



BASELINE

COALITION FOR THE PROGRESSIVE CLOSURE OF DUMPSITES IN LATIN AMERICA AND THE CARIBBEAN

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COALITION FOR THE PROGRESSIVE CLOSURE OF DUMPSITES IN LATIN AMERICA AND THE CARIBBEAN - BASELINE REPORT

This document has been prepared within the framework of the Voluntary Coalition of governments and relevant organizations for the progressive closure of dumpsites in Latin America and the Caribbean, with the support of the Latin America and the Caribbean Office of UNEP, which hosts the Secretary of the Coalition.

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Coordination, compilation and editing – UNEP: Jordi Pon, Maria Candela Zaffiro Tacchetti, Maria Alejandra Fernandez, Marco Bravo Arriagada, Luisa González, Vanessa Falkowski.

Coalition Members (comments and contributions): Argentina (Ministerio de Ambiente y Desarrollo Sostenible), Chile (Ministerio de Medio Ambiente), Costa Rica (Ministerio de Medio Ambiente, Ministerio de Salud), Cuba (Ministerio de Ciencia, Tecnología y Medio Ambiente), Ecuador (Ministerio de Ambiente), El Salvador (Ministerio de Ambiente y Recursos Naturales), Honduras (Secretaría de Recursos Naturales y Ambiente), Panama (Ministerio de Ambiente), Paraguay (Ministerio del Ambiente y Desarrollo Sostenible), Dominican Republic (Ministerio de Ambiente y Recursos Naturales), Suriname (Coordination Environment - Cabinet of the President), Saint Lucia (Saint Lucia Solid Waste Management Authority), Trinidad and Tobago (Ministry of Planning and Development, T&T Solid Waste Management Company), Uruguay (Ministerio de Medio Ambiente), Venezuela (Ministerio del Poder Popular para el Ecosocialismo), Asociación Interamericana de Ingeniería Sanitaria y Ambiental (AIDIS), Asociación Brasileira de Empresas de Limpeza Pública y Residuos Especiales – ABRELPE / International Solid Waste Association- ISWA, Asociación para el Estudio de los Residuos Sólidos, Argentina (ARS), Banco de Desarrollo de América Latina (CAF), University Consortium for the Sustainable Waste Management for Latin America and the Caribbean, Climate and Clean Air Coalition (CCAC), Fundación Avina, Pan American Health Organization (PAHO/WHO), Unión Iberoamericana de Municipalistas (UIM).

Steering Committee of the Coalition: Argentina –vice Chair- (Sergio Federovisky, Ministerio de Ambiente y Desarrollo Sostenible), El Salvador –Chair- (Ivania Avendaño, Ministerio de Ambiente y Recursos Naturales), Guatemala (Jorge Grande, Ministerio de Ambiente y Recursos Naturales), Suriname (Vanessa Sabajo, Coordination Environment, Cabinet of the President), Uruguay (Marisol Mallo, Gabriela Medina, Silvana Martínez, Ministerio de Ambiente), ISWA/ABRELPE (Carlos Silva Filho), ARS (Atilio Savino), UIM (José Chira).

Countries that submitted the survey: Argentina, Barbados, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Panama, Peru, Dominican Republic, Trinidad and Tobago, Saint Lucia, Suriname, Uruguay, Venezuela.

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EXECUTIVE SUMMARY

Within the framework of the XXI Meeting of the Forum of Ministers of the Environment of Latin America and the Caribbean (Buenos Aires, Argentina, October 9-12, 2018), the Voluntary coalition of governments and relevant organizations for the gradual closure of dumpsites in Latin America and the Caribbean was established. The main purpose of the Coalition is to develop a Roadmap for the progressive closure of dumpsites and the effective transition towards integrated waste management in the region, as well as to promote the development of technical guidelines, facilitate the strengthening of capacities and exchange of information, and raise awareness on the importance of the sound management of waste.

Within this context, the Coalition included in its Work Plan 2019-2020 the development of a baseline document, with the aim of collecting and analyzing available information on the current situation of dumpsites in the Latin American and Caribbean region, in order to contextualize the proposed Roadmap for the closure of dumpsites, as well as the different activities and documents that shall be developed by the Coalition.

The development of this document has been carried out based on the compilation and analysis of available information, as well as through a questionnaire addressed to countries of the region by July 2020 with the support of focal points of the Coalition. A total of 19 countries responded the survey, thus providing a very valuable information for the identification of trends and challenges of countries in this area.

The document includes a review of the general situation on waste generation and management in Latin America and the Caribbean, with a focus on final disposal and the occurrence of dumpsites and its impacts. It also analyzes the regulatory framework and existence of plans for the closure of dumpsites in countries of the region, as well as challenges for its implementation and practical experiences. Some of the main findings of the study are summarized below:

- With the progressive improvement of waste management systems, it is perceived that the countries have more and better information, despite the fact that **there are still important gaps in the information systems of many countries**, and the level of detail and comparability of the data is generally weak, particularly for indicators related to the use or recycling of waste, or the characterization of inappropriate final disposal sites. Variations in terminology and classification of waste and facilities between countries also make it difficult to consolidate information in this type of analysis.
- **Total waste generation in the region continues to increase**, and the per capita generation rate is also expected to increase in the coming years (currently averaging 1 kg / inhab / day). On the other hand, recycling or waste recovery rates, despite the difficulties of quantifying informal recovery, generally remain below 10%. This represents a challenge for the progressive closure of dumpsites, the siting of new facilities and the reduction of waste that is destined for final disposal, so **it is necessary to strengthen prevention and valorization of waste**, particularly for predominant fractions such as organic waste.
- **Inadequate final disposal of waste and the presence of dumpsites affect to a greater or lesser extent all countries of the region.** However, there are important differences between countries. While in some cases disposal in sanitary landfills is above 75%, there are countries where most of the waste is disposed of improperly, either in controlled sites or dumpsites.

- Inadequate waste management including its disposal in dumpsites causes a series of **impacts** that affect social development, human health, and the preservation of the environment. The type of impacts that are frequently reported in the region are related to impacts derived from fires and uncontrolled burns, water and soil contamination, vectors, and landslides. Dumpsites and controlled sites are also an important source of greenhouse gases, like methane.
- In the region, **more than 14,000 inappropriate final disposal sites have been identified**, including more than 10,000 dumpsites, which can be of very different sizes and characteristics. At the same time, nearly 2,000 sanitary landfills are identified, where a greater proportion of the total reported waste is deposited (around 55%), since they serve the main urban agglomerations.
- In contrast, **the majority of municipalities in the region (around 70%) use inadequate final disposal sites**, particularly smaller municipalities. It is observed that as progress is made towards integrated models with separate collection, transfer stations and regional sanitary landfills, it is possible to provide a solution to a greater number of municipalities.
- The dumpsites that are reported in the countries of the region can be of different characteristics, including in some cases the identification of small sites that can occur in the same municipality. Despite this, the **main dumpsites** in the different countries are also identified (more than 40 sites reported in this study). Establishing detailed sites inventories is a fundamental element in designing and implementing strategies for the progressive closure of dumpsites.
- Numerous successful **cases of dumpsite closures** have been identified in the region, which can serve as experiences for the exchange of information and lessons learned between countries and municipalities. At least ten countries have reported for the present study examples of concrete experiences of dumpsite closures.
- The countries of Latin America and the Caribbean have made important **progress in the development of normative and political frameworks** to regulate waste management, and most of them (80%) explicitly prohibit inappropriate dumping. Although to a lesser extent, a large part of the countries also have specific plans for the progressive closure of landfills, although their level of implementation poses a series of challenges.
- According to the survey conducted to the countries, the main **challenges to progress in the closure of dumpsites** include the lack of technical capacity in local governments, followed by the lack of financial resources, inadequate allocation of resources and jurisdiction, the lack of political will, and lack of institutional capacity. The results indicate that the lack of legislation or policies is not the main barrier, but rather the difficulty for its effective implementation. In this sense, **a set of measures** for institutional strengthening, financial sustainability, and the promotion of new models based on prevention and the use of resources is required.
- As a result of the survey, a majority of Latin American and Caribbean countries indicate the **year 2030 as the temporary goal that would be most feasible to eradicate dumpsites** in their respective countries.

1. INTRODUCTION

1.1 Background

The **Voluntary coalition of governments and relevant organizations for the progressive closure of dumpsites in Latin America and the Caribbean** is established as a follow-up of Decision 1 on chemicals, marine litter and waste management, which was adopted within the framework of the XXI Meeting of the Forum of Ministers of the Environment of Latin America and the Caribbean (Buenos Aires, Argentina, October 9-12, 2018). In this context, the countries agreed to develop a *roadmap for the progressive closure of dumpsites and the effective transition towards comprehensive waste management in the region, including the development of technical and financial guidelines, considering the various realities of the region, and promoting the exchange of good practices and experiences.*

Based on this mandate, the United Nations Environment Program (UNEP) convened a constitutive meeting of the Coalition (Buenos Aires, September 10-11, 2019), where the objectives, the Framework, the organizational structure and the main elements and actions of a Work Plan were defined.

The objectives of the Coalition are:

1. **Develop a Roadmap** for the progressive closure of dumpsites and the effective transition towards integrated waste management in Latin America and the Caribbean.
2. Promote the development, adaptation and dissemination of **guidelines**, including technical, social, environmental and economic aspects, considering the existing work and in coordination with other initiatives;
3. Facilitate **capacity building and exchange of information**, experiences and good practices about policies, instruments, related projects and financial opportunities.
4. Promote **awareness raising** on the importance of the sound management of waste throughout its life cycle, and the consequences of their inadequate management.

The **2019-2020 Work Plan** is structured according to the agreed objectives of the Coalition; for each of them, the main actions to be carried out are indicated, as well as the specific activities, milestones, time frame, possible implementers and partners, and the type of resources required.

The establishment of the Coalition and its Work Plan was welcomed during the **Intersessional Meeting of the Forum of Ministers** (Barbados, 5-6 November 2019), where participants encouraged the participation of countries and organizations in this initiative, and recommended the implementation of the 2019-2020 Work Plan, including the development of a roadmap with specific objectives and technical guidelines, which will be presented at the XXII Meeting of the Forum of Ministers.

Given this, and in order to operationalize the work of the Coalition, three **technical subcommittees** were established:

- Subcommittee 1: Development of the Roadmap and baseline.
- Subcommittee 2: Development, adaptation and dissemination of guidelines.
- Subcommittee 3: Capacity building, information exchange and awareness raising.

This document is part of the scope of work of Subcommittee 1, which includes the development of a baseline that serves as a reference for the development of the Roadmap.

1.2 Objectives and scope of the baseline

The general objective of the baseline document is to collect and analyze available information on the **current situation of dumpsites in the Latin American and Caribbean region**, in order to contextualize the proposed roadmap for the closure of dumpsites, as well as the different activities and documents that the Coalition will develop.

In this sense, the baseline compiles and analyzes available information on the presence and use of dumpsites in different countries of the region, the related impacts, as well as trends and examples of regulatory measures, plans and programs that have already been adopted for the closure of dumpsites, including specific experiences.

The document aims to provide an initial diagnosis based on information already available, which can be updated in future editions.

1.3 Methodology and preparation process

The development of this baseline document has been carried out from the compilation and analysis of **available information** on the situation and management of dumpsites in the Latin American and Caribbean region.

The available information has been **obtained from different sources of information**, such as:

- Reference publications on waste management in the region.
- Reports from the competent authorities, published or available on their websites.
- Official documents related to plans, programs or legislation publicly available.
- Reports and articles published by different organizations and authors, including the professional and academic sector.

In order to complement and validate the available information, a **questionnaire** was also prepared for the countries of the region, which was sent to all focal points of the Forum of Ministers of the Environment, with a copy to the focal points of the Coalition, by early July 2020. A total of **19 countries**¹ in the region responded to the questionnaire, thus providing a very valuable information for the identification trends and challenges of countries.

The document compiles the most recent data available to date, the year of which may vary depending on the source and country (generally the data correspond to the years 2018-2019). The compilation and editing work has been carried out by the Coalition Secretariat, during the period from May to September 2020, with the support of the members of Subcommittee 1 and the group

¹ Argentina, Barbados, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Honduras, México, Panama, Peru, Dominican Republic, Santa Lucia, Suriname, Trinidad and Tobago, Uruguay and Venezuela.

of focal points and different countries of the region, and it was concluded in November 2020, following the regional consultation with the countries and members of the Coalition.

2. THE MANAGEMENT AND FINAL DISPOSAL OF WASTE IN LATIN AMERICA AND THE CARIBBEAN

2.1 General situation of waste generation and management in the region.

Current trends such as population growth, increased extraction of resources, and unsustainable consumption patterns, all based on a linear economy, have led to multiple environmental challenges at the global and regional level (UNEP, 2018). This is how proper management of waste turns out to be a central issue to be included in regional agendas, especially considering the effects caused by the emergence of a health crisis like the current pandemic, which disrupts the entire regular waste management system.

Waste management includes various stages, including collection, storage, transport, treatment, and final disposal. Some indicators associated with the different stages of waste generation and management in the Latin American and Caribbean (LAC) region are presented below.

2.1.1 Waste generation.

In terms of generation, it is estimated that by 2014 the region generated a total of approximately **541,000 tons of municipal solid waste per day**, with an average per capita generation of **1.04 kg/inhabitant-day** (UNEP, 2018). According to the estimated generation projections towards the year 2050, considering population and economic growth data (leading to a progressive increase in the generation rate per inhabitant), the generation of urban waste in LAC would be 369 million tons per year (World Bank, 2018). It should be noted that in the region, the higher-income countries show higher waste generation rates.

According to the most up-to-date information, obtained from the questionnaire addressed to the countries for this study, it has been found that the per capita generation remains at a regional average corresponding to 1 kg inhabitant / day. However, it is necessary to highlight that the reported generation data varies from base year between 2014 and 2019, which with the census measurement of inhabitants each year, can make it difficult to estimate more accurately this indicator. This shows the importance of having data measurements and updated reports on the estimation of waste generation.

Regarding waste composition, the organic fraction represents on average, 50% of the total generated, showing a greater participation in percentage by weight in the countries with lower income (see Figure 1). The lack of specific treatment for this stream causes the generation of greenhouse gases and the production of leachates, in addition to reducing the quality of eventually recyclable products and making the process difficult, which is why it is crucial to consider the use of specific treatments for this stream, and to progressively reduce the amount of organic waste sent to final disposal.

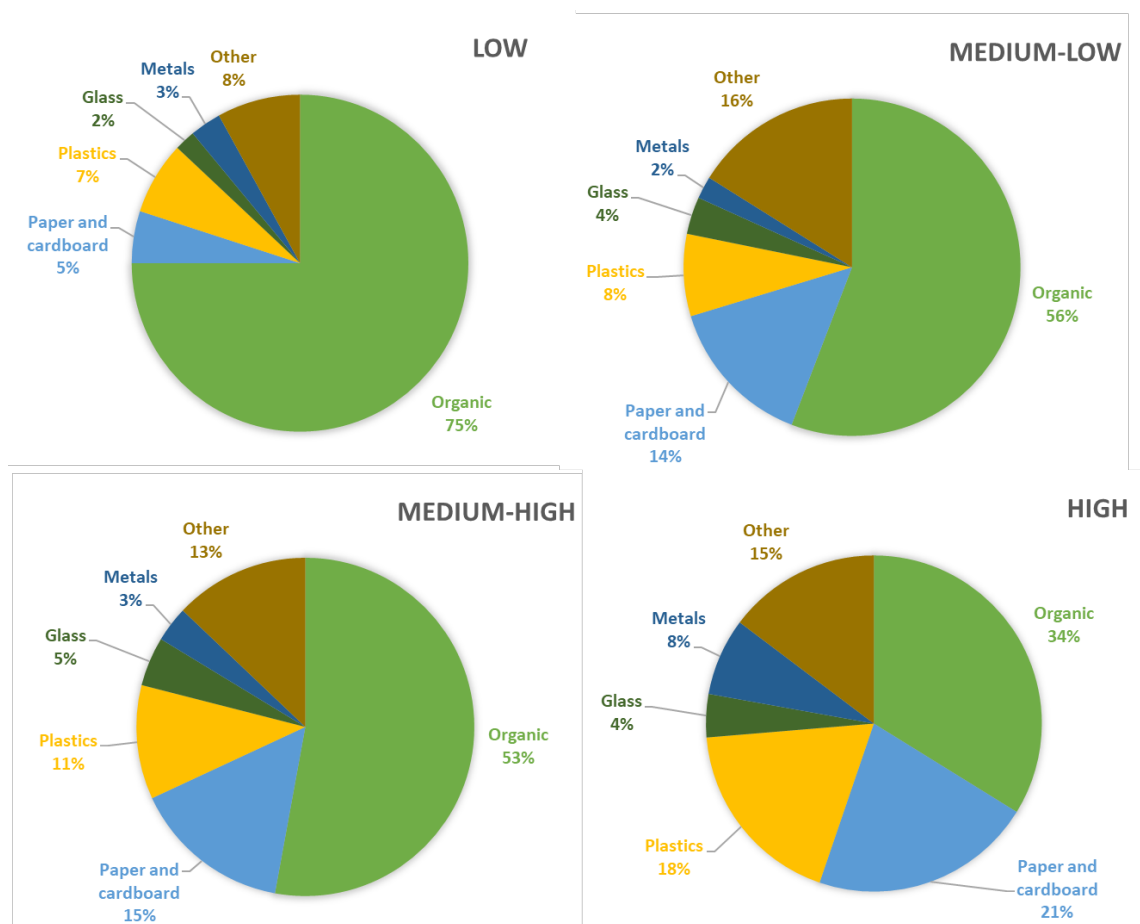


Figure 1. Variation in the composition of Municipal Solid Waste grouped by country income levels. Source: UNEP, 2018.

2.1.2 Waste collection coverage.

Waste collection is an activity that, in economic terms, is the one that consumes most resources in the urban cleaning systems of the countries of the region. Consequently, it is important to carry out an adequate planning and design of routes in order to raise the indicators in the collection efficiency.

Comparing to global trends, waste collection coverage is high in the region. Countries show estimated values close to 90% of the population covered by the service, with direct municipal service being the most common modality of provision (UNEP, 2018). This indicator can vary significantly between some countries, as well as depending on the size of the cities, and whether it refers to urban or rural population, being generally lower in the latter case.

Data on collection coverage equivalent to 56% in Guatemala, 70% in Honduras and 80% in El Salvador have been reported, while other countries such as Chile, Costa Rica or Uruguay report

rates of practically 100% of urban collection. Despite the progress that can be drawn from the latest reports on this matter, in the region, approximately 35,000 tons per day remain uncollected, with an approximate impact of 40 million people, equivalent to 7% of the population in the region (UNEP, 2018). In the rural sector, the average on the collection can drop by as much as 30% (World Bank, 2018).

2.1.3 Waste transport and storage.

Waste transport within the management chain becomes relevant to the extent that there may be significant losses due to the removal of some materials between generation at the source and final disposal, giving rise to the proliferation of dumpsites without timely control. In addition, the selective collection circuits must be differentiated from those wastes whose destination is final disposal, generating new logistic processes for high separation effectiveness. As an additional element, there is the factor associated with the safety and the frequency flows of the vehicles on the routes, which allows an adequate transport of waste to its temporary storage or final disposal site, as the case may be.

Some countries in the region use transfer stations, as a temporary storage site for the subsequent transport of waste towards final disposal, or to increase the efficiency of material recovery. It is estimated that after doing the respective waste collection, the distance traveled between city centers and final disposal sites can vary between 4 and 62 kilometers (World Bank, 2018).

2.1.4 Waste recovery as a resource.

The possibility of achieving high percentages of efficiency in the recovery of resources present in waste will strongly depend on the previous stages of the management system. Having segregation programs at source and selective collection will allow a better quality of materials in the recovery facilities, which will result in more efficient processes. The methods used for the segregation of materials, as well as the treatment and recovery technologies implemented, can vary significantly between countries and cities in the region. In practically all countries, segregation takes place in all stages of waste management: at the source, sweep, collection, transfer and final disposal sites, mainly associated with the work carried out by informal waste pickers (UNEP, 2018).

The informal sector in this area is highly active within the region. However, due to the characteristics of the sector, there is no accurate information on the number of waste pickers, or the amount of waste handled by them. The presence of waste pickers in cities has been reported from 175 in Cuzco, Peru, to 20,000 in Sao Paulo, Brazil. Some large cities in the region can have almost 4,000 informal pickers for recyclable material (World Bank, 2018), and at the regional level, it is estimated that their number could be up to 4 million people dedicated to this activity (IDB, 2015). In addition to collecting waste on the street, they also develop their work at dumpsites without control for the safe transit of people, with potential health impacts.

Although considerable efforts have been made in the region to estimate recycling rates at country level, few countries have a national estimate of this indicator. Reported rates can vary between 18% in Colombia, 15% in Peru, to less than 2% in Brazil (Figure 2), however this indicator presents difficulties of comparison, due to the important influence of the informal sector. On average, it is estimated that the recycling rate in most of the countries is below 10%, which is again consistent from what is observed by the data reported by the countries that have responded to the survey.

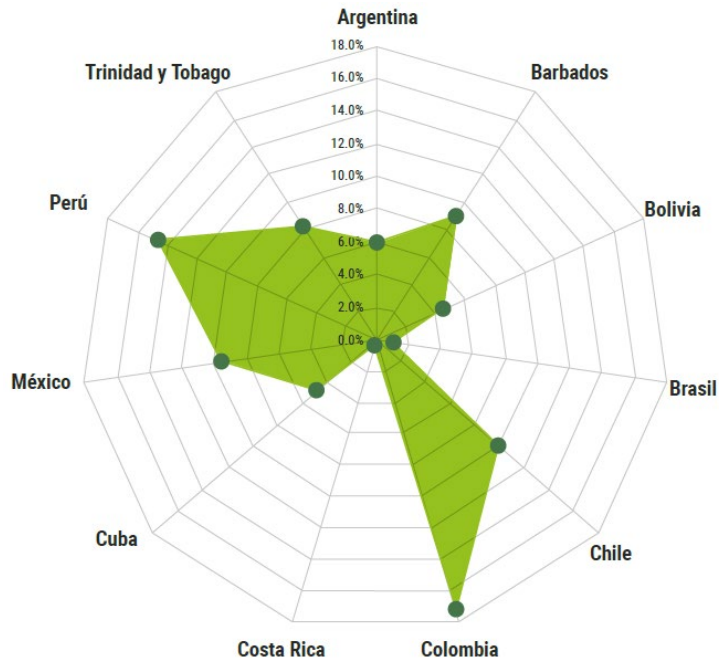


Figure 2. Recycling rate in countries of the region. Source: UNEP, 2018.

In relation to the technologies implemented for the recovery of materials, there are various models that have been improved over time, although their use is also influenced by the level of development of the countries and the feasibility of their application given the particular contexts of the cities of the region. As shown in Figure 1, the percentage of the organic fraction can exceed 50% of the composition of municipal waste, which indicates the need to design and implement treatments that allow an appropriate management of this material, also considering the effect that its decomposition in the environment generates serious problems such as leachate formation and greenhouse gas emissions.

Some of the applied and operational technologies in the region, either to achieve energy recovery, or waste material, are mechanical separation, energy use of biogas from landfills, compost production, anaerobic digestion, or biological mechanical treatment. Some incineration facilities are identified, but they are primarily intended for healthcare waste management.

2.2 Final waste disposal situation in the region

Although proper final disposal of solid waste has significantly improved over the past decades in Latin American and the Caribbean, approximately **145,000 t / day end up in dumpsites, are burned or are otherwise inadequately disposed of**, which is equivalent to 27 % of the regional population, or the waste generated by 170 million people (UNEP, 2018). This creates serious health risks, both for people who regularly operate at the dumpsites, and for the surrounding population. At the same time, it gives rise to a set of severe environmental impacts, including water pollution, emission of toxic and greenhouse pollutants, as well as soil pollution, which in turn affect production activity, like the tourism sector.

Another level of complexity in this matter is reflected by the various streams of special waste, such as hazardous waste, waste from healthcare facilities, construction and demolition waste, food

waste or waste from electrical and electronic equipment, which frequently are not properly inventoried and characterized. Regulations for these waste streams exist in some countries, however, due to the lack of adequate systems for their treatment, they have the risk of being handled incorrectly with the inherent risks to health, or being disposed of in dumpsites. Given the outbreak of a pandemic such as the current COVID-19, addressing the situation associated with medical waste also represents a new important challenge for many countries.

2.2.1 General typology of final disposal sites

Despite the fact that final waste disposal sites may differ significantly depending on the construction and operation conditions, in general three types of situations are usually differentiated (UNEP, 2005):

i. Dumpsite²

It corresponds to an area in which solid waste is thrown or disposed of indiscriminately without proper planning and without taking into account health regulations. Dumpsites represent the type of place with the lowest requirement and operating cost among the different types of final disposal, therefore being the most frequently used in most of the developing countries. They are also recognized as representing a serious threat to public health and the environment, mainly due to the following:

- Their location is not planned, and they can be found in any available vacant area, in many cases not suitable for the dumping of waste.
- Its operation is practically random, having no general operating guidelines that direct its proper operation, with workers who lack the appropriate equipment and the experience that allows good waste management. Burning to reduce volumes is common in these type of places.
- There is no control over the amount and type of waste discharged, there are risks of handling medical, municipal, dangerous or toxic waste, making the risks to public health and the environment even more significant.
- There is no timely control or the necessary measures to control the emissions of pollutants released into the atmosphere due to the decomposition of waste, as well as the leachates generated.
- By not necessarily having perimeter containment lines, it is possible that there is the presence of animals, birds and rodents that could become vectors of potential diseases.

In addition to the potential impact on health and the environment, dumpsites have serious negative impacts on the value of adjacent properties, thereby deteriorating the quality of life of the people in the surrounding communities, which is seen affected by a social stigma from being near a dumpsite. On the other hand, the absence of ground cover must be taken into account, and the potential proliferation of waste recovery activities, added to the practice associated with burning, with the risk of fires close to residential sectors.

ii. Controlled site

² Terminology can differ between countries.

A controlled site is a place of final disposal not necessarily designed, where there are improvements in the operational aspects of its functioning and management in relation to dumpsites. Controlled sites evolved due to the need to close dumpsites and replace them with improved disposal facilities, and in consideration of the financial constraints of local municipal units. Controlled waste disposal can be implemented on existing waste (from previous open discharge operations) or on new sites. In some cases they have been updated in order to incorporate some of the practices associated with sanitary landfills, such as location regarding hydrogeological suitability, leveling, compaction, leachate control in some cases, partial gas management, access control and maintenance of basic records.

iii. Sanitary Landfill

A sanitary landfill is an engineering waste disposal facility designed, constructed, and operated in a manner that minimizes impacts on public health and the environment. Unlike dumpsites and controlled sites, sanitary landfills undergo extensive planning from site selection to post-closure management. Therefore, although it requires substantial financial resources, it is the most desirable and appropriate method of final disposal of waste as a final disposal mechanism. These facilities usually have leachate storage ponds and subsequent physical, chemical or biological treatments. Likewise, they have chimneys for the burning of biogas or technologies that allow its use as an energy source in the same installation. In most cases there is compaction of the waste, with the use of geomembranes and layers of sand and gravel that maintain control over the ground when the waste is deposited.

Annex 1 includes a comparative table for these three types of sites, based on different design and operation criteria.

2.2.2 Situation of dumpsites in the region

Within the same country, cities and municipalities may present different levels in terms of the type of final disposal they use, and in particular small towns or remote sites may have less satisfactory facilities. The World Bank (2018) reports that globally the usual practice in most developing countries continues to be final disposal in dumpsites and open burning, however, the Latin American and the Caribbean region has made progress in improving this condition in recent years. In the period between 2002 and 2010, the final disposal of Municipal Solid Waste (MSW) in sanitary landfills increased in the region from 22.6% to 54.4%, simultaneously reducing the figure corresponding to the use of dumpsites as final destination of the MSW from 45.3% to 23.3% (IDB-AIDIS-PAHO, 2011). However, as presented below, although inappropriate disposal in dumpsites has been reduced, according to the data collected for this study, the proportion of waste that is deposited in sanitary landfills has not increased significantly for the region as a whole (54.6%).

This trend towards a progressive decrease in the proportion of waste destined for dumpsites can also be verified when comparing the data reported by certain countries for the preparation of the Waste Management Outlook for LAC (UNEP, 2018), with the information provided for the present study. For example, countries such as Costa Rica, Colombia, Ecuador, Mexico, Peru or Uruguay have reported significant reductions, more than 10 percentage points, in an equivalent period of 3-4 years. In other cases, not enough information is available, or the data are not directly comparable. On the other hand, it should be noted that there are also situations in certain places where sanitary

landfills have taken the status of dumpsite or controlled sites due to a deficient operation or lack of resources.

Table 1 shows available information on the situation of final disposal of waste in countries of the region, according to the three types of facilities described above. The information collected through the surveys shows that the degree of adequate disposal of waste (sanitary landfills) varies between countries in the region. Countries such as El Salvador, Colombia, Costa Rica, Chile and Ecuador send more than 70% of the waste deposited to sanitary landfills, while in other countries inadequate disposal, either in dumpsites or controlled sites, is still predominant, as in Guatemala, Honduras, Dominican Republic, Suriname or Trinidad and Tobago. These trends are based on estimations, but looks consistent with the information reported in previous publications (UNEP, 2018; World Bank, 2018; IDB, 2015). This same information is represented in Figure 3, comparing in this case the final disposal in sanitary landfills with the inappropriate disposal (dumpsites and controlled sites).

Table 1. Status of final disposal in countries in the Latin American and Caribbean region.

Data refer to the percentage (%) of the amount of waste destined to each type of facility.

Source: own development based on the country surveys. * Source: Ministry of the Environment, 2020.

Country	Dumpsite (%)	Controlled site (%)	Sanitary Landfill (%)
Argentina	24.5%	9.9%	65.6%
Brazil*	17.5%	23.0%	59.5%
Chile	2.4%	18.0%	79.6%
Colombia	2.0%	1.9%	96.1%
Costa Rica	9.6%	--	90.4%
Ecuador	11.6%	15.5%	72.8%
El Salvador	1.0%	--	99.0%
Honduras	57.6%	27.9%	14.5%
Guatemala	65%	35%	0.0%
Mexico	4.3%	55.5%	40.2%
Peru	46.6%	--	53.4%
Dominican Republic	55.3%	44.6%	0.05%
Saint Lucia	0.0%	31.7%	68.3%
Trinidad and Tobago	0.0%	100%	0.0%
Uruguay	5.5%	29.6%	64.8%

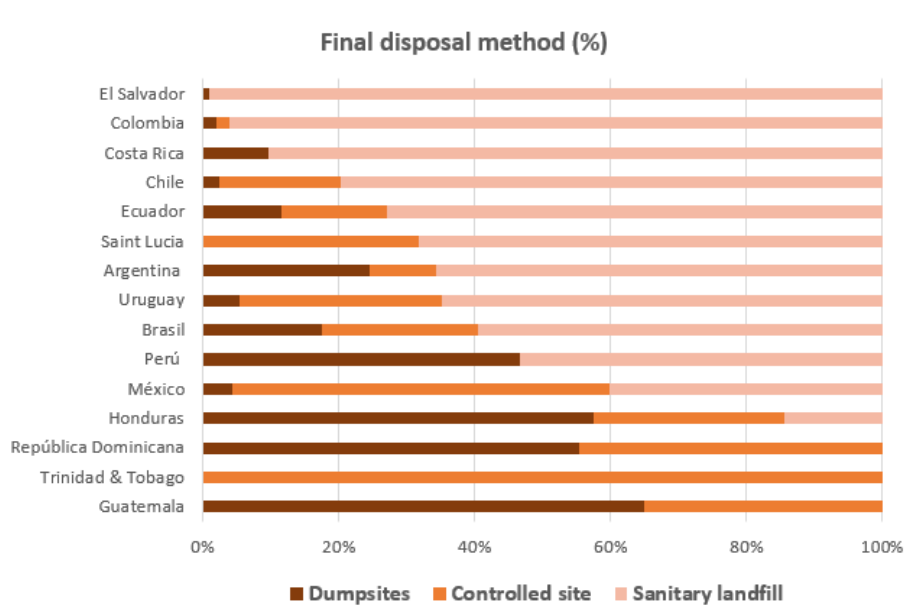


Figure 3. Final disposal in sanitary landfills vs. inadequate final disposal in Latin American and Caribbean countries (dumpsites and controlled sites). Source: Own elaboration based on data supplied and compiled from the countries.

The detailed data on final disposal collected for this document, mainly through the surveys to the countries, are shown in **Annex 2**. According to the information collected from more than 19 countries, the Latin America and the Caribbean region identifies the presence of **more than 11 thousand dumpsites**, 2,890 controlled sites, and 1,993 sanitary landfills. It is important to remember that these are estimated data, subject to different inventory methods, but that can provide a first quantitative dimension of the situation, for a group of countries that represent approximately 90% of the region's population.

When analyzing the number of municipalities that use the different final disposal methods and the amount of waste that is deposited in an adequate way (sanitary landfills) or inadequate (dumpsites and controlled sites), it is observed that about **8 thousand municipalities** use a total of at least 14 thousand sites of inadequate disposal, while the 1993 sanitary landfills offer a solution to some 3467 municipalities, and receive a higher quantity of waste. In summary, sanitary landfills represent 12% of the final disposal sites, but are used by 30% of the municipalities in the region and receive about 55% of the total waste deposited (see Figure 4).

This shows that to the extent that there are more adequate disposal sites represented by sanitary landfills, it is possible to cover a greater number of municipalities served by these facilities, for example through regionalization processes. This may be important to consider when seeking solutions and strategies for the nearly 8 thousand municipalities (around 70%) that still do not use adequate final disposal sites.

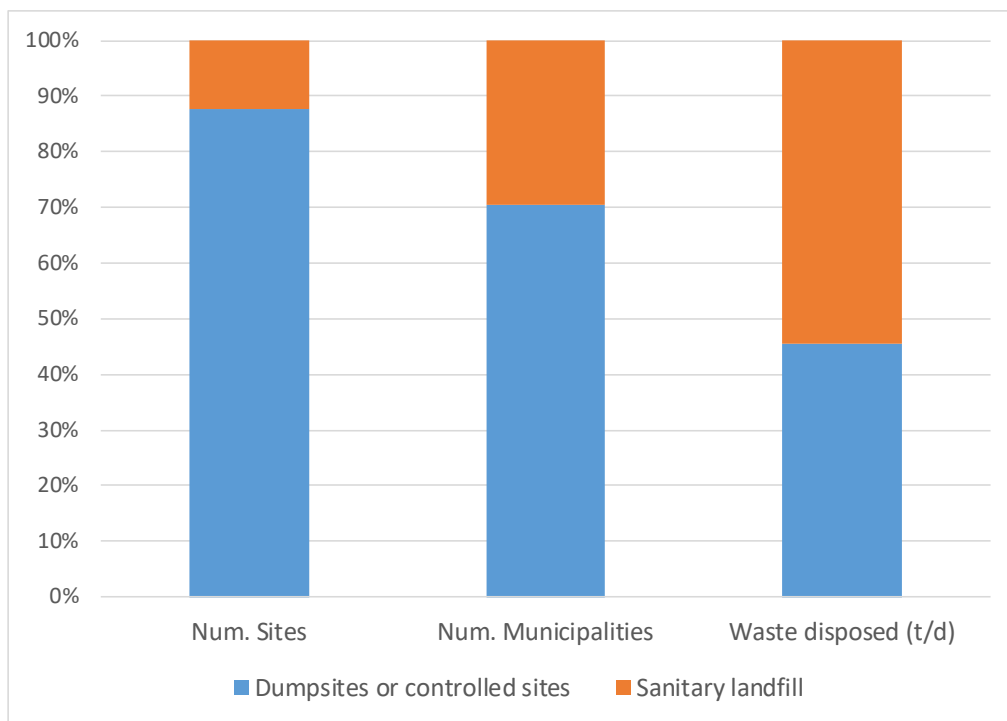


Figure 4. Final disposal sites, municipalities and amount of waste deposited in Latin America and the Caribbean. Source: own elaboration from the data supplied and compiled for 20 countries.

Through the survey, information was also collected on the **main operational dumpsites in the region**. Although detailed information on the characteristics of these sites is frequently not available, **Annex 3** identifies some **40** dumpsites reported by 11 countries, with some information on their age, accumulated waste, currently deposited waste, surface area and presence of informal waste pickers.

It should be noted that some of the large dumpsites that had been identified in publications from previous years (ISWA, 2016), no longer appear in these lists due to its **closure processes**, as described later in this document, as for example the case of Estrutural (Brasilia, Brazil), or La Chureca (Managua, Nicaragua). On the other hand, some of the sites identified in Annex 3 have already started technical closure plans or processes, as is the case of the Tegucigalpa landfill in Honduras.

Although the information is not yet complete for the region as a whole, it is observed as a positive trend that governments progressively have more detailed inventories³, which is a fundamental element for establishing baselines and strategies for prioritization and intervention in the countries.

³ Including more detailed geo-referenced surveys, as the case of Guatemala, Dominican Republic or Panama.

3. REGULATORY AND POLICY CONTEXT OF FINAL WASTE DISPOSAL

Political will, institutional coherence and the definition of policies on waste management, together with the development of the necessary, consistent and clear regulation, and its subsequent monitoring, are essential to bring a systematic change in the eradication of dumpsites and increasing the use of suitable sites for final waste disposal.

In the region, different efforts made by countries to implement measures related to the closure of dumpsites can be reflected in the numerous related policies and regulations that have been adopted, mainly during the last twenty years, intended to secure a minimum environmental and health quality standards. As a result, more than half of the countries in the Latin American and Caribbean region have chosen to formulate public policies on the matter, specifically the prevention and prohibition of dumpsites in their regulations, and/or establish through decrees, resolutions or regulations the basic sanitary and safety conditions to be fulfilled by adequate or controlled final waste disposal sites.

3.1 Governance in waste management and its institutional framework

When we allude to environmental governance, we refer to the set of processes and institutions, both formal and informal, where norms, values, behaviors and organizational modes intervene in which different players involved articulate their interests, mediate their differences and exercise their rights and obligations in a given environmental context. environmental objective. **Governance on waste management implies a system whose objective will be to achieve the best possible management in a given context**, requiring that governance take into account the complexities and interrelationships existing within and outside governments, encouraging cooperation and reconciliation of the diverse perspectives presented by the different stakeholders that come together in such a process (UNEP, 2018).

Solid waste management involve the participation and collaboration of the three powers of the State (executive, legislative and judicial) and of all levels of government (national, provincial or state, and municipal or communal). In this regard, the national government has a highly key role within the normative process given its primary responsibility as guarantor of the right to health and a healthy environment, being the entity in charge of establishing, supervising and defining the scope of the norms and objectives of environmental quality, and the obligations of every stakeholder, through a participatory and transparent way that achieves environmental quality and the demands of all interested stakeholders (UNEP, 2018).

It should be noted that, in terms of inter-institutional coordination, in recent years a greater role has been observed from the ministries of the environment in the development of environmental and health policies on solid waste, the creation of laws, the location of sanitary landfills, and the generation of permits and promotion of sectoral development. However, greater implication in the coordination of the functions of surveillance and control of health and environmental obligations with health authorities is required (AIDIS, 2018).

At the local level, close collaboration between state and municipal governments is essential. However, integrated waste management is primarily a municipal responsibility, under direct tasks and operations schemes, with human, technological and financial resources specific of each municipality. Said entities are competent to control or grant waste management services in their

territory, and in some cases, to associate with other municipalities in order to address one or all stages of the waste management: transport, transfer, treatment and final disposal, for example, through the use of regional sanitary landfills (AIDIS, 2018).

On the other hand, in addition to coordination between different levels of government and institutions, the participation of different key stakeholders is important, including the private sector, workers in the sector (including the informal sector), the community, non-governmental organizations, as well as the area of research and academy, among others.

3.2 **Regulatory framework**

3.2.1. Legislation with provisions regarding final disposal

Governance in waste management finds one of its main pillars in legal regulations. Many countries in the region have laws in force for solid waste, where provisions are established regarding the concept of final site disposal, the obligations that must be fulfilled by waste generators and managers, as well as the applicable penalties for cases of non-compliance. Sometimes the definitions referring to the final disposal site are directly linked to the characteristics of the soils and / or the distance to the groundwater table or the urban layout, and in others, it is simply mentioned that the authorities will define its location (UNEP, 2018).

In some cases, the laws do not cover all waste, but rather focus on legislating household or urban waste, which is why it does not include hazardous waste or those of special or industrial management, adopting specific regulations for this.⁴

Table 3. Examples of countries whose legal framework covers the definition of final disposal.

Country	Year	Legal framework	Reference
Argentina	2004	National Law No. 25916 on the Household Waste Management	Article 3 Subsection g
Bolivia	2015	National Law No. 755 on Waste Management	Annex
Brazil	2010	Law No. 12305, Establishes the National Solid Waste Policy	Art. 3 Subsection VII
Chile	2005	D.S. Number 189, Regulation on Basic Sanitary and Safety Conditions in Sanitary Landfills.	Article 4
Colombia	2015	Regulatory Decree No.1784	Chapter 3
Costa Rica	2014	Regulation on Landfills N° 38928-S	Art. 1 Subsection e
Cuba	2002	Cuba Standard No. 135: Urban Solid Waste - Final Disposal. Sanitary and Environmental Hygienic Requirements.	
Ecuador	2019	Regulation to the Organic Code of the Environment of Ecuador, published in the official registry No. 507	Art. 596
El Salvador	2019	Integral Waste Management Law.	Article 6
Honduras	2010	Regulation for the Integral Management of Solid Waste, Executive Agreement No. 1567	Article 6
Mexico	2003	General Law for the Prevention and Comprehensive Management of Waste.	Article 5 Subsection V
Nicaragua	2014	Special Law on Integral Management of Solid Waste and Hazardous and non-Hazardous Waste.	Article 6
Paraguay	2009	Integral Management of Solid Waste	Art. 40 and Chapter IX
Peru	2017	Law on Integral Solid Waste Management	Article 2
Dominican Republic	2003	Standard for the Environmental Management of Non-Hazardous Solid Waste NA-RS-001-003	Article 2.17

⁴ Such is the case in Argentina where, for example, by Law No. 25612/02 industrial waste is regulated.

Saint Lucia	2004	Waste Management Act	Art. 1 Subsection 3
Uruguay	2013	Decree N° 182/013, which regulates the management of industrial, agro-industrial and commercial waste.	Art. 32
	2019	Law 19829 on Integral Waste Management	Art. 3 inc. m
Venezuela	2010	Integral Garbage Management Law No. 6.017	Article 62

Source: Own elaboration on the basis of the survey of legislation and consultations with the countries.

In the LAC region, many countries have managed to improve final disposal through the development of sanitary landfills. For such purposes, the legislation and regulations must adopt the regulatory and financial instruments necessary to ensure the feasibility of these alternatives. In most cases, the issuance of these specific norms is materialized through decrees, technical resolutions and / or provisions that are regulatory or complementary to the general law⁵, in order to elaborate on the required level of detail (UNEP, 2018). Thus, Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Peru, Saint Lucia, Uruguay and Venezuela, for example, establish in their regulations a series of protection requirements related to the siting of sanitary landfills, their construction characteristics, details of the operation, monitoring, closure and complementary works activities.

In the event that the final disposal of waste in sanitary landfills is economically unfeasible, Brazil, for example, has included in its new legal framework (Law 14026 of 2020, which modifies Law 12305/10), the possibility of adopting other solutions, as set forth in the technical and operational standards established by the competent body, in order to avoid damage or risks to public health and safety, and to minimize environmental impacts.

3.2.2. Legislation with provisions regarding the closure of dumpsites.

Both the existence of dumpsites and the open burning of waste are long-standing prohibitions in most of the laws of the region, which shows that **the mere existence of legal norms alone are not sufficient to achieve a good governance on waste** (UNEP, 2018).

“It is important to remember that closing down a dumpsite is neither a simple nor an easy task. It requires an alternative waste management system, so it requires adequate planning, as well as institutional and administrative capacity, financial resources, social support and finally political consensus. All these conditions are really difficult to meet in countries where dumpsites are the dominant method of waste disposal and level of governance quality is questionable” (ISWA, 2016).

Several countries in the region have established as a priority line in their legal systems the prohibition of dumpsites in their national and sub-national regulations. Generally, it is the authority of the national governments to plan and establish long-term policies, through regulatory frameworks and the adoption of action plans regarding the closure of dumpsites and the development of technical characteristics for a proper final disposal, falling to the municipal governments of almost the entire region the power to fill out the provisions that refer to the

⁵ There are countries which have high-level legal instruments such as: Decrees, Policies, Regulations and Technical Standards, which are mandatory. However, these norms have the weakness that they have a legal status lower than a Law (AIDIS, 2018).

prohibition of the dumping of waste, the adoption of appropriate final disposal sites, etc., with the exception of some Caribbean countries.⁶

In Argentina⁷, the national law establishes among its precepts the adequate operation in final disposal centers authorized by the competent authority, while the autonomous entities implicitly and explicitly discourage the operation in dumpsites and ensure their sanitation through their provincial laws. A similar scenario occurs in Mexico, where there is a general law at the national level for the Prevention and Comprehensive Management of Waste, by which it is stated that the laws issued by the federal entities, referring to the management and final disposal of urban solid waste must contain provisions that prohibit the opening of new dumpsites. In this regard, of the 32 Mexican states, only the environmental laws of the State of Nayarit and Sonora do not have implicit or explicit restrictions on the prohibition of dumpsites.

Other countries such as Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador (see Box 1), Panama, Peru, Dominican Republic, Saint Lucia, Uruguay, and Venezuela, also referred to through national laws⁸, decrees⁹ and / or regulations¹⁰, to the use of better final disposal methods, by preventing and prohibiting non-authorized sites. Likewise, in other countries, there are draft legislations, as is the case of Honduras, whose bill for integrated waste management contemplates the closure of dumpsites within 5 years after the law comes into force.

The inappropriate final disposal of waste is also sometimes contemplated in the criminal law. For example, in the case of Peru, through its article 306 of the Criminal Code, non-compliance with the rules regarding solid waste management is penalized, thanks to the incorporation of crimes against natural resources and the environment through Legislative Decree No. 635 in 2016. Said article specifies the configuration of the crime of establishing solid waste dumpsites without authorization or approval of the competent authority, seriously damaging the quality of the environment, human health or the integrity of economic processes, setting a sentence of life imprisonment of no more than four (4) years.

⁶ In 12 Caribbean countries, services are operated by government agencies directly, which, in addition to managing and financing the services, also plan, regulate, control and have the power to contract or grant a concession to private entities, the partial operation or total urban cleaning services. The size of these countries and their limited urban population facilitate this type of organization (IDB, 1997).

⁷ Such is the case of Argentina, Brazil, Mexico and Venezuela, whose government systems are based on the decentralization of power, which refers to a territorial division into autonomous units that dictate their own rules, elect their own authorities, choose their own authorities, are self-administered and self-finance.

⁸ Barbados, Costa Rica, Dominican Republic, El Salvador, Saint Lucia, Uruguay, and Venezuela.

⁹ For instance, Chile, Colombia and Peru.

¹⁰ Such is the case, for instance, of Ecuador.

Box 1: Regulatory, institutional, and financial framework on the dumpsite closure process in El Salvador

The use of dumpsites has been prohibited in El Salvador since 2007. Through the developing of environmental and procedural assessments for the closure of dumpsites, in compliance with the temporary provisions on the integral treatment of solid waste, established by Legislative Decree No. 237/07, the local governments presented environmental assessments to the Ministry of Environment and Natural Resources in which they committed to proceed with the closure of dumpsites and transfer their waste to the 11 regional sanitary landfills authorized in the country by the Ministry. To this end, the Legislative Assembly, through Decree No. 1080/12, offered the 262 municipalities of the country the possibility of using 25% of the total resources allocated by the Fund for the Economic and Social Development of Municipalities (FODES, in its Spanish acronym), in order to close dumpsites, along with activities related to collection, transport and final disposal of solid waste. In this context, in order to comply with this legal mandate, the Environmental Inspectorate of the Ministry of Environment verifies that the operational closure of dumpsites is complied. For that purpose, a “Green” Line for society has been created in order to report cases on non-compliance with this law. Currently, almost all waste is deposited in sanitary landfills.

Table 5 includes information from sixteen (16) LAC countries in which legislation could be identified that explicitly or implicitly stipulates the prohibition of dumpsites, either in general or specific regulations on the matter, together with a brief reference to the legal text. This information is also illustrated on the map in Figure 5.

Table 5. Examples of countries whose national legal framework includes the prohibition of dumpsites.

Country	Year	Details
Argentina	2004	Establishes the proper operation in final disposal centers. The competent authorities must legitimize the methods and technologies that prevent and minimize possible negative impacts on the environment and the quality of life of the population, in view of the operation and closure of treatment plants and transfer stations, as well as for the operation, closure and post-closure of final disposal centers (Article 19)
Brazil	2010	It contemplates the elaboration of a state plan for solid waste in the terms provided in the Law. In this regard, the elimination and recovery of dumpsites is established as a minimum content, associated with social inclusion, with an action horizon of 20 years with reviews every 4 years (Article 14, subsection V)
Chile	2005	Faced with the need to avoid the occurrence of environmental health contingencies and in order to ensure the provision of a final household solid waste disposal service with adequate security for the normal development of the localities that dispose of such waste, the evaluation and management of Sanitary Landfills (Preamble)
Colombia	1974	The management of residues, garbage and waste is contemplated, through the use of the best methods, in accordance with the advances in science and technology, for the collection, treatment, processing or final disposal of residues, garbage in general and waste of any kind (Article 34)

Costa Rica	2010	The municipalities will be responsible for the integrated management of the waste generated in their canton. For this, they must prevent and eliminate dumpsites, and the unauthorized collection of waste (Article 8, subsection F)
Cuba	1997	It is forbidden to emit, pour or discharge substances or dispose of waste, odors and other physical factors that affect or may affect human health or damage the quality of life of the population. (Article 146)
Ecuador	2019	The Autonomous Decentralized Municipal and Metropolitan Governments must close the existing dumpsites in the canton, through technical closure projects authorized by the National Environmental Authority. Likewise, the final disposal of non-hazardous solid waste is prohibited without the corresponding environmental administrative authorization. Likewise, final disposal is prohibited in natural areas that make up the National System of Protected Areas, in the public water domain, marine waters, beaches, on public roads, in the open, patios, lands, lots, streams or in any other place other than the one designated for the effect, according to the secondary rule issued by the National Environmental Authority (Article 536)
El Salvador	2007	As of zero hours on September 10, 2007, it was strictly forbidden to deposit waste in the open, or in any other place that is not legally authorized, and failure to comply will result in sanctions for the owners of the works (Articles 2 and 3)
Mexico	2018	The legislation issued by the federative entities in relation to the generation, management and final disposal of urban solid waste may contain the following prohibitions: III. Open new dumpsites (Article 100)
Panamá	2010	The dumping or deposit of materials or solid waste in any prohibited place, public road, easement, waterways, streams, parks and gardens is prohibited (Article 22, subsection1)
Peru	2016	The abandonment, dumping or disposal of waste in places not authorized by the competent authority or those established by law is prohibited. Places of inappropriate final disposal of solid waste identified as dumpsites must be closed by the provincial municipality in coordination with the respective district municipality.
Dominican Republic	2000	The placement launch and final disposal of waste in places not established for it by the competent authority is prohibited. In this regard, the operation of municipal dumpsites in the vicinity of bodies of water is impeded, and the prior establishment of a municipal dumpsite and the materialization of an environmental assessment study is established as essential. (Article 107, subparagraph I and II)
Saint Lucia	2004	Local authorities, when choosing the best solid waste disposal method for their jurisdictions, should consider climatic conditions, economic capacity, community interest, environmental, hygienic and social benefits, and the availability of places of spill. (Article 119)
Trinidad and Tobago	2016	It is considered a crime to deposit waste in any public place that is not in those spaces established for the purpose of collecting it, or in approved sites (3.1.a). In this regard, a person who is guilty of a crime under this article shall be sentenced to a fine or to a prison sentence of 6 months, in the case of a natural person, and a fine in the case of a legal person (3.6)
Uruguay	2019	It is established as a serious offense to abandon, dump or deposit in an uncontrolled manner, including exposing in public or private places of public access, the solid waste included in said regulation (Art. 40, Decree 182/013, of June 20, 2013, which regulates the environmentally sound management of industrial, agro industrial and commercial waste). Beyond the current guidelines at the departmental level, a period of three years is granted as of promulgated the Law N° 19829 on Integrated Waste Management for those sites that are operational to comply with the provisions of national law. In this framework, the Departmental Governments must adapt the infrastructure and operating conditions of the current final disposal sites to comply with the minimum conditions that the Ministry of Environment will determine in due course, becoming controlled sites, or they must proceed to the closure of the these sites (Article 51).

Venezuela	2010	The disposal of waste and solid waste in dumpsites or in stealth dumps is prohibited. (Second Transitory Provision).
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Source: Own development based on the survey of legislation and consultations with the countries.



Figure 5. Latin American and Caribbean countries with identified legislation that explicitly or implicitly prohibits the dumping of waste. Source: Own development based on the survey of legislation and consultations with the countries.

3.3 Planning

Planning with a preventive environmental and health approach is key to avoiding, mitigating or controlling a number of environmental, social, economic and health impacts, requiring the adoption of long-term plans which demand sustained vision and commitment over time and along the alternation of political mandates (UNEP, 2018). In the region, for example, countries such as Argentina, Brazil (see Table 2), Chile, Colombia (see Table 3), Costa Rica, Cuba, Ecuador, El Salvador, Panama, Peru, Suriname, and Trinidad and Tobago, have a policy, plan or program at the national level where the progressive closure of dumpsites in their country is included among their goals, while countries such as Honduras, Mexico and Uruguay are in the process of reviewing or approving these national strategies¹¹. In the case of Uruguay, although there is not yet a plan at the national

¹¹ Regarding solid waste management, it is either possible to identify laws or national plans for waste management when it comes to this process. If the objectives are clear, a law can be developed in the first instance on which the national plans will depend. On the contrary, when a country for different reasons considers that it is not the time to develop a law, it can count on the adoption of a national waste management plan, in which the rules will be framed and will later be embodied in a law (AIDIS, 2018) .

level, Article 14 of Law No. 19829, published in 2019, establishes the development of the National Waste Management Plan at the head of the Ministry of Environment, which will fulfill the role of a strategic planning instrument at the national level for the implementation and development of the national waste management policy, within a maximum period of two years from the entry into force of said law.

Argentina, on the other hand, faced with the challenge of closing the 5,000 dumpsites that are estimated to exist in the country, will implement during the next five years the execution of a Federal Plan for the Eradication of Dumpsites, in conjunction with the provincial and municipal governments, with the main objective of reducing the disposal of urban solid waste in dumpsites and increasing its disposal in socio-environmental complexes designed, built and operated properly both in urban centers and in tourist municipalities in the country for differentiated and efficient treatment of waste, together with initiatives that include the educational field, the gender

Box 2: New goals and regulatory measures for the closure of dumpsites in Brazil.

A case of combining and updating legislative and planning instruments for the closure of dumpsites is Brazil, whose National Solid Waste Policy (PNRS), instituted by Law No. 12.305/10, considered among its primary objectives the end of all dumpsites for **2014**. However, in 2018, according to the Brazilian Association of Special Waste and Public Cleaning Companies (ABRELPE), about 40% of the collected waste was still improperly disposed (ABRELPE, 2019). In this context, the Ministry of the Environment launched the **Zero Waste Program**, within the framework of the Urban Environmental Quality Agenda, in order to fulfill the National Solid Waste Policy, complying with the federal directive to eliminate existing dumpsites and support municipalities to implement adequate forms of final disposal (MMA, 2019).

In addition, more recently, article 54 of said Law No. 12.305/10 has been modified through the **new legal framework for sanitation**: Law No. 14026 of July 2020. Said new legal body establishes that the environmentally appropriate final disposal of waste must be met by December 31, **2020**, except for those municipalities that have prepared an inter-municipal plan for integrated solid waste management by that date, and have collection mechanisms that ensure the economic and financial sustainability of services. In such cases, the following details are established:

- 1) until August 2021, for the capitals of the States and Municipalities that belong to the Metropolitan Region or the Integrated Development Region of the capitals;
- 2) until August 2022, for municipalities with a population greater than 100,000 inhabitants, as well as for municipalities whose urban area of the municipal headquarters is located less than 20 km from the border with neighboring countries;
- 3) until August 2023, for those municipalities with a population between 50,000 and 100,000 inhabitants;
- 4) until August 2024, for those municipalities with a population of less than 50,000 inhabitants.

Currently (Sep-2020), a National Solid Waste Plan (Planares) has also been launched for public consultation, which represents a long-term strategy at the national level to operationalize the legal provisions, principles, objectives and guidelines of the National Solid Waste Policy (MMA, 2020).

perspective, awareness and social communication (Integrated Urban Solid Waste Management Program, 2020).

Box 3: Planning and regionalization for the closure of dumpsites in Colombia.

A possible reference of national measures regarding the closure of dumpsites in the region is the case of Colombia. As of 2005, the Andean country was already beginning to work on various aspects related to the integrated management of waste, developing new regulations and improving the provision of public services associated with the collection and final disposal of waste, aimed at prohibiting the final disposal of solid waste in systems other than landfills. By 2015, Colombia had 360 disposal systems to receive waste from 1,102 municipalities (UNEP, 2018).

To achieve these ends, the 2006-2010 National Development Plan was created through which an incentive was established for municipalities to locate regional sanitary landfills in their territory, accompanied by measures related to departmental water and sanitation plans, public service cleaning facilities and the construction of transfer stations in order to increase the use of economies of scale. This regionalization positively generated the **disposal of 91% of the waste from 803 municipalities in 62 final disposal sites in 2015** (UNEP, 2018).

Likewise, instruments associated with command and control were issued, including an order for the prohibit dumpsites, and the control and surveillance of order enforcement and prohibition of imposing unjustified access restrictions to regional sanitary landfills; as well as economic instruments that require the calculation of the variable cost of final based on the number of tonnes disposed, the payment per tonne to the municipalities that allow the location of regional sanitary landfills in their territories and financing of the National Government for offsetting up regional schemes and construction and/or adaptation of regional landfills (UNEP, 2018).

In 2016, the National Government established the guidelines of a new **National Policy for the Integrated Management of Solid Waste 2016-2030**. Through this project, the country seeks to identify those municipalities or regions that are difficult to manage through a process to prepare a plan to close dumpsites and inadequate final disposal sites within three years, and to implement solid waste treatment schemes by optimizing sanitary landfills and gradually incorporating of complementary technologies, with a specific goal of ten years.

3.4 Summary of regulatory trends in the region

This chapter has presented an overview of progress in countries of the region in the adoption of laws and regulations that prohibit dumpsites, encouraging their reduction in order to mitigate environmental and human health impacts, specifying the minimum conditions for the design, operation and closure of such sites of inadequate disposal.

It is based on a review of legally binding national instruments at the national or federal level, taking into account subnational legislation (of states or provinces, or municipalities, for example), for which the consultation of the countries of the region has been considered, of which 19, to date, have provided a series of very valuable references and innovations for the identification of trends

and challenges in the countries, complemented by the collection of data, laws and regulations through online data and government websites.

In this regard, it has been considered and consulted on the existence of national, regional and/or municipal policies, plans or programs that include the progressive closure of dumpsites in their countries, on the existence of regulations that implicitly or explicitly prohibit dumpsites, and on existing norms that regulate the final disposal of waste, including specifications for sanitary landfills or other final disposal facilities.

Based on the information provided by 19 countries, the following trends have been identified in the region (see Figure 6):

- 84% of the surveyed countries regulate the final disposal of waste, including specifications for sanitary landfills or other final disposal facilities.
- 79% of countries have regulations that implicitly or explicitly prohibit dumpsites.
- 63% of the countries have a policy, plan or program that includes the progressive closure of dumpsites.

These data indicate that **most of the countries in the Latin American and Caribbean region have adopted some type of legislation to regulate the final disposal of waste, and that most of them explicitly prohibit the inadequate final disposal.** Although to a lesser extent, numerous countries also have specific plans for the progressive closure of dumpsites, although its implementation requires overcoming a number of challenges, such as those indicated in the section below.

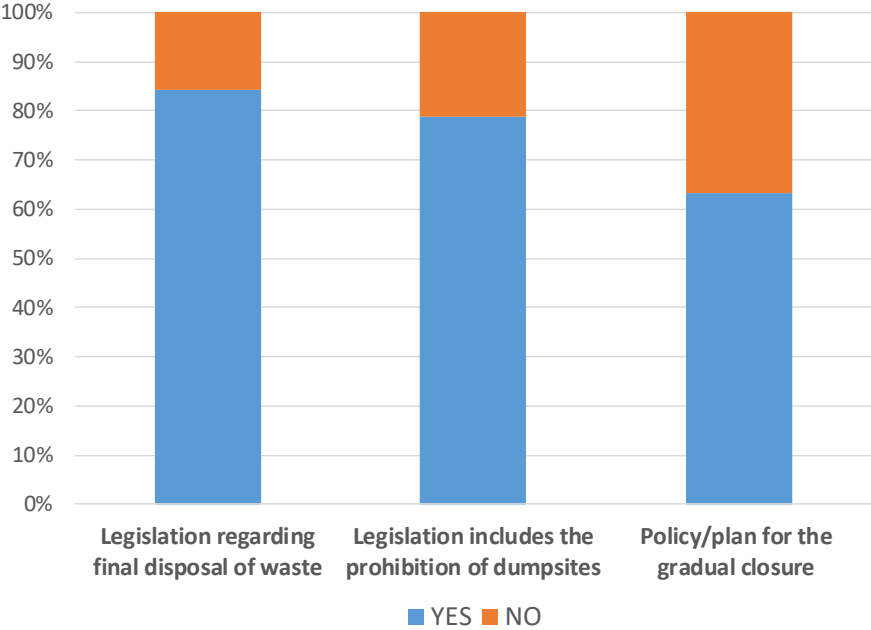


Figure 6. Countries in the region with and without national laws, regulations or plans regarding final disposal and the prohibition and progressive closure of open dumps. Source: own elaboration based on the response survey of 19 countries.

3.5 Challenges for closing dumpsites and possible goals in the countries of the region

As presented above, countries of Latin America and the Caribbean have made important progress in the development of normative and political frameworks to regulate the adequate management of waste, including its final disposal, as well as the preparation of plans for the progressive closure of dumpsites. However, the occurrence of still a significant number of inappropriate final disposal sites in numerous countries in the region has also been evidenced, and this is related to a set of challenges and difficulties that local and national governments must face in order to carry out the closure of dumpsites.

In this sense, the survey to the countries specifically consulted about the **main challenges for moving forward in the closure of the dumpsites**. To this end, they were requested to select the five main challenges in the country from a specific list, and to assign a priority value for each of them. This enabled establishing an indicator of aggregate priority based on the consolidation of the response of the group of countries, in order to observe regional trends, which is shown in Figure 7.

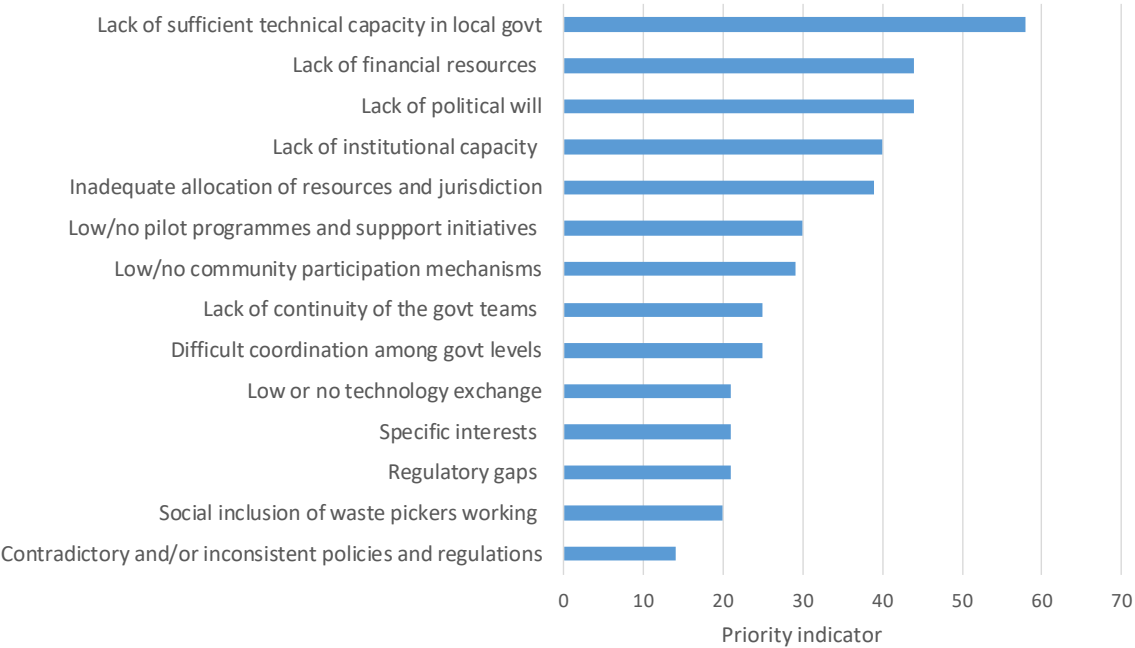


Figure 7. Main challenges to advance in the closure of dumpsites in the LAC region. Source: own elaboration based on responses from 19 countries.

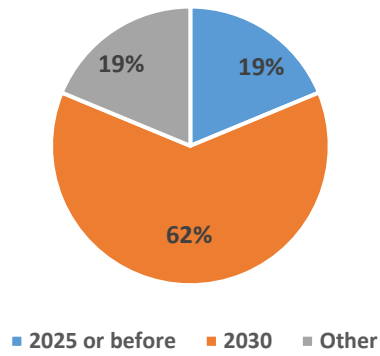
As it can be observed, **the lack of sufficient technical capacity in local governments** stands out above the others, followed by a second group of aspects such as lack of financial resources, lack of political will, lack of institutional capacity, and the inadequate allocation of resources and jurisdiction, which are elements somehow related. Other aspects were weighted comparatively with lower priority, but were frequently mentioned within the five main challenges of each country, such as the lack of continuity of government teams, or the difficult coordination between institutions. On the contrary, and in consistently to what has been described above, it is evident that **the lack of legislation or policies is not reported as the main challenge, but rather the difficulty to effectively enforce them.**

On the other hand, it was also consulted what **changes or measures** countries consider that would be necessary at the institutional, regulatory or management level, to promote and facilitate the progressive closure of dumpsites. In this regard, the following aspects were noted:

- **Institutional and articulation measures** referring to the need to establish binding mechanisms that strengthen assistance and technical capacities from the central government to local authorities, through the formulation of projects for the closure of landfills and the construction of adequate final disposal facilities, together with the allocation of financial resources. For this, the necessary articulation and alignment of government entities at all levels, political will, institutional strengthening, and a clear and defined vision of this problem over time, accompanied by political decisions that prioritize solid waste management and their final disposal are highlighted.
- **Measures for the development, compliance and enforcement of regulations**, including in some cases the issuance of comprehensive waste management framework laws or the modification and / or updating of the existing regulatory framework. In general, it advocates the increase of inspection, surveillance and control activities of inappropriate final disposal sites, compliance with the peremptory deadlines established for the eradication of dumpsites, the enforcement of current legislation, reaching the instances of sanction to the competent authorities that do not comply with what is legally established.
- **Economic and resource mobilization measures** alluding to the financing of comprehensive waste management projects and closure of open dumps by strengthening the economic, administrative and technical capacities of the municipalities, as well as, thanks to the participation of society in the costs of waste management and the adaptation of rates that include separation for recycling.
- **Measures related to the transition towards a new model based on the circular economy** in order to promote the use and valorization of waste, together with the sustainable management of natural resources, generating innovative sources of employment, both for entrepreneurs and central actors to the economy, which implies the generation of economic benefits.

Finally, in relation to a possible timeframe goal for the elimination of dumpsites in the respective countries, **most of the countries indicated the year 2030 as the most feasible goal**, with 63% of the responses, while a smaller number of countries indicated before (2025) or after that date (see Figure 8).

Possible target to phase-out dumpsites



Possible target to phase-out dumpsites

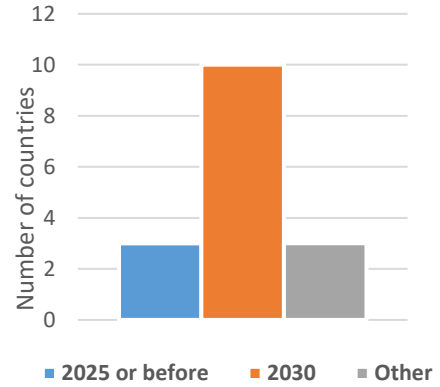


Figure 8. Possible goal to eradicate dumpsites in countries of Latin America and the Caribbean. Source: own elaboration based on responses from 18 countries.

4. IMPACTS ASSOCIATED WITH DUMPSITES.

The region of Latin America and the Caribbean is not alien to the inadequate management of waste, including its disposal in dumpsites, as well as open burning or other inadequate management practices, which cause impacts that affect social development, human health, and the preservation of the environment (UNEP, 2018). Assessing these impacts must be jointly associated with various variables, including the location of the dumpsite, the proximity water bodies or waterways, the geological, hydrogeological and climatic conditions, in addition to the composition and quantity of the waste, the physical extension of the installation and age of the landfill (D-Waste, 2014).

According to the *Waste Atlas Report* (2014), the most relevant impacts associated with the disposal of waste in landfills are summarized below, both for the environment and for the public health and safety.

4.1 Environmental impacts

4.1.1 Surface and groundwater pollution

Water pollution can occur when this resource has contact with residual liquids such as leachates. These are generated mainly by the dragging effect that rainfall and other water sources exert on waste, organic and inorganic, reaching groundwater or surface waters (UAESP Bogotá, 2020). In some cases, waste is placed directly in the water resulting in direct physical and chemical contamination of the water surface. Likewise, those dumpsites that are close to coastal areas can be an important source of direct pollution to marine and coastal ecosystems.

4.1.2 Soil contamination

Soil contamination is another consequence of improper waste management. Many pollutants (especially heavy metals) get trapped in the soils below landfills, leading to the risk of increased environmental contamination in the long term and restricting the possible further use of the site.

4.1.3 Air pollution and climate change

The uncontrolled burning of solid waste (particularly of certain types of plastics), is a significant source of smoke emissions and gaseous pollutants into the air. This smoke commonly contains microparticles of black carbon, a short-lived climate pollutant, as a result of incomplete or poor combustion of solid waste. These black carbon particles have adverse effects on health due to its very small size, less than 2.5 micrometers or even 1 micrometer (PM_{2.5}, PM₁) and are able to enter through the respiratory tract and seriously affect health, generating respiratory and cardiovascular problems (US EPA, 2012). In addition, they are characterized by their high global warming potential, estimated 5000 times higher than CO₂, acting as a powerful climate forcer (Bond et al., 2013).

The polluting gases emitted during the uncontrolled burning of solid waste will depend on the physical-chemical composition of the waste, but they are generally the typical gases generated in combustion processes, such as carbon monoxide (CO), nitrogen oxides (NO_x), sulfur oxides (SO_x) or even carcinogenic compounds such as dioxins and furans, which represent a health hazard. In some cases, the generation of hydrogen sulfide can cause odors and direct hazards to the environment due to the disposal of certain types of waste.

On the other hand, dumpsites are also an important source of greenhouse gas (GHG) emissions, since the decomposition process of organic waste generates various GHGs, mainly CO₂ and CH₄ (Kirkeby et al., 2007). These gases, not being handled correctly, are emitted directly into the environment, contributing to global warming. Previous studies estimate that carbon (C) constitutes between 75 and 105 kg per ton of municipal solid waste (MSW) and this is emitted in the form of biogas when anaerobic decomposition occurs (Manfredi et al., 2009). Additionally, CH₄ and N₂O, the two most important greenhouse gases after CO₂, have a characterization factor of 28 and 265 (Global Warming Potential), respectively, which implies a high contribution to global warming. According to the study *Advancing and measuring sustainable consumption and production for a low-carbon economy in middle-income economies and new industrialized countries in Peru* (Ziegler, et. Al, 2020), it is evidenced that a landfill can generate emissions from 1685 to 1757 kg CO₂-eq per ton of municipal solid waste (while in a landfill with energy recovery it is between 136-186 kg CO₂-eq per ton of MSW). Finally, it is important to mention that methane gas is characterized by being a precursor in the formation of tropospheric ozone, which is a gas with important health effects due to its ability to irritate the respiratory tract (GMI, 2020).

4.1.4 Flora and fauna

Fauna in and around sanitary landfills can be affected either by direct consumption of solid waste, or by the consumption of contaminated plants and / or animals, or as a result of the effects of leachate on groundwater and surface waters. In turn, plants near open-air dumpsites can be directly affected by waste, dust or smoke from burning.

Dumpsites tend to affect the type and number of plants in the surrounding area. The presence of dead vegetation is often associated with the area around dumpsites. Dead vegetation is normally the result of trampling on foot, with vehicles or animals, but it can also be the result of direct contamination by waste or leachate, migration of gas from landfills, or as a result of burning or the effects of smoke.



Figure 9. Environmental impacts generated by dumpsites. Source: ISWA, 2015

4.2 Impacts on Public Health and Safety

One of the main health risks for people in direct contact with open-air dumpsites is the **spread of diseases**. The most common health problems are related to gastrointestinal, dermatological, respiratory problems, and various other types of infectious diseases. According to the Pan American Health Organization (2005), the populations exposed to risks due to the inadequate management of solid waste are:

- The general population.
- Formal workers in the solid waste sector (collectors and cleaning workers).
- People dedicated to the informal selection and recovery of recyclable materials in the street and in storage and final disposal sites.
- Population adjacent to final disposal sites.
- Urban population without home collection.
- Population groups marginalized from society, such as street children and adolescents and the homeless who feed directly on household waste found in bags, containers and containers where waste is stored for collection and at final disposal sites.

It should be noted that another source of damage to human health are **vectors to diseases** and various other animals such as birds, rodents and insects that are attracted to dumpsites to feed and reproduce. This is worrisome from a public health point of view because these animals can act as disease transmitters.

Likewise, **accidents** in dumpsites also represent a risk to people's health. The greatest danger is related to cuts and wounds (and their subsequent infection). These effects can be aggravated in highly polluted and unsafe environments, due to improper waste disposal. This also contributes to creating other types of accidents that involve fires, explosions, and landslides, caused for example by the accumulation of gases such as methane.

4.3 Examples of impacts related to dumpsites

Through the report *A Roadmap for the Closure of dumpsites* (ISWA, 2016), world cases are exemplified where different types of incidents in open-air dumpsites have affected the lives of more than 65 million people.

The same report highlighted that exposure to dumpsites has a greater impact on the life expectancy of a population than malaria and that in addition to human and environmental impacts, the financial cost of it, is close to tens of billions of dollars.

In general, information on impacts associated with dumpsites is limited. This has been evidenced in the consultation with the countries, where the majority indicated that they do not have detailed information on incidents or cases of impact documents, in part because this type of information is recorded mainly at the municipal level. The main type of incident that is reported is related to fires or burns, and to a lesser extent to vectors and pollution episodes. Box 4 describes some cases in the region, which are usually reported in the media.

Box 4: Examples of incidents or impacts on landfills in the region

Landslide and derived impacts in landfill of Doña Juana, Colombia, September 1997.

In September 1997, the landslide of one million two hundred thousand tons of waste occurred at the Doña Juana landfill, which receives waste from the city of Bogotá. The incident affected the health of the inhabitants of the area located in the surroundings, causing respiratory infections, allergies, vomiting and skin rashes, mainly in children. In addition, it affected nearby water sources and the contamination of the waters due to the dumping of leachate. Consequently, those affected brought a legal action against the District of Bogotá, through which it was sentenced in 2012 to pay the plaintiffs a sum close to USD 76 million (UNEP, 2018).

Riverton Dump fire, Jamaica, March 2016.

In Jamaica, thick and noxious smoke from the Riverton Dump landfill fire covered Jamaica's capital in March 2016, as a wind-fueled fire burned in a sprawling open-air dumpsite on the outskirts of the city. From Kingston that has seen repeated fires. Schools closed and the government advised residents to stay indoors and close windows. Prior to this incident, the last major landfill fire, in April 2014, burned for almost two weeks, sending more people with respiratory distress to health clinics (ISWA, 2016).

Massive landslide in Guatemala, April 2016.

In Guatemala City, a massive landslide at the dumpsite killed four people on April 26, 2016, with at least 24 others missing. Almost all of them were informal waste pickers. This happened in the Guatemala City dumpsite, the largest dumpsite in all of Central America, where a large number of people work (ISWA, 2016).

Fire at La Duquesa dumpsite Dominican Republic, May 2020.

A large fire took place at the Duquesa dumpsite during the month of May 2020. This incident particularly affected the neighboring population, in the midst of the crisis due to the COVID-19 pandemic (CNN, 2020).

5. PRACTICAL EXPERIENCES IN THE CLOSURE OF DUMPSITES IN THE REGION

According to the environmental guide *Sanitation and Closure of Dumpsites* (Ministry of Environment, 2002), the general procedures for the closure of dumpsites vary according to the context of each country, however, the generality to achieve their closure is based on taking into account six aspects ranging from problem identification, data collection and study of alternatives, to establishing monitoring and follow-up systems once the closure has been carried out (see Figure 10).

In the Latin American and Caribbean region, there are success stories in which, through different mechanisms, technical instruments and efforts, open dumpsites have been closed following the above general guidelines or others adapted to the context of each country and municipality, and in parallel alternatives have been developed that meet technical, environmental and social conditions, such as sanitary landfills.

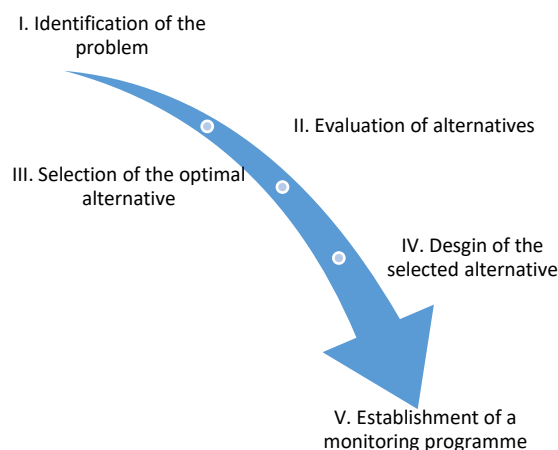


Figure 10. Procedures for closing dumpsites. Source: *Sanitation and Closure of Open Pit Dump* (2002).

5.1 Estrutural (Brazil)

The Estrutural dumpsite was considered the second largest in the world during its operation as reported in the report *The 50 Largest Dumpsites in the World* (D-Waste, 2004).

The dumpsite was located in the city of Brasilia, Brazil, and occupied an area of 136 hectares. It was active for more than 50 years and until the year of its closure, it received between 21 and 30 million tons of municipal solid waste. About 2,500 informal waste pickers lived and worked there, while about a million people lived within a range of up to 10km from the landfill. On a social and environmental level, the dumpsite had visible drawbacks, involving accidents and death of people, health effects on the surrounding populations, without neglecting the contamination of waters and soils of neighboring lands.

In this sense, the Federal District of Brazil concluded a process to close the dumpsite in 2018. Its closure process included the design of the first sanitary landfill (called ACJ) in the city, which also had a social component in which it included recyclers as providers of public services. It should be

noted that just after the closure of the dumpsite, the area was adapted to receive 6,000 tons of construction and demolition waste per day, and is currently the only space in the federal district destined for this type of waste (Federal District of Brasilia, 2018) .

The closure of the dumpsite began through the development of a **preliminary diagnosis** of the situation of the landfill, which identified the 27 main problems that it caused and categorized them into five main blocks: i) waste management, ii) irregular traders, iii) pickers , iv) environmental aspects, v) contraventions, as well as the 17 government agencies with the institutional capacities to undertake actions for the closure of landfills. In this sense, through the Decree 36,437, the then governor formed a **Working Group** composed of selected agencies to address the problems identified in the diagnosis.

The task of this working group was to prepare an intervention plan for the dumpsite Estrutural, with the objective that the waste would be treated and allocated correctly and, consequently, the conditions would be generated for its closure and the construction and inauguration of a sanitary landfill. Said plan identified 42 essential activities to carry out the closure, in which multiple institutional actors were involved, such as environmental, infrastructure, social and financial entities, among others. To define the roles of each of these actors in a coordinated way, the closing process involved defining several projects:

- i. **Requalification of the old dumpsite:** actions were carried out to analyze the level of contamination in the area, analysis of the potential use of the area for energy purposes, as well as pollution remediation actions.
- ii. **Implementation of a designed sanitary landfill:** the ASB was inaugurated in January 2017, considering the current regulation for the operation of this type of facilities.
- iii. **Construction and implementation of waste recovery facilities:** the waste recovery facility (known in Spanish as IRR) receives the waste destined for the separation process carried out by waste pickers, with the help of mats and other equipment. IRRs are essential to assign in viable conditions to workers who until then carried out work activities in the dumpsite. Work management in the IRR was carried out by previously selected recycler cooperatives, through processes that required technical qualification and the joint definition of a specific management model.
- iv. **Plan for the transition from waste pickers to IRRs:** the transition from waste pickers to IRRs required social protection actions. An epidemiological study of waste pickers was also carried out for the diagnosis of acquired diseases and subsequent treatment of public health systems.
- v. **Implementation of a new separate collection model:** the definition and implementation of a new separate collection model for the Federal District, allowed to increase the quantity and quality of dry waste suitable for recycling destined for the IRR processes, was another project developed. It included actions aimed at collecting recyclable materials in government agencies (solidarity collection) and reverse logistics, especially glass and tires.

Finally, the monitoring and control of the numerous activities of these projects were carried out through follow-up meetings, in which members of the organizations involved reported on the progress of the actions under their responsibility. All this structuring was essential to achieve the goal of closing the Estrutural dumpsite within the originally planned time frame.

Regarding environmental benefits, the impact of not closing this dumpsite was evaluated versus having a sanitary landfill with waste treatment, composting and recycling facilities. In a *No Action* scenario, more than 1.4 million tons of CO₂e would be generated by 2050, while, in the *sanitary landfill* scenario, said emissions would be a little more than 400,000 tons of CO₂, that is, 70 % of emissions will have been mitigated (ISWA, 2019). In Figure 11 you can see the effects of these scenarios.

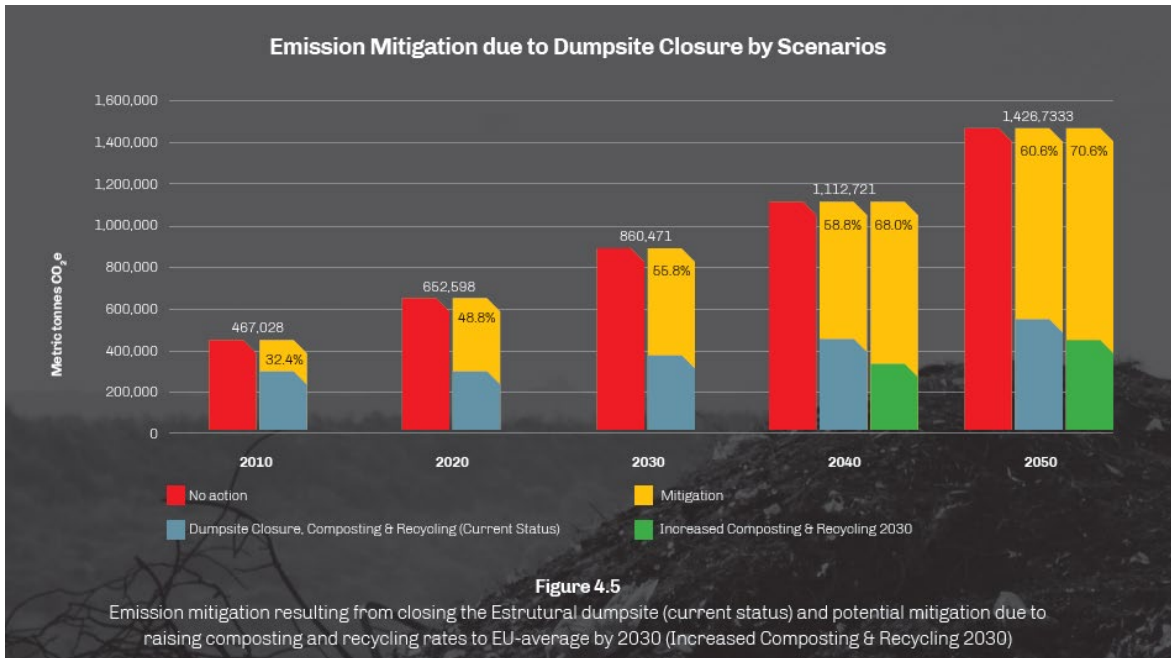


Figure 11. Emissions mitigation due to the closure of the Estrutural dumpsite Source: ISWA 2019

5.2 La Chureca (Nicaragua)

La Chureca was, until 2016, the largest open-air dumpsite in Latin America and one of the most marginal points of the city of Managua in Nicaragua. It arose from the accumulation of rubble caused by the 1972 earthquake, and it came to congregate more than four million cubic meters of waste dumped in an uncontrolled way. From its origin, a settlement of people grew gradually in the environment: they lived in the dumpsite and worked in the disorderly collection of recyclable products from discarded waste, living in conditions of poverty and intolerable unhealthy conditions.

However, the reality of this dumpsite was transformed through a set of interventions, which represented an investment of 43.2 million euros, of which 38.2 were provided by the Spanish Agency for International Development Cooperation (known in Spanish as AECID), and were used in several projects to guarantee the integral recovery of the dumpsite:

i. Sealing of the dumpsite: The main objective was to improve the living conditions of the population, guarantee their transfer and improve their working conditions, as well as the improvement of the environmental situation.

ii. Construction of a technical separation plant for plastic, paper, glass, and metal waste to recover potentially recyclable waste from waste collection routes.

iii. The installation of an **organic waste management system** with a view to its use and production of compost.

iv. **Housing development:** Urbanization works were developed for the construction of houses delivered to families living next to the dumpsite (1,500 inhabitants), landscaping, street adaptation, paving.

The dumpsite sealing project was based on four areas: i) stabilization of the dumped waste, ii) protection of the atmosphere, iii) control of leachate, and iv) preservation of water and soil. It began with the conditioning and regularization of surfaces, and concluded with the shaping of slopes with a backhoe to obtain regular surfaces that would facilitate the seating of the sealing and waterproofing layers as shown in the following image:



Figure 12. La Chureca. History of a transformation. Source: AECID.

The technical characteristics of the sealing were:

- i. Bottom layer formed by a non-woven geotextile of 250 to 300 grams / square meter.
- ii. High-density polyethylene membrane with a minimum thickness of 2mm, smooth on the platform.
- iii. Upper layer formed by a non-woven geotextile of 300 gr / mt²
- iv. Access roads were built to guarantee the exploitation and treatment of the dumpsite.
- v. Dumpsite revegetation: A 100 cm revegetation layer was placed with bean and grass seeds that capture and drain the precipitation waters that infiltrate the surface of the dumpsite.
- vi. A network composed of 38 wells is built for the capture and treatment of the gases generated inside the dumpsite.
- vii. Lake Xolotlán was protected: A breakwater of 1,745 meters and a volume of 25,708 cubic meters was built.
- viii. A leachate system was created to collect all the liquids. Once collected they are recirculated in the dumpsite to force their evaporation.

In this sense, the project also contributed to the construction of 258 homes, as well as schools, sports and leisure areas for young people and children, a police station and a medical center, a Community Cultural Center and the Acahualinca Workshop School for professional technical training (AECID, 2016). In addition, support has been provided to the Managua Mayor's Office in setting up the Municipal Company for the Comprehensive Treatment of Solid Waste and a

microcredit fund to promote the creation of small economic activities by the former inhabitants of the settlement.¹²

5.3 Other regional cases

Table 6 summarizes about 15 additional experiences in execution or implemented, related to the progressive closure of dumpsites, which have been reported by about 10 countries for the present study.

¹² Ministry of Foreign Affairs, European Union and Cooperation of Spain, 2016. La Chureca: the most modern landfill in Latin America https://www.aecid.es/ES/Paginas/Sala%20de%20Prensa/Historias/25_Nicaragua.aspx

6. KEY FINDINGS

Some of the key elements identified according to the information collected for the baseline study of the Coalition for the closure of dumpsites in Latin America and the Caribbean are summarized below:

- For this study, direct responses from **19 countries** in the Latin American and Caribbean region have been received, along with information from secondary sources. With the progressive improvement of waste management systems, it is perceived that the countries have more and better information, despite the fact that **there are still important gaps in the information systems of many countries**, and the level of detail and comparability of the data is generally weak, particularly for indicators related to the use or recycling of waste, or the characterization of inappropriate final disposal sites. Variations in terminology and classification of waste and facilities between countries also make it difficult to consolidate information in this type of analysis.
- **Total waste generation in the region continues to increase**, and the per capita generation rate is also expected to increase in the coming years (currently averaging 1 kg / inhab / day). On the other hand, recycling or waste recovery rates, despite the difficulties of quantifying informal recovery, generally remain below 10%. This represents a challenge for the progressive closure of dumpsites, the siting of new facilities and the reduction of waste that is destined for final disposal, so **it is necessary to strengthen prevention and valorization of waste**, particularly for predominant fractions such as organic waste.
- **Inadequate final disposal of waste and the presence of dumpsites affect to a greater or lesser extent all countries of the region.** However, there are important differences between countries. While in some cases disposal in sanitary landfills is above 75%, there are countries where most of the waste is disposed of improperly, either in controlled sites or dumpsites.
- Inadequate waste management including its disposal in dumpsites causes a series of **impacts** that affect social development, human health, and the preservation of the environment. The type of impacts that are frequently reported in the region are related to impacts derived from fires and uncontrolled burns, water and soil contamination, vectors, and landslides.
- In the region, **more than 14,000 inappropriate final disposal sites have been identified**, including more than 10,000 dumpsites, which can be of very different sizes and characteristics. At the same time, nearly 2,000 sanitary landfills are identified, where a greater proportion of the total reported waste is deposited (around 55%), since they serve the main urban agglomerations.
- In contrast, **the majority of municipalities in the region (around 70%) use inadequate final disposal sites**, particularly smaller municipalities. It is observed that as progress is made towards integrated models with separate collection, transfer plants and regional sanitary landfills, it is possible to provide a solution to a greater number of municipalities.
- The dumpsites that are reported in the countries of the region can be of different characteristics, including in some cases the identification of small sites that can occur in the same municipality. Despite this, the **main dumpsites** in the different countries are also identified (more than 40 sites reported in this study). Establishing detailed sites inventories is a fundamental element in designing and implementing strategies for the progressive closure

of dumpsites, including prioritizing interventions based on the potential impact on health and the environment, while adopting measures to prevent the proliferation of new dumpsites.

- Numerous **cases of dumpsite closure** have been identified in the region, which can serve as experiences for the exchange of information and lessons learned between countries and municipalities. At least ten countries have reported for the present study examples of concrete experiences of dumpsite closures.
- The countries of Latin America and the Caribbean have made important **progress in the development of normative and political frameworks** to regulate waste management, and most of them (80%) explicitly prohibit inappropriate dumping. Although to a lesser extent, a large part of the countries also have specific plans for the progressive closure of landfills, although their level of implementation poses a series of challenges.
- According to the survey conducted to the countries, the main **challenges to progress in the closure of dumpsites** include the lack of technical capacity in local governments, followed by the lack of financial resources, inadequate allocation of resources and jurisdiction, the lack of political will, and lack of institutional capacity. The results indicate that the lack of legislation or policies is not the main barrier, but rather the difficulty for its effective implementation. In this sense, **a set of measures** for institutional strengthening, financial sustainability, and the promotion of new models based on prevention and the use of resources is required.
- As a result of the same survey, a majority of Latin American and Caribbean countries indicate the **year 2030 as the temporary goal that would be most feasible to eradicate dumpsites** in their respective countries.

GLOSSARY

Dumpsite: dumpsite in which solid waste is dumped or disposed of indiscriminately without proper planning and without taking into account health regulations^[1]. It represents the type of place with the lowest requirement and operating cost among the different types of final disposal. They are recognized as posing a serious threat to public health and the environment since their location is not planned and they can be found in any vacant area available, with a random operation and no general operating guidelines that guide proper operation. Burning is a common form of volume reduction and there is no control over the quality and type of waste dumped, making the risks to public health and the environment even more significant.

Biogas: Gas rich in methane resulting from the fermentation process of the biological decomposition of organic matter in the absence of oxygen. Biogas can be recovered to produce heat and / or electricity^[2].

Final disposal: the discharge, deposit, spill, leak or the placement of solid waste in or on any land. It is the final stage of solid waste, after its collection, treatment or incineration. Final disposal often involves depositing the waste in a dumpsite or landfill.

Integrated solid waste management: Refers to the strategic approach to the sustainable management of solid waste, which covers all sources and all aspects, including generation, separation, transfer, classification, treatment, recovery and elimination in an integrated manner, with an emphasis on maximizing resource efficiency^[3].

Leachate: Liquid that has been filtered through solid waste or by other means and has extracted, dissolved or suspended materials from it. Since leachate can contain potentially hazardous materials, leachate collection and treatment is a vital step in controlled municipal waste landfills.

Waste prevention: Programs, strategies and activities that prevent materials from entering the waste stream^[5].

Open burning: The practice of setting fire to garbage in the open air.

Collection of waste: The act of collecting waste from homes, businesses, industrial and commercial plants and other places, loading it into a collection vehicle (normally closed), and transporting it to a facility for further processing or transmission, or a disposal plant^[7].

Collection: Collection of waste, including sorting and initial storage of waste for transport to a waste treatment facility^[8].

Waste: Substances or objects to be disposed of, to be disposed of, or to be disposed of in accordance with the provisions of national legislation^[9].

Hazardous and toxic waste: Substances or objects that are disposed of, that are intended to be eliminated, or that must be disposed of in accordance with the provisions of national legislation and that possess certain dangerous characteristics, such as being toxic, explosive, corrosive or reactive, among others. The generation and management of such wastes can cause adverse effects on human health and the environment, either by itself or by coming into contact with other wastes. Therefore, hazardous waste requires special treatment and must be disposed of in an environmentally sound manner. The generation, management and transboundary movements of hazardous waste must be carried out in accordance with the procedures established in the Basel Convention (1989). There may also be other specific requirements, restrictions or prohibitions at the national level^[10].

Commercial solid waste: Waste generated by commercial establishments, such as wholesale and retail establishments, or from services such as shops, offices, markets, hotels, restaurants and warehouses, among others^[11].

Municipal solid waste: All solid waste generated in an area, except industrial and agricultural waste. Construction and demolition debris and other special waste that can enter the municipal

waste stream are sometimes included. In general, hazardous waste is excluded, except insofar as it enters the municipal waste stream. They are sometimes defined as all solid waste whose responsibility a municipal authority agrees to manage in some way ^[12].

Final disposal site: The facility where solid waste is ultimately dumped and deposited.

Valorization: The entire process of extraction, storage, collection, or processing of materials from the waste stream to obtain value and divert and direct the material to a value-added chain ^[14].

Controlled site: Final disposal site not necessarily designed, where there are improvements in the operational aspects of its operation and management in relation to open dumps. They have evolved with respect to the latter according to their sanitary need for closure, including relative improvements aimed at minimizing the impacts on public health and the environment. These final disposal sites in some cases have been updated in order to incorporate some of the practices associated with sanitary landfills, such

as the location regarding hydrogeological suitability, leveling, compaction, leachate control in some cases, partial gas management, access control and basic record keeping ^[15]. For the purposes of this document, together with the disposal in dumpsites, it is considered as part of the inappropriate final disposal, considering the potential impacts on public health and the environment.

Sanitary Landfill: An engineered disposal facility designed, constructed, and operated in a manner that minimizes impacts on public health and the environment ^[16]. Its design implies an exhaustive planning from the selection of the operation site, to the post-closure management, becoming the most desirable and appropriate method of final disposal of waste. A sanitary landfill usually has storage and treatment systems for leachates, chimneys to control and burn the biogas generated by decomposition, and a process of compaction of waste on geomembranes that maintain control on the ground when the waste is deposited.

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ACRONYMS AND ABBREVIATIONS

ABRELPE	Brazilian Association of Public Cleaning and Special Services Companies
AECID	Spanish Agency for International Development Cooperation
AIDIS	Inter-American Association of Sanitary and Environmental Engineering
ARS	Association for the Study of Solid Waste, Argentina
CEPAL	Economic Commission for Latin America and the Caribbean
GHG	Greenhouse Gas
GMWO	Global Waste Management Outlook
IDB	Inter-American Development Bank
IRR	Regional Initiative for Inclusive Recycling
ISWA	International Solid Waste Association
LAC	Latin America and the Caribbean
PAHO	Pan American Health Organization
SDG	Sustainable Development Goal
MSW	Municipal Solid Waste
UNEP	United Nations Environment Programme

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ANNEXES

Annex 1. Classification of the final waste disposal facilities.

Source: UNEP, 2018 (based on UNEP, 2015).

Criteria	Open dumps	Controlled Dumpsites	Landfills
Site Installation	<ul style="list-style-type: none"> Unplanned and often misplaced 	<ul style="list-style-type: none"> Hydrogeological conditions considered 	<ul style="list-style-type: none"> Site choice is based on environmental, community and cost factors
Capacity	<ul style="list-style-type: none"> The capacity of the site is not known 	<ul style="list-style-type: none"> Planned capacity 	<ul style="list-style-type: none"> Planned capacity
Planning of cells	<ul style="list-style-type: none"> There is no cell planning Waste is thrown indiscriminately Work zone / area is not controlled 	<ul style="list-style-type: none"> There is no cell planning, but the work zone / area is minimized. Layout is only done in certain areas. 	<ul style="list-style-type: none"> Cell-by-cell design development Work zone / area is delineated based on smallest practical space Layout is done only in designated cells
Site preparation	<ul style="list-style-type: none"> Very little or no land preparation 	<ul style="list-style-type: none"> Base stone of the disposal site. Control of drainage and surface waters on the periphery of the site 	<ul style="list-style-type: none"> Extensive site preparation
Leachates management	<ul style="list-style-type: none"> No leachate management 	<ul style="list-style-type: none"> Partial leachate management 	<ul style="list-style-type: none"> Full management of leachate
Gas management	<ul style="list-style-type: none"> There is no gas management 	<ul style="list-style-type: none"> Partial gas management or no gas management 	<ul style="list-style-type: none"> Full gas management
Application of soil covering	<ul style="list-style-type: none"> Occasional or non-existent waste coverage 	<ul style="list-style-type: none"> Ground cover is implemented on a regular basis, not necessarily daily 	<ul style="list-style-type: none"> Intermediate and final ground cover is applied daily
Waste compaction	<ul style="list-style-type: none"> No compaction 	<ul style="list-style-type: none"> Compaction in some cases 	<ul style="list-style-type: none"> Compaction of waste
Maintenance of the access street	<ul style="list-style-type: none"> Inadequate maintenance of the access road 	<ul style="list-style-type: none"> Limited maintenance of the access road 	<ul style="list-style-type: none"> Full development and maintenance of the access road
Fencing	<ul style="list-style-type: none"> Without fencing 	<ul style="list-style-type: none"> With fencing 	<ul style="list-style-type: none"> Secure fencing with gate
Entry of waste	<ul style="list-style-type: none"> There is no control over the quantity and / or composition of waste entering the site 	<ul style="list-style-type: none"> Partial or no control over the amount of waste, but the waste that is accepted for disposal is limited to municipal solid waste 	<ul style="list-style-type: none"> Full control over the quantity and composition of waste entering the site Special provisions for certain types of waste
History of records	<ul style="list-style-type: none"> No record history 	<ul style="list-style-type: none"> Basic record history 	<ul style="list-style-type: none"> Complete record of the volume, type, and source of the waste received. In addition to a detail of the activities and events carried out on the site
Collection in the place	<ul style="list-style-type: none"> Collection of waste by informal collectors 	<ul style="list-style-type: none"> Controlled waste collection and trading 	<ul style="list-style-type: none"> No on-site waste collection and trading
Closure	<ul style="list-style-type: none"> No proper closure of the site after closure of operations 	<ul style="list-style-type: none"> The decommissioning activities are limited to covering with 	<ul style="list-style-type: none"> Complete closure and post closure management

		uncompacted soil and compacted soil and the placement of vegetable plantations	
Cost	<ul style="list-style-type: none"> • Low initial investment, high long-term cost 	<ul style="list-style-type: none"> • Low to moderate initial investment, high long-term cost 	<ul style="list-style-type: none"> • Increasing initial O&M costs, moderate long-term cost
Environmental and sanitary impacts	<ul style="list-style-type: none"> • High possibilities of fires and unfavorable impacts on the environment and health 	<ul style="list-style-type: none"> • Minimal risk of unfavorable impact on the environment and health when compared to an open-air dump 	<ul style="list-style-type: none"> • Minimal impact and health risks

Annex 2. Final waste disposal data in Latin American and Caribbean countries.

Country	Survey	Basural				Vertedero				Rellenos sanitarios			
		N° estimado de sitios	Residuos depositados (Ton/día)	Residuos depositados (%)	N° Municipios servidos	N° estimado de sitios	Residuos depositados (Ton/día)	Residuos depositados (%)	N° Municipios servidos	N° estimado de sitios	Residuos depositados (Ton/día)	Residuos depositados (%)	N° Municipios servidos
Argentina	YES	5,000	10,932	24.6	291	N/D	4,417	9.9	117	N/D	29,227	65.5	774
Barbados	YES	N/D	N/D	N/D	N/D	4	N/D	N/D	N/D	1	287	42	N/D
Brasil		1037	34,850	17.5	1493	540	45,830	23	1508	607	118,631	59.5	1508
Chile	YES	38	496	2	38	48	3,700	18	93	38	16,415	79	230
Colombia	YES	101	613	1.98	101	30	592	1.91	33	973	29,737	96	174
Costa Rica	YES	4	370	9	5					7	3,469	86	73
Cuba	YES	119	31	0.2	11	618	19,539	99.8	15	87			16
Ecuador	YES	47	1,483	11.6	47	76	1,976	15.5	76	98	9,281	72.8	98
El Salvador	YES	N/D		N/D	N/D	N/D		N/D	N/D	17	3,394	80	262
Guatemala	YES	2,240	5,903	65	316	N/D	3,179	35	N/D				
Honduras	YES	N/D	3,373	57.6	257	13	1,637	27.9	13	17	848	14.5	28
México	YES	685	3,695	4.28	509	1,436	47,931	55.5	1,134	82	34,726	40.2	79
Panamá	YES	N/D	N/D	N/D	N/D	63	N/D	N/D	N/D	2	2,800	N/D	7
Perú	YES	1,585	9,935	46.6	1,606	N/D		N/D	N/D	52	11,395	53.4	167
República Dominicana	YES	350	7,858	55.3	128	6	6,335	44.6	27	1	7	0.05	3
Santa Lucía	YES	53		N/D	N/D	1	68.2	27	6	1	146.8	73	5
Surinam	YES	2	597	81	19	1	N/D	N/D	N/D	N/D	N/D	N/D	N/D
Trinidad y Tobago	YES					5	1,830	99	14				
Uruguay	YES	40	220	5.5	29	16	1,180	29.6	61	4	2,580	64.9	22
Venezuela	YES	159			160	33			154	6			21
TOTAL ALC	19	11,460	80,357		5,010	2,890	138,213		3,251	1,993	262,944		3,467

Source: own elaboration based on the information provided in the questionnaires of the countries or official references.

Annex 3. Dumpsites identified in the Latin American and Caribbean region.

País	Nombre / Ubicación del basural	Antigüedad (años)	Residuos acumulados (toneladas)	Residuos depositados (t/d)	Superficie (ha)	Recuperadores informales en el sitio (Núm.)
Argentina	BCA de Luján	>30	1.3 M	120	12	163
	BCA de Formosa	>30	16,180	197	97	SI
	BCA Bariloche	>30	1 -1.5 M	129	10	112
Colombia	BOTADERO – Santa Cruz de Mompox			175		
	MARMOLEJO - Quibdó			73		
	HATILLO DE LA SABANA - El Banco			34		
	KILILI - Puerto Asís			31		
Costa Rica	Turrialba	>20		150		NO
	Dota	>20		50		NO
	Tarrazú	>20		70		NO
	Corredores	>20		100		NO
Ecuador	Botadero del cantón Esmeraldas	27	840,000	240		42
Guatemala	Municipio de Guatemala, vertedero Zona 3	68		3000	25	2000 fam
	Quetzaltenango	25		600	37	70
Honduras	Tegucigalpa	42	4-5 M	850	40	200
México	TABASCO, Cárdenas, Basurero Municipal	4	457,593	313		
	QUINTANA ROO, Othón P. Blanco, Tiradero de Chetumal			306		
	Veracruz, Minatitlán, Basurero Municipal Las Matas	30	3,066,000	280	26	
	CHIAPAS, San Cristóbal de Las Casas, Entierro Sanitario	5	182,500	250		
	MICHOACÁN, Apatzingán, Basurero Municipal	5	160,600	220		
Perú	Botadero Pampas de Reque, Municipalidad de Chiclayo	30		250	307	
	Botadero Sector Pampa de Ñoco, Municipalidad de Chincha	20		100	181	
	Botadero Municipal Municipalidad de Piura	25		420	65	
	Botadero Pampa de Los Perros, Municipalidad de Huaral	N/D		81	49	
	Botadero El Milagro, Municipalidad de Trujillo	30		1061	43	
República Dominicana	Puerto Plata	20		300	6	80
	San Cristóbal	6		270	22	60
	San Francisco de Macorís.	13		300	7	100
	San Pedro de Macoris	14		290	5	75
	La Romana	15		290	8	70
	Bonao	13		140	6	60
	Moca	37		150	4.3	65
Higüey	12		220	10	70	
Surinam	Ornamibo	22	3,746,780 m3	458	17.5	40
Trinidad & Tobago	Beetham	38	2,773,977	537	78	75-100
	Forres Park	37	2,593,147	465	34	60-75
	Guanapo	38	1,156,918	183	12	35-50
Uruguay	Ciudad del Plata	20	S/D	40		SI
	Young	23	54.000 a 2011	12,5		SI
	Bella Unión	4	S/D	10		SI
	Tranqueras	> 20	>14.000 a 2011	6		SI
	José Pedro Varela	S/D	S/D	4		SI

Source: own elaboration based on the information provided in the questionnaires of the countries.

Annex 4. Examples of additional experiences in execution or implementation.

Source: Own elaboration based on the survey of legislation and consultations with the countries.

Country	Experience/Dumpsite location	State	Closure experience	Impacts/Results generated
Argentina	Concordia, Entre Ríos	On-going	Dumpsite with 243 hectares. In 2015, there were 80 waste pickers in place, while in 2019 there were 200 waste pickers.	<ul style="list-style-type: none"> Given the health emergency caused by COVID-19, it is estimated that the number of recyclers will increase to 350 this year (2020). It has the PISO program, which seeks the Inclusion of waste pickers within the Environmental Center through: <ul style="list-style-type: none"> Municipal literacy Workshops (classification and valuation of waste, circular economy, handicrafts with recycling, among others).
Colombia	<p>i. “La Esmeralda” de Barrancabermeja – Santander</p> <p>ii. Villeta, Cundinamarca</p> <p>iii. Moravia, Medellín (LA Network, 2017)</p>	<p>Closed</p> <p>Closed</p> <p>Closed</p>	<p>iii. By 1984, 17,000 people were already living in Morro de Moravia, at which point the municipal administration decided to close the dumpsite. In 2004, the “Moravia Comprehensive Intervention Project and its area of influence” was defined. There, 2,224 families were identified among 1.5 million tons of waste.</p>	<p>i. Post-closure Activities of La Esmeralda Dumpsite</p> <p>ii. Construction works for the closure and environmental restoration of the solid waste dumpsite in the municipality of Villeta.</p> <p>iii.</p> <ul style="list-style-type: none"> Resettlement of the families that lived in the "Morro" and recovery of the social fabric. Studies and technical designs of appropriate technologies for environmental recovery. Studies of urban planning and landscaping for urban recovery. Development of citizen participation and consultation processes. Community Gardens of Moravia
Chile	i. Villa Alemana (Valparaíso)	Closed and sealed	i. Within the framework of the commitment adopted with the Ministry of Health as a measure prior to the construction of the Marga Marga Hospital, the	i. On the land adjacent to the closed and sealed dumpsite, the engineering design is under development to execute a municipal composting plant, the compost generated will be used (among

	ii. Puchuncaví	Closed and sealed	<p>Municipality began in February 2018 the gradual closure of its dumpsite, land on which a sports park is projected (El Martutino, 2018).</p> <p>ii. The dumpsite stopped operating at the end of 2018, at which time the municipality began to manage the resources to make the final closure, adjusting to the National Solid Waste Policy, and in this way, recover the 7.14-hectare land . He had an investment close to an investment that reaches \$ 460,300,579 Chilean pesos or US \$ 586,290 (More Noticia Chile, 2020) ^[66].</p>	<p>others) to achieve a reinsertion of the former dumpsite as a communal green area.</p> <p>ii. The construction of a solid waste transfer and recovery center is planned on land adjacent to the dumpsite, which will serve the Quintero and Puchuncaví communes (Quintero and Puchuncaví Municipalities Association).</p>
Cuba	Dumpsite in the east center of Guantánamo - Barrio de Sur Isleta. (Interpress Service, 2007)	Closed	<p>The Ecological Center for Urban Waste Processing (known in Spanish as CEPRU), developed in a neighborhood in the eastern Cuban city of Guantánamo, is the result of one that sought to transform a dumpsite into an ecological hub for the area.</p>	<ul style="list-style-type: none"> • Recycled with the planting of different timber and ornamental plant species. • Preparation of organic fertilizers from waste. • Soil recovery and elimination of uncontrolled burning. • Increased citizen awareness in caring for the environment. • The project achieved the reforestation of about three hectares and obtained about 1,000 positions per year, as well as the incorporation of 40 houses of the community to the forest redoubling. • The decomposition time of waste was cut in half, the production of organic matter was increased by 60 tons, and the uncontrolled burning of 150 tons of waste per month was eliminated. • Created at least five new jobs for women, improved working conditions for all staff, who received training courses, also benefiting 50 percent of the residents of Isleta.

El Salvador	Santa Ana and El Salvador city	Closed	To have executed 28 technical closure works of open-air dumpsites used in some cases for more than 50 years, through the Component Support for Municipal Waste Management of the Critical Areas Decontamination Program, executed by the Ministry of Environment and Natural Resources, between 2003 and 2011.	No information
Ecuador	Dumpsite of the canton of Portoviejo, in the province of Manabí	Ongoing	The municipality will extend the useful life of the dumpsite with the construction of a pop-up cell in 2020. \$ 150 thousand will be invested in the project and it will be operational until 2022.	
Guatemala	“El Choconal” located in Sacatepéquez	Ongoing	The Ministry of Environment and Natural Resources (MARN) will close the “El Choconal” dumpsite located in Sacatepéquez. This dumpsite is owned by the municipality of Antigua Guatemala, so they must present a new environmental instrument to MARN, in which they must specify what the new area will be or how they will treat the waste.	
	Municipality of Guatemala, Dumpsite Zone 3	Ongoing	In process recovery and remediation of the area. An environmental diagnosis has been presented to the environmental authority, to operate and remedy the area, subsequently the closure of the dumpsite is planned. The continuity of operation is conditioned to three processes that the municipality is required to carry out, being the transfer of the rainwater collector, the stabilization of slopes and the construction of a leachate lagoon.	
México	Bordo Poniente	Closed	Bordo Poniente was opened in 1985, and in its years of operation, around 12 thousand tons of solid waste were generated in Mexico City were deposited daily. Only in its fourth stage,	

			which began in 1994, 72 million tons of waste were confined.	
Panamá	i. Boquete ii. Penonomé iii. Aguadulce.	Closed	No information No information iii. Adaptation and sanitation of the Aguadulce municipal dumpsite, in the province of Coclé. This dumpsite has 11 hectares of land, of which only 3 hectares are used, where the works are carried out.	No information No information iii. Formation of walls provided with the same waste, to later be covered with compacted clay and avoid contamination. In addition, an inverted tub will be built to dispose of the waste.
Perú	Program "Recovery of Degraded Areas by Solid Waste in Priority Zones"	Ongoing	In priority areas of Puno, Piura, Ancash, Tumbes, Apurímac, Ica, Huánuco, Madre de Dios, San Martín, Junín, Lambayeque, Ayacucho, Amazonas, Lima and Pasco »(SNIP Code: PROG-5-2015-SNIP, 30 dumpsites Will be closed.	There are groups of recyclers in 23 of them, who have a source of income in recycling and have come to this activity, mainly due to their levels of poverty and poor accessibility to a job. Through this diagnosis, information was collected (through samplings) regarding the particular situations in each dumpsite, such as number, gender and age of recyclers, the fact of belonging or not to an association, the number of days a week they attend to the dump.