0* of the World Bank (Kaza et al., 2018) and the *Waste Management Perspective Waste in Latin America and the Caribbean from the United Nations Environment Program* (UNEP, 2018). These initiatives, intensive in time and resources, made it clear that the lack of homologation of the indicators presented sometimes gave rise to partial results, and made it difficult to compare data among peers and analyze evolution in the face of the lack of historical series.

To close this gap in availability, quality, and frequency of information on MSW management, the IDB developed the Solid Waste and Circular Economy Hub for Latin America and the Caribbean, as a regional online system, with data and statistics from the sector, which is updated periodically. The objective of the Hub is to harmonize indicators and information among countries through international standards, facilitate coordination between national statistical offices and other sectoral institutions, provide a perspective of compliance with some of the Sustainable Development Goals (SDGs) and monitor the transition towards a low-carbon circular economy.

The Hub has been conceived to evolve gradually in stages. The scope of the first phase is based on a statistical approach at the national level for the sector that includes information available in the countries on the supply of MSW, and its utilization through recovery (through recycling, composting, anaerobic digestion, co-processing or thermovalorization), accumulation in sanitary landfills, and flows to the environment (which includes inadequate final disposal and uncollected waste), as well as information on flows of materials collected without an identified destination.

In a second phase, and with an expanded statistical perspective, the system will seek to include data from the production and consumption stage of materials with a circular economy approach, as well as flows from recovery activities via inclusive recycling, imports and exports, and waste generated in economic activities.

Regarding the first phase, the process for the integration of the regional system involved the design and consecutive construction of the following components:

1. The first of them is the “Diagnosis on the availability of information and statistics on the comprehensive management of solid waste and the circular economy”, which contains the status of the LAC MSW management data published by national statistics offices and other sectoral institutions by 2023.
2. From this compilation document, the Technical Manual of the Solid Waste and Circular Economy Hub was prepared, which establishes the processes for its operation as an online system and includes the technical sheets of the indicators (metadata); the methods of collecting and processing information, analyzing, and reporting data quality; the standards for the transmission of statistics, and the formats that must be used in the operational stage.
3. Based on the specifications and guidelines of the Manual, the regional database of the system was integrated, consisting of the information collected in the countries of the region, ensuring the integrity and traceability of the statistics, as well as the estimation of those missing variables for the calculation of the indicators of interest.
4. From the database, this Regional material flow assessment: municipal solid waste (**EVAL 2023**) was structured for the 26 IDB borrowing member countries, with 14 MSW management indicators, to characterize the state of the sector in the region.
5. Finally, through the portals <http://hubresiduoscirculares.org/> and <http://circularwastehub.org>), the Solid Waste and Circular Economy Hub for Latin America and the Caribbean provides the interface with users for the visualization of data and statistics, ensuring and making their access more flexible in an interactive way and diversifying the consultation schemes, with the purpose of updating them annually based on the system’s procedures and processes.

3. Methodology

The Regional material flow assessment: municipal solid waste (**EEVA 2023**) was applied to the 26 borrowing member countries¹ of the Inter-American Development Bank (IDB). The geographic approach considered two subregions:² the first, Latin America, includes Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Dominican Republic, Uruguay and Venezuela, and the second, the Caribbean, includes the Bahamas, Barbados, Belize, Guyana, Jamaica, Suriname and Trinidad and Tobago. In future phases, the rest of the countries that make up the Latin American and the Caribbean (LAC) region will be incorporated.

The information used was compiled through consultations on the websites of national statistical offices and other sectoral institutions, as well as provided and validated together with the sectoral authorities of the participating countries. This information was consolidated in the Solid Waste and Circular Economy Hub and used for the preparation of this document, therefore the terms and conditions of said website also apply to this publication. Future newsletters will progressively add new data and indicators depending on the quality and availability of information in the Hub.

The information gathered went through an editing process, focused on documenting the traceability of the data, its integrity, and the correction of inconsistencies where appropriate, which allowed the construction of a regional database called “Harmonized input baseline”, which contains discontinuous information from 1998 to 2020 by country for the different indicators considered; subsequently, the regional database called “Harmonized baseline at exit for 2021” was integrated through an imputation process to estimate those missing variables required for the calculation of the indicators.

The **EEVA 2023** was developed in accordance with the international statistics standard established in the Central Framework of the Environmental and Economic Accounting System (SEEA) (United Nations, 2016), with the objective of measuring the physical flows of municipal solid waste (MSW) between the environment and the economy, to determine the traceability of materials at the national and regional level on an annual basis. (National Administrative Department of Statistics, 2022: 2)

Within the conceptual framework of the SEEA, the generation and management of MSW is analyzed in the processes that are part of the dynamics of material flows between economic activities, households, the rest of the world, and the environment. The calculation of the MSW material flow takes place based on the supply-use identity, composed of the elements described in the following equation:

Equation 1. Balance of supply and utilization of municipal solid waste

$$\text{MSW Supply} = \text{MSW Utilization}$$
$$P+C = T+Re+FA+AR+NI$$

Where:³

¹ The list and some characteristics of the borrowing member countries can be consulted at: <https://www.iadb.org/es/acerca-del-bid/countries-members-borrowers>.

² The subregions correspond to the geographical coverage used by the Economic Commission for Latin America and the Caribbean (ECLAC) in the Statistical Yearbooks of Latin America and the Caribbean (LAC).

³ The conceptual basis can be found at: <https://hubresiduoscirculares.org/sobre-el-hub/>.

Supply⁴ of municipal solid waste:

P = Generated in production processes assimilable to MSW

C = Generated in consumption processes of MSW

Utilization⁵ of municipal solid waste:

T = Cogeneration and other valorization

Re = Recycling and reuse of materials

FA = Flows to the environment

AR = Accumulation in sanitary landfills

NI = Unidentified destination

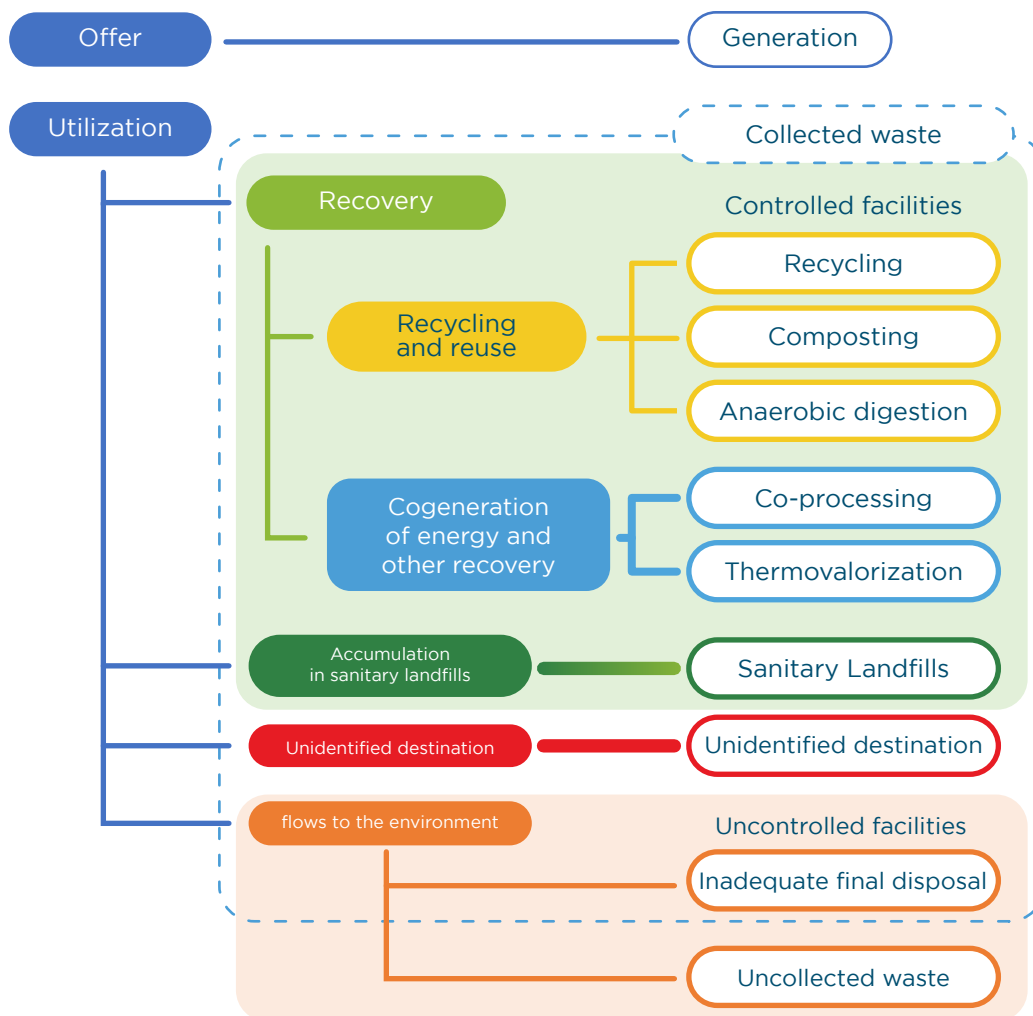
According to the SEEA conceptual framework (United Nations, 2016), “the total supply of solid waste refers to the generation of materials, from the productive processes of economic activities and the final consumption of households.” For its part, the utilization of MSW can include its recovery and accumulation in sanitary landfills, as well as flows to the environment and unidentified destinations, with the subcategories and pathways shown in Figure 1.⁶

⁴ For the purposes of this study, the categories “Generated in the accumulation processes” and “Imports” are excluded.

⁵ For the purposes of this work, the item “Exports” is excluded.

⁶ The categories “Controlled facilities” and “Uncontrolled facilities” respond to the level of control defined in the metadata for Indicator 11.6.1, “Proportion of municipal solid waste collected periodically and with an adequate final discharge with respect to the total urban solid waste generated, broken down by city”, of Sustainable Development Goal (SDG) 11: Sustainable Cities and Communities.

Figure 1. Material flow: municipal solid waste



Source: Own elaboration.

It is worth clarifying that, based on the accounting framework used, the United Nations (2016: 53, § 3.78 and § 3.79) details the following:

Controlled and managed landfills, emissions capture and storage plants, treatment plants and other waste disposal sites are considered within the economy. Therefore, waste flows to these facilities are flows within the economy and not to the environment. Subsequent flows from them can go directly to the environment as waste or lead to the creation of other products or waste.

Waste from homes or industries can be dumped in open fields or abandoned on roadsides (possibly illegally). Similarly, at sea, tankers can clear their tanks (also possibly illegally) or lose their cargo when they capsize. These flows must be recorded as waste that passes from the economy to the environment.

The indicators used for the collection, processing, and validation of information from the countries under study and whose metadata are described in the Hub Technical Manual, are the following:

1. Generation per capita.
2. Collection coverage.
- 3-4. Inadequate final disposal.
5. Accumulation in sanitary landfills.
6. Recycling of materials.
7. Composting.
8. Anaerobic digestion.
9. Co-processing.
10. Thermovalorization.
11. Greenhouse gas (GHG) emissions from the sector.
12. Revenues from taxes or fees.
13. Cost of management.
14. Jobs per 1.000 inhabitants.

Additionally, for the purposes of the evaluation, population data from the Economic Commission for Latin America and the Caribbean (ECLAC, 2022), urbanization rates from the World Bank (2023), values of the gross domestic product (GDP) per capita of CEPALSTAT (ECLAC, 2023) and GHG projections taken from the Climate Change Indicators Panel of the International Monetary Fund (IMF, 2023) were used.

For the future, it is expected to expand the scope of this assessment to include material flows to and from the rest of the world through exports and imports and residual products.

4. Advance in the management of municipal solid waste through data and statistics

Among the pending challenges facing municipal solid waste (MSW) management in Latin America and the Caribbean (LAC) is the availability of accurate, reliable, and timely data and statistics (Correal et al., 2023a), which makes it difficult to know the state and evolution of the sector and prevents identifying opportunities for its optimization.

Initially developed to monitor and manage threats to human health and the environment, data and statistics on MSW management have currently been reoriented towards the recognition of its economic value, particularly in the context of the circular economy (UNECE, 2021), the creation of equitable and inclusive green jobs, and the potential for the mitigation of greenhouse gases (GHG), mainly, methane.

This new measurement trend for the sector is also reflected in the goals and indicators of MSW management integrated into the Sustainable Development Goals (SDGs) related to sustainable cities and communities, as well as responsible production and consumption.

Evidence can be found on the relevance of closing the information availability gap in monitoring the waste management policy of the European Union (EU), whose objective to reduce the impact on the environment and health and improve efficiency in the use of resources has been evaluated since 2004 through statistics on the generation and management of waste from companies and households. Thus, through Eurostat, it is reported that, for 2020, in the EU there was an increase of 29,4% in the amount of waste recovered compared to the base year, while the amount disposed of decreased by 21,3% (Eurostat, 2023).

In addition to the frequency, deadlines and costs associated with generation, collection, validation, and publication of data and statistics for MSW management become fundamental, which could be reduced through the application of information technologies and digital transformation, adding the innovation component for the analysis and systematization of information.

In an effort to assess the relevance of data and statistics for the quality of MSW management in LAC, the availability of information in the countries for the 14 indicators that make up the period 2017-21 with the proportion of MSW that was managed in controlled facilities⁷ in 2021 were compared, and a direct correlation was detected between the countries in the region that have the greatest availability of information (Colombia, Chile, Brazil,⁸ Peru, Ecuador, Bolivia, Costa Rica, Uruguay and Argentina) and the highest proportions of MSW sent to controlled facilities, with percentages ranging from 60% to 90% (see Figure 2).

⁷ Municipal solid waste (MSW) destined for recycling, composting, anaerobic digestion, co-processing, thermovalorization and sanitary landfill facilities is considered to comply with a basic, improved or total level of control according to the scale integrated in the Indicator metadata. 11.6.1 of Sustainable Development Goal (SDG) 11: Sustainable Cities and Communities.

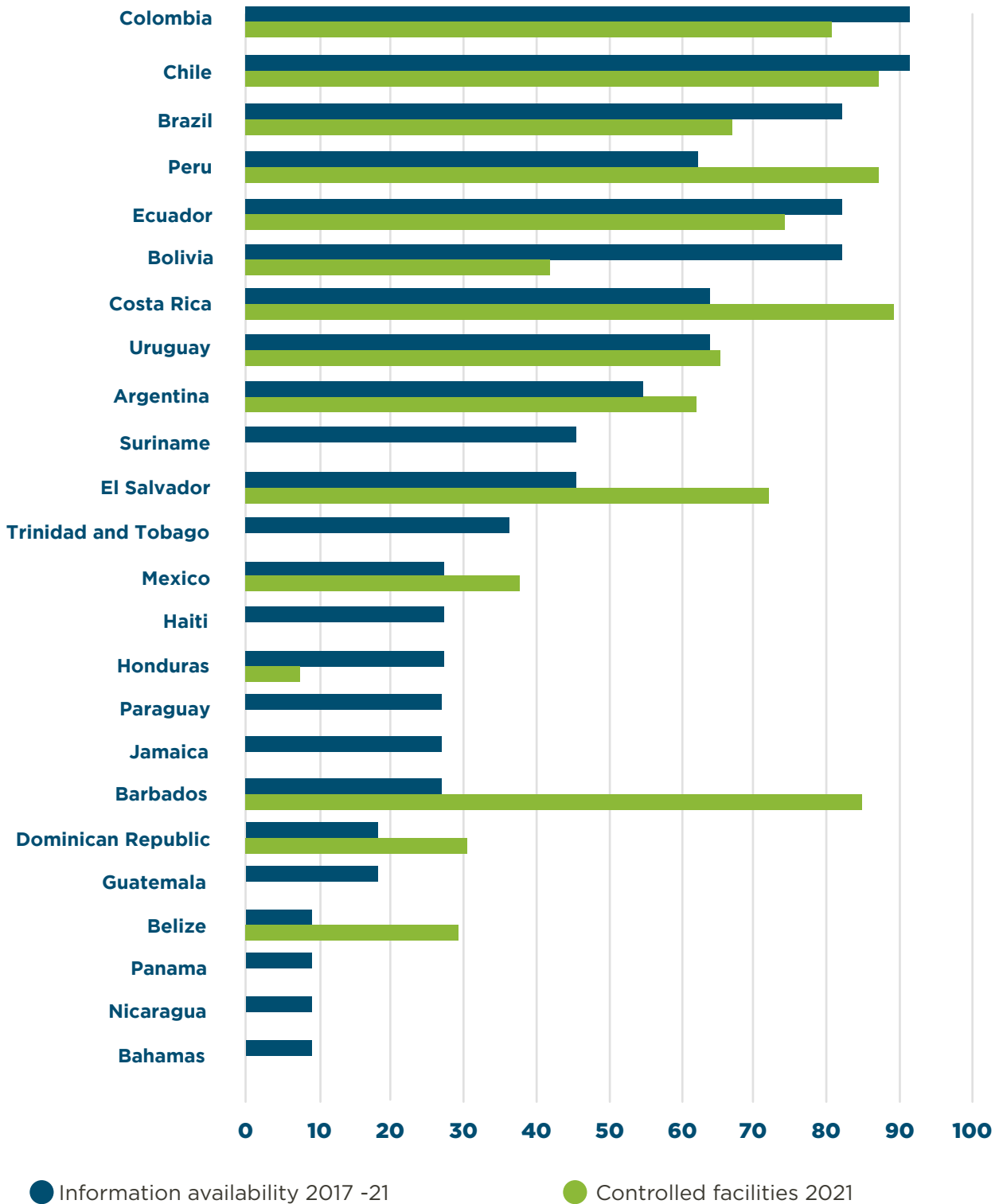
⁸ In the case of Brazil, the available information reported in this **EVAL 2023** corresponds to the National Sanitation Information System (SNIS), with the expectation of expanding it in subsequent editions when considering the data reported by the National Information System on Solid Waste Management (SINIR).

On the contrary, with some exceptions, in those countries where the availability of data and statistics is limited or non-existent, the proportion of MSW managed in controlled facilities is also lower or non-existent.

These findings corroborate that the availability of data and statistics has a positive relationship with the level of quality of MSW management in the LAC region, making it imperative for the sector to close the existing gaps in terms of precision, reliability, and frequency. In this sense, there is an opportunity to include innovation and digital transformation processes, to reduce the costs and times necessary to generate, collect, validate and publish information.

The demonstrated importance of the availability of information makes the latter a strategic resource to monitor and evaluate the progress of the sector, trace trends, build and implement public policies, structure projects and design financing solutions, particularly within the framework of the transition towards the circular economy, the fight against climate change and compliance with the SDGs.

Figure 2. Availability of information and proportion of municipal solid waste sent to controlled facilities in Latin America and the Caribbean (in percentage)



Source: Regional database of the Solid Waste and Circular Economy Hub: <https://hubresiduoscirculares.org/datos/>.

Note: To further detail the methodology for obtaining the percentage of controlled facilities, see section 10.

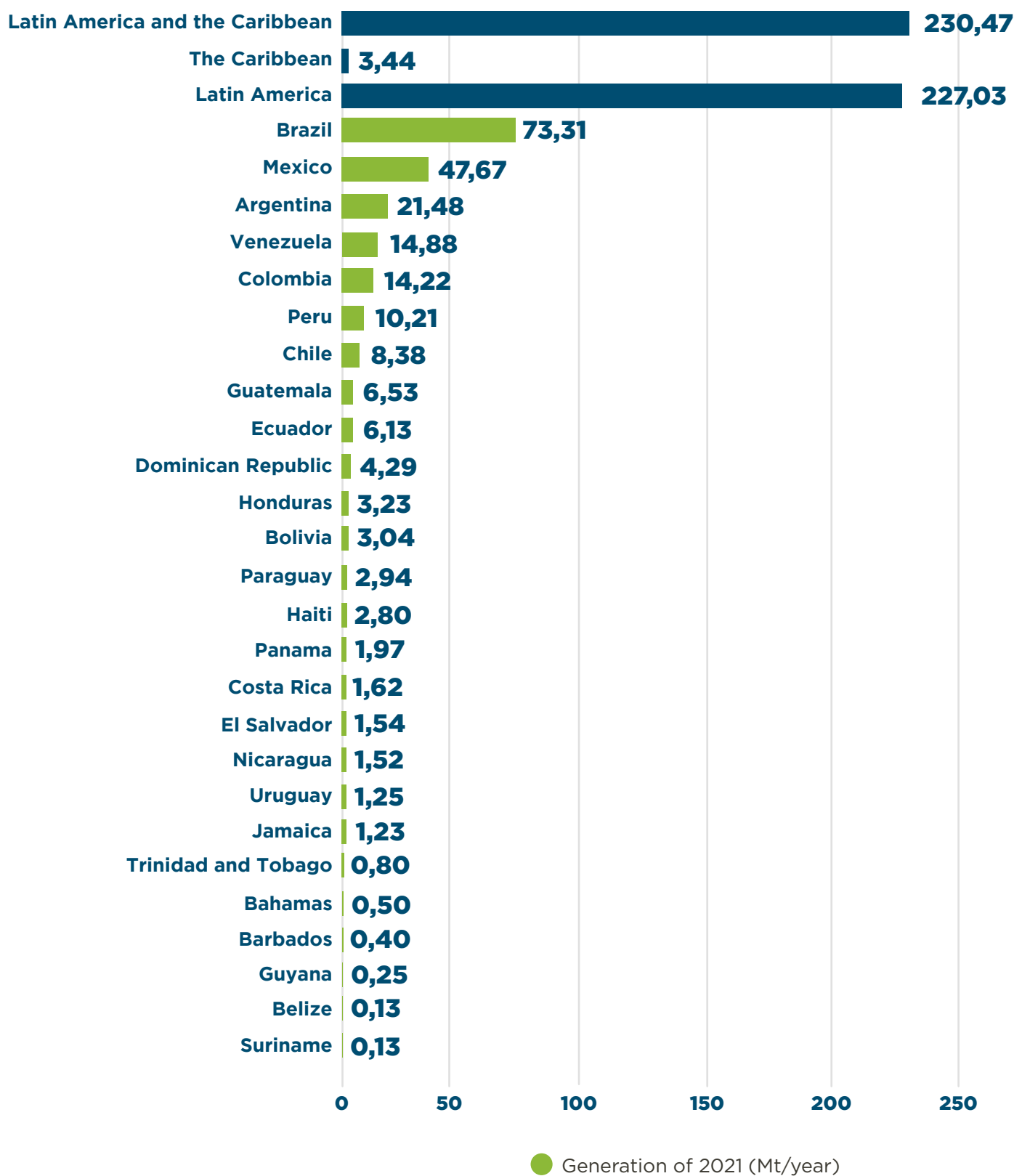
5. An increasing supply of municipal solid waste in the region

The magnitude and behavior of the supply of municipal solid waste (MSW) constitute the starting point for planning and monitoring its management and are also the fundamental contrast element to determine the relevance and traceability of materials through the different ways in which they are utilized.

In 2021, MSW generation in Latin America and the Caribbean (LAC) reached 230 million tons, with Brazil as the country with the highest generation in the region (73 million t/year), followed by Mexico (47 million t/year) and Argentina (21 million t/year), numbers that, together, represent more than 60% of the total. Meanwhile, for 2030, a generation of 296 million tons of MSW is projected and for 2050, 402 million tons (Kaza et al., 2021), a figure that almost doubles the current figure.

From the subregional perspective, the contribution of Latin America to the total generation of MSW (98,5%) is preponderant compared to the contributions coming from the Caribbean (see Figure 3).

Figure 3. Total generation of municipal solid waste by country and subregion in Latin America and the Caribbean, 2021 (million tons per year)



Source: Regional database of the Solid Waste and Circular Economy Hub: <https://hubresiduoscirculares.org/datos/>.

Table 1. Per capita generation of municipal solid waste, population and total generation of municipal solid waste, degree of urbanization and GDP per capita in Latin America and the Caribbean, 2021

Region or country	Population 2021 (inhabitants)	PPC from MSW 2021 (kg/person-year)	Generation 2021 (Mt/year)	Degree of urbanization (urban population, percentage of the total)	GDP per capita (US\$ per person)	GDP (millions of US\$)	Tons of MSW/millions of US\$ of GDP
Latin America and the Caribbean	639.222.709	360,55	230,47	81,40	8.261	5.083.973	45,3
Latin America	632.362.654	359,02	227,03	81,70	8.244	5.009.934	45,3
The Caribbean	6.860.055	501,79	3,44	53,20	9.785	74.039	46,5
Brazil	214.326.217	342,07	73,31	87,32	9.228	1.650.423	44,4
Mexico	126.705.133	376,23	47,67	81,02	9.277	1.272.784	37,5
Colombia	51.516.563	276,08	14,22	81,74	6.885	314.009	45,3
Argentina	45.276.780	474,50	21,48	92,23	11.693	485.295	44,3
Peru	33.715.470	302,95	10,21	78,50	6.822	223.571	45,7
Venezuela	28.199.866	527,54	14,88	88,33	s/d	79.653	186,8
Chile	19.493.182	430,02	8,38	87,82	16.060	316.881	26,5
Ecuador	17.797.735	344,34	6,13	64,36	5.810	106.166	57,7
Guatemala	17.608.480	371,06	6,53	52,25	4.594	85.987	76,0
Bolivia	12.079.467	251,85	3,04	70,48	3.301	40.408	75,3
Haiti	11.447.564	244,55	2,80	57,96	1.290	19.536	143,3
Dominican Republic	11.117.870	386,22	4,29	83,21	8.464	94.295	45,5
Honduras	10.278.346	314,71	3,23	58,98	2.462	28.485	113,6
Nicaragua	6.850.536	221,61	1,52	59,28	1.983	14.009	108,4
Paraguay	6.703.801	438,00	2,94	62,50	6.173	39.492	74,4
El Salvador	6.314.172	244,19	1,54	74,12	4.275	28.737	53,7
Costa Rica	5.153.949	313,49	1,62	81,43	12.802	64.586	25,0
Panama	4.351.267	452,95	1,97	68,78	14.543	63.605	31,0
Uruguay	3.426.256	365,00	1,25	95,60	18.547	59.295	21,1
Jamaica	2.827.696	434,82	1,23	56,65	5.292	14.649	83,9
Trinidad and Tobago	1.525.668	523,79	0,80	53,27	14.583	24.460	32,7
Guyana	804.574	311,16	0,25	26,90	10.659	6.817	36,7
Suriname	612.983	215,35	0,13	66,22	5.387	3.248	40,6
Bahamas	407.905	1.234,83	0,50	83,37	27.604	11.209	44,9
Belize	400.033	331,12	0,13	46,20	5.966	2.153	61,5
Barbados	281.196	1.405,25	0,40	31,25	15.606	4.872	81,1

Source: Regional database of the Solid Waste and Circular Economy Hub: <https://hubresiduoscirculares.org/datos/>.

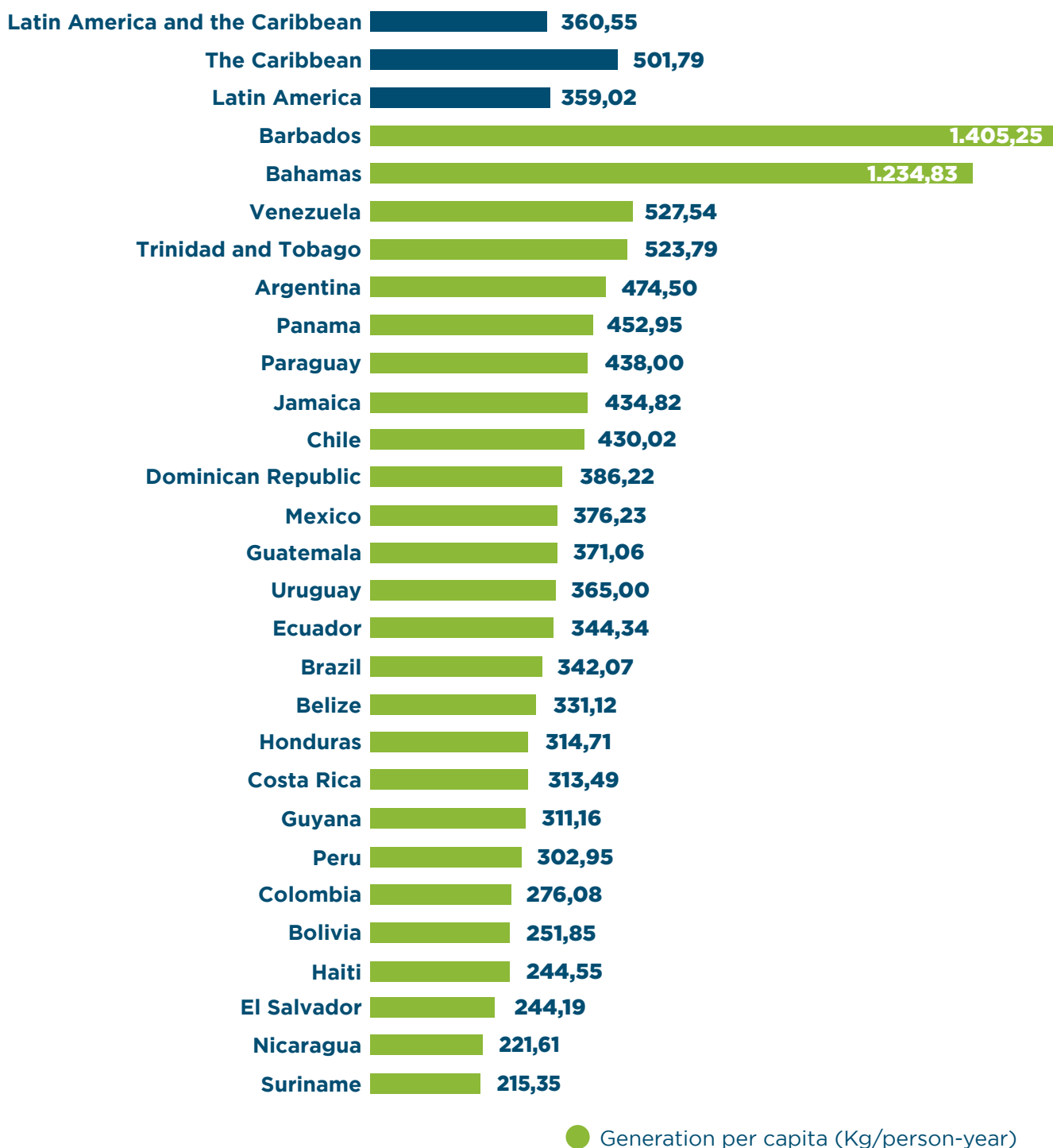
PCC: production per capita; GDP: gross domestic product; MSW: municipal solid waste; n/d: no data.

Likewise, in 2021 the annual per capita generation of MSW in the region ascended, on average, to 360,55 kg/person, and it is estimated that, if the current trend continues, the regional rate will increase by 50% by 2050, and it will reach an annual generation per capita of 529 kg/person. (Kaza et al., 2021).

In this case, the subregional relationship is reversed, since in first place is the Caribbean, with 501,79 kg/person-year, followed by Latin America, with 359,02 kg/person-year (see Figure 4). This is a gap that increases significantly at the national level, in which case Barbados and Bahamas stand out, with values that exceed 1.000 kg/person-year, because of their high economic dependence on tourist activity.⁹

⁹ According to the World Trade Organization (WTO) (WTO, 2022: 11), in 2019, the share of tourism in the gross domestic product (GDP) amounted to 17,5% in Barbados. On the other hand, the Diplomatic Information Office of the Ministry of Foreign Affairs, European Union and Cooperation (2022: 2) indicates that, in the structure of the GDP, the services sector of Barbados contributes 88,7% of the national total, and the tourism sector contributes to this figure with 15,6%.

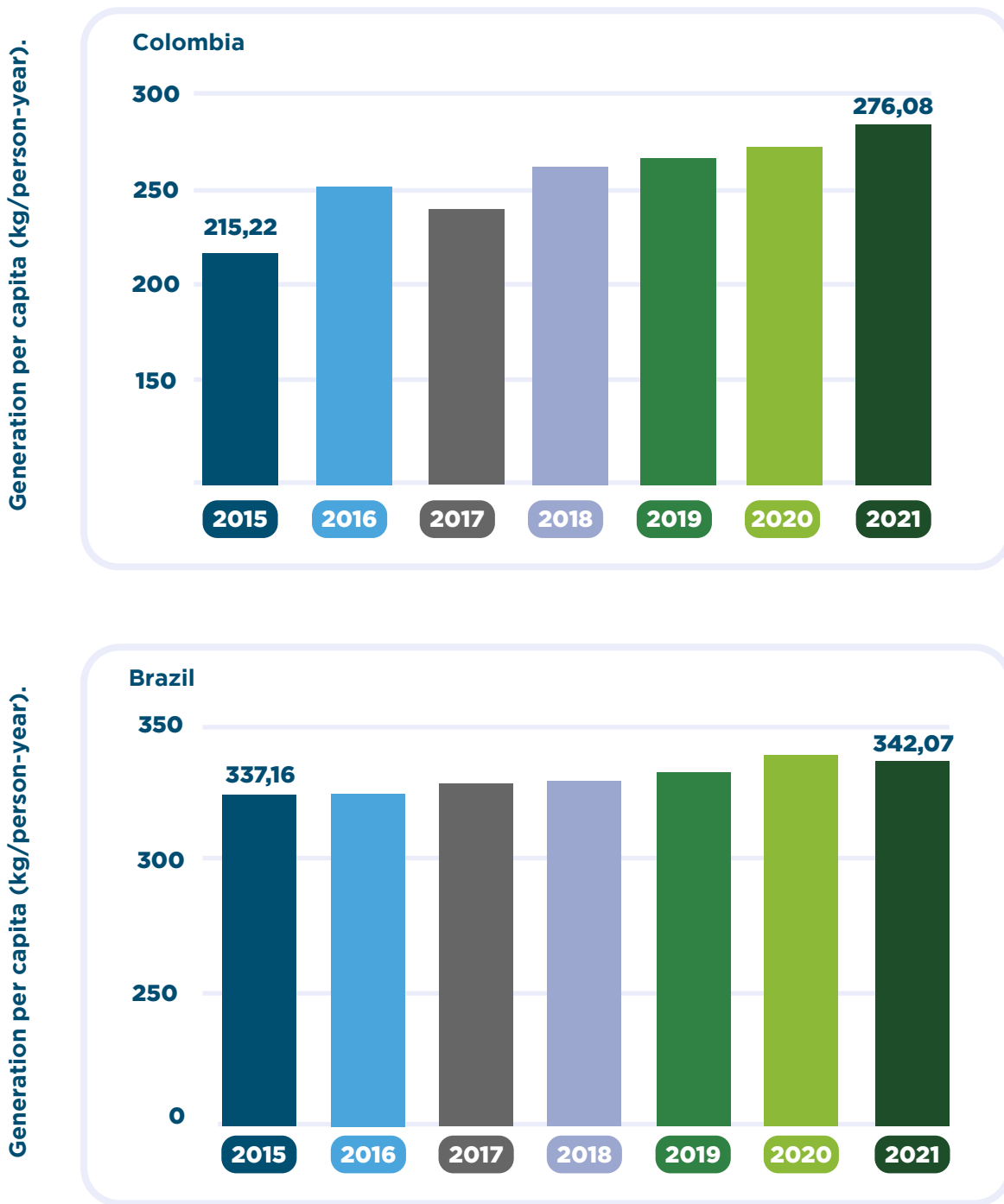
Figure 4. Per capita generation of municipal solid waste in Latin America and the Caribbean, 2021



Source: Regional database of the Solid Waste and Circular Economy Hub: <https://hubresiduoscirculares.org/datos/>.

On the other hand, the historical data integrated into the regional database show that, although in some years there are downward variations in the per capita MSW generation indicator, the trend among LAC countries is characterized by growth, as exemplified by the consecutive values corresponding to the Colombian rate (12,3%) and Brazil (7,5%) available for the period 2015-21 (figure 5).

Figure 5. Countries with a growing trend in the per capita generation of municipal solid waste



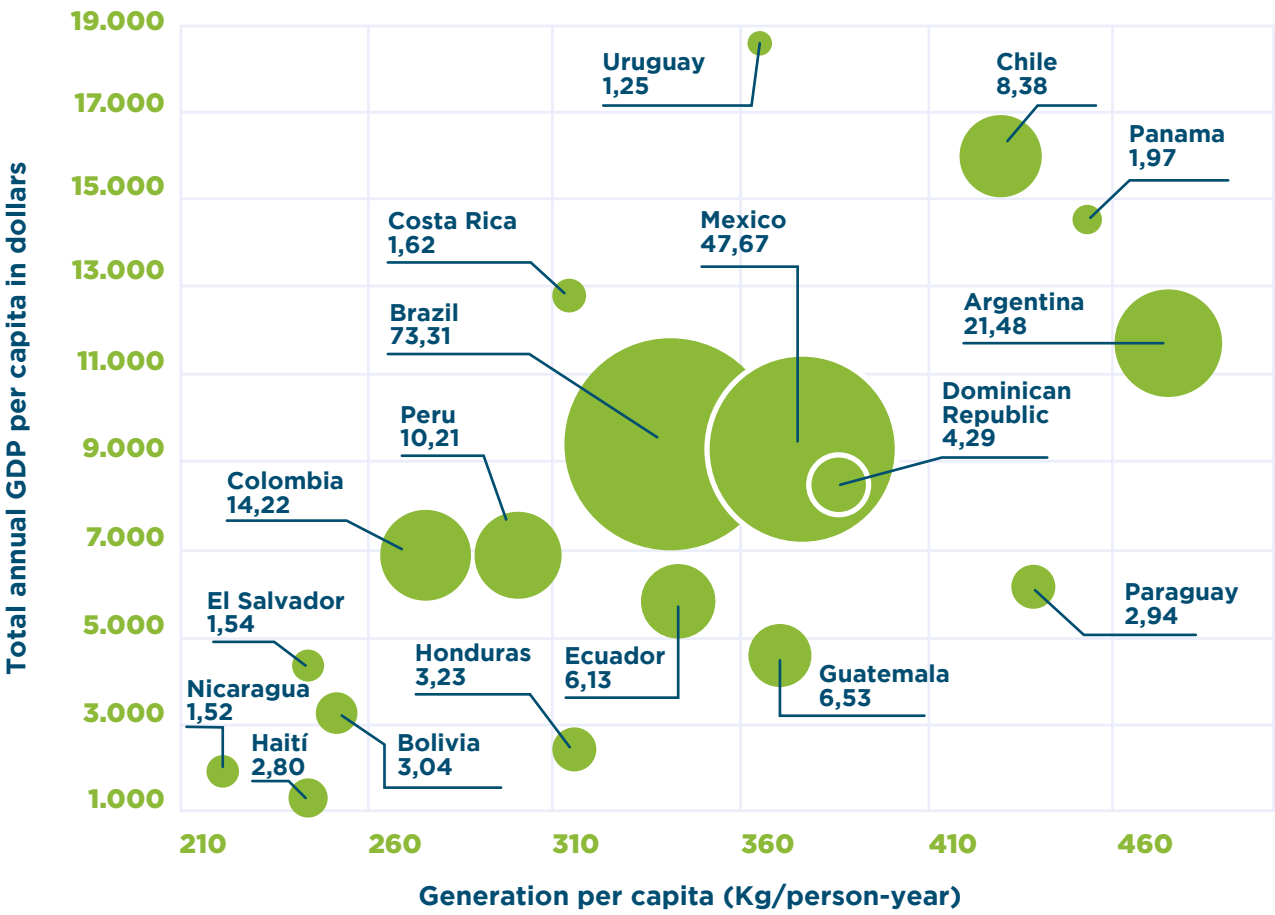
Source: Regional database of the Solid Waste and Circular Economy Hub: <https://hubresiduoscirculares.org/datos/>.

This incremental behavior of MSW generation over time is usually linked to processes such as economic and population growth, as well as the increase in the proportion of inhabitants permanently concentrated in urban areas, all accentuated by production and consumption patterns clearly unsustainable, linked to a linear economy (UNEP, 2018; Kaza et al., 2018).

The results corroborate that in LAC the trend that relates an increase in MSW generation to economic growth persists. Thus, in the Latin American subregion, Argentina, Panama, and Chile, which are high-income countries, have rates of 474 kg/person-year, 452 kg/person-year and 430 kg/person-year, respectively, and almost double the rates of lower-income countries such as Nicaragua (221 kg/person-year), Haiti (244 kg/person-year) and Bolivia (251 kg/person-year).

However, it should be noted that this rate also depends on the consumption patterns of the population, since there are cases, such as Costa Rica, which exhibits one of the highest per capita incomes in the region but has a relatively limited generation of 313 kg/person-year. Figure 6 reflects the generation of MSW per capita in Latin American countries.

Figure 6. Generation of municipal solid waste per capita, annual total by country and GDP per capita, Latin America, 2021

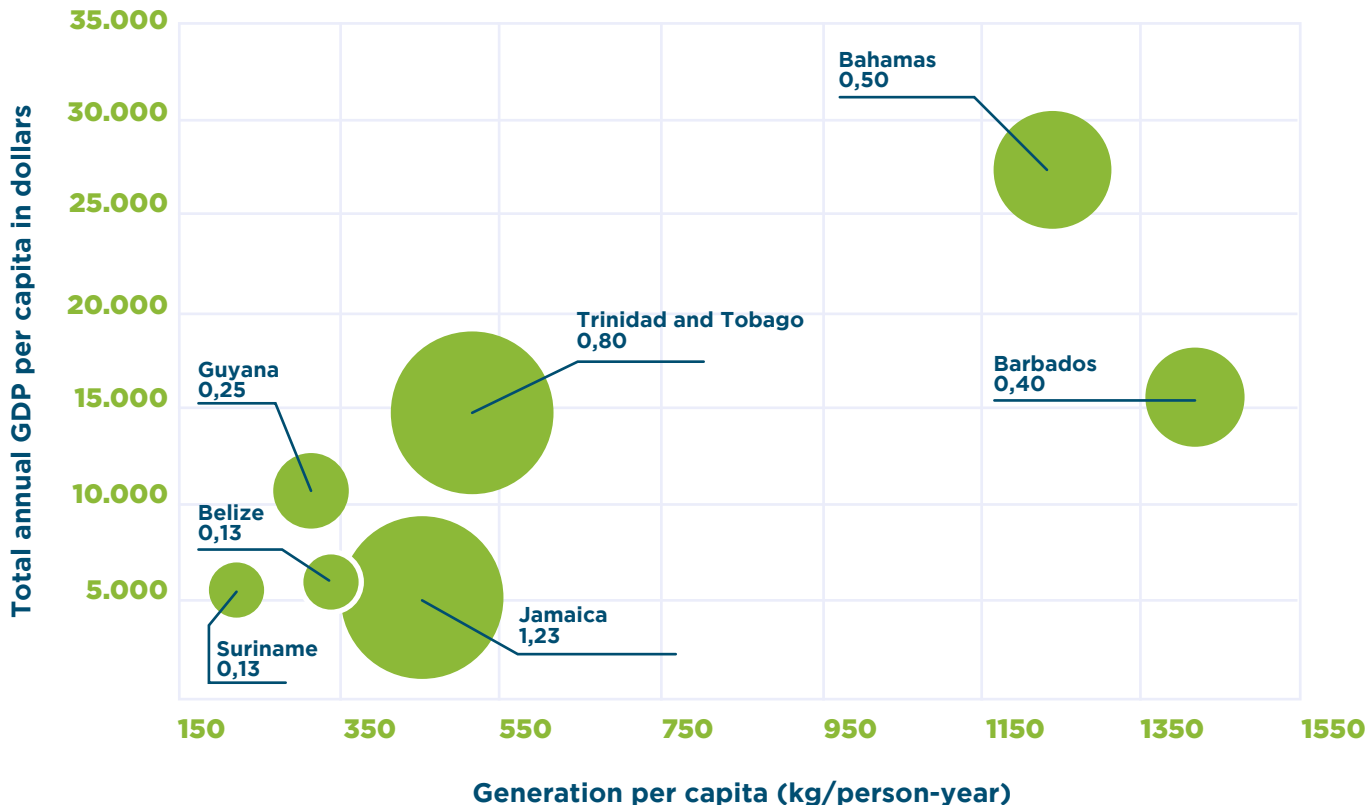


Source: Regional database of the Solid Waste and Circular Economy Hub: <https://hubresiduoscirculares.org/datos/>.

Note: The size of the bubble represents the total solid waste generated in millions of tons per year.

At the same time, in the Caribbean countries the condition of a generation of MSW per capita relatively proportional to GDP also persists (figure 7), except for Barbados, an island that stands out from the central tendency by presenting a rate almost four times higher than the regional average, the highest among the participating nations of this **EEVA 2023**.

Figure 7. Municipal solid waste generation and GDP in the Caribbean, 2021

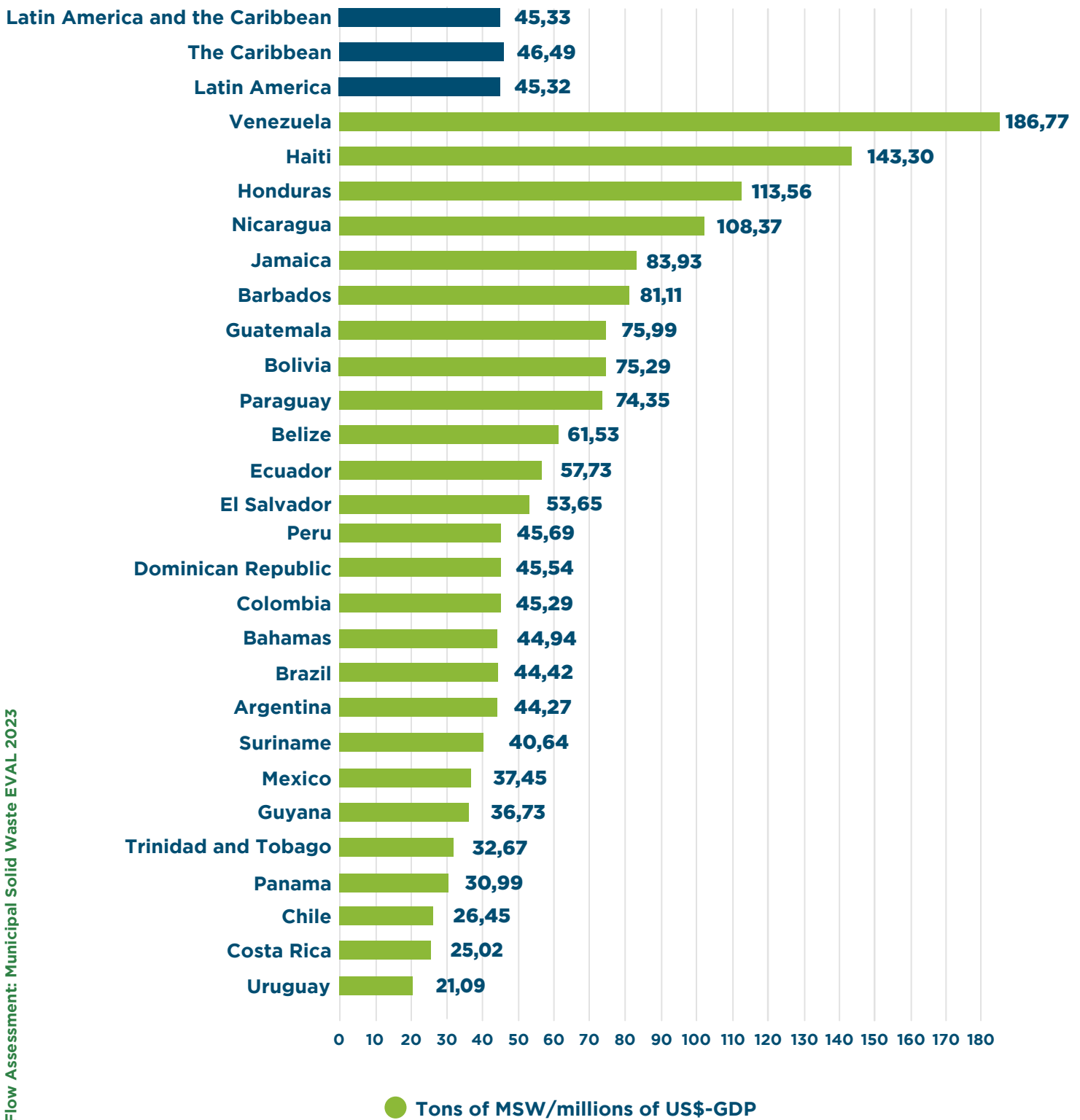


Source: Regional database of the Solid Waste and Circular Economy Hub: <https://hubresiduoscirculares.org/datos/>.

Note: The size of the bubble represents the total municipal solid waste generated in millions of tons per year.

A complementary analysis of these variables shows the intraregional behavior as of 2021 with respect to the intensity of MSW generation currently required to create wealth among LAC nations. In this sense, and with a circular economy approach, Uruguay, Costa Rica and Chile stand out as the most efficient countries in the use of resources (with 21,09, 25,02 and 26,45 tons of MSW per million dollars of GDP, respectively), while, at the other extreme, with the lowest degrees of decoupling, are Venezuela (186,77 tons of MSW/million US\$-GDP) and Haiti (143,30 tons of MSW/million US\$ -GDP), figures that are equivalent to more than three times the continental average (figure 8).

Figure 8. Municipal solid waste generation intensity in relation to GDP in Latin America, 2021

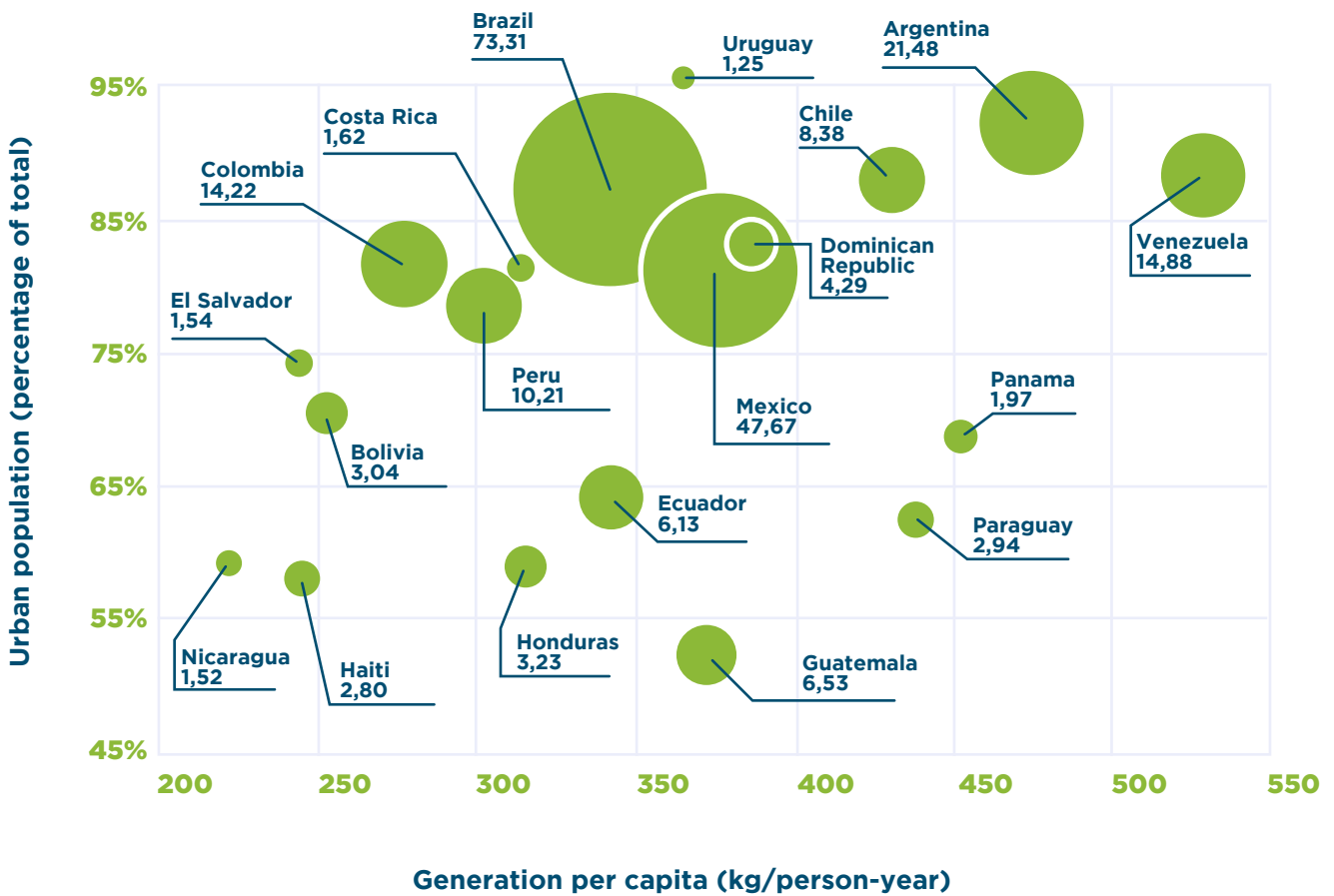


Source: Regional database of the Solid Waste and Circular Economy Hub: <https://hubresiduoscirculares.org/datos/>.

From the perspective of the degree of urbanization, a greater dispersion is observed in the results, linked to a higher per capita generation rate, although it is possible to identify a central tendency that still correlates them.

In this way, countries like Argentina and the Bahamas, with urbanization levels higher than 80%, in 2021, exhibited one of the highest rates of MSW generation per person for their respective subregions, a condition that is not met by Barbados and Guatemala, whose per capita MSW supply appears to be insensitive to the small urban population they have (figures 9 and 10).

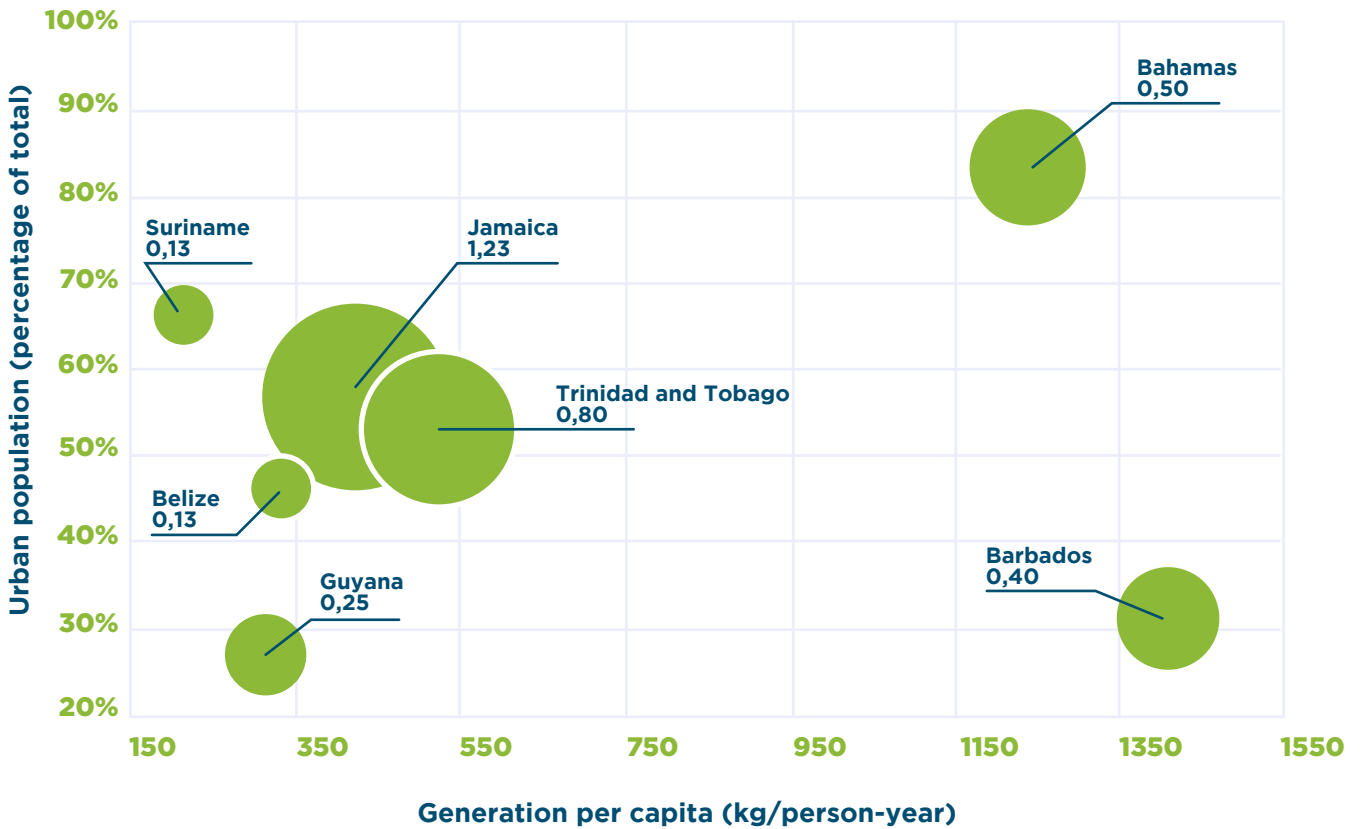
Figure 9. Generation of municipal solid waste and degree of urbanization in Latin America, 2021



Source: Regional database of the Solid Waste and Circular Economy Hub: <https://hubresiduoscirculares.org/datos/> and Kaza, Yao, Bhada-Tata and Van Woerden (2018).

Note: The size of the bubble indicates the total municipal solid waste generated in millions of tons per year.

Figure 10. Generation of municipal solid waste and degree of urbanization in the Caribbean, 2021



Source: Regional database of the Solid Waste and Circular Economy Hub: <https://hubresiduoscirculares.org/datos/>.

Note: Bubble size indicates total of municipal solid waste generated in millions of tons by 2021.

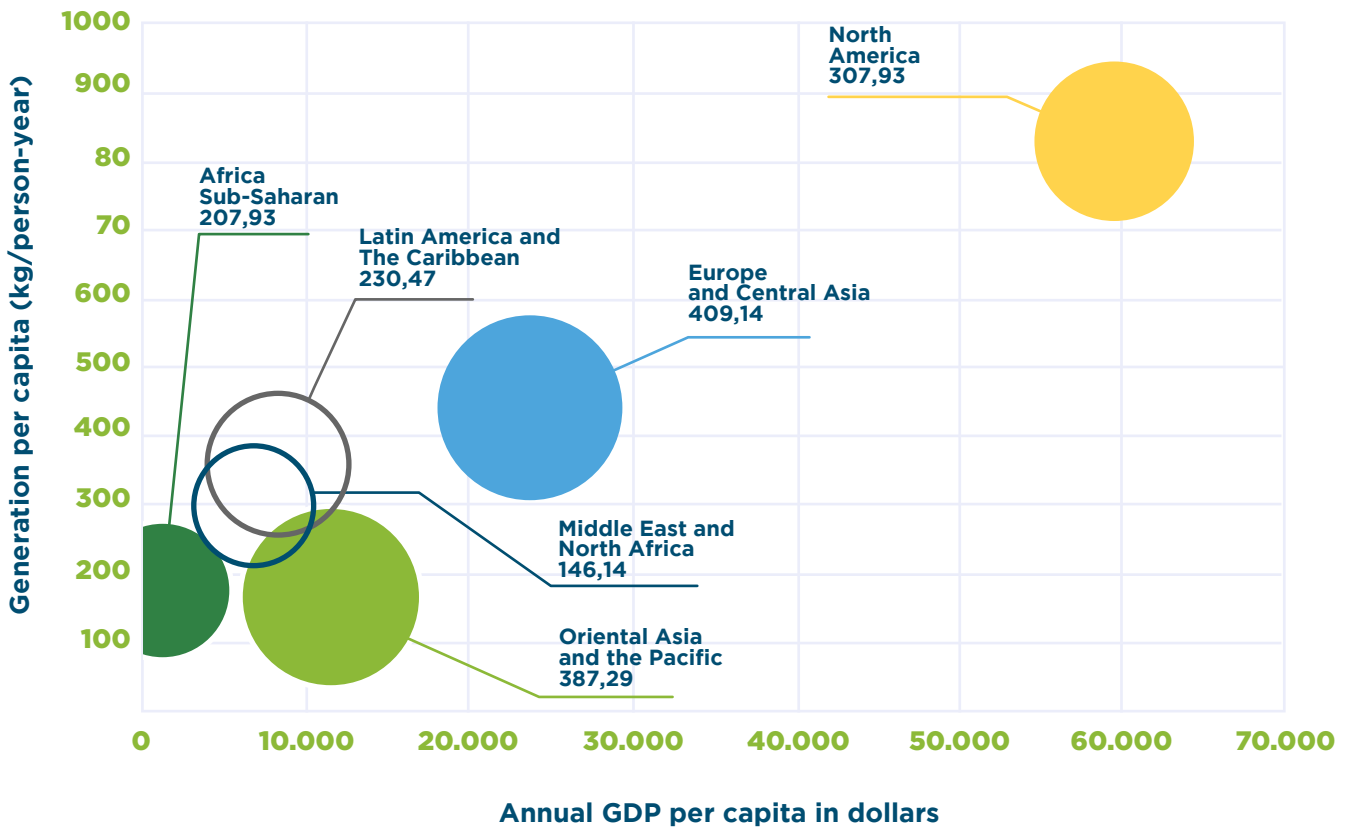
In 2021, LAC produced 13% of the global MSW supply, which has made it the third region with the largest quantities of MSW generated, above the Middle East and North Africa, and Sub-Saharan Africa.

In general terms, the behavior of the different regions of the world maintained the correlation between the magnitudes of the per capita MSW generation rates and the income of the nations, as well as their degrees of urbanization.

Additionally, a comparative analysis shows that Sub-Saharan Africa and LAC are the regions that produce the greatest amount of MSW for each dollar that enters their economies (with 110 and 43 grams, respectively), which reveals the highest inefficiencies in the use of resources. For its part, despite being the second most urbanized region globally, LAC was in an intermediate position with respect to the annual intensity in which its inhabitants produce MSW.

Figures 11 and 12 present a comparison between LAC and other regions in terms of MSW generation, GDP per capita, and degree of urbanization.

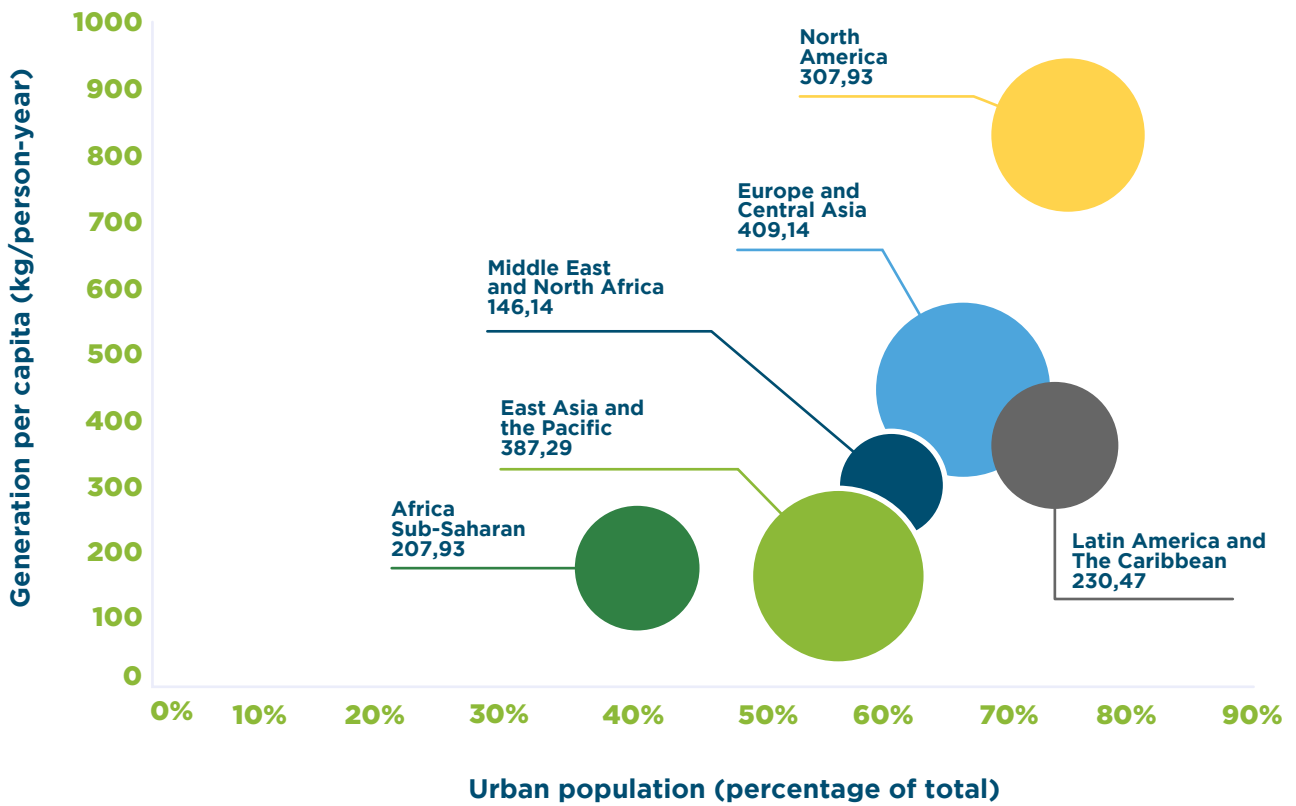
Figure 11. Comparison of municipal solid waste generation and GDP per capita, Latin America and the Caribbean versus other regions of the world, 2021



Source: Regional database of the Solid Waste and Circular Economy Hub: <https://hubresiduoscirculares.org/datos/> and Kaza, Yao, Bhada-Tata and Van Woerden (2018).

Note: The size of the bubble indicates the total municipal solid waste generated in millions of tons per year.

Figure 12. Comparison of municipal solid waste generation and degree of urbanization, Latin America and the Caribbean versus other regions of the world, 2021



Source: Regional database of the Solid Waste and Circular Economy Hub: <https://hubresiduoscirculares.org/datos/> and Kaza, Yao, Bhada-Tata and Van Woerden (2018).

Note: The size of the bubble indicates the total municipal solid waste generated in millions of tons per year.

The **EVAL 2023** updates the magnitudes of the MSW supply for LAC and, in addition, confirms that the region maintains an upward trend, closely related to the persistent linear production and consumption patterns in the countries that comprise it, which preserve the correlation between the per capita generation rate of MSW and economic growth, linked to the concentration of the population in urban areas.

Tracking and monitoring the MSW generation indicator in LAC is essential to verify the impact of any prevention and minimization measure on the supply of materials side, with the expectation that there will be a stabilization or reduction in their values. In this sense, attention must be paid to the organic fraction of MSW and its link to food waste, an item that, with 52% of the total weight, represents the largest flow of materials generated in the region. It is also necessary to consider the fraction corresponding to waste related to containers and packaging, such as paper and cardboard, plastic, glass, and metal, which, together, constitute 32% of the total weight (Correal et al., 2023a).

In addition, active participation of the generators and the need for them to effectively change the habits and patterns of consumption and production of waste is of great importance, for which the use of tools such as behavioral economics based on the knowledge of the emotional or behavioral tendencies of the actors can be considered or economic instruments, such as “pay as you throw” programs, which propose calculating rates based on the amount of MSW presented for collection (Correal et al., 2023a).

Likewise, it is essential to maximize the appropriation of the service by citizens, to break the inertia of the vicious circle recognized as the “low-level equilibrium” regarding provision. To do this, we must insist that each person recognizes their responsibility as a waste generator and the consequent obligation to pay for the service and point out the contributions that each person can make to improve waste management through its delivery to the sites, times and forms defined by the municipality or the service provider (Correal et al., 2023b).

Given this trend scenario, it is imperative to move towards a circular economy, gradually decoupling economic development from the use of resources, through the efficient use and preservation of their value, the regeneration of nature (Ellen McArthur Foundation, 2023) and, consequently, the reduction of MSW supply in the LAC region.

6. Take on the challenge of increasing the recovery of municipal solid waste in Latin America and the Caribbean

In accordance with the conceptual framework of the System of Environmental-Economic Accounting (SEEA) adapted for this **EEVA 2023**, the recovery of municipal solid waste (MSW) for Latin America and the Caribbean (LAC) includes the flow of materials utilized that have as destination recycling and reuse facilities (including recycling, composting, and anaerobic digestion),¹⁰ as well as the cogeneration of energy and other valorization (including co-processing and thermal valorization). Meanwhile, MSW that is not valorized can accumulate in sanitary landfills, be quantified as materials with an unidentified destination or determined as flows to the environment, either through the indicator of inadequate final disposal or one that reflects the amount of MSW that is not collected.

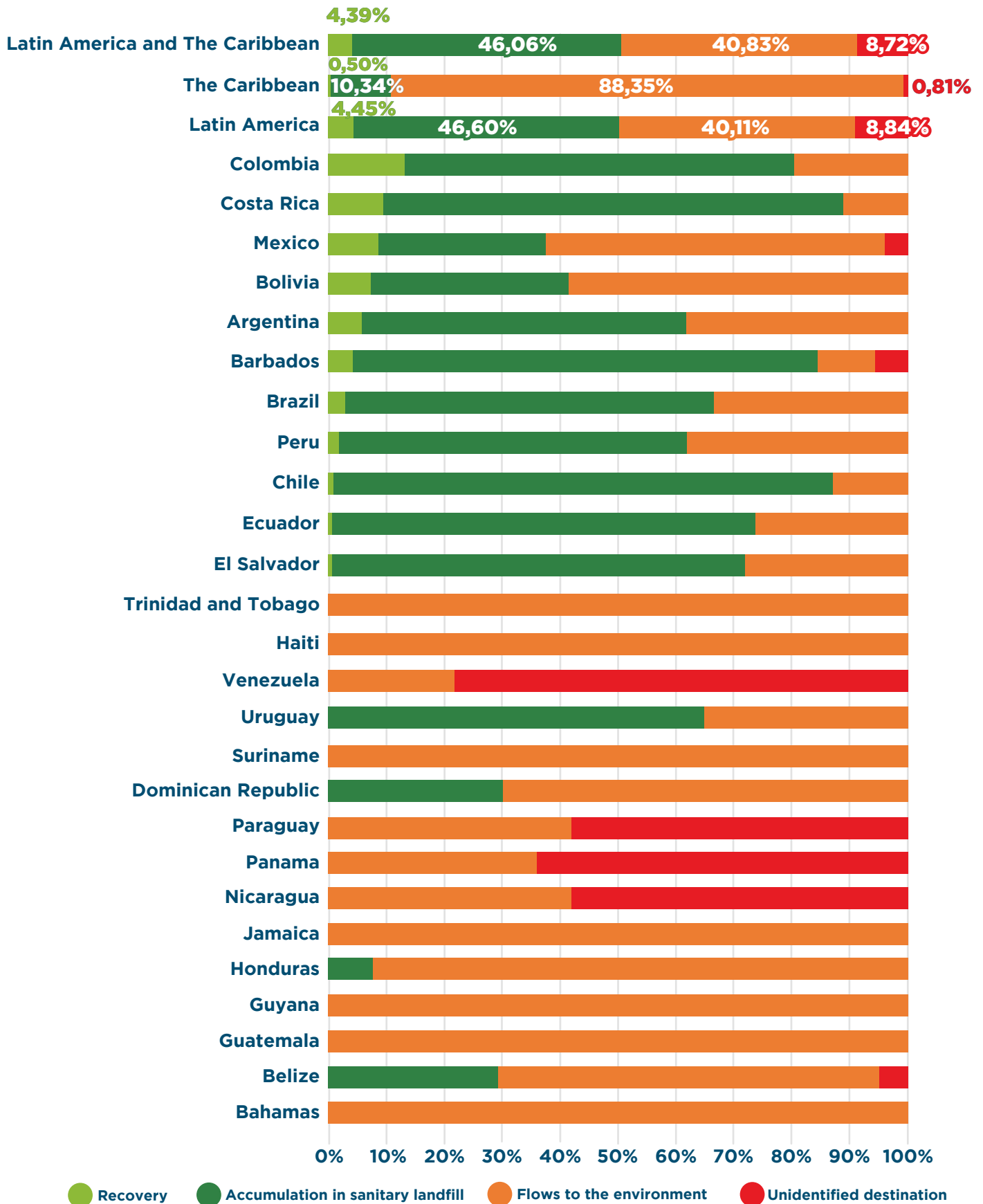
As can be seen in figure 13, for 2021, the predominant utilization of MSW in LAC corresponded to the accumulation in sanitary landfills (46,06% of the total materials), followed by flows to the environment (40,83% of the total generated). The destination of a relevant amount of MSW could not be identified from the information collected and edited (8,72%). Finally, the flow of materials valorized in the region is incipient (4,39% of the total generated). The previous trend is maintained for the Latin American subregion, while in the Caribbean the fundamental utilization of MSW corresponds to flows to the environment (88,35% of what is produced at that subregional level).

In Chile, Barbados, Costa Rica and Ecuador, the highest proportions of MSW accumulation in sanitary landfills are observed (with 86,44%, 80,26%, 79,21% and 73,11%, respectively); also, the first three countries on the previous list, emit the least amount of flows to the environment (which implies a small amount of materials with inadequate final disposal or that are not collected).

If it is considered that currently the utilization of sanitary landfills for the shipment of MSW in LAC prevails over other possible destinations, coupled with the confirmed growth of generation in the region and the need to replace inadequate final disposal sites with facilities controlled, it is understood that it is necessary to incorporate into sanitary landfills those technologies that allow active capture of biogas for its subsequent burning through flares or for the generation of energy, with the purpose of mitigating the expected increase in the production of greenhouse gases (GHG), particularly methane gas (UNEP, 2018).

¹⁰ The information collection process for the integration of the regional database of the Solid Waste and Circular Economy Hub did not identify MSW flows sent to thermal valorization facilities in the LAC region. Meanwhile, material flows directed to anaerobic digestion facilities (particularly in Brazil) are not reflected in national statistics for the sector, due to the small scale of their operations.

Figure 13. Utilization of municipal solid waste in Latin America and the Caribbean, 2021 (percentage of generation)



Source: Regional database of the Solid Waste and Circular Economy Hub: <https://hubresiduoscirculares.org/datos/>

In LAC, recycling predominates as the main form of recovery (with 3,85% of the supply of materials), followed by lower percentages associated with composting and co-processing facilities (recovery through anaerobic digestion is not reported, although there are specific projects in Brazil,¹¹ nor through incineration with/without energy recovery). The previous behavior is sustained for Latin America, while the Caribbean is characterized by a small percentage of recovery only for the recycling of materials (contributed by Barbados, together with Trinidad and Tobago).

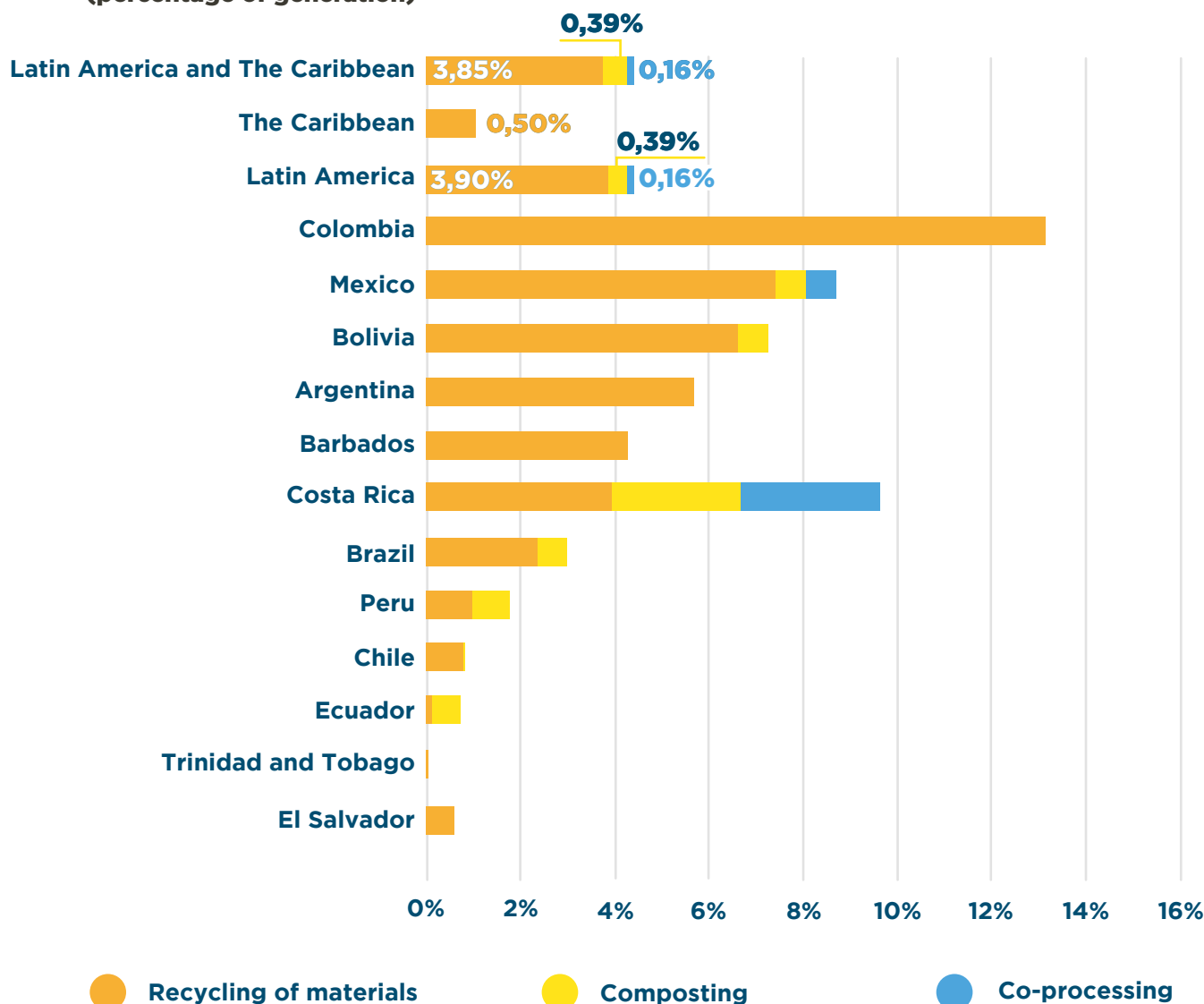
Given the current configuration of regional recovery, estimates stand out indicating that up to 50% of the MSW recycled in LAC comes from the involvement of approximately 2 million grassroots recyclers (Latin America and the Caribbean Circular Economy Coalition, 2022). , recognized as those “people who are dedicated to collecting recyclable waste to sell it, either individually or in different modes of organization” (The Economist Intelligence Unit, 2017: 10).

By 2021, only 12 LAC countries had information related to the recovery of MSW, among which Costa Rica and Mexico stand out as the only ones to report data on the three types of destinations identified: recycling, composting, and co-processing (see figure 14).

Regarding the recycling of materials, Colombia, Mexico, and Bolivia lead this area in the region (with 13,17%, 7,45% and 6,80% of their material supply, respectively). Regarding composting, the countries that send the highest proportion of MSW for this form of recovery are Costa Rica (2,70%), Peru (0,82%) and El Salvador (0,65%). Finally, MSW co-processing is reported in Costa Rica and Mexico, with 2,98% and 0,65% of its generation, respectively (figure 14).

¹¹ According to the National Solid Waste Plan (Planares) of Brazil (Ministry of the Environment, 2022: 38), there are anaerobic digestion project initiatives in the municipality of Bertioga, which since 2018 has had the first anaerobic digestion plant in containers, with a treatment capacity of 120 tons per month; it is also worth mentioning the Caju Biogas Plant, in Rio de Janeiro, which has been operating since 2018 in the Caju EcoParque, with the capacity to receive 30 tons of waste per day.

Figure 14. Recovery of municipal solid waste in Latin America and the Caribbean, 2021 (percentage of generation)



Source: Regional database of the Solid Waste and Circular Economy Hub: <https://hubresiduoscirculares.org/datos/>.

In addition to consolidating the elimination of inadequate final disposal sites, the main challenge for LAC, in terms of a utilization of materials increasingly oriented towards the low-carbon circular economy, is to significantly increase the current rates of MSW recovery.

In this sense, as the regional potential of recovery focuses particularly on the flows of organic materials (which is especially relevant for closing the biological cycle associated with the circular economy in order to recover nutrients and improve soil quality, as well as prevent erosion) and in containers and packaging, which together represent more than 80% of the available supply by weight (Correal et al., 2023a), it will be vital for LAC to further strengthen and incentivize MSW recycling and composting activities, and to promote the incorporation of anaerobic digestion processes. Likewise, in the case of the remaining flows that cannot be recycled or have a new use, their recovery in co-processing or thermovalorization facilities must be promoted and, finally, the accumulation in sanitary landfills of those that cannot be valorized must be ensured.

7. Intensify efforts to eliminate municipal solid waste flows sent to the environment

In Latin America and the Caribbean (LAC), practically 50% of municipal solid waste (MSW) are released to the environment or have an unidentified destination.

In this sense, the regional flow for 2021 shows that, of what is sent to the environment, the largest amount of materials ends up in inadequate final disposal sites (25,57% of what is generated), while those not collected are positioned in second place (15,25% of the supply), followed by unidentified destination (8,72% of what is produced). Figure 15 reflects these flows.

While this condition is determined by the behavior observed in Latin America, the Caribbean subregion is characterized by a trend that almost triples inadequately disposed MSW and a collection gap that widens by 35%.

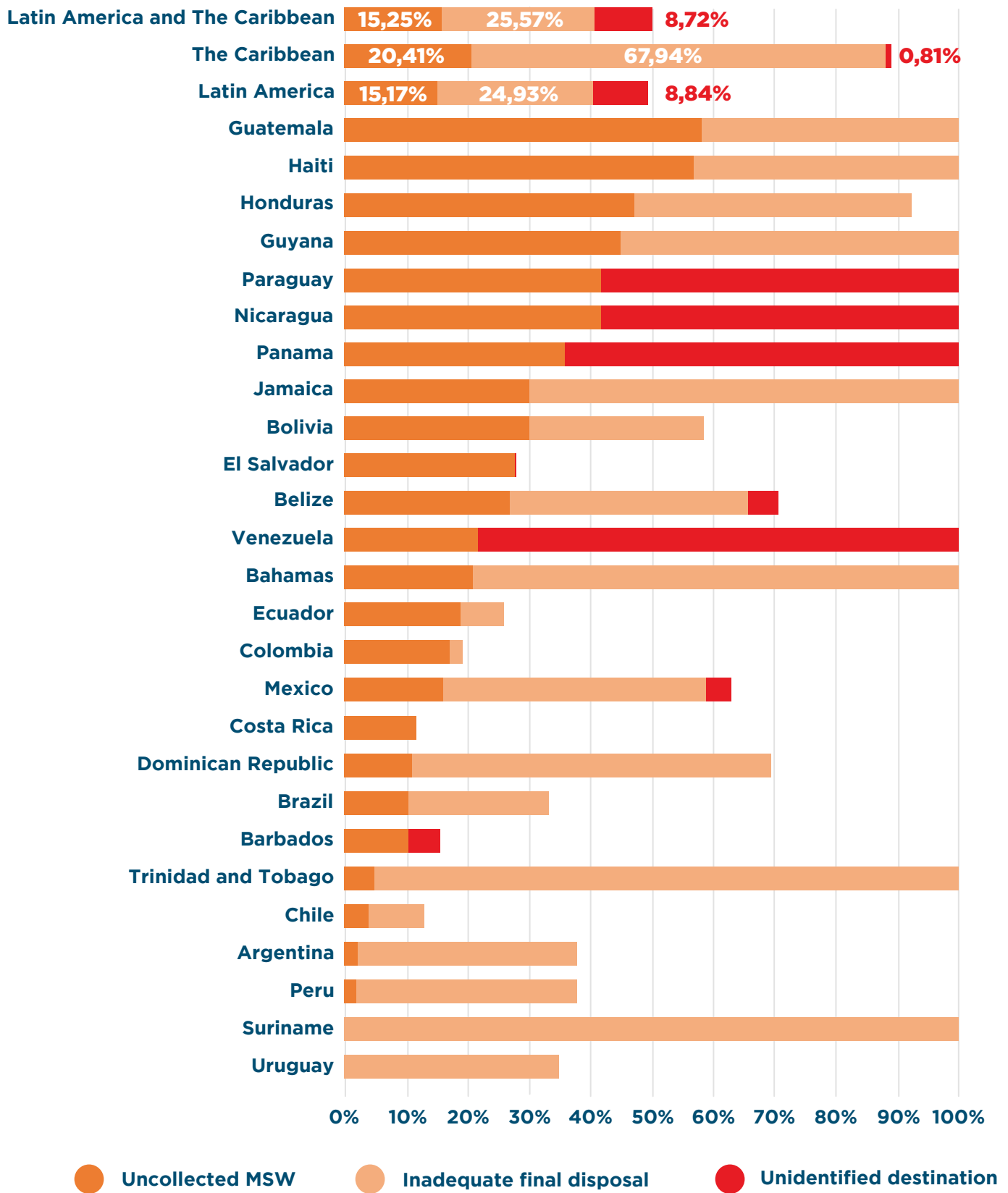
The negative impacts associated with these uncontrolled material flows are multidimensional. Inadequate final disposal, which in some countries exceeds 70% of MSW supply, significantly increases the risk of soil and water contamination through leachate runoff, and has an impact on the global warming phenomenon caused by the indiscriminate release of methane gas, and even, when open burning practices exist, of black carbon. On a trans-sectoral level, MSW flows to the environment have the potential to affect the operation of urban drainage systems, deepening the impact of flooding, a condition that is exacerbated by the increase in extreme weather events associated with climate variability.

Additionally, despite the progress that the region has made in recent years (Kaza et al., 2018; UNEP, 2018), the information and data integrated in this regional assessment indicate that certain nations still present lags of collection services of more than 40 %, with the consequent health effects derived from the proliferation of vectors and the consequent transmission of diseases. Finally, in some countries, the uncertainty associated with the destination of certain flows of collected MSW (in some cases exceeds 50% of what is generated), prevents achieving effective traceability of the leak points of plastic materials, which end up in river, coastal and maritime ecosystems.

Today, MSW released without control or traceability to the environment in LAC is equivalent to 114 million tons annually (49,54% of the total MSW generated). In this sense, the magnitude of the problem is monumental, and its attention will require doubling efforts to redirect and eliminate these flows within the framework of the transition towards a circular and low-carbon economy.

To achieve this, it will be necessary to accomplish the gradual closure of the current inadequate final disposal sites; intensify actions aimed at providing access to collection services for the rural population of the region and improving quality in the case of the urban population, so that services are no longer basic but become improved or total; and, finally, promote the use of information technologies and the digital transformation of the sector to provide the necessary traceability of those material flows currently without an identified destination, moving from assumptions and estimates to observed measurements (McKinsey&Company, 2021).

Figure 15. Flows of municipal solid waste towards the environment and with an unidentified destination in Latin America and the Caribbean, 2021 (percentage of generation)



Source: Regional database of the Solid Waste and Circular Economy Hub: <https://hubresiduoscirculares.org/datos/>.

8. Improve the management of municipal solid waste, a key aspect in Latin America and the Caribbean to tackle climate change in the short term

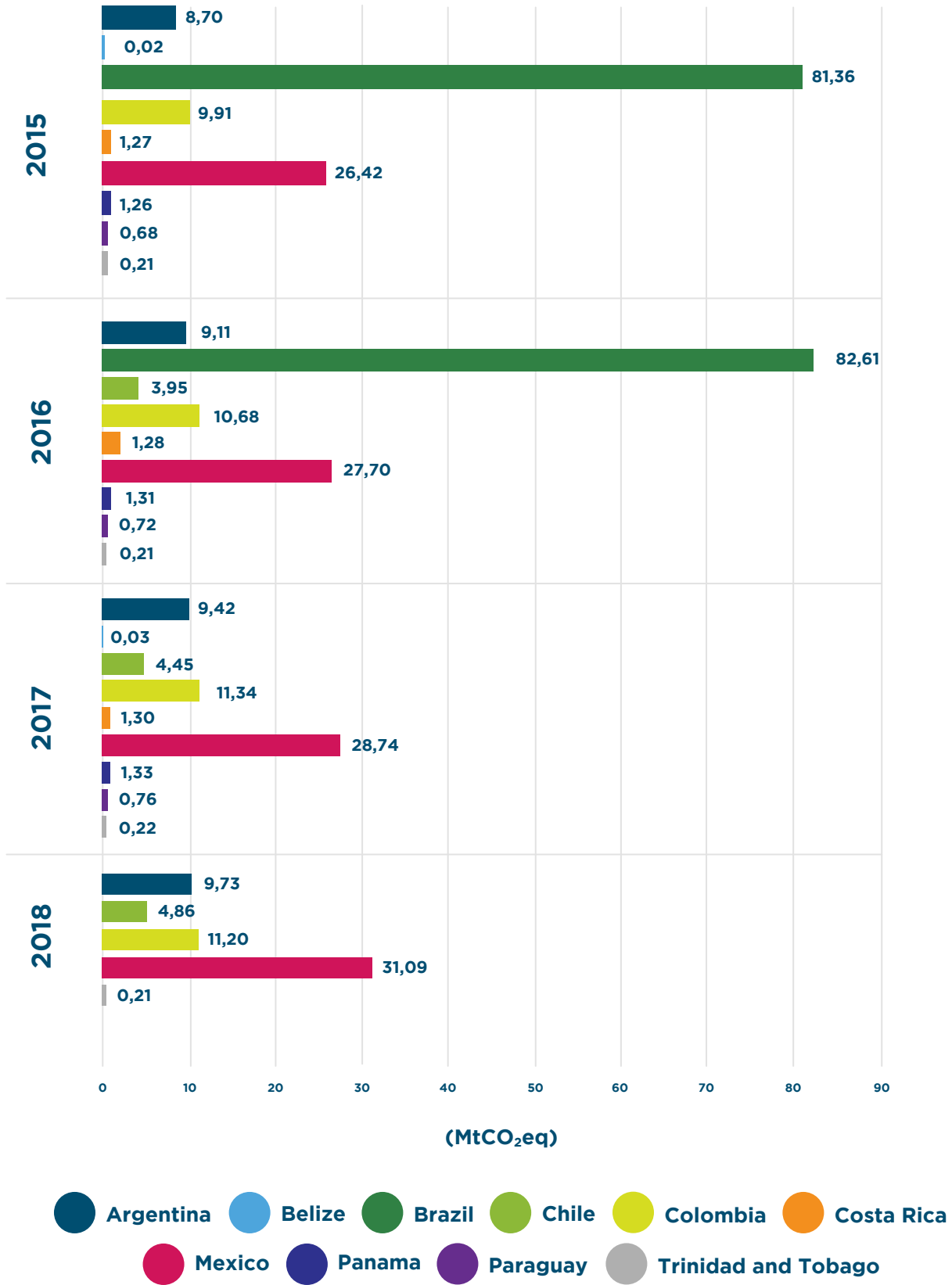
The management of municipal solid waste (MSW) contributes to the generation of greenhouse gases (GHG), mainly methane, carbon dioxide and nitrous oxide, either through its combustion or as a result of stabilization in the final disposal stage (EPA, 2022); for this reason, it is recognized that “greenhouse gases from waste are a fundamental factor that contributes to climate change” (World Bank, 2018).

Regarding methane, according to the International Energy Agency (IEA), “it is responsible for around 30% of the increase in global temperatures since the industrial revolution” (Ellerbeck, 2022). Likewise, this gas “remains in the atmosphere for about 12 years” (Climate & Clean Air Coalition, n.d.), so its reduction has immediate climate impacts.

According to the Latin American and the Caribbean Circular Economy Coalition (2022: 9), the Latin American and Caribbean (LAC) region “contributes approximately 10% of global greenhouse gas emissions”; of this figure, around 10% derives from industrial processes and waste.

During the process of integrating the regional database, based on biennial reports and inventories, and national communications from the participating countries, it was possible to collect information about GHG emissions specific to the MSW sector. Thus, in the first instance, the results revealed a great discontinuity of information, the greatest availability of which is concentrated in the period 2015-18 and with the predominance of Brazil, Mexico, Colombia, and Argentina as the nations with the highest values of CO₂eq tons emitted annually (figure 16).

Figure 16. CO₂eq emissions from the solid waste sector, 2015-18 (MtCO₂eq/year)

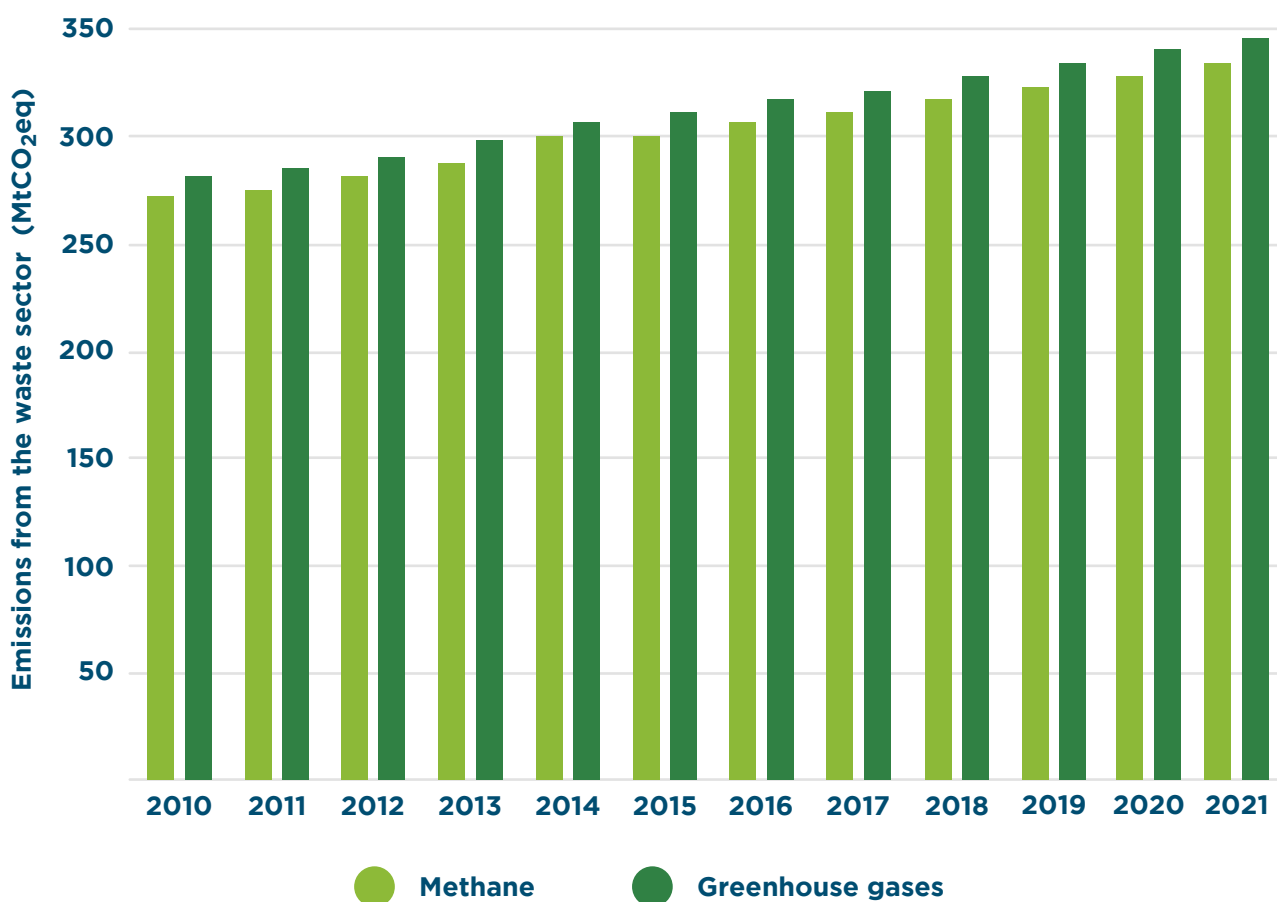


Fuente: Base de datos regional del Hub de residuos sólidos y economía circular: <https://hubresiduoscirculares.org/datos/>.

Due to information limitations, projections from the International Monetary Fund (IMF) were used, which in its Panel of Climate Change Indicators (IMF, 2023) publishes annualized data from 1970 to 2021 for the waste sector (including MSW and wastewater) and disaggregates them into the most relevant GHGs, including methane, carbon dioxide and nitrous oxide.

According to IMF projections, for 2021, GHG emissions in LAC from the solid waste sector total 345,48 million tons of CO₂eq (MtCO₂eq), of which 97% correspond to methane emissions, which corroborates the predominant nature of this GHG for the region (figure 17).

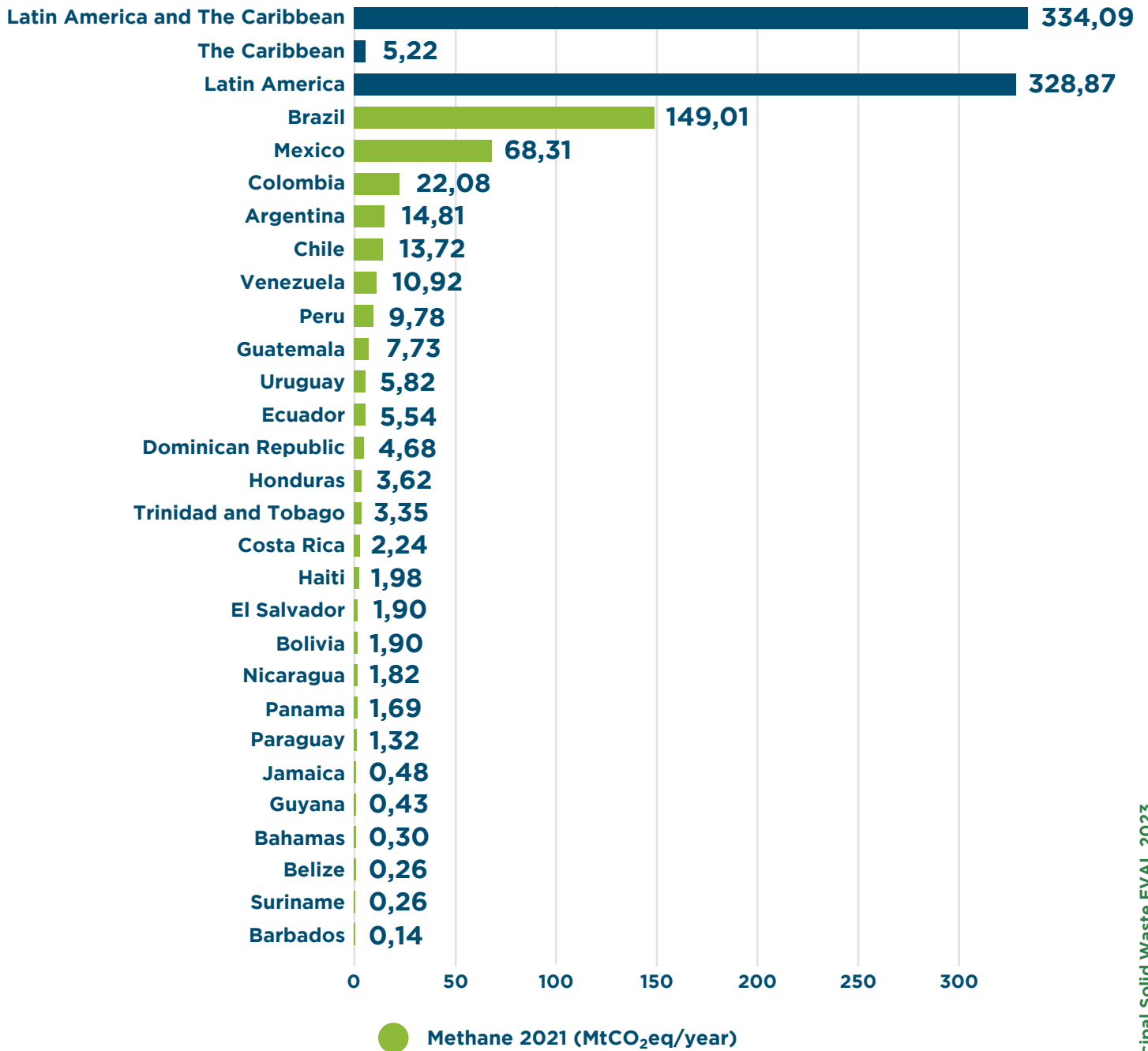
Figure 17. Proportion of methane in total emissions from the solid waste sector in Latin America and the Caribbean, 2010-21 (MtCO₂eq/year)



Source: Own elaboration based on projections of the International Monetary Fund (IMF).

A look at the national level reveals that five countries concentrate just over 80% of the methane emissions estimated for 2021 in LAC (figure 18): Brazil (149,01 MtCO₂eq), Mexico (68,31 MtCO₂eq), Colombia (22,08 MtCO₂eq), Argentina (14,81 MtCO₂eq) and Chile (13,72 MtCO₂eq).

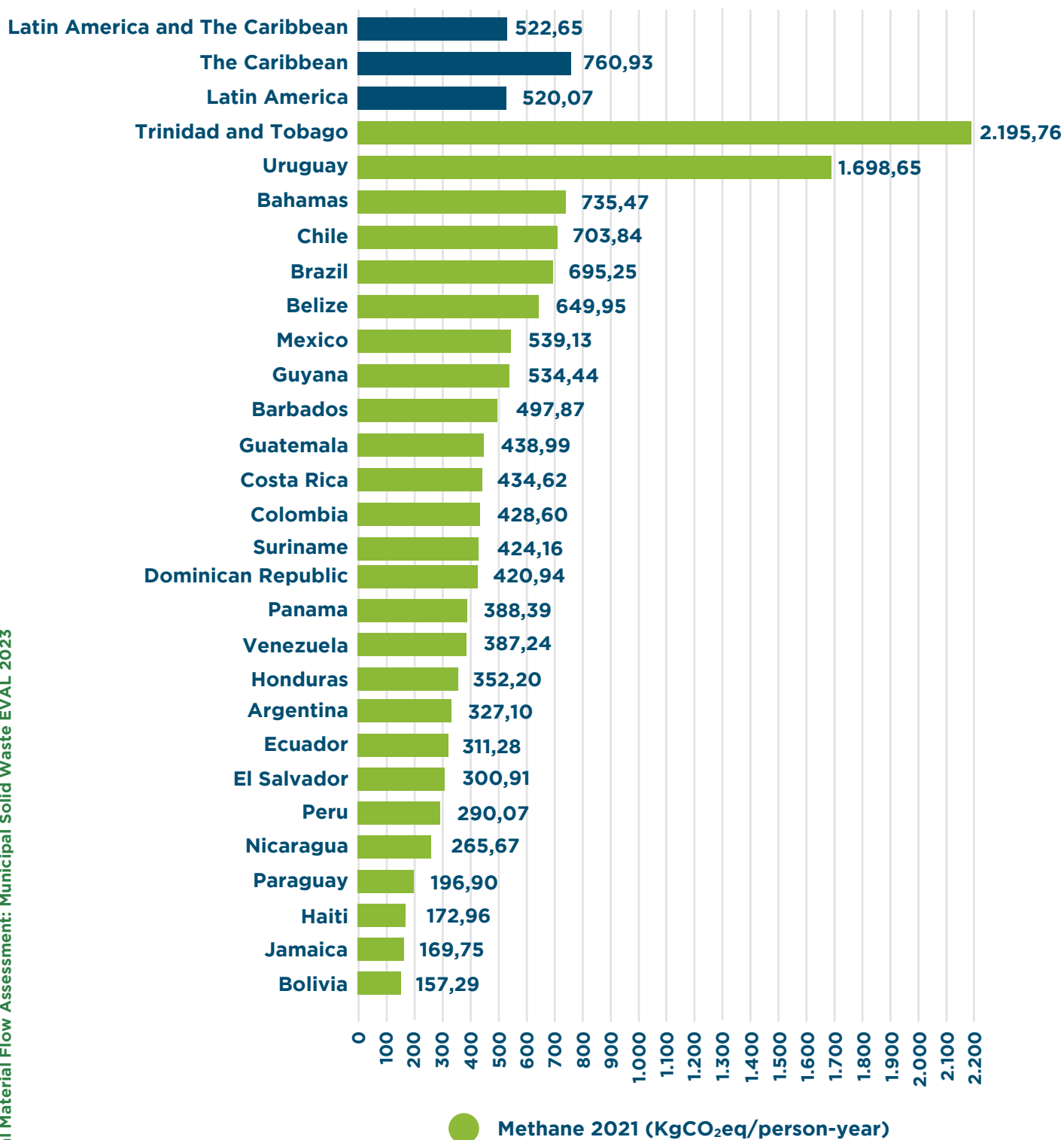
Figure 18. Methane emissions from the waste sector in Latin America and the Caribbean, 2021 (MtCO₂eq/year)



Source: Own elaboration based on projections of the International Monetary Fund (IMF).

On the other hand, an approximation in terms of methane emissions per capita shows that Trinidad and Tobago, together with Uruguay, have annual rates higher than the 1.500 kgCO₂eq/person, a figure between three and four times higher than the regional value of 522,65 kgCO₂eq/person-year (figure 19).

Figure 19. Methane emissions per capita in Latin America and the Caribbean, 2021 (kgCO₂eq/person-year)



Source: Own elaboration based on projections of the International Monetary Fund (IMF).

It is worth mentioning that, within the framework of the 26th United Nations Conference on Climate Change (COP) of 2021 held in Glasgow, the importance and urgency of prioritizing actions regarding methane mitigation were evident, and – in that context – the Global Methane Pledge (GMP) was signed, the objective of which is to reduce global methane emissions by 2030 by 30% below the levels recorded in 2020. Promoted in 2021 by the United States and the European Union (EU), more than 100 countries have joined the commitment, representing more than two-thirds of the world's gross domestic product (GDP) and nearly half of global anthropogenic methane emissions.¹²

With the purpose of contributing to the goal proposed by the GMP, various financing and technical assistance initiatives have emerged at the international and regional levels.

Such is the case of the Global Methane Hub,¹³ the first coordinated global financing effort for the mitigation of this gas, concentrated in the energy, agriculture, and waste sectors, which represent 96% of anthropogenic methane emissions. Additionally, and as part of the GMP *Waste Pathway*, launched during COP27, the Inter-American Development Bank (IDB) will be financing projects with a high impact on methane reduction in different LAC countries and will launch the “*Too Good to Waste*” initiative to implement waste projects related to the mitigation of this gas (United States Department of State, 2022).

Finally, the “Organic Recycling Latin America and the Caribbean” program benefits six countries in the region (Chile, Costa Rica, Mexico, Peru, the Dominican Republic, and Uruguay), with the aim of accelerating the implementation of methane mitigation projects in the sector and create conditions conducive to a sustained expansion of organic waste management technologies.¹⁴

The significant proportion of methane gas that makes up the GHG emissions reported for the MSW sector in LAC makes its mitigation unavoidable, to contribute to a rapid reduction in the rate of global warming in the short term, since this is the more effective technical-financial strategy and also generator of social, environmental and economic co-benefits.

Some actions to improve MSW management in the region and that would prevent or mitigate methane emissions are the following: i) limit the disposal of organic waste in sanitary landfills and recover and recycle it through composting techniques (in homes, at community level or in municipal or regional facilities) or anaerobic digestion with the valorization of biogas; ii) resort to the active capture of biogas in sanitary landfills and the technical closure of inadequate final disposal sites, and iii) reduce and prevent food losses (in production processes) and waste (in consumption processes).¹⁵ (Correal et al., 2023a).

¹² See the link <https://www.globalmethanepledge.org/>.

¹³ See the link <https://www.globalmethanehub.org/>.

¹⁴ See the link <https://www.reciclorganicoslac.org/>.

¹⁵ See the #SinDesperdicio initiative led by the Inter-American Development Bank (IDB) at the link <https://sindesperdicio.org/es/>.

9. The Sustainable Development Goals and the commitment to improve the flow of materials and municipal solid waste management to advance towards the circular economy

The Sustainable Development Goals (SDGs) constitute a planning and monitoring tool for countries, both at the national and local levels, in their transition towards sustainable development (United Nations, s/f). Two indicators that refer to municipal solid waste (MSW) management are Indicator 11.6.1: Proportion of municipal solid waste collected periodically and with an adequate final discharge with respect to the total urban solid waste generated, broken down by city, and Indicator 12.5.1: National recycling rate, in tons of recycled material. Box 1 contains a detailed description of Indicator 11.6.1 in relation to MSW.

11 SUSTAINABLE CITIES AND COMMUNITIES



Box 1. Indicator 11.6.1: Proportion of municipal solid waste collected and managed in controlled facilities with respect to the total municipal solid waste generated, by city^a

SDG 11.6 aims for better environmental performance of cities. As part of this SDG, Indicator 11.6.1 measures progress in the performance of a city's municipal solid waste management (MSW)^a. To do this, it quantifies the parameters listed below, which are essential for sustainable planning and implementation of MSW management:

- a. Total MSW generated in the city (tons/day).
- b. Total MSW collected in the city (tons/day).
- c. Proportion of the population with access to the MSW collection service in the city (percentage).
- d. Total MSW managed in controlled facilities in the city (tons/day).
- e. MSW Composition.

The parameters (b) [Total MSW collected] and (c) [Proportion of the population with access to MSW collection services] are two different concepts. While subsection (b) refers to the quantities of waste that arrive at the facilities for management, (c) considers the population that receives waste collection services. In some cities it is common for waste “collected” from homes to be dumped in surrounding areas rather than transported to final disposal or recovery facilities. In this case, the home has collection services, but the waste collected is contaminating the environment. Therefore, it is possible for a city to have a high proportion of the population with access to basic waste collection services, but the amount of MSW collected and transported to waste management facilities to be low.

(continues on the next page)

Box 1. *(continuance)*

Although subsection (c) is addressed by SDG 1 (End poverty in all its forms everywhere), under SDG Target 1.4 and Indicator 1.4.1, which focuses on universal access to basic services, with a particular emphasis on poor and vulnerable groups, SDG 11.6.1 metadata provides guidelines, quality scales and household questionnaires to measure the proportion of the population with access to MSW collection services “basics”. The household questionnaire can be integrated into the national census or into the global household survey mechanism, such as the Demographic and Health Survey or the Multiple Indicator Cluster Surveys of the United Nations Children’s Fund (UNICEF). Due to the lack of standardized concepts and definitions to differentiate these two notions, many cities report the proportion of MSW collected on their own terms. Therefore, the Indicator 11.6.1 metadata clearly distinguishes between parts (b) and (c) and introduces approaches to monitoring and reporting on part (c).

The population with access to basic MSW collection services is the proportion that effectively receives waste collection services, whether basic, improved, or total, defined by a scale that considers aspects of frequency, regularity, differentiation by fractions and proximity of the collection points. This aspect is measured under the evaluation of Indicator 11.6.1 of the SDGs, but is reported through a different indicator, Indicator 1.4.1., which deals with access to basic services.

MSW managed in controlled facilities are those MSW collected and transported to recovery and final disposal infrastructures with basic, improved, or total control, depending on the level of control of the waste management facilities. The scale in question can be used as a checklist to evaluate the level of control of a particular recovery or disposal facility. It should be considered that in this case the emphasis is on operational control rather than engineering or design. A facility built to a high standard, but not operated in accordance with Level 3 (or higher), is not considered a controlled facility.

^a See <https://unstats.un.org/sdgs/metadata/files/Metadata-11-06-01.pdf>

For its part, in

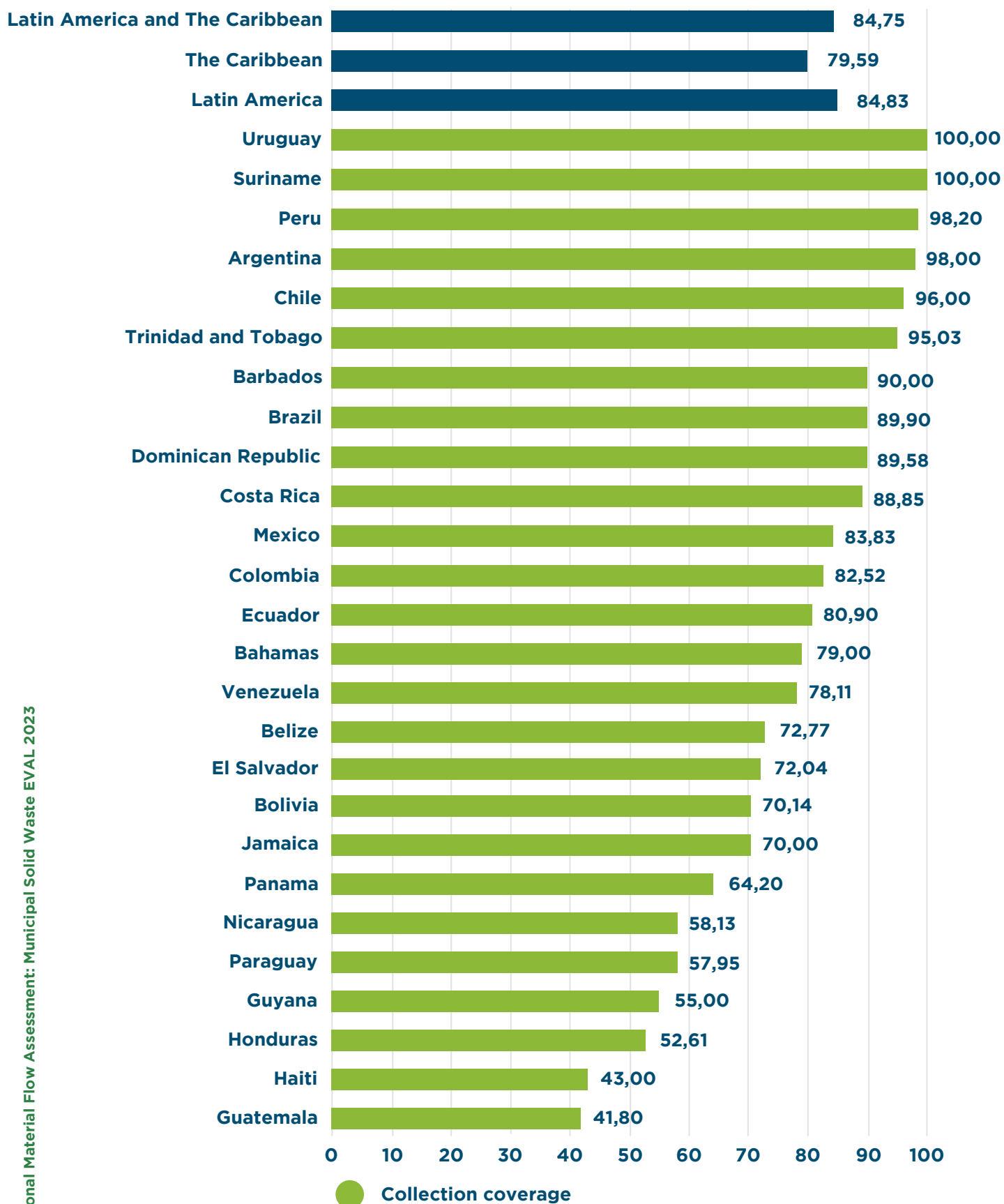
<https://unhabitat.org/sites/default/files/2022-03/Waste%20wise%20cities%20tool%20-%20ES.pdf>.

It is possible to access the document Waste Wise Cities Tool: Step-by-step guide to evaluate the performance of a city’s urban solid waste management through Indicator 11.6.1-Monitoring.

In the LAC region, collection coverage¹⁶ average for 2021 amounted to 84,75%, a trend that remains close for the subregions of Latin America and the Caribbean. The cases of Uruguay and Suriname stand out, with total coverage, as well as those of Peru, Argentina, Chile and Trinidad and Tobago, with values very close to 100% (see figure 20).

¹⁶ “Total municipal solid waste (MSW) collected refers to the amount of MSW collected by or on behalf of municipalities, as well as MSW collected by the private sector. It includes mixed waste and fractions collected separately for recovery operations (through door-to-door collection through voluntary deliveries)” (United Nations Department of Economic and Social Affairs, 2021).

Figure 20. Collection coverage in Latin America and the Caribbean, 2021 (percentage of generation)



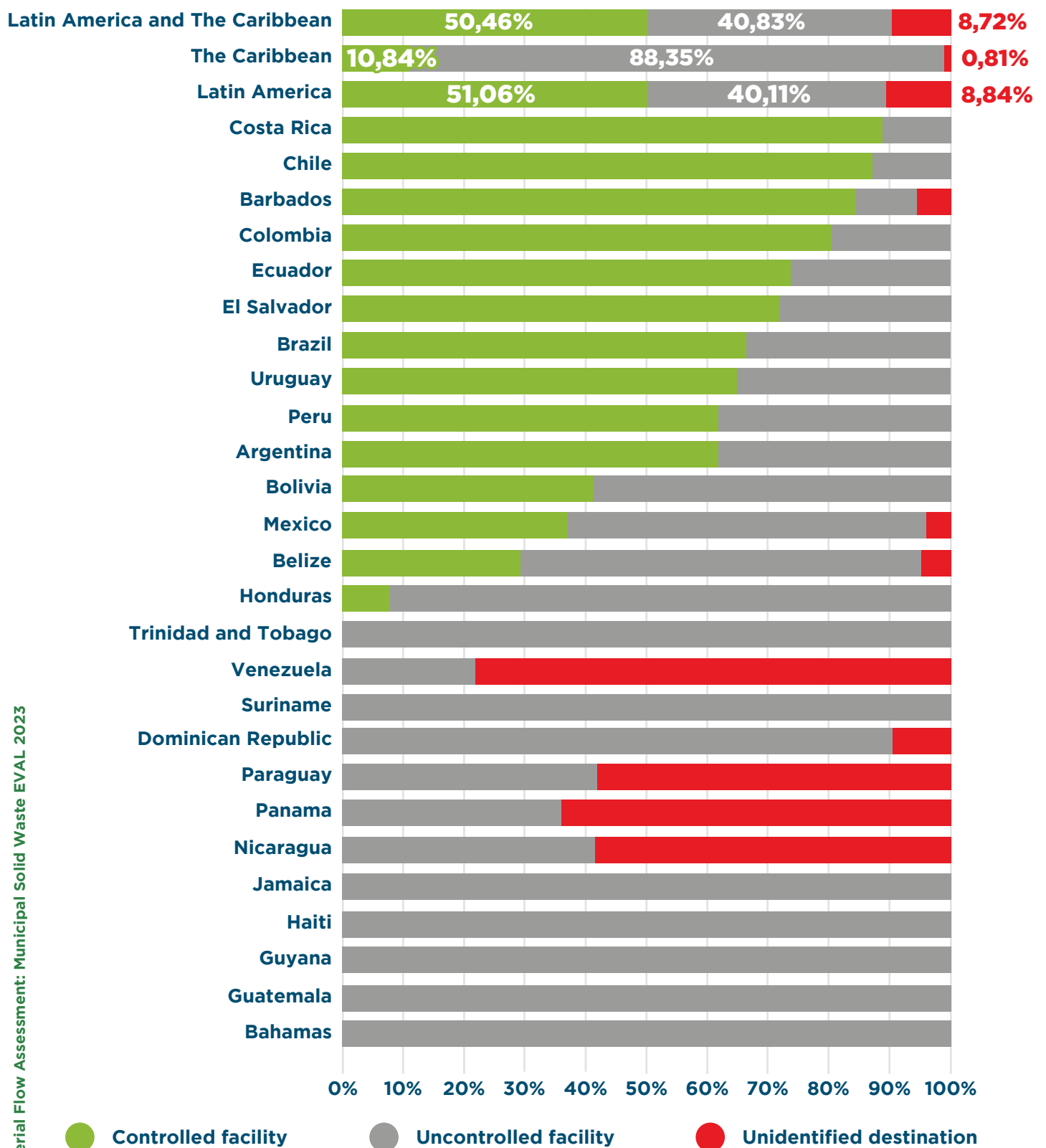
Based on the methodology and for the purposes of this **EEVAL 2023**, it is assumed that the controlled facilities correspond to those where MSW is recovered and accumulated in sanitary landfills. For its part, an uncontrolled facility is considered to correspond to flows to the environment, a classification that includes inadequate final disposal and uncollected waste. Without falling into these two categories, the flow of materials with an unidentified destination is equivalent to the collected MSW whose traceability could not be identified in the regional database.

In LAC, MSW sent to controlled facilities slightly predominates, with 50,46% (figure 21), followed by those sent to uncontrolled facilities (40,83%) and, finally, a repertory that does not can be categorized (8,72%). The previous trend is maintained for the Latin American subregion, while in the Caribbean the relationship is notably reversed, with a significant 88,35% of uncontrolled facilities.

Costa Rica and Chile lead the group of countries in which a large part of the MSW is sent to controlled facilities, with 88,85% and 87,18%, respectively; these two countries also stand out for not presenting unidentified destinations.

In contrast to the above, Bahamas, Guatemala, Guyana, Haiti, Jamaica, and Suriname send all their MSW to uncontrolled facilities. For their part, Venezuela, Panama, Nicaragua, and Paraguay constitute, in order of importance, the group of countries with the largest number of material flows that do not have identified destinations, even with values that exceed the proportion sent to uncontrolled facilities.

Figure 21. Indicator 11.6.1: Amount of municipal solid waste managed in controlled facilities in Latin America and the Caribbean, 2021 (percentage of generation)



Source: Regional database of the Solid Waste and Circular Economy Hub: <https://hubresiduoscirculares.org/datos/>.

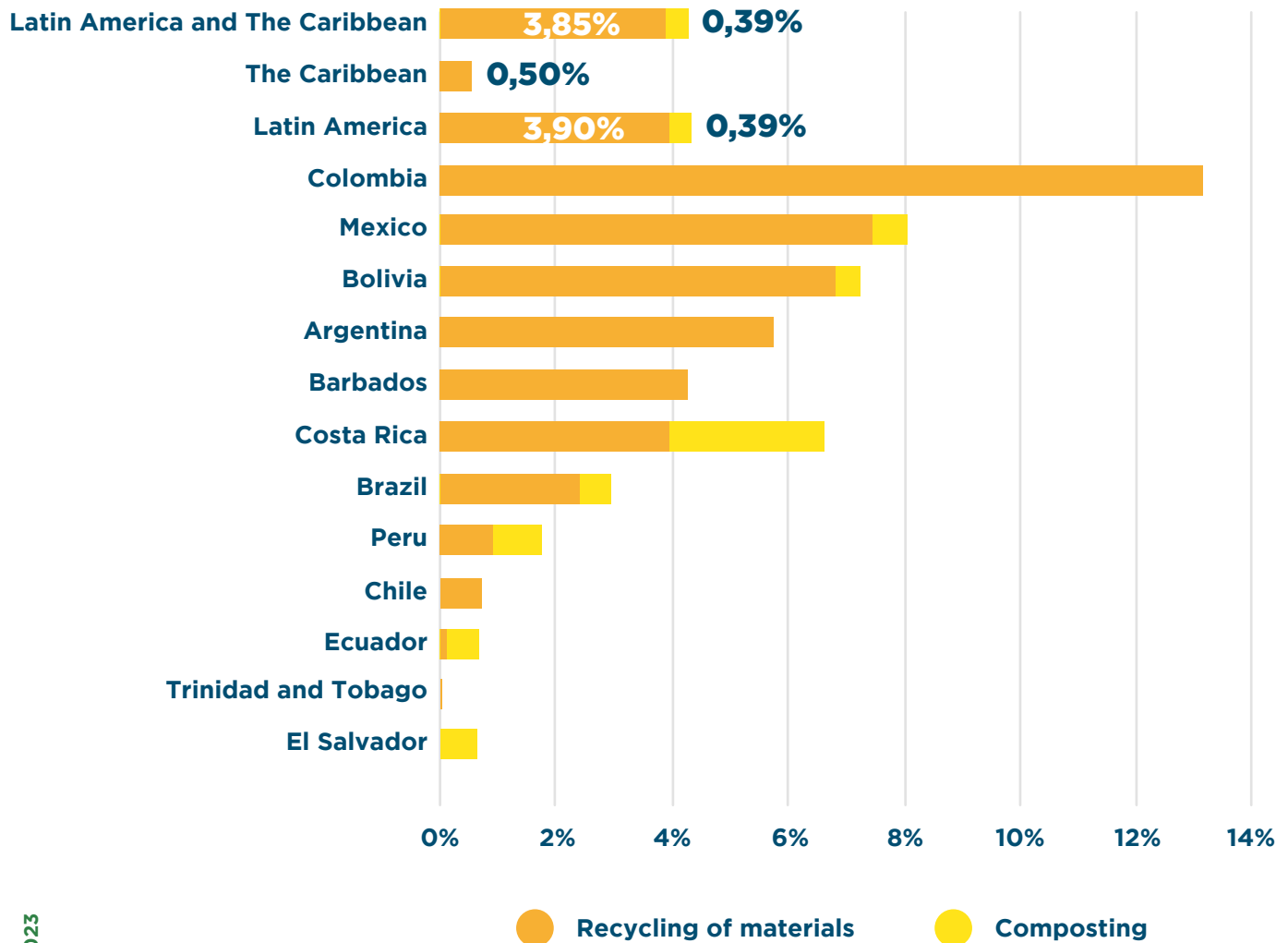
According to the methodology of this regional evaluation, Indicator 12.5.1: National recycling rate in tons of recycled material,¹⁷ it is understood as the amount of MSW destined for recovery activities in recycling, composting, or anaerobic digestion facilities of the total MSW supply of each country (without considering for the moment the quantities of materials exported and imported).

Indicator 12.5.1 for the LAC region in 2021 is mainly constructed from recycling facilities (3,85% of MSW supply) and is complemented by smaller data from composting facilities (0,39% of materials flow). The previous trend is maintained for the Latin American subregion, while in the Caribbean no composting activities are reported, but there are indicators of recovery through recycling of small magnitude (0,5% of what is generated at the subregional level). See the panorama on recycling reflected in figure 22, where these details are recorded based on Indicator 12.5.1.

Colombia, Mexico, and Bolivia lead the group of countries that send a proportion of their MSW towards recycling materials (with 13,17%, 7,45% and 6,80%, respectively). For their part, Costa Rica (2,70%), Peru (0,82%), Ecuador (0,59%) and El Salvador (0,65%), send the highest percentage of materials to be recovered through composting (figure 22).

¹⁷ This analysis focuses specifically on municipal solid waste (MSW), and does not include imports and exports, which is expected to be incorporated in future statistical bulletins of the Solid Waste and Circular Economy Hub.

Figure 22. Indicator 12.5.1: National recycling rate in Latin America and the Caribbean, 2021 (percentage of generation)



Source: Regional database of the Solid Waste and Circular Economy Hub: <https://hubresiduoscirculares.org/datos/>.

From the perspective of the SDGs, in addition to the evident need to close the collection coverage gap for certain countries in the region, there is an opportunity to measure and increase the level of service currently provided, through the scale proposed in the metadata of the Indicator 11.6.1, which considers aspects of frequency, regularity, and proximity of collection points.

On the other hand, improving MSW management in LAC necessarily requires increasing the flow of materials that are sent to controlled recovery and final disposal facilities, paying special attention to maintaining and raising their level of control (which must go from being basic to become improved or total), and emphasizing operational control rather than its engineering or design, as suggested by the metadata of Indicator 11.6.1.

Finally, it is a priority to promote measures aimed at increasing the national recycling rate in LAC, which must be especially oriented to the fraction of organic waste as well as containers and packaging, which represent close to 80% of the total regional flow of materials and framed in the context of the transition towards a low-carbon circular economy.

10. Proper management of municipal solid waste, motor for the intensive generation of green jobs

Preliminary estimates from the International Labor Organization (ILO) indicate that the transition towards a circular economy will create a total of 4,8 million new jobs in Latin America and the Caribbean (LAC) by 2030, particularly in areas related to improving waste management, recycling, and the service sector (Latin American and the Caribbean Circular Economy Coalition, 2022).

In the region, the availability of information regarding jobs generated by the sector is scarce: only 12 countries out of 26 report data with greater frequency since 2016. Based on these data, it is estimated that in LAC there are on average 1,24 direct jobs related to municipal solid waste management (MSW) per 1.000 inhabitants (figure 23).

However, these figures do not account for the participation of the informal sector, nor do they provide details on gender and diversity in its integration. These details, together with the limited publication of statistics on the subject, constitute the greatest challenge in measuring the true impact that improvements in MSW management would have on the generation of green jobs.

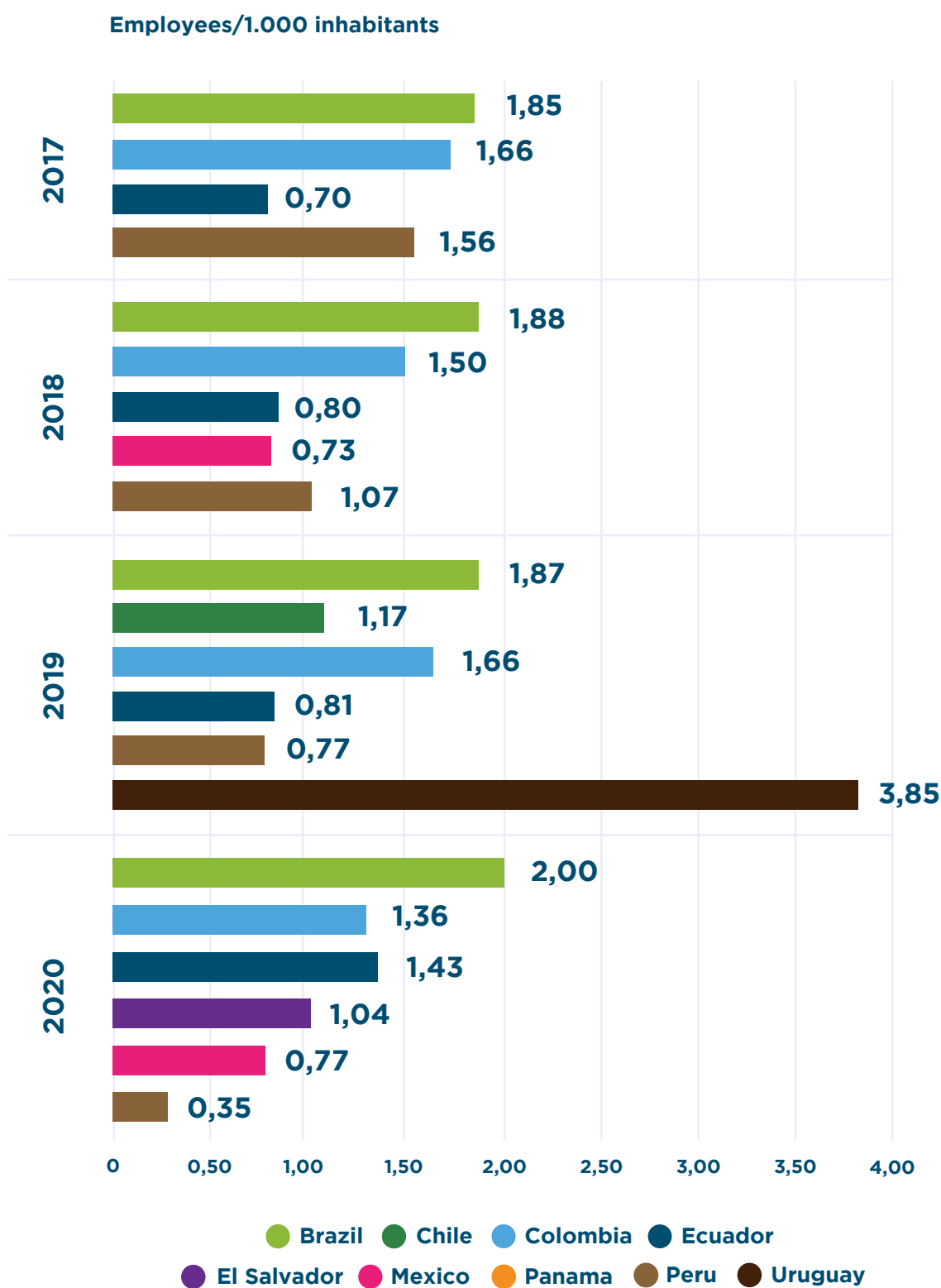
Given the above, some countries have begun to estimate the possible increases that there would be in jobs associated with the circular economy and the MSW sector. In Colombia, for example, the collection, treatment, waste disposal and materials recovery sector are expected to grow by 17% by 2030, generating 12.400 jobs (ILO, 2021). In Mexico, for its part, the creation of 12.200 jobs linked to MSW management is estimated, with an increase of three jobs for every million Mexican pesos in demand (ILO, 2013).

It is essential that this expectation of increased jobs for the sector is accompanied by the promotion of decent working conditions; in particular, to reduce the vulnerability of the 2 million recyclers who collect and recover up to 50% of the region's MSW (Sturzenegger and Espinola, 2023).

Ideally it would be expected that, in a circular economy, “informal businesses and workers operating in circular business models (such as repair, renovation, remanufacturing and recycling) can benefit from public and private support to improve and maintain health and safety standards, develop skills and access technologies to support their interconnection with highly functional circular value chains” (Latin American and the Caribbean Circular Economy Coalition, 2022).

On the other hand, MSW management is among those sectors dominated by men, who will concentrate 80% of the new jobs created in the transition to a low-carbon economy (Latin American and the Caribbean Circular Economy Coalition, 2022); due to this, it is necessary more than ever to apply a perspective in terms of gender and diversity. Although women are increasingly participating in the sector, differentiation by gender roles is evident in certain areas of work and positions of power. Globally, 51,6% of women who work in the waste sector carry out work related to prevention, recycling, recovery, and the change towards the circular economy. On the contrary, their participation is much lower, for example, in activities linked to landfills (12,5%). Likewise, more than 60% of women in the sector work in teams or in project management, but those at the highest levels of organizations constitute a much smaller proportion (Godfrey et al., 2018).

Figure 23. Jobs generated in the waste sector per 1.000 inhabitants



Source: Regional database of the Solid Waste and Circular Economy Hub: <https://hubresiduoscirculares.org/datos/>.

Additionally, 12,9 million women work in the informal waste field worldwide (United Nations, 2021). Indeed, it is estimated that they cover 33% of recyclers in Brazil, 42% in Bogotá (Government of Colombia, 2022) and 70% in Quito. Despite their representativeness, they face inequalities and threats related to their gender, namely: access to less valuable materials in recycling, lower salary remuneration, handling of materials that are more harmful to health, violence and sexual harassment, and the need to carry out their children with them to perform the work (UNEP, 2021).

Therefore, appropriate MSW management must “recognize that the need for inclusion is a key part of mitigating the impacts of inequality and ensuring that systems are designed to work for all, with intentionally designed interventions to develop and invest in skills training for women and entrepreneurs, and all non-binary genders” (Latin American and the Caribbean Circular Economy Coalition, 2022).

11. Closing the municipal solid waste management gap in the Caribbean

The Caribbean subregion has geographical and socioeconomic characteristics that have a particular impact on municipal solid waste (MSW) management, namely: many island territories and a significant influence of tourist activities and associated services on the domestic gross product (GDP).

Although the annual supply of materials in the Caribbean is much smaller compared to that of the Latin American subregion, the data show that, in per capita terms, the Caribbean accounts for a supply rate that is 139% higher. In fact, the countries in the subregion that have the highest annual generation have a unit indicator per person higher than the average for Latin America: Barbados (1.405,25 kg/person-year), Bahamas (1.234,83 kg/person-year), Trinidad and Tobago (523,79 kg/person-year) and Jamaica (434,82 kg/person-year).

This condition is maintained in the case of the generation of methane emissions per person, since the subregion releases 1,46 times more tons of carbon dioxide equivalent (CO₂eq) per person than the continental zone of LAC, with Trinidad and Tobago, Bahamas and Belize lead the way, as they emit values higher than the Latin American average (2.195,76 kgCO₂eq/person-year; 735,47 kgCO₂eq/person-year, and 649,45 kgCO₂eq/person-year, respectively).

In relation to the flow of MSW, in 2021 the Caribbean faced the great challenge that 88,35% of generated materials were released as flows to the environment or sent to uncontrolled facilities (2,34 million and 0,7 million tons destined for inadequate final disposal or not collected, respectively), a more adverse condition than in Latin America. Furthermore, the subregion barely recycles 0,5% of MSW, without other forms of recovery being reflected in the regional database of this **EVAL 2023**.

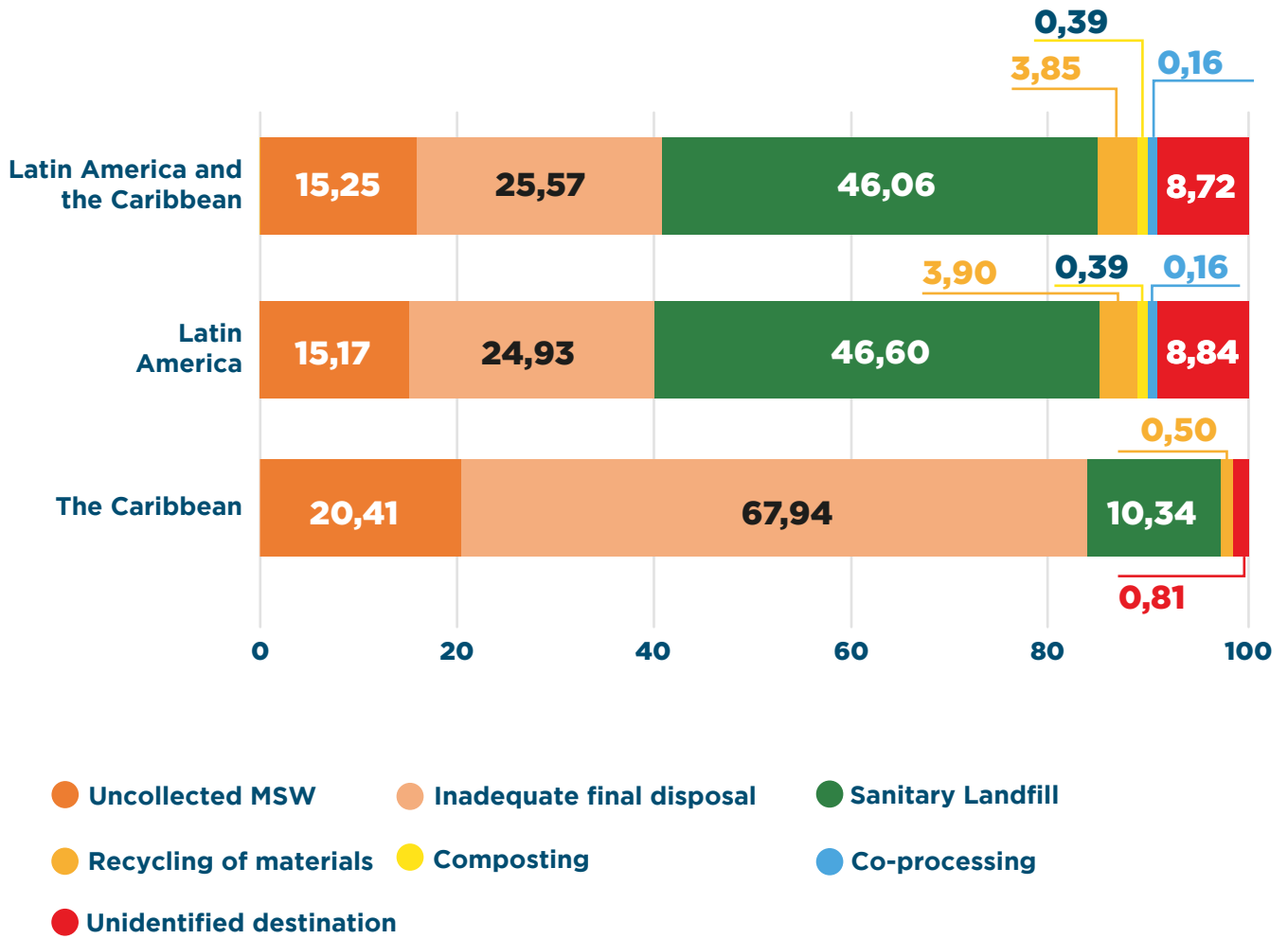
Closing the gap for the Caribbean of the significant flows to the environment (including methane emissions) and the reduced recovery rate require, in the first instance, that measures be applied to prevent and minimize the generation of MSW, and the intensity of its rate per person, specifically oriented to specific economic activities, such as tourism and services. In this sense, the provisions to control single-use plastics and the Extended Producer Responsibility (EPR) systems associated with the fraction of containers and packaging are appropriate, as well as initiatives to prevent and reduce food waste directly linked with the organic fraction of the MSW.

Additionally, all improvements in MSW management performance aimed at increasing the collection service for the subregion must be accompanied by the closure of inadequate final disposal sites and make effective the transition to sites with adequate control levels, in accordance with Indicator 11.6.1 of the SDGs.

In a complementary way, encourage the creation of green jobs and diversify sources of revenue (such as resources from the climate sector for methane mitigation), based on the momentum generated by the transition towards a low-carbon circular economy, are actions capable of further enhancing the recovery of materials in recycling facilities and paving the way to composting and anaerobic digestion activities.

For a comparative overview between the subregions of Latin America and the Caribbean, see figure 24.

Figure 24. Subregional differences in integrated solid waste management: Destinations in Latin America and the Caribbean, 2021 (percentage of generation)



Source: Regional database of the Solid Waste and Circular Economy Hub: <https://hubresiduoscirculares.org/datos/>.

MSW: municipal solid waste.

12. Financial sustainability, a fundamental requirement to improve the competitiveness of municipal solid waste management

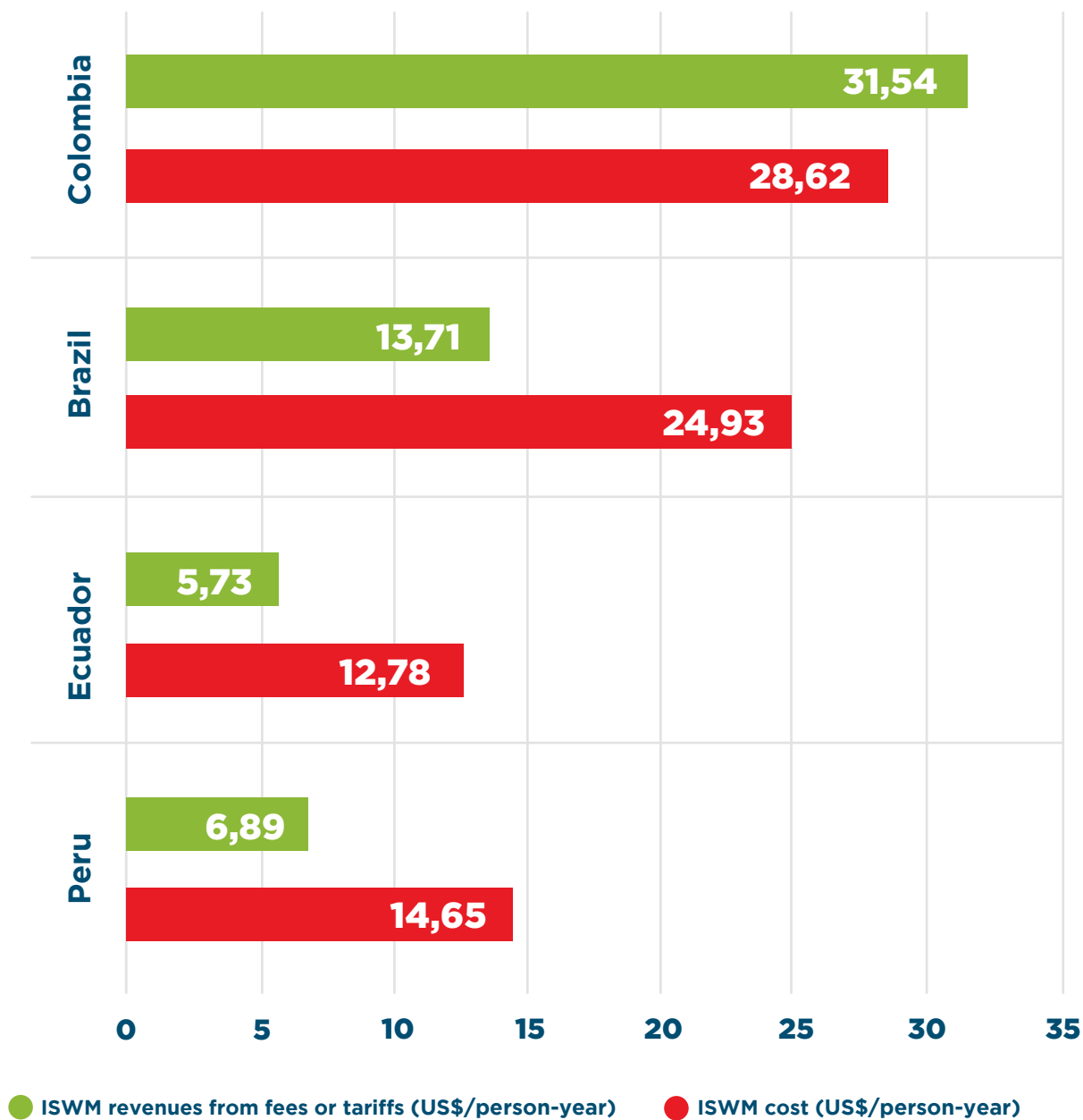
In the regional database, information available on municipal solid waste management (MSW) costs includes only nine countries, and information on revenues covers only six. The limited availability significantly reduces, for the purposes of this **EEVA 2023**, the possibility of carrying out an exhaustive analysis and understanding the behavior in this area.

To improve the competitiveness of MSW management, it is essential to monitor the allocation of economic resources and recovery levels, to influence the financial sustainability of the sector. Particularly, it is of utmost importance to “have effective income that ensures its operational and financial sustainability. This is imperative to ensure that the necessary actions are executed and produce the expected collective benefits and remain over time”, and to get out of the inertia characterized by a “limited availability of funds”, which produces a “vicious circle” called “low level equilibrium” that is reflected in “few resources, low quality in the provision and low appropriation of the service by citizens” (Correal and Piamonte, 2022).

In a comparative analysis carried out based on the data collected for 2021, Colombia stands out, with a positive balance, when revenue from fees or tariffs is compared with the costs of MSW management. Indeed, in this way, Colombia demonstrates higher levels of efficiency in its financial performance, in contrast to the other countries evaluated, which exhibit a deficit that ranges from 80% to 125% with respect to revenues and, thus, maintain the trend of a management “highly dependent on public budgets, which, given the low collection of fees or service tariffs from generators, must allocate resources from other sources to cover costs” (Correal and Piamonte, 2022).

See figure 25 for an overview of integrated solid waste management (ISWM) in selected LAC countries.

Figure 25. Review of the financial sustainability of integrated solid waste management in specific countries

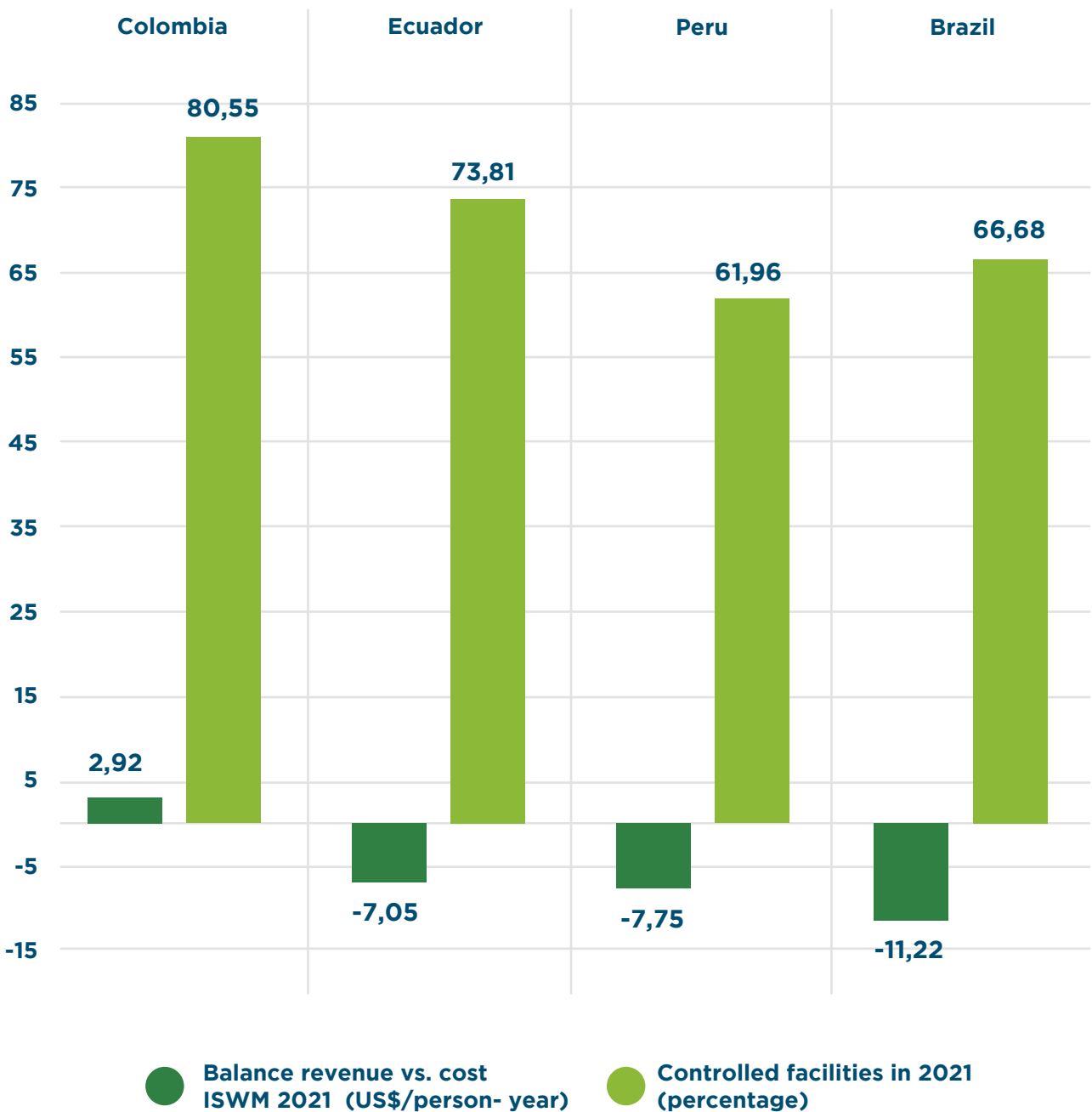


Source: Regional database of the Solid Waste and Circular Economy Hub: <https://hubresiduoscirculares.org/datos/>.

ISWM: integrated solid waste management.

In a complementary way, the information integrated in the regional database shows, for 2021, a correlation between the increase in financial efficiency for MSW management and greater flows sent to controlled facilities, thereby avoiding the release of materials to the environment, as well as the negative effects partners (see figure 26).

Figure 26. Cost of integrated solid waste management versus proportion of municipal solid waste sent to controlled facilities, 2021



Source: Regional database of the Solid Waste and Circular Economy Hub: <https://hubresiduoscirculares.org/datos/>.

ISWM: integrated solid waste management.

One of the ways to aspire to MSW management in LAC that is self-sustainable, financially efficient and competitive, in accordance with a low-carbon circular economy model, consists of diversifying income sources to go more beyond fees and tariffs, as well as public budgets, contemplating alternatives such as the following: “i) those derived from the sale of recyclable materials, nutrients or recovered energy; ii) the resources of the climate sector [...]; iii) the financing of recycling chains through extended producer responsibility mechanisms [...], and iv) thematic, green or social impact bonds [...]” (Correal and Piamonte, 2022).

13. Conclusions and recommendations

The availability of data and statistics has a positive relationship with the quality level of municipal solid waste (MSW) management in the Latin American and Caribbean (LAC) region, and it is fundamental and imperative for the sector to close the existing gaps with respect to precision, reliability and frequency, a scenario that is presented as an opportunity to include innovation and digital transformation processes in order to reduce costs and times necessary for the generation, collection, validation and publication of data.

The importance of the availability of information turns it into a strategic resource for making decisions, measuring the impact of actions, and specifying sectoral evolution, as well as for building and implementing public policies, structuring projects and designing financing solutions, particularly within the framework of the transition towards the circular economy, the fight against climate change and compliance with the Sustainable Development Goals (SDGs).

By updating the magnitudes and intensities per capita of MSW supply for LAC, it is confirmed that an upward trend is maintained in the region, closely related to the persistent linear production and consumption patterns in the countries that comprise it, which maintain the correlation between the MSW per capita generation rate and economic growth, joined with the concentration of the population in urban areas.

Given this scenario, it is imperative to move towards a low-carbon circular economy, gradually decoupling economic development from the use of resources, through the efficient use and preservation of their value, the regeneration of nature and, consequently, the reduction of MSW supply in LAC.

It will also be essential for the transformation process, that tools such as incentives based on behavioral economics or economic instruments are used, and that the appropriation of the service by citizens is maximized.

To this end, LAC's main challenge, in terms of the utilization of materials progressively more oriented to the principles of the circular economy, consists of considerably increasing the current MSW recovery rates.

In this sense, it will be vital that in LAC - with a focus on inclusion, gender and diversity - MSW recycling and composting activities are strengthened and incentivized; anaerobic digestion processes are promoted with the valorization of biogas, and the active capture of biogas in sanitary landfills and in the technical closure of inadequate final disposal sites, and food losses (in production processes) and waste (in consumption processes) are reduced and prevented.

On the other hand, with 114 million tons annually, the magnitude of the problem of MSW released without control or traceability to the environment is monumental, and its attention will require redoubling efforts to redirect and eliminate these flows.

Along these lines, it will be of particular importance to gradually close the current inadequate final disposal sites and achieve the transition to controlled facilities. Reinforce actions aimed at providing access to collection services for the rural population of the region and improving their quality in the case of the urban population, and, finally, promote the use of information technologies and the digital transformation to provide the necessary traceability of those material flows that currently have an unidentified destination.

Additionally, from the perspective of the Sustainable Development Goals (SDGs), besides the need to close the collection coverage gap for certain countries in the region, there is an opportunity to measure and increase the level of service currently provided, using for this, the scale proposed in the metadata of Indicator 11.6.1, which considers aspects of frequency, regularity, and proximity of the collection points.

Likewise, improving MSW management in LAC necessarily requires increasing the flow of materials that are sent to controlled facilities, paying special attention to maintaining and raising their level of control (which must stop being basic, and become improved and total), with emphasis on operational control rather than on its engineering or design, as suggested by the metadata of Indicator 11.6.1.

When addressing the fight against climate change, the significant proportion of methane that comprises the greenhouse gas (GHG) emissions reported for the MSW sector in LAC makes its mitigation unavoidable to contribute to a rapid reduction in the rate of global warming in the short term, since this is the most effective technical-financial strategy, and also generates social, environmental and economic co-benefits.

Some actions to improve MSW management in the region and that would prevent or mitigate methane emissions are the following: limit the disposal of organic waste in sanitary landfills; recover and recycle such fraction through composting techniques (in homes, at the community level or in municipal or regional facilities); apply anaerobic digestion with the valorization of biogas, and reduce and prevent food losses (in production processes) and waste (in consumption processes).

Special attention is required in the Caribbean to close the gap represented by the significant flows to the environment (including methane emissions) and the reduced recovery rate, for which it is necessary to take immediate measures to prevent and minimize the generation of MSW and the intensity of its rate per person. These provisions must be specifically oriented towards specific economic activities, such as tourism and services. In this sense, measures to control single-use plastics and Extended Producer Responsibility (EPR) systems associated with the fraction of containers and packaging are appropriate, as well as initiatives to prevent and reduce food waste directly linked with the organic fraction of the MSW.

On the other hand, all MSW management performance improvements aimed at increasing the collection service for the Caribbean subregion must be accompanied by the closure of inadequate final disposal sites and the transition to facilities with appropriate levels of control, in line with SDG Indicator 11.6.1.

In a complementary way, encourage the creation of green jobs and diversify sources of revenue (such as resources from the climate sector for methane mitigation), based on the momentum generated by the transition towards a low-carbon circular economy, are actions that will further enhance the recovery of materials in recycling facilities and will give rise to activities of composting and anaerobic digestion.

For the following editions of the EVAL it will be relevant to improve the availability and quality of data and statistics on the competitiveness dimension of MSW management, specifically the revenue, cost, and employment indicators. It is worth highlighting that, for 2021, the regional database presents a correlation between the increase in financial sustainability for MSW management and greater flows sent to controlled facilities, avoiding the expulsion of materials to the environment.

Finally, a growing rate of employment in the sector is exhibited in those nations that have the largest historical series available, with values that fluctuate between 2% and 18% annually. However, these figures do not consider the participation of the informal sector, nor do they provide details on gender and diversity in its integration, which, together with the limitations that characterize the publication of statistics on the matter, constitutes a great challenge in terms of measuring the true impact that improvements in MSW management would have on the generation of green jobs.

14. Next steps for the Solid Waste and Circular Economy Hub

The relations between the countries of Latin America and the Caribbean (LAC) and the different key actors that will participate in the Solid Waste and Circular Economy Hub may take place in a context of regional cooperation. With the purpose of collecting and transmitting data under certain quality criteria, defining the procedures and interaction mechanisms, as well as the means that will be used for the flow of information. The functionality of the Hub will have the scope resulting from the agreements between the different actors involved in the different stages of its development, and from the fulfillment of said agreements.¹⁸

It should be highlighted that the institutions of the region, which have responsibilities in the generation and dissemination of information, should constitute the main ally of the Solid Waste and Circular Economy Hub. The information available from the national statistical offices and other sectoral institutions has made it possible to integrate the 2021 regional database based on data from the different information systems in operation, and the dialogue established with the technical staff of such entities.

A common knowledge base must be standardized among the different actors to reduce the existing gaps in terms of the availability of information, as well as establish a standardized language, based on the best practices that have already been implemented in the region and adopting-adapting those identified in other latitudes.

In this sense, an invitation is extended to countries to harmonize their indicators and statistics in line with the metadata and processes integrated in the Technical Manual of the Solid Waste and Circular Economy Hub, which, in turn, are aligned with the conceptual framework of the System of Environmental-Economic Accounting (SEEA) and the procedures developed by other international systems such as Eurostat, so that traceability can be achieved on an annual basis.

Based on the above, among other initial activities, coordination within the region must be prioritized, to socialize the first results and findings, and establish a work agenda and a roadmap with a view to implementing basic actions to the Hub update.

Naturally, the previous approach means that, among the immediate actions, the creation of a regional community (community of practice) is contemplated, which facilitates the harmonization of information and the exchange of experiences/good practices.

To carry out the above, it is advisable to follow the proposals of the European Framework for Waste Statistics (UNECE, 2021), namely: ensure continuous collaboration with international organizations, to establish platforms of communities of practice for research and development of guidelines aimed at generating statistics on waste and proposing guidelines and the development of capacities for the periodic production of data with the assistance of such organizations. To this end, the challenges that the European Framework poses regarding existing waste statistics must be considered, including: the difficulties in collecting information and data; the requirements for harmonization of concepts and terminology, and the expansion of the coverage of the statistics that are currently collected, focused on the formal sector, which prevents telling the full story.

¹⁸ See the definition of governance available at: <https://biblioguias.cepal.org/gobierno-digital/concepto-gobernanza>.

The Solid Waste and Circular Economy Hub constitutes an opportunity to provide continuity in the measurement, processing, and publication of open data on municipal solid waste management (MSW), fundamental tools for decision making, estimating the impact of the actions undertaken and the assessment of sectoral evolution.

In this way, the system integrated by the Hub, the Sectoral Guidelines For Solid Waste Management and Progress Toward The Circular Economy: Accelerating Sector Transformation designed by the Inter-American Development Bank (IDB) in 2023; National, subnational, or municipal waste plans, and roadmaps and strategies to move towards the circular economy will become the cornerstone of the long-awaited and necessary sectoral change.

Information is a strategic resource: what is not measured cannot be improved. Therefore, to advance and transcend the management of MSW in LAC, it is time to measure.

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