



**ROADMAP
FOR THE PROGRESSIVE CLOSURE OF DUMPSITES
IN LATIN AMERICA AND THE CARIBBEAN**

**Voluntary Coalition of governments and relevant organizations for the progressive closure of
dumpsites in Latin America and the Caribbean**

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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, as well as the development of proposed Roadmap for the closure of dumpsites, for its consideration by the Forum of Ministers of Environment.

The **objective** of this Roadmap is to serve as a guidance on the considerations and steps to be followed for the progressive closure of dumpsites in the countries of Latin America and the Caribbean. It is addressed to national and sub-national governments in the region, who shall adapt and implement the Roadmap according to their specific baseline situation, conditions and circumstances. While the targets, milestones and specific timelines shall be tailored in each country, the adoption of this Roadmap as a reference document intends to contribute to an overall goal of phasing-out the dumpsites by 2030 in Latin America and the Caribbean, according to the baseline analysis and already existing goals in LAC countries.

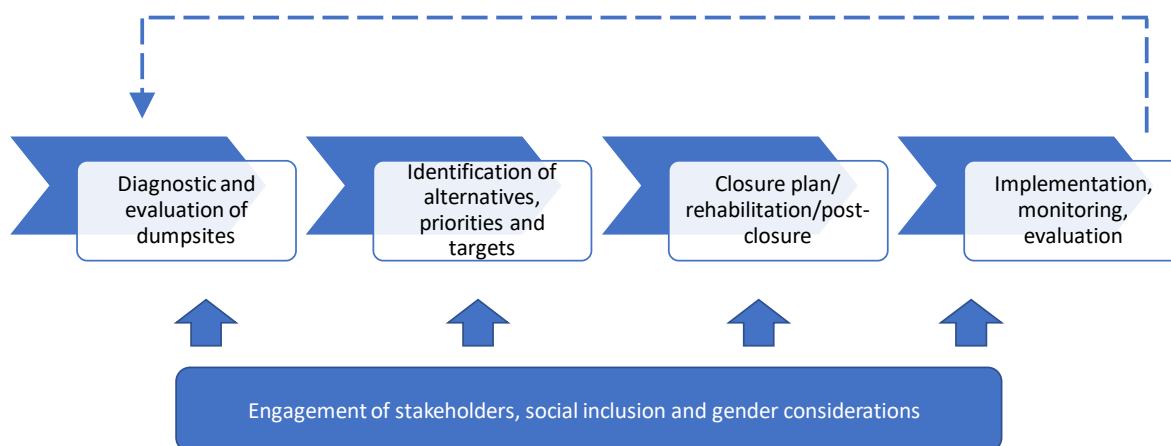
The document includes an overview of the **status of waste generation and management in Latin America and the Caribbean**, with an emphasis on the final disposal and occurrence of dumpsites and its impacts. The regulatory framework and existing plans for the closure of dumpsites in the countries of the region is analyzed, as well as the challenges for its implementation and practical experiences. The following can be concluded:

- Waste management systems have notably been improved over the past decades in the region of Latin America and the Caribbean (LAC), including increased waste collection coverage, and improved handling and disposal of waste. Regulatory frameworks have also been strengthened, including general prohibition of waste dumping, and development of more integrated policies and plans.
- However, total and per capita waste generation continues to increase, while recycling rates are still generally low in the region. Also, about 45% of all waste generated in the region still end up in inadequate final disposal sites, including more than 10,000 dumpsites identified in LAC countries. The situation can vary significantly across the region, but the unsound management of waste affect to a greater or lesser extent to all countries of the region.
- Dumpsites and open burning of waste create serious health risks, both for people who work at the sites, as well as the communities around them, affecting the daily lives of millions of people across the region. At the same time, this results in severe environmental impacts, including water pollution, emission of toxic and greenhouse pollutants, as well as soil pollution, which in

turn affect economic activities. The impacts associated to the unsound management of waste can be exacerbated during health crisis like the COVID-19 pandemic, particularly on waste workers and informal recyclers.

The closure of dumpsites is a complex process which needs to be properly planned, including technical, environmental, economic and social considerations. It also requires an alternative waste management system, adequate institutional capacity, social support and political consensus.

The proposed Roadmap provides an overview of the different elements and practical steps to be considered for the progressive closure of dumpsites in the LAC region, including: diagnostic and evaluation of dumpsites; identification of alternatives, priorities and targets; development of a closure and post-closure plan; the stakeholder engagement process; and the implementation, monitoring and evaluation. Reference is also made to existing guidelines and information resources, which contain more detailed technical information.



As per the way forward, countries in the region of Latin America and the Caribbean should **accelerate the process to eradicate dumpsites and inadequate waste management and disposal practices** and promote the transition towards waste prevention models. National and local governments are encouraged to adapt and implement this Roadmap according to their specific baseline situation, conditions and circumstances, with the overall goal of phasing-out dumpsites no later than year 2030.

The Voluntary Coalition for the progressive closure of dumpsites should continue to support the implementation of the Roadmap, by developing or tailoring specific technical guidelines, facilitating capacity building and exchange of information and practical experiences, promoting awareness raising, and facilitating resource mobilization.

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 to 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 UN Environment Program (UNEP) convened a constitutive meeting of the Coalition (Buenos Aires, September 10-11, 2019), where the objectives, the Working 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 to 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 existing work and in coordination with other initiatives
3. Facilitate the **capacity building and exchange of information**, experiences and good practices about policies, instruments, related projects, and funding opportunities.
4. Promote **awareness raising** on the importance of the sound management of waste throughout its life cycle, and the consequences of inappropriate waste management.

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), whose 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, to be presented at the XXII Meeting of the Forum of Ministers.

To this end, the members of the Coalition, with the support of the Secretariat (UNEP Latin America and the Caribbean Office), have contributed to the development of different activities and documents, including a baseline document¹, which serves as a reference for the development of this Roadmap. The baseline provides an overview of the current situation of dumpsites in the Latin American and Caribbean region, based on the compilation of available information and responses of countries to a questionnaire which was sent to focal points of the Forum of Ministers of the Environment, with copy to the focal points of the Coalition, by July 2020². This Roadmap has been

¹ The Baseline document is available [here](#).

² A total of 19 countries in the region responded to the questionnaire, thus providing an important information base for the identification trends and challenges of countries.

prepared with the technical support of the members of the Coalition, and was submitted for regional consultation during October-November 2020.

1.2 The need to close dumpsites

Although waste management systems have been notably improved over the past decades in the region of Latin America and the Caribbean (LAC), about 45% of all waste generated in the region still end up in inadequate final disposal sites, including more than 10,000 dumpsites identified in LAC countries. The situation can vary significantly across the region, but the unsound management of waste affect to a greater or lesser extent to all countries of the region.

Dumpsites and open burning of waste create serious health risks, both for people who work at the sites, as well as the communities around them, affecting the daily lives of millions of people across the region. At the same time, this has resulted in severe environmental impacts, including water pollution, emission of toxic and greenhouse pollutants, as well as soil pollution, which in turn affect economic activities.

For this reason, it is essential to progressively phase-out open dumpsites, and replace them with effective management practices and final waste disposal methods, within the framework of integrated waste management strategies that promote waste prevention and minimization.

Closing the dumpsites is not an easy task and significant challenges are yet to be overcome. At the same time, numerous countries and municipalities in the region have made important progress and succeeded in this endeavor, thus providing valuable experience and proving it is not only a possible pathway, but a needed one. The multiple impacts associated to dumpsites means that the opportunities and benefits resulting from its closure are even greater, including from an environmental, social and economic perspective, as summarized in Box 1.

1.3 Objectives and scope of the Roadmap

The objective of this Roadmap is to **serve as a guidance on the considerations and steps to be followed for the progressive closure of dumpsites** in the countries of Latin America and the Caribbean.

It is **addressed to national and sub-national governments** in the region, who shall adapt and implement the Roadmap according to their specific baseline situation, conditions and circumstances.

While the targets, milestones and specific timelines shall be tailored in each country, the adoption of this Roadmap as a reference document intends to contribute to an **overall goal of phasing-out the dumpsites by 2030 in Latin America and the Caribbean**, according to the baseline analysis and already existing goals in LAC countries.

This will contribute to the implementation in the region of the **2030 Agenda** for Sustainable Development³ and the mandate of the United Nations Environment Assembly (**UNEA**), including the outcome of the third session “Towards a Pollution-free Planet” and subsequent resolutions⁴.

In accordance to the objectives of the Coalition, it must be noted that while the focus and scope of this Roadmap is on the progressive closure of dumpsites and the eradication of inadequate waste management practices in the region, it is intended to complement and facilitate the transition towards a wider framework of integrated waste management, where minimization and diversion of waste from final disposal is a priority⁵.

Box 1: Benefits of closing dumpsites and upgrade of waste management systems.

Environmental

- Reduced emissions of greenhouse gases (including methane and black carbon).
- Reduced pollution of air, land, freshwater and marine environments.
- Reduced extraction of raw materials due to increased recycling.

Public health and quality of life

- Cleaner streets, neighborhoods and public spaces due to improved collection.
- Improved sanitation and water quality.
- Reduction in waste-related diseases.
- Improved worker safety.
- Reduced noise, odor, dust, traffic.
- Reduced vectors (rats, insects, birds).
- More convenient end-user disposal.

Financial and economic

- Increased jobs in the waste management and recycling sector.
- Reduced public health and environmental costs.
- Improved cost recovery.
- Lower costs due to increased efficiency and economies of scale.
- Improved attractiveness for business developments.

Source: adapted from ISWA (2016)

³ Including the contribution to the achievement of numerous Sustainable Development Goals (SDGs), such as SDG 3, 6, 11, 12, 14, or 15, considering that the unsound management of waste relates to multiple environmental, social and economic dimensions.

⁴ Ministerial Declaration: [Towards a Pollution-Free Planet](#).

⁵ Accordingly, this initiative is also complementary to the work of the **Regional Coalition on Circular Economy** for Latin America and the Caribbean, within the framework of the LAC Forum of Ministers of Environment.

2. STATUS OF WASTE MANAGEMENT AND CLOSURE OF DUMPSITES IN LATIN AMERICA AND THE CARIBBEAN

This chapter provides an overview of the current situation and trends in the LAC region in relation to waste management and final disposal, the regulatory framework and programs for the closure of dumpsites, challenges for its implementation, and some practical experiences in the region. This is a summary of the findings and information compiled during the Baseline document of the Coalition⁶.

2.1 The management and final disposal of waste in Latin America and the Caribbean

Total waste **generation** in the LAC 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). Previous estimates indicate that the approximate amount of solid waste that end up in dumpsites, burning or other inappropriate practices is 145,000 t/day (UNEP, 2018). Waste **composition** can differ between countries, but as an average the organic waste fraction represents 50% of waste.

Waste **collection** has progressively been improved in most of the countries, and frequently values above 90% of collection coverage are reported, mainly in urban populations. However, this indicator can vary significantly between countries, and tends to decrease in smaller cities and rural or remote areas. It has been estimated that at least 35,000 t/day of waste remain uncollected in the LAC region (UNEP, 2018), thus increasing the risk of unsound management and regular appearance of dumps or micro-dumps.

Despite the continuous increase of waste generation, **recycling** or waste recovery rates, generally remain below 10% in LAC countries. This represents a challenge for the progressive closure of landfills, the siting of new facilities and the reduction of waste sent to final disposal. The actual recovery of waste is difficult to estimate, considering the important activity of informal waste pickers, that can be up to 4 million people in the region (IDB, 2015). This is also a key element to be considered in the process of closing dumpsites, as indicated below in relation to social considerations and inclusion.

In relation to **final disposal** of waste, in general three different types of disposal sites can be identified: open dumpsites, controlled sites, and sanitary landfills (UNEP, 2005). Only sanitary landfills can be considered as an adequate final disposal method, while controlled sites represent some improved operational conditions comparing to dumpsites.

In the LAC region, final disposal practices have been improved during the last decades. Between 2002 and 2010, the use of sanitary landfills increased in the region from 22.6% to 54.4%, simultaneously reducing the use of dumpsites from 45.3% to 23.3% (IDB-AIDIS-OPS, 2011). However, while the inappropriate disposal in dumpsites has been further reduced, according to the baseline study of the Coalition the proportion of waste that goes to sanitary landfills has not been significantly increased in the region (54.6%).

The unsound disposal of waste and the presence of dumpsites affect to a greater or lesser extent all the countries of the region, however it must be noted that different situations can be observed across the region. While in some cases disposal of waste in sanitary landfills is above 75%, there are

⁶ The Baseline document includes more detailed information, available [here](#).

countries where most of the waste is disposed of improperly, either in controlled sites or dumpsites (see Table 1). These trends are based on estimations, but consistent with the information reported in previous publications (UNEP, 2018; World Bank, 2018; IDB, 2015). This same information is represented in Figure 1, comparing in this case the final disposal in sanitary landfills with the inappropriate disposal (dumps and controlled dumps).

Table 1. Status of final disposal in countries of the Latin America and the 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's questionnaires. *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%
Perú	46.6%	--	53.4%
República Dominicana	55.3%	44.6%	0.05%
Saint Lucia	0.0%	31.7%	68.3%
Trinidad & Tobago	0.0%	100%	0.0%
Uruguay	5.5%	29.6%	64.8%

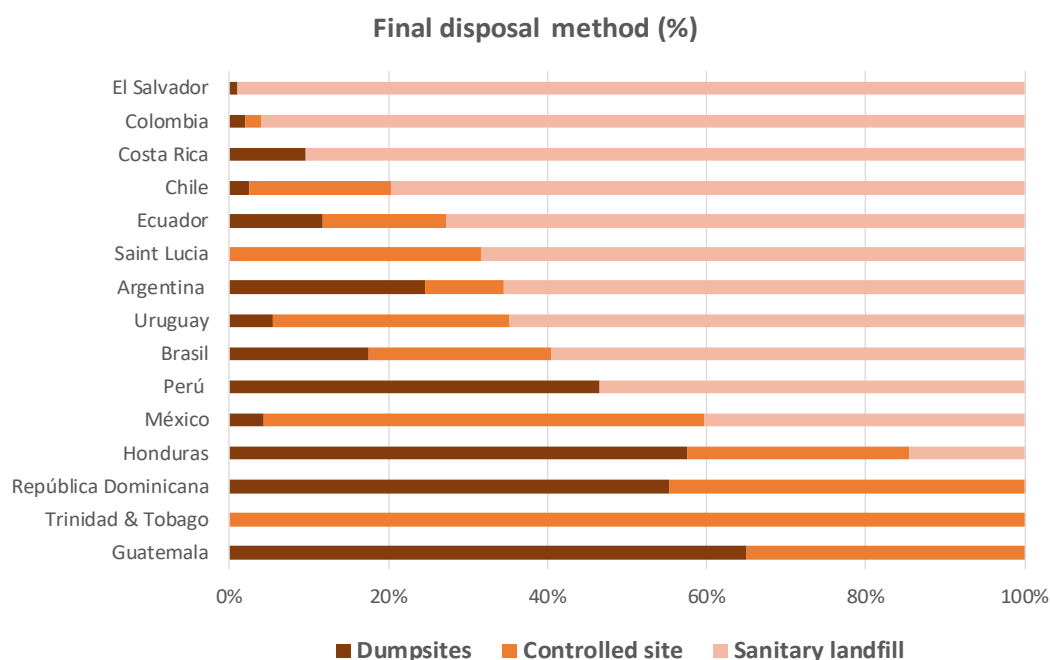


Figure 1. Final disposal in sanitary landfills vs inadequate final disposal in Latin America and the Caribbean countries (dumpsites and controlled sites). Source: own development on data supplied and compiled from countries.

In the LAC 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 conditions. 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 (see Table 2).

Table 2. Information related to final disposal of waste in the Latin America and the Caribbean region. Source: Own development with data from data supplied and compiled for 19 countries.

Final disposal site typology	Number of sites identified	Estimated waste deposited (Tons/day)	Estimated Deposited waste (%)
Dumpsites	11.460	80.357	16,7
Controlled sites	2.890	138.213	28,7
Sanitary landfills	1.993	262.944	54,6
TOTAL	16.343	481.514	100

When analyzing the number of municipalities that use adequate (sanitary landfills) or inadequate disposal methods (dumpsites or controlled sites), it is observed that about 8,000 municipalities use a total of at least 14,000 inadequate sites. On the other hand, the 1,993 sanitary landfills identified offer a solution to 3,467 municipalities and receive a higher amount 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 54.6% of the total waste deposited (see Figure 2). This indicates the potential of sanitary landfills to provide regional solutions, which could be considered when defining strategies for the 8,000 municipalities (70%) that still do not use adequate final disposal facilities⁷.

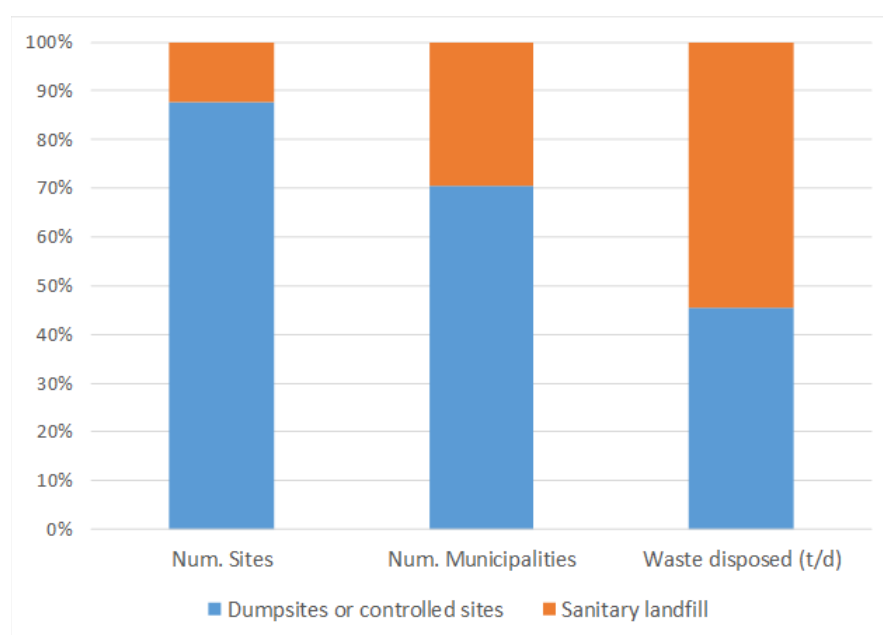


Figure 2. Final disposal sites, municipalities and amount of waste deposited in Latin America and the Caribbean. Source: own elaboration from the data supplied and compiled for 20 countries.

⁷ It is important to note that these are estimative data, subject to different inventory methods, but that provides an initial quantitative dimension of the situation, for a group of countries that represent approximately 90% of LAC region's population.

Through the survey conducted to LAC countries, information was also collected on the main operational dumpsites in the region, including more than 40 sites from 11 countries. Although the information is not yet complete for the entire region, a positive trend that can be observed is that governments have progressively begun to have more inventories on this matter, which will allow the establishment of prioritization and intervention strategies. It can also be noted that some of the largest dumpsites that had been identified in former publications (ISWA, 2016), no longer appear in these lists, due to closure processes already implemented in the region.

2.2 Regulatory framework, policies and programs for dumpsites closure in the region

In Latin America and the Caribbean, efforts made by countries to improve solid waste management can be reflected in the numerous related policies and regulations that have been adopted, mainly during the last twenty years, intended to secure minimum environmental and health quality standards. This includes the formulation of related public policies, regulations that specifically forbids dumpsites, and/or establish the basic sanitary and safety conditions to be fulfilled by adequate or controlled final waste disposal sites.

Governance on waste management and institutional framework

Governance on waste management implies a system whose objective is to achieve the best possible management in a given context. It requires taking 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), together with different stakeholders, including the private sector, the informal sector, civil society, among others. The national government has a key role within the normative process given its primary responsibility to guarantee the right to health and a healthy environment but also the municipalities, under direct tasks and operations schemes, with human, technological and financial resources specific of each municipality.

Regulatory framework regarding final disposal and the closure of dumpsites

Many countries in the region have solid waste laws in force which includes provisions concerning the concept of final disposal, the obligations that must be fulfilled by waste generators and managers, the applicable penalties for cases of non-compliance, among others⁸. 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 law, in order to elaborate on the required level of detail⁹ (UNEP, 2018).

⁸ A comprehensive review of the regulatory framework in LAC countries is provided in the Baseline document of the Coalition.

⁹ As an illustration, countries such as Costa Rica, Ecuador, Guatemala, Nicaragua, Panama, Peru, Saint Lucia, or Venezuela 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 relation to the specific regulation of dumpsites and open burning of waste, there are long-standing prohibitions in most of the laws of the region. For instance, in Argentina, the national law establishes the adequate operation of final disposal, 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 national level by which it is stated that the laws used by federal entities must contain provisions that prohibit dumpsites. Other countries also refer to the use of better methods of final disposal by preventing and prohibiting unauthorized sites through national laws, decrees or regulations. Likewise, in some countries there are on-going legislative initiatives, as is the case of Honduras, whose draft bill for integrated waste management contemplates the closure of dumpsites within 5 years after the law comes into force. The inappropriate disposal of waste is also sometimes incorporated into the criminal law, for example, in the case of Peru¹⁰.

As it will be described below, the implementation of a strategy or plan for the closure of dumpsites requires a strong political will, either at national or local level, and a sustained allocation of resources. The regulatory framework needs to also consider the enabling conditions to facilitate enforcement. For instance, in El Salvador, municipalities were enforced to proceed with the closure of dumpsites and transfer their waste to the 11 regional sanitary landfills authorized in the country by 2007. To facilitate this process, specific regulations were also developed to allow local authorities to use part of the national funds allocated for local development, to finance the closure operations.

Planning the closure of dumpsites

Planning with a preventive environmental and health approach is key to avoiding, mitigating and 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. In the region, for example, countries such as Chile, Colombia, 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 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 level, Article 14 of Law 19829, published in 2019, establishes the development of the National Waste Management Plan, within a maximum period of two years from the entry into force of said law.

As an example of recent strategies, Argentina will implement during the next five years a Federal Plan for the Eradication of Dumpsites (2020) in conjunction with the provincial and municipal government, with the main objective of reducing the disposal of municipal solid waste in dumpsites and increasing its disposal in socio-environmental complexes designed. Another case of combining and updating legislative and planning instruments for the closure of dumpsites is Brazil. The Zero Waste Program was launched in 2019 by the Ministry of the Environment, complying with the federal directive to eliminate existing dumpsites and support municipalities to implement adequate

¹⁰ Article 306 of the Criminal Code.

¹¹ It is either possible to initiate the process through laws or national plans, depending of the situation in each country. 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) .

forms of final disposal. More recently, a new legal framework for sanitation (Law 14026/20 July 2020) establishes that the environmentally appropriate final disposal of waste must be met by December 31, 2020, with some phased exceptions until 2024, taking into account the population of the municipality and other conditions¹².

Overview of regulatory trends in the region

According to the baseline analysis, **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 generally explicitly prohibit the inadequate final disposal (see Figure 3). Although to a lesser extent, numerous countries have also specific plans for the progressive closure of landfills. However, an adequate regulatory and planning framework is a necessary but not sufficient condition to eradicate dumpsites. Its effective implementation requires overcoming a number of challenges, such as those indicated in the section below.

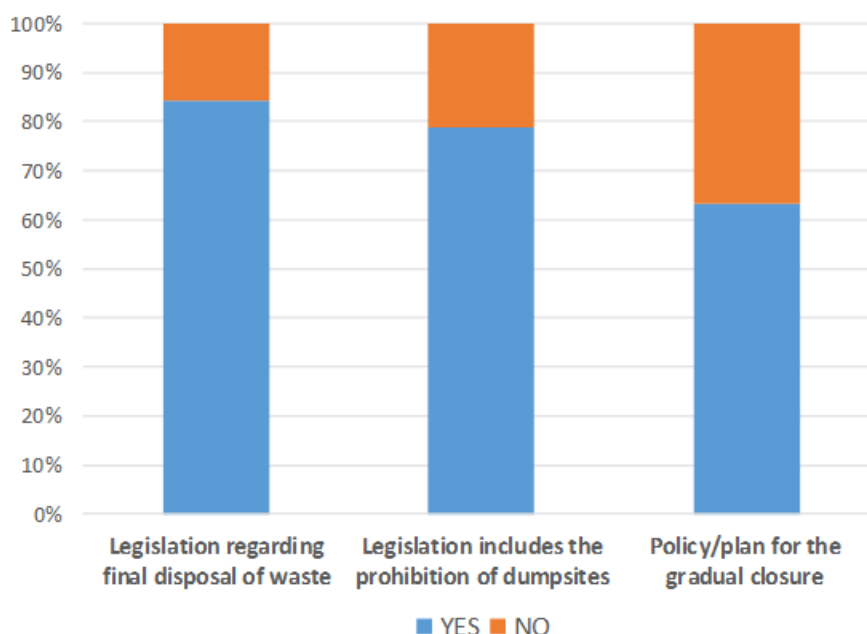


Figure 3. Countries in the LAC region with and without national laws, regulations or plans regarding final disposal and the prohibition and progressive closure of open dumps. Source: own development based on the response of 19 countries.

2.3 Identification of challenges

Political will, institutional coherence and the definition of policies on waste management, together with the development of necessary, consistent and clear regulation, and its subsequent monitoring, are essential to bring a systematic change in the eradication of dumpsites and increasing the adequate final disposal of waste. As described above, the prevalence of a significant number of

¹² More details about these examples are included in the Baseline document of the Coalition.

dumpsites in countries of the region, indicates that there is a set of challenges and difficulties that local and national governments are facing to address its closure.

According to the survey conducted to LAC countries during the baseline analysis (see Figure 4), the **lack of sufficient technical capacity in local governments** followed by other factors such as lack of financial resources, lack of political will, lack of institutional capacity, or inadequate allocation of resources and jurisdiction, are some of the main obstacles pointed out by countries. Other issues that are frequently mentioned are related with the lack of continuity of government teams, or the difficult coordination between institutions. On the other side, and consistently to what has been indicated above, it is evident that **the lack of legislation or policies is not reported as the main challenge, but rather the difficulty in applying them effectively.**

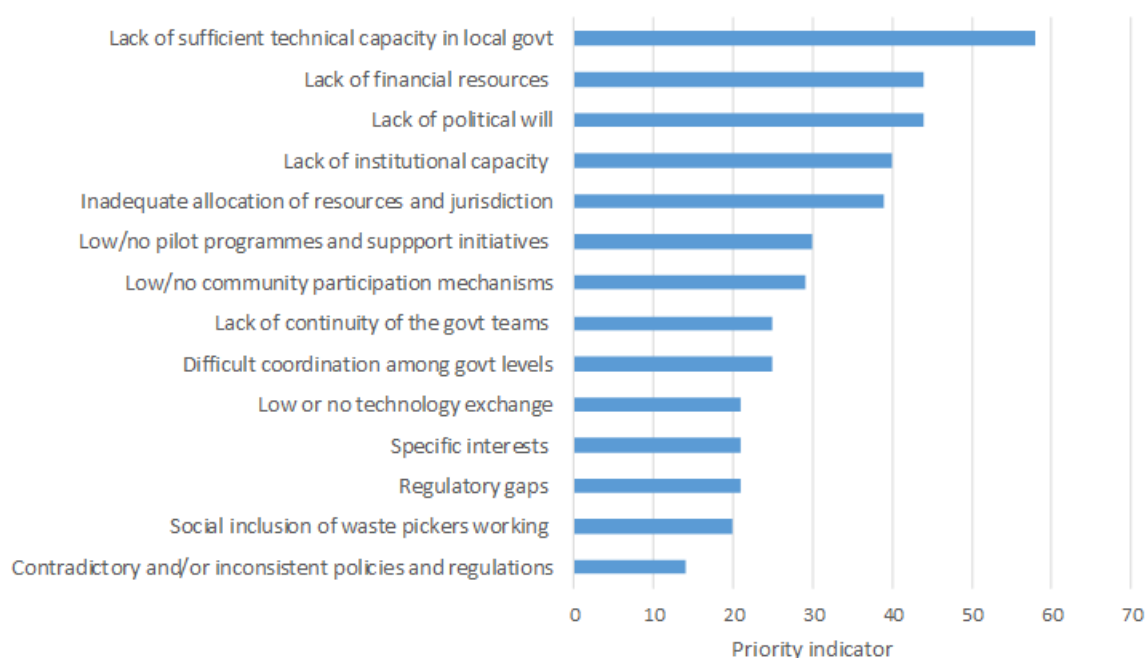


Figure 4. Main challenges to progress with the closure of dumpsites in the LAC region. Source: own development based on responses from 19 countries.

2.4 Practical experiences in the closure of dumpsites

In the region of Latin America and the Caribbean, there are success stories in which, through different mechanisms, technical instruments and efforts, open dumpsites have been closed following general guidelines 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.

One documented experience in the region is the **closure of the Estrutural dumpsite in Brazil**, considered as the second largest in the world during its operation as reported in The World's 50 biggest dumpsites (D-Waste, 2004). This 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. Box 2 provides an overview of the general process that was followed, which was implemented over a period of three years, which is further described in the baseline document of the Coalition.

Box 2. Closure process of the Estrutural dumpsite, Brazil:

- I. Requalification of the dumpsite
- II. Implementation of a designed sanitary landfill.
- III. Construction and implementation of waste recovery facilities.
- IV. Plan for the transition from waste pickers to waste recycling facilities.
- V. Implementation of a new separate collection model.

In environmental terms, the benefits and the impact of not closing this dumpsite versus having a sanitary landfill with waste treatment, composting and recycling facilities, were analyzed. In a *No Action* scenario, more than 1.4 million mt of CO₂ would be generated by 2050, while, in the *sanitary landfill* scenario, such emissions would be a little more than 400,000 mt CO₂, that is, 70% of emissions will have been mitigated (ISWA, 2019).

Other experiences of closing large dumpsites can be identified in Mexico (Bordo Poniente, Mexico City) or Nicaragua (La Chureca, Managua). During the baseline analysis, more than 15 examples of on-going or implemented interventions in dumpsites were reported by countries (including Argentina, Colombia, Chile, Cuba, El Salvador, Ecuador, Guatemala, Mexico, Panama, and Peru), which can serve as an important base for practical knowledge exchange in the region.

Regarding health and social impacts of open dumpsites, it should be mentioned that one of the most important challenges is to assess the economic burden that dumpsites represent for national and local health systems (ISWA, 2014). Exposure to particulate matters, dangerous chemicals, and unsafe sanitation conditions can lead to chronic bronchitis, respiratory and heart problems, lung and skin cancer, leukemia, nervous disorders, and gastrointestinal diseases, among others (ISWA, 2014). For instance, some of the range costs of these diseases associated with emissions from open dumpsites, ranges from US \$40 for gastrointestinal diseases to US \$500,000 for chronic bronchitis (ISWA, 2014).

3. CONSIDERATIONS FOR CLOSING DUMPSITES

The implications associated with the closure of dumpsites may require significant efforts aimed at improving the environmental conditions of the operational and surrounding site. For this reason, a closing operation of these sites is neither a simple nor an easy task; it requires an alternative waste management system, with adequate planning, administrative and institutional capacity, financial resources, social support and political consensus. All these conditions are difficult to meet in countries where dumpsites are a dominant method of waste disposal and the governance system is weak.

The importance of closing dumpsites lies in the improvement of the health conditions of millions of people, including the quality life also of those who used to live around or within these sites, as well as other social and economic benefits related with upgraded waste management services, new recycling markets, and increased value of land. Also, the closure of dumpsites provides a reduction in GHG emissions, and decreases the leakages of solid waste to the oceans, as many dumpsites are located near the coast, or inland waterways.

When addressing a process of closing dumpsites, there are some specific considerations to be taken into account, which must be comprehensively mapped out through a plan, including technical, environmental, economic and social considerations.

3.1 Technical considerations

According to the complex understanding of the standard operation of a dumpsite, some technical challenges must be taken into account when faced with the specific option of a closure. The most common problems that can be perceived from the operation of these sites are related, among others, to the existence of widely dispersed uncovered waste, no application of cover soil, open fires and/or waste periodically on fire, no compaction of waste, no recording or inspection of incoming waste, and little or no control of leachate and management of gases from the decomposition process. In many cases, unwanted effects are also seen as a result of the lack of perimeter closures or specific control points around the operating mechanism of the dumpsite.

Immediate actions and improvements to any open dumpsites should be implemented in a way that future potential contamination and clean-up costs can be kept to a minimal level. They should be always based on a proper site investigation and risk assessment (ISWA, 2016). Thus, before the development of the long-term solution, it is important to identify and implement a package of immediate improvements, as reflected in section 4. The improvements include measures for health protection, reducing the environmental impacts and preparing the new system.

Once the immediate actions and improvements has been implemented, the expected results are oriented to:

1. Reduce leachate generation and thus less surface and groundwater contamination.
2. Reduce air pollution from less or elimination of open burning.
3. Less contaminants in surrounding soil and water bodies.
4. Reduce potential for infectious diseases.
5. Reduce operational and site accidents due to site control, improved management and good practices.

6. Better quality of living for the people living nearby.

The expected results may not be enough for the protection of the environment and public health and safety but they will serve as a catalyst in considering a safer and longer term sustainable waste management solution in handling of waste as well as protecting the environment and public health and safety¹³.

As it has been mentioned, defining a technical process for the closure of dumpsites requires not only immediate actions, but also others that requires a longer-term analysis. Currently, it can be seen three methods of closing an open dumpsite, which are considered long-term solutions; Closure by Upgrading into a Controlled Sanitary Landfill, In-Place Closure by Covering the Waste and Closure by Removing Waste from the Dump.

When choosing the closure or upgrading method of a dumpsite, it should be borne in mind that the most technically advanced solution may not always be the most appropriate. Depending on the situation, simple improvements of operational aspects (such as applying cover soil and eliminating open burning) can often result in short-term improved performance and significantly reduce environmental impacts. The key principle should always be to keep things simple and sustainable in a local context, while maximizing actual improvement in environmental performance (ISWA, 2016).

In short, when facing the technical challenges associated with the closure of dumpsites, consideration must be given to both immediate solutions, as well as those that involve long-term decisions. In any case, it is important to consider at least the following elements:

- Cover systems and sealing layers.
- Control of leachates and gases generated from the decomposition process.
- Configuration of dumpsite location relief.
- Management of stormwater and rainwater during the closing process.
- Site Revegetation and long-term management.

3.2 Environmental considerations

The inadequate disposal of waste in dumpsites have significant adverse effects on nature and the whole environment system, including animals, plants, and humans. Dumpsites are the third largest source of global anthropogenic methane (CH₄), a greenhouse gas 25 times more powerful than CO₂ (ISWA, 2019). Moreover, dumpsites damage the environment and the health of those hundreds of millions living on or around them. Some of the most potential and common impacts of dumpsites are related to surface and groundwater contamination, soil contamination, air pollution, climate change and affectations to flora and fauna, so as the spread of odors, insects, rats, smoke and gases, among others, as described in Table 3.

Table 3. Environmental impacts of open dumpsites. Source: ISWA, 2019.

Type of environmental impact	Characteristics of environmental effects of dumpsites
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¹³ Greedy, D. Thrane, J. 2008. "Closed for business – A look at the closure of open dumps", Waste management World.

Surface and groundwater contamination	Contamination of water may occur when leachate from the dump, via flow paths (on or under the surface), reaches groundwater or surface water. Waste sometimes deposited directly into water at dumpsites resulting in the direct chemical and physical contamination of surface water.
Soil contamination	Many contaminants (especially heavy metals) are trapped in the soils beneath dumpsites, resulting in risk of further long-term environmental contamination and restricting the potential after use of the site.
Air pollution and climate change	The uncontrolled burning of waste and degradation of organic waste in dumpsites represents an important source of atmospheric pollution and greenhouse gases emission such as methane. Other types of gas emissions may contribute to the degrading of the ozone layer and/or may be toxic to humans (especially scavengers or any local populations).
Affectation to flora and fauna	<p>Fauna in and around dumpsites may be impacted either by direct consumption of the solid waste, or by consumption of contaminated plants and/or animals, or because of leachate effects on groundwater and surface water.</p> <p>Plants and vegetation are also affected by waste, dust, or smoke from burning, trampling by foot, vehicle, or animals, but also from direct contamination by leachate, burnings, among others.</p>

Consequently, and to avoid and reduce potential effects on nature, it is important that policies, plans and programmes conducted to close dumpsites at the regional, national and municipal level, consider environmental impacts analysis and ensure compliance with environmental preservation requirements to lessen the impacts on soil, air and water.

3.3 Economic considerations

3.3.1. The cost of inaction

It is important to highlight that **uncontrolled dumpsites operations pose serious negative impacts and costs** on both the economy and the society. Negative economic impacts are spread through various sectors as waste management, recycling, job creation attracting inward investments, environmental protection, public health and quality of citizens' life. The negative economic impacts from dumpsites and the lack of national policies for their upgrade or closure in developing countries could be identified in the following areas.

- Increased economic costs: Although in many cases authorities continue to operate dumpsites as it seems to be the cheapest option, the truth is that dumpsites are substantially more expensive than an integrated waste management system. The economic costs of not addressing waste management problems exceed the financial costs of environmentally sound waste

management. This is obvious once the cost of environmental degradation and the costs posed to health systems are taken into consideration¹⁴.

- Environmental costs: Dumpsites create long-term environmental impacts like surface and groundwater pollution, threats to terrestrial and marine environments, GHGs emissions, and direct atmospheric pollution mainly from open burning. The cost of environmental degradation, although it is usually ignored, becomes more obvious when high resources must be spent for clean-up and dumpsite rehabilitation projects. At this point, it takes relevance the option to intervene the waste management process, in order to prioritize less generation, recycling and recovery before final disposal (waste management hierarchy concept).
- Increased social costs: There are several social costs involved that are usually either ignored or underestimated like the potential for employment, business and economic growth, the improved livelihood and health & safety conditions for informal recyclers, the cost of land and property devaluation.
- Increased disposal costs: The siting and operation of dumpsites without any technical and scientific documentation about their allocation and their necessity drives increased operational unit costs on a national or regional level due to the unplanned and frequently unreasonable use of equipment and staff. According to the Waste Management Outlook for LAC (UNEP, 2018) the cost of inaction in terms of health, environmental impact and development must be considered, as it may range from five to ten times higher than the cost of sound waste management.

Overall, according to the Waste Management Outlook for LAC (UNEP, 2016) the cost of inaction in terms of health, environmental impact and development must be considered, as it may range from five to ten times higher than the cost of sound waste management.

3.3.2. Financing the closure of dumpsites

The sustainability of each and every waste management system depends on its financial and economic structure and performance. In general terms, affordability is likely to be a key constraint, and securing sustainable sources of revenue to improve the level of service provided is likely to be challenging. Raising the necessary investment finance, particularly in low-income countries, for new environmentally sound waste management facilities is still an important challenge.

In the LAC region, **financing is vital for the sustainability of waste management schemes**. This is one of the weaknesses that needs to be overcome, as municipalities in the region tend to ignore direct and indirect management costs, investment is insufficient and service charging system are flawed. In addition, budget allocation for management must compete with other resource-consuming priorities (health, poverty alleviation, drinking water supply, and infrastructure) (UNEP, 2018).

A policy for financing dumpsite closure should be part of a broader policy for the introduction of integrated waste management systems. There are important and serious financial barriers to initiate a process oriented to a dumpsite closure. Most of the times, those barriers are the result of the lack

¹⁴ Cointreau, S. & C. Hornig (2003), Global Review of Economic Instruments for Solid Waste Management in Latin America. Inter-American Development Bank (IDB).

of a specific policy for the effective and viable financing of dumpsite closure and system upgrading projects. It is also usual to observe a huge financial gap in waste management policies that undermines policy's overall performance. Some financial barriers identified are the lack of public financial resources, lack of coherent policies and coordination, quality of regulation in waste management projects, limited access to financial instruments and tools, limited administrative capacity of waste authorities, and also the restricted markets for waste management and recyclables (ISWA, 2016). Section 4.3.3 below describes some mechanisms for financial planning.

3.4 Social considerations

While it is possible to analyze a particular solid waste system from multiple perspective (technical, environmental, economic), it is also important to consider that systems are operated and managed by people. A solid waste system is thus in a real sense a social system, linking different human actors in various types of relationships via differential sets of constraints and incentives. The manner in which the system is managed has both, direct and indirect impacts on individuals, communities, institutions, and practices (ISWA, 2016).

The homes closest to dumpsites are often those of vulnerable populations who make a living by scavenging for recyclables with a monetary value. Just as gaps in solid waste services disproportionately affect the poor, improvements in service delivery can dramatically improve the lives of vulnerable populations. Informal waste recycling is a common livelihood for the urban poor in low- and middle-income countries. About 1 % of the urban population, or more than 15 million people, earn their living informally in the waste sector.

Waste pickers are often a vulnerable group and frequently include women, children, the elderly, the unemployed, or migrants. They generally work in unhealthy conditions, lack social security or health insurance, are subject to fluctuations in the price of recyclable materials, lack educational and training opportunities, and face strong social stigma (World Bank, 2018).

When properly supported and organized, informal recycling can create employment, improve local industrial competitiveness, reduce poverty, and reduce municipal spending on solid waste management and social services. Some of the more successful interventions to improve waste pickers' livelihoods are formalization and integration of waste pickers, strengthening of the recycling value chain, and consideration of alternative employment opportunities.

The social aspects of a final disposal site and its closure or upgrading should thus not be approached as a stand-alone or add-on, but rather as a transversal dimension to be integrated into all levels and phases of the intervention, which should include a careful assessment of the relevant social context and implications at every stage of the waste stream and every phase of the process, a meaningful multi-actor participation process, and the use of both of these as inputs into design, execution and later operation.

Failure to adequately incorporate social considerations into the design and implementation of a dumpsite closure carries multiple risks. Some of them are related to rejection of proposed facilities due to local opposition, failure of operation of new facilities due to excessive operational costs, higher collection, treatment and disposal costs for special and hazardous waste, failure of separate collection schemes due to inadequate equipment, recycling plants or sustainable markets for recyclables, social turmoil due to the diversion of recyclables from the established informal sector,

lack of monitoring capacity of local authorities, and failure of remedial works at closed dumps due to inadequate control of access.

Any major intervention should include a comprehensive analysis of social impacts as an essential input to both design of the new system and the closure/upgrading process. The main social impacts of dumpsite upgrading or replacement include: physical displacement, direct effects to housing, land, property, economic activities and access to recyclables, broader effects on local economies, real stage values, the poverty-environmental nexus, and impact related to the negative social perception of disposal sites and other waste infrastructure¹⁵.

The assessment of social considerations is critical not only to identification and avoidance of risks but also the identification and optimization of opportunities. It becomes necessary to know how to respond to the social limitations that are present in each phase or stage, address how the proposed solutions will affect the people, and the actions that can support expected results, identifying risks and opportunities by the best way.

¹⁵ Bernstein, J. 2004. Toolkit: Social Assessment and public participation in municipal solid waste management. Urban Environment Thematic Group. Washington, DC: The World Bank.

4. ROADMAP FOR THE CLOSURE OF DUMPSITES

This chapter provides a guidance to national governments or local authorities on the process and procedure to plan for the closure of dumpsites and develop alternative sound solid waste management (SWM) systems. It brings together all the elements for closing dumpsites (technical, financial, governance and social) in order to improve waste management systems with minimum environmental and health impacts. To do so, it presents, in practical aspects, what should be included in the diagnostic and evaluation of a dumpsite, the identification of alternatives, priorities and targets, how to set the closure and post-closure plan and, finally, the implementation, monitoring and evaluation, all considering an active involvement of key stakeholders (see Figure 5).

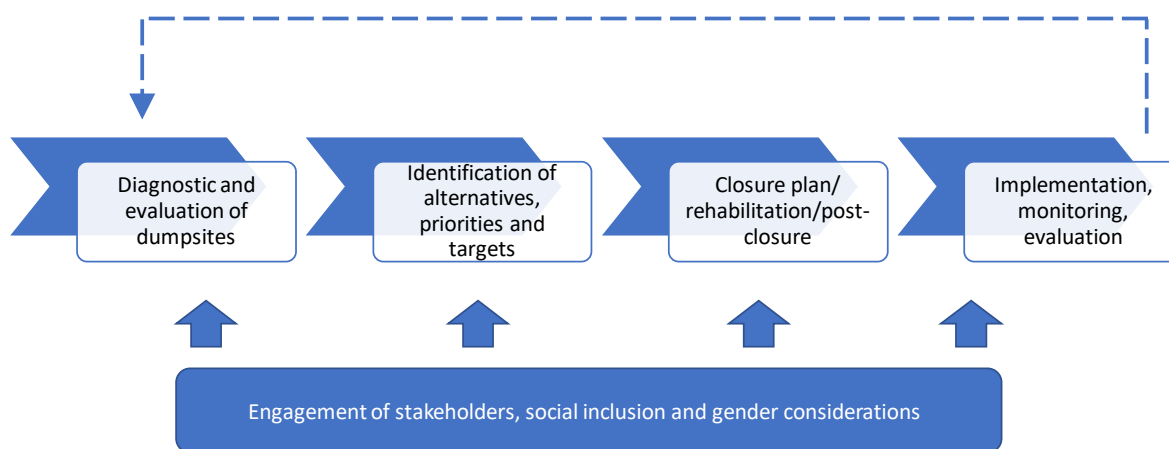


Figure 5. Process to be considered for the closure of dumpsites.

4.1 Diagnosis and evaluation of dumpsites

An adequate planning of the closure of dumpsites requires an initial **identification and characterization** of the sites present in the country, province or municipality. For each dumpsite, the following dimensions of information need to be gathered:

General information	Environmental information	Socio and economic information
Years of operation. Geographic location. Specific size, obtaining a reasonable estimate of the volume of waste. Type and composition of the disposed waste. Technical requirements for the final disposal of waste. Mobility or dynamics of the dumpsite. Land ownership.	Level of toxicity or risk of accumulated waste (classification) and its impacts on fauna and flora, soil, air and water. Topographic survey. Type and characteristics of the soil. Presence of surface and groundwater and determination of its quality.	Adjacent urban situation Presence of recyclable material collectors and families and socioeconomic activities. Presence of vectors.

This information is obtained clearly in a field work, therefore the most practical thing is to carry a check-list in order to quickly establish a profile of the dumpsite, and it can be enriched with any detail that may have importance later to develop the closure plan and post-closure management.

For the purposes of the diagnosis and evaluation of dumpsites, one example is the Form/checklist proposed in the Guide for the Technical Closure of Dumpsites, Ministry of Environment and Water, Bolivia, 2012 (See Annex I).

If the geographic scope of the plan is at national level, with multiple dumpsites identified, a **classification** or categorization of dumpsites can then be conducted, by collecting complementary information of the municipalities. An example of criteria for establishing a categorization of dumpsites is provided below (Correal, 2019):

- Amount of waste disposed.
- Population of the municipality.
- Availability of closure plans.
- Administrative and economic capacity of the municipality.
- Possible solution for final disposal.

Finally, a **prioritization** can also be conducted through a weighing or assessment of a range of technical-operative, environmental, administrative, social and economic criteria, providing an indication of both the potential and feasibility to implement a closure and final disposal solution, and the overall impact or risk mitigated by the intervention. This will enable municipalities to establish a priority ranking for the intervention on dumpsites, and guide the national government in the definition of municipalities that will be subject to an intervention and/or transformation plan in the short, medium and longer term (Correal, 2019).

4.2 Identification of alternatives, priorities and targets

Once the dumpsite(s) have been diagnosed and evaluated, it is necessary to identify alternatives in relation to (i) new or existing infrastructure (sanitary landfill, transfer stations, recycling plants,...) and (ii) the type of intervention in the impacted area, either from the closure, waste removal and new use or implementation of a new area for final disposal with a landfill, as well as to establish priorities and targets within the national or local action plan for the closing of dumpsites.

4.2.1 Identification and analysis of alternatives

A fundamental step of the planning process will be the identification and analysis of alternative sites, infrastructure, and methods for the management and final disposal of waste currently being disposed in dumpsites or inadequate facilities. In relation to waste requiring final disposal, the following options can be considered (Correal, 2019):

- Use of an existing regional sanitary landfill
 - With transfer station
 - Without transfer station

- Construction of a local sanitary landfill¹⁶
 - Upgrade of the existing site into a sanitary landfill (see below).
 - Construction of a new sanitary landfill

It is strongly recommended **to consider within the planning process all possible options to prevent and divert waste from landfilling**, including promotion of waste prevention and minimization, and taking the necessary measures to increase recycling of waste materials, including priority waste streams like organic waste. This will significantly reduce over time the required landfilling capacity and disposal area, while producing important environmental and socio-economic benefits.

In relation to the specific site(s) to be intervened, there are three alternative methods¹⁷ of closing a dumpsite and each considered being a long-term solution:

Closure by upgrading method	<p>It is assumed that there is available space adjacent to the existing open dump where new waste can be deposited in properly system.</p> <p>Includes the use of a low permeability cap and a topsoil layer over the existing waste mass.</p> <p>Important to keep things simple and sustainable in a local context.</p> <p>Requires landfill gas collection system and leachate collection point if there be a leachate seep on sideslope.</p>
In-place closure method	<p>Commonly used method when there is no more space for additional waste.</p> <p>The existing waste is left in-place and covered with local soil and re-vegetated.</p> <p>A basic landfill gas collection system can be installed, depending on the gas generation volume estimated, the waste composition, and the age of the waste.</p> <p>Depending on the local conditions, there might be a possibility to remove some leachate.</p>
Removal waste method	<p>Involves the removal of the waste mass from the open dump and the disposal of it off-site, typically to a proper sanitary landfill.</p> <p>Can be combined with sorting the waste for recyclable material recovery and separation of some hazardous waste.</p> <p>It can lead to odor problems to the neighborhood and will need to be managed accordingly.</p> <p>After the removal and clean-up, the former land use as a waste dump should be noted in land records and the land can be treated as its new classification.</p>

¹⁶ In some cases, different management options may need to be considered, for instance for remote and small populations, where access to regional sanitary landfills will not be possible, and the construction and operation of a landfill not feasible.

¹⁷ ISWA Working Group on Landfill. 2006. "Key Issue Paper: Closing of Open Dumps", ISWA, Available at: http://www.iswa.org/index.php?eID=tx_iswaknowledgebase_download&documentUid=93.

For each site-specific situation, it is important to select the method based on a study that takes other considerations such as sustainability and affordability of different waste management technologies in addition to site improvement and the potential environmental effects and benefits. Frequently the most advanced technical solution may not necessarily be the right solution but the simple and sustainable would, when analyzed by the site performance and environmental impacts.

4.2.2 Priorities and targets

Deciding goals and developing strategies is at the core of the waste governance process. Strategic planning enables decision-makers and practitioners to go beyond the unstructured mode of operation and carefully analyze not only at the waste system itself but also at the developments in a broader societal context which may impact on that system. A national waste management strategic plan can be of considerable value providing guidance for those involved, which is based on profound knowledge and understanding of the local circumstances, including both constraints and the existing strengths.

Waste prevention, waste minimization, reuse and recycling will be important goals for any institutional change. This will require good communications, the need to facilitate involvement and to engage in dialogue with all stakeholders in the system.

In this sense, to facilitate any systemic change in SWM operations it is fundamental to understand the existing situation, and the following aspects should be considered for that:

- Characterization of waste composition: fundamental to determine adequate treatment and disposal options.
- Understanding of how the current waste streams are being managed.
- A coherent mix of policy instruments comprising legislation accompanied by avid enforcement, economic instruments, providing incentives and disincentives for specific waste practices and “social” instruments, based on communication and interaction with stakeholders.
- Support of direct regulation started at the National Government level where adequate laws have to be introduced.
- Implementation of social instruments.
- Engagement with informal recyclers.

Planning is therefore fundamental for any project, as it sets the ground for a successful conception and implementation. Through adequate planning, it is possible to better understand current practices and challenges and provide answers to current and future demands. A strategic planning must present short, mid and long-term vision, strategies and targets for the waste management and waste handling of a municipality, a region or a country.

Based on the initial diagnosis of and evaluation of dumpsites at national or sub-national level, and the baseline conditions mentioned above, the specific goals, targets and milestones for the phase-out of dumpsites shall be established, in consultation with the relevant institutions and stakeholders.

During the above-mentioned baseline analysis in the LAC region, in relation to a possible timeframe target for the elimination of dumpsites, **most of the countries indicated the year 2030 as the most**

feasible goal, with 62% of the responses, while some countries indicated before (2025) or after that date (see Figure 6).

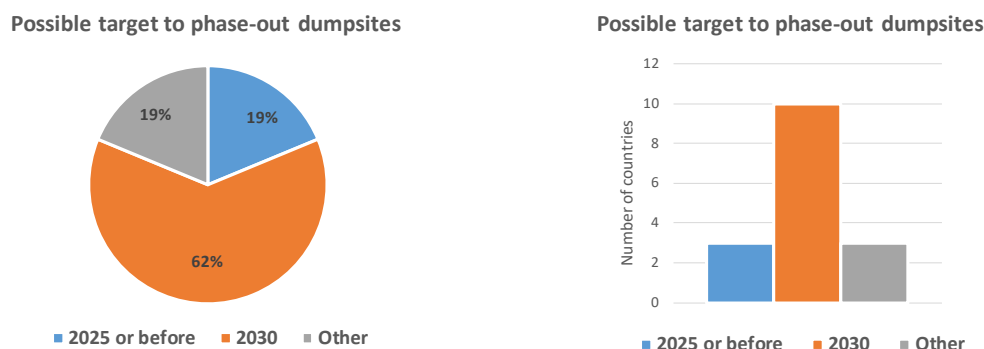


Figure 6. Possible goal to phase-out dumpsites in the countries of Latin America and the Caribbean. Source: own elaboration based on responses from 18 countries.

Different types and modalities of targets and milestones can be established. For instance, some initial milestones can be related with the completion of the comprehensive inventory and characterization of dumpsites, and the related intervention and financial plan to close priority dumpsites, taking into account feasibility, cost-benefit and risk-based criteria. At country level, targets and related regulatory and enforcement measures can be established through a phased approach, considering the population of municipalities, e.g. by fixing shorter deadlines for larger cities. This has been the approach in some countries of the region, like Brazil¹⁸. Also, some authorities may wish to establish targets through a progressive increase in the overall proportion of waste that is soundly disposed, e.g. through sanitary landfills. Table 4 provides an illustrative example of these progressive approaches, considering for example a 10-year timeframe. The specific targets and timeframe will need to be tailored considering the baseline and specific national and local conditions and circumstances.

Table 4. Examples of possible targets to be considered in a Roadmap for a progressive closure of dumpsites in a country or territory during a certain timeframe (to be tailored based on baseline and specific conditions).

Year		Targets on knowledge and planning	Targets based on size of municipality [Number of inhabitants]	Targets based on waste disposed [% waste disposed in sanitary landfill]
1	[2021]	Inventory process designed and launched		
2	[2022]	100% dumpsites characterized		
3	[2023]	Intervention and financial plan adopted	No Dumpsites in cities > 1,000,000 hab	50%
4	[2024]			
5	[2025]		No Dumpsites in cities > 100,000 hab	60%

¹⁸ In Brazil, Law 14026 of July 2020 establishes a phased approach for the enforcement of the environmentally sound disposal of waste, between 2020 and 2024, depending on the size of the municipality and other conditions.

6	[2026]	Evaluation and adjusted plan as appropriate		
7	[2027]		No Dumpsites in cities > 10,000 hab	80%
8	[2028]			
9	[2029]			
10	[2030]		No Dumpsites in 100% municipalities	100%

4.3 Development of a closure plan, rehabilitation and post-closure management

A closure plan should be prepared to assess potential impacts and to inform, train and educate users. This must be proposed in line with the National Solid Waste Plan, when applicable. This should be developed prior to closing a dumpsite and before starting a new facility and/or a new sustainable disposal option. The plan should involve all the technical, social, governance and financial aspects, as summarized in the following sections.

4.3.1 Technical aspects

As mentioned above, there are three available methods for closing dumpsites. Which option to use should be based on a study taking into consideration the sustainability and affordability of waste management options in the local context, while ensuring real improvement in relation to the actual and potential environmental effects of the dumpsite.

In this regard, the process of a plan's elaboration is highly relevant. A closure plan should be written to assess potential impacts and to inform, train and educate users. This should be done prior to closing a dumpsite and before starting a new facility and/or a new sustainable disposal option. The plan should involve all the social, governance and financial challenges involved, as described in the previous context. However, in a technical level, it should address the following at the minimum:

1. Choose a closure method (using feasibility and risk-based assessment).
2. Choose a cap or cover system.
3. Meet regulatory requirements per site-specific conditions.
4. Select a leachate and landfill gas management system, if applicable.
5. Construction Quality Control & Quality Assurance Program (CQC/QA).

The purpose of installing a cap or cover system is to stop people from continuing using the site as an open dump. But more importantly it minimizes risk of infectious diseases carried by animals and it also controls infiltration of rainwater that becomes leachate.

With a cap system installed, the risk of fires will be eliminated since the pathway of oxygen to the waste mass is cut off. However, landfill gas generation continues and there is a need of some kind of gas collection system to control gas migration and emission to the atmosphere. The later will contribute to the greenhouse effect if not burnt. A closure cost estimates should also be included in the closure plan, typically based on a selected cover system per unit area.

Understanding that the technical process of closing dumpsites involves a breadth of knowledge and decisions, Annex 1 of this document refers to a series of guidelines with comprehensive technical information and guidance.

4.3.2 Human resources

If there is to be systemic change in moving away from the open dumps it is essential that human resources are made available, with a pool of specialists. It is unlikely that any of these specialist professions will be fully appraised with waste management practices. Therefore, it is essential that a relevant training program should take place for putting together the skills necessary. This is particularly relevant, for the strengthening of technical capacities in local authorities.

Developing proper human resources is an element of the broader change required. In this sense, it is important to take into account some important aspects for effective change management regarding human resources, such as overcoming resistance, engaging employees, implementing change in phases, and communication change¹⁹.

4.3.3 Financial aspects

A closure cost estimate should also be included in the closure plan, typically based on a selected cover system in dollars, or euros, per unit area. This is particularly valuable under circumstances of limited financial and other resources, so as to accomplish allocation to the most beneficial purposes, in terms of particular facilities or activities. Importantly, a long-term vision is needed, as it will take many years to plan, build and repay the investment required for improved facilities, meaning that waste planning may well go beyond the duration of a typical political cycle.

Alternative financing for dumpsites closure and waste management upgrade projects is among the most important challenges regarding the implementation of waste management policies in developing countries.

The new approach in waste management policies should focus on the creation of economies of scale, through the consolidation of small scale dumpsites projects and the interconnection of dumpsites closure and upgrade projects with the use of potential products (for example biogas production and/or compost) and with the recovery of recyclables that now are ending up in dumpsites, which could create some profit making activities.

A new and innovative policy model for the effective and viable finance of relevant projects, from microfinance projects to megaprojects, through the promotion of private sector participation (PSP) could incorporate the following issues (in different policy mixtures and combinations):

- Promotion of co-finance through the development of joint ventures and bonds for waste management projects;
- Provision of different financial products, including (apart from loans from commercial banks and international organizations) co-finance instruments combined with grants;
- Financing of whole life – cycle projects, based on a complementary approach and according to national/regional waste management strategy goals;

¹⁹ Henry Hornstein, The need to integrate project management and organizational change, IVEY Business Journal, March – April 2012, available at <http://iveybusinessjournal.com/publication/the-need-to-integrate-project-management-and-organizational-change/#.VLgT-ivF9HQ>

- Strengthening public – private sector collaboration and partnering in the implementation of the financed projects, through standardized and flexible – accessible institutional forms;
- Financing the development of a national market for waste management and recycling products, through the promotion of competition, transparency and by strengthening the entrepreneurship at different levels;
- Support the creation of economies of scale in projects’ financing, through the establishment of local / regional partnerships as a condition for providing grants and loans;
- Incorporation of strategic planning principles, as the participatory regional and local waste management planning, the result-oriented finance, the introduction of circular economy principles and the use of life-cycle approach in waste management;
- Provision of financial resources-grants for the technical support and capacity development of public private partnerships (PPP) projects.

4.3.4 Regionalization

The setting up of a proper and sound municipal solid waste management (MSWM) system in compliance with higher standards is prohibitively expensive for most of the municipalities in the developing world. The costs can only be commercially justified and borne by a large number of users. In this sense, regionalization presents itself as an alternative, especially for small municipalities.

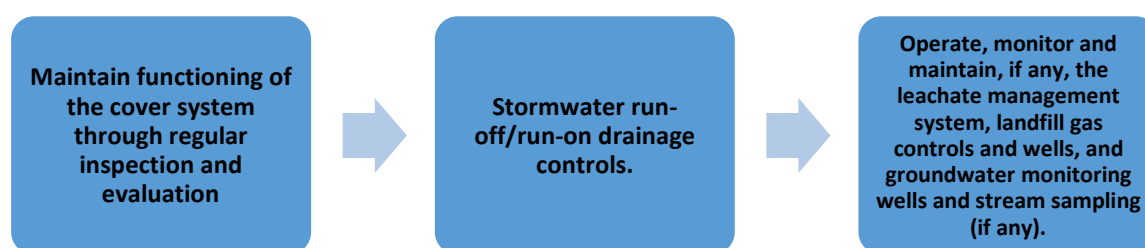
The regionalization of waste management operations greatly depends on the geographical and topographical structure of the project area, which influences the operational costs for regional sanitary landfills.

Experience in transition suggests that the closure of dumpsites is a precondition for regionalizing MSWM. Without the enforced closure of uncontrolled landfills and dumps, its use is likely to be continued in many cases, as it is the cheapest option. The government’s role is to set environmental and other standards for landfills, according to which it has the right to mandate the closure of non-compliant landfills.

4.3.5 Post-closure management

Aftercare (or post-closure care) must be carried out until the landfill no longer poses a threat to human health and the environment, in which case some inert waste landfills may be exempt or require limited aftercare. Many regulations require provisions for a minimum post-closure period of 30 years, and operators usually consider 30 years by default.

The goal of the post-closure care includes the following:



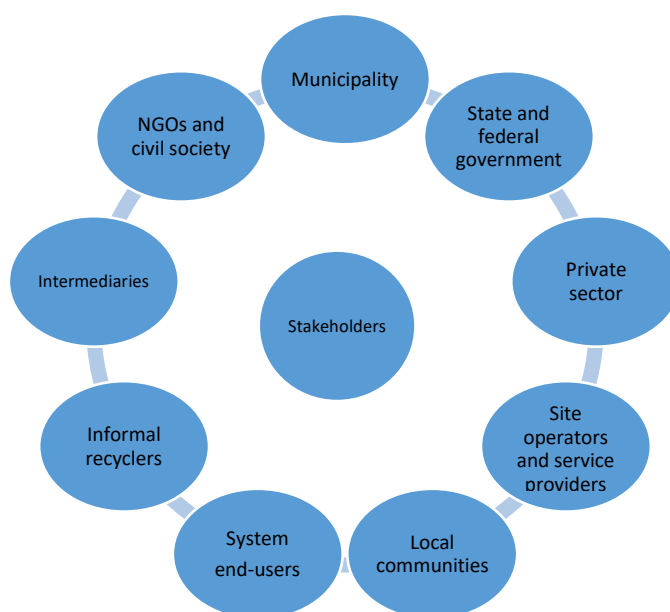
When designing a cover system for the closure of a dumpsite, it is beneficial to incorporate suitable post-closure end-use activities of the dumpsite²⁰, which adds values and quality of life to the communities around the dumpsite. However, the access to monitoring and control systems of the closed facility should be protected and restricted to authorized personnel only.

For a successful installation of a quality cover system, it is important to implement a good construction quality control and CQC/QA during construction.

4.4 Stakeholder engagement, social inclusion and gender considerations

4.4.1 Stakeholder analysis and engagement

Stakeholder analysis consists in identifying, mapping and assessing each of these categories and their relationships to one another and to the system as a whole. Having strong buy-in from all key stakeholders is critical to the success of an inclusive waste and recycling initiative and failure to secure buy-in from key actors can be a deal-breaker. Typical stakeholders in a dumpsite intervention can include:



Identifying affected, interested and third parties is also required to better integrate a conciliated approach when closing the dumpsite that will allow the intervention to be successful.

²⁰ Ahmed, S. A. and S. M. Ali. 2004. "Partnerships for solid waste management in developing countries: linking theories to realities," Habitat International 28:(3):467-79.

Stakeholder engagement should be a part of all social components of a SWM system or project. Each social dimension involves some form of dialogue with key system actors. As strong buy-in from all key stakeholders is a critical factor of success, all actors must be positively and appropriately engaged. The form of engagement, however, will differ according to the type of actor.

The goals of the stakeholder engagement process for a dumpsite closure are generally: a) to address social concerns²¹; b) to enhance environmental and social performance of the new system; and c) to strengthen sustainability. In order to achieve these goals, it is important to:

1. Ensure that all risks and potential impacts to affected parties have been duly identified and assessed.
2. Consider a broader range of expertise and perspectives from interested parties.
3. Ensure the effective mitigation of negative impacts and/or the environmental and social enhancement of the project with the engagement of third parties.
4. Establish control mechanisms to ensure good relations with local communities and other affected parties).
5. Ensure adequate budgeting for negative impact mitigation and inclusion work.

In practice, the various aspects of stakeholder engagement work together, as each system or project phase and aspect involves risks and impacts, key stakeholders and management/mitigation strategies. Obviously, the way specific issues affect various actors may differ by type of stakeholder. Different aspects of the intervention may affect different stakeholder categories, and these may in turn be differentially affected by and/or involved in the intervention.

4.4.2 Social Instruments and Processes

Standard instruments and processes for addressing specific social aspects of dumpsite closures include:

1. Communication/Public Awareness Plans (aimed at waste generators, end users);
2. Specific communication processes (for local communities with NIMBY issues);
3. Resettlement Plans (for persons affected by resettlement impacts);
4. Informal Recycler Inclusion Plans (for informal recyclers affected by site closures).

The most important and complex social dimension of dumpsite closure is usually the presence of informal recyclers and their incorporation into the new or upgraded waste system in a way that is fair, technically viable and financially sustainable²². Frequently expressed goals and aspirations of informal recyclers in solid waste interventions include:

- Equal or greater access to recyclables
- Equal or higher incomes

²¹ Which leads to the NIMBY effect (“Not in My Back Yard”) and opposition to siting of waste facilities.

²² Gerdes, P. and E. Gunsilius. 2010. The Waste Experts: Enabling conditions for informal sector integration in solid waste management: Lessons learned from Brazil, Egypt and India. Eschborn: GTZ.

- Continued work in the waste/recycling sector
- Improved working conditions
- Recognition and respect
- Consideration of their existing business model

The various benefits and drawback of the existing informal system around the dumpsite to be closed should be carefully assessed in a detailed social assessment prior to design, so that the new system will be able to build on what already exists, preserve what is working, and determine what is being lost in the intervention and thus must be restored or compensated.

4.4.3 Informal Recycler Inclusion Plan

Work with informal recyclers in a dumpsite closure is generally structured around the preparation and execution of an Inclusion Plan, which sets forth the key aspects of the actions to be taken with affected recyclers. An Inclusion Plan generally consists of the following components²³:



The scope of the Inclusion Plan shall depend upon the scope and nature of impacts, the number of recyclers involved, and other aspects of the situation.

Goals

The general goal of a Recycler Inclusion Plan should normally be to improve – or, minimum, maintain or restore – the livelihoods and standards of living of all affected recyclers to pre-project levels. Where National legislation and/or donor safeguard policies demand it, this goal is mandatory, elsewhere it is advised). Specific goals should include:

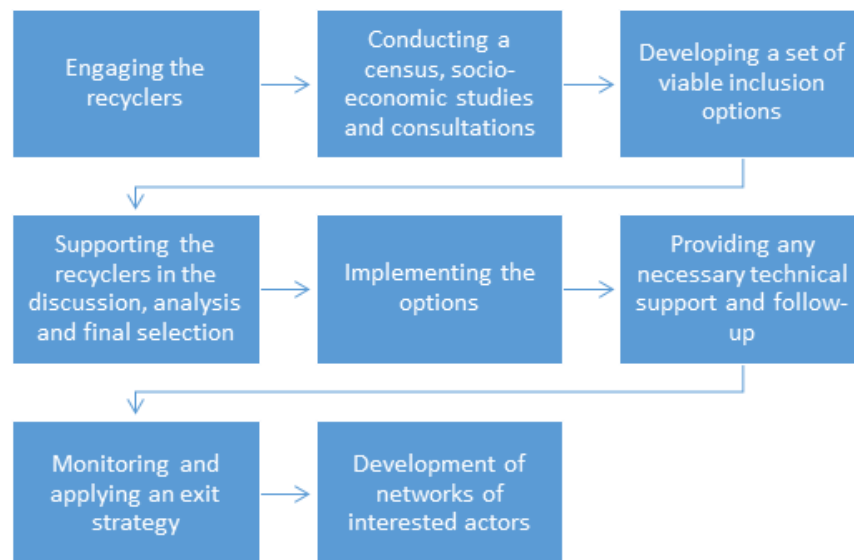
²³ Cohen, P., J. Ijgosse and G. Sturzenegger. 2013. Preparing Informal Recycler Inclusion Plans: An operational guide. Washington, DC: Inter-American Development Bank.

- Ensuring adequate, reliable, and safe access to recyclables;
- Developing viable alternatives where such access is impossible;
- Improving health, safety and security of working conditions;
- Increasing effectiveness, efficiency and profitability;
- Providing formalization, recognition and access to benefits;
- Strengthening capacity, skills and collective organization;
- Ensuring Gender equity and addressing the special needs, capacities and aspirations of women and vulnerable groups;
- Eradicating child labor in a responsible manner.

It is important to note that the **gender perspective** must be integrated into waste sector decision-making and policy-setting from the beginning. This will make the policy more efficient and generate more benefits for society as a whole. Even if, in broad terms, the integration of the gender perspective is very limited in public policies in LAC, for example, regarding the working conditions of female recyclers, it is also true that there are experiences in Latin America that show that it is progressively being incorporated by cooperatives of recyclers (UNEP, 2018).

Steps

The work with informal recyclers during a dumpsite closure may itself be divided into several phases that, although to some degree overlapping, are best done in the following order:



Diagnostics

Strong, timely and relevant data are critical to developing viable options to incorporate recyclers

into new waste and recycling systems. Three key data streams²⁴ should serve as inputs to the development of options: a) the recyclers, their skills, experience and potentials; b) their opinions (normally as expressed through the consultation process); and c) the socio-economic and political context (including existing and potential market challenges and opportunities).

No recycler population is homogeneous, but rather tends to demonstrate multiple types of internal diversity. This heterogeneity should be taken into account in diagnostics, consultation, and the development of solutions (which should themselves generally be multiple to account for the diversity of actors in a given recycler population).

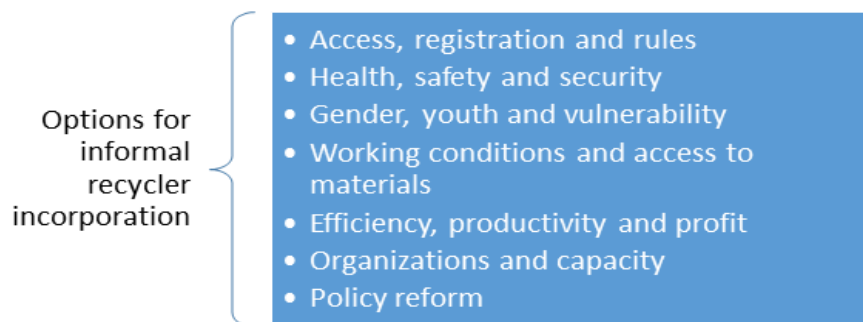
Modes of Incorporation

Incorporation of informal recyclers into waste and recycling systems can follow several strategies. The basic lines of support for increasing profits and supporting the development of viable and sustainable institutions include:

- Increasing scale;
- Adding value;
- Moving up the recycling chain (to doorstep or bulk collection, separation, transport, transformation and even commercialization);
- Improving effectiveness and efficiency;
- Expanding the range of goods and services offered;
- Building legitimacy, social recognition, commercial partnerships, and incentives.

Options

Typical options for informal recycler incorporation can be grouped in the following categories:



²⁴ C. Velis, D. Wilson, Ond. Rocca, St. Smith, A. Mavropoulos & Chris Cheeseman An analytical framework and tool ('InteRa') for integrating the informal recycling sector in waste and resource management systems in developing countries, Waste Manag Res 2012 30: 43, available at http://wmr.sagepub.com/content/30/9_suppl/43.full.pdf+html.

It is advisable to include at least three of the options listed above in any given plan. These need not be mutually exclusive, but can be complementary, overlapping or mutually reinforcing, and combined in multiple ways according to the particular situation. They should also include at least one alternative outside the existing system (with the understanding that, as a general rule, risk tends to increase the farther people are moved from their habitual mode of work). Where possible, solutions should be low-tech, low-cost (both initial and operational), simple (to operate and maintain), and incremental, taking the form of a phased and gradual process.

The importance of incentives

Informal recyclers earn income while focusing on a relatively limited number of types of waste fractions (i.e., those that are in sufficient demand on the private market to be profitable). Public systems, however, have a different mandate (i.e., to protect public health and the environment), and thus need to separate a wider range of recyclables than is of financial interest to recyclers²⁵ (whether due to low prices, excessive work requirements, or overly volatile markets). Diagnostics²⁶ should therefore consider, in cooperation with system design, the savings (minus transport, transfer and disposal costs) that could potentially be generated by the diversion of these materials and consider the creation of reasonable incentives for the recyclers based on those savings (the public system being the ‘buyer’ in this case). Such local and national policy changes should be considered wherever they can directly benefit the system²⁷.

4.5 Implementation, monitoring and evaluation

4.5.1. Implementation

Once the different plans or strategies for the closure of dumpsites, stakeholder engagement and social inclusion have been developed, it is at the implementation stage that many of the true obstacles to a successful closure strategy may become apparent.

The process of implementation actually begins with the **formal adoption and launch** of the dumpsite closure plan or phase-out strategy. The launch should be accompanied by an appropriate public relations campaign.

Following adoption and launch, a number of other steps become important (UNEP, 2013):

- **Awareness raising and communication**, first among stakeholders in waste management and among concerned sectors in government, followed by the wider community.
- **Assigning responsibilities and tasks** among the players identified in the closure plan.
- **Mobilizing resources** (see 4.3.3 above)
- Economic instruments, including the charging of fees, introduction of tax incentives and disincentives.
- Investment incentives for the private sector and for public-private partnerships.

²⁵ Terraza, H. and G. Sturzenegger. 2010. Dinámicas de Organización de los Recicladores Informales: Tres casos de estudio en América Latina. Nota Técnica no. 117. Washington, DC: The Inter-American Development Bank

²⁶ GIZ (2011) Role of Informal Sector in Solid Waste Management and Enabling Conditions for its Integration

²⁷ Samson, M. (ed.). 2009. Refusing to be Cast Aside: Waste Pickers Organizing Around the World. Cambridge, MA: WIEGO.

- Securing the necessary budget from government.
- Negotiating arrangements with relevant private sector participants.
- Access and use of development finance²⁸.
- Identifying and delivering any necessary **legislative and regulatory changes**.
- **Enforcement** (in the case of laws or regulations)
- Gathering and recording of reliable **information and data**, and public dissemination.

During implementation, attention needs to be given also to **maintaining momentum and political commitment**. Among the relevant aspects to be considered would be:

- Ways of retaining and refreshing **political support**, which needs to be sustained throughout the process. One example is ensuring that the plan will deliver some tangible and politically attractive short-term results, like some initial interventions in critical dumpsites, and reporting of related environmental and social benefits.
- Including some elements to provide support during implementation, e.g. specific follow-up on priority issues or **task forces** focused on particular challenges, like informal recycler inclusion.
- Considering whether responsibility at the point of implementation needs to be shifted from those who developed the plan, as implementation often requires a different set of skills.

Critical to successful implementation is **compliance and enforcement**. All the elements that are given effect through legislation and regulation need to be especially supported by firm and clear compliance activity to create the atmosphere of certainty and predictability that is essential to successful implementation. An inspectorate that can visit landfill and other critical waste disposal sites, for example, and ensure that they are in conformance with legislated standards (thus preventing a regression to dumpsite conditions), is an essential element in implementation, for which appropriate resources need to be allocated.

4.5.2 Monitoring and Evaluation

Assessment of the progress and success of a dumpsites closure plan or strategy requires that progress towards the goals and targets is measured and assessed. This requires:

- **Information and data** on each dumpsite, including environmental and operational aspects.
- A **process for evaluation of progress**, including the identification of barriers to success and assessment of the success or failure of particular initiatives
- **Reporting** of the results to governments and to stakeholders.

It is important to be able to reliably track and measure social performance along with other aspects of an intervention. This involves the establishment of comprehensive and reliable baseline data in the diagnostic phase, the development of a limited number of meaningful core indicators in the design phase, strong monitoring during the implementation phase and rigorous ex-post evaluation following the intervention. The use of participatory monitoring, as one aspect of the empowerment of informal recyclers and other key actors, is highly recommended.

²⁸ A number of key issues on the access and better utilization of International Development Assistance tools in solid waste management have been identified by ISWA (2014)

If the main committee used in developing the plan or strategy is retained, its major task should be to receive and consider reports of progress, identify obstacles, and adjust policies and resource allocations to address failures, shortcomings and new challenges. If the main committee is not retained, a new committee or some alternative structure will need to be established and given this responsibility.

There is a potential conflict of interest if the body responsible for implementation of the plan is also responsible for deciding whether progress is adequate. For that reason, it is desirable that a **formal evaluation** be conducted by a body that is independent from the plan development and implementation process. This type of monitoring and evaluation can be set up as a one-off exercise, or established on an ongoing basis, or it can be delegated to a national institution that is suited to the purpose, if such an institution exists.

5. TECHNICAL GUIDELINES AND INFORMATION RESOURCES

This Roadmap provides a general guidance on the considerations and steps and process recommended to address the closure of dumpsites in the region. However, it is expected that the authorities and specific teams that will be responsible to design and implement the closure plans, shall require access to more detailed technical guidelines, and information on experiences and approaches in the region.

To this end, and in accordance with the objectives and work plan of the Voluntary Coalition for the closure of dumpsite, a preliminary compilation of relevant technical guidelines and information resources has been conducted, which is summarized in **Annex I**. The list is not comprehensive and includes about a dozen of references and the links to access them. For ease of use and consultation, a preliminary systematization and characterization of these information resources can be observed, according to whether it contains technical, environmental, social/health, and/or economic elements, the type of document (Roadmap, Technical guideline, Case Study,...), and a brief description of its content.

This compilation will be periodically updated with the support of the members of the Coalition, in order to provide further information resources to all countries in the region.

6. CONCLUSIONS AND RECOMMENDATIONS

According to the information provided in this document, the following can be concluded:

- Waste management systems have notably been improved over the past decades in the region of Latin America and the Caribbean (LAC), including increased waste collection coverage, and improved handling and disposal of waste. Regulatory frameworks have also been strengthened, including general prohibition of waste dumping, and development of more integrated policies and plans.
- However, total and per capita waste generation continues to increase, while recycling rates are still generally low in the region. Also, about 45% of all waste generated in the region still end up in inadequate final disposal sites, including more than 10,000 dumpsites identified in LAC countries. The situation can vary significantly across the region, but the unsound management of waste affect to a greater or lesser extent to all countries of the region.
- Dumpsites and open burning of waste create serious health risks, both for people who work at the sites, as well as the communities around them, affecting the daily lives of millions of people across the region. At the same time, this results in severe environmental impacts, including water pollution, emission of toxic and greenhouse pollutants, as well as soil pollution, which in turn affect economic activities. The impacts associated to the unsound management of waste can be exacerbated during health crisis like the COVID-19 pandemic, particularly on waste workers and informal recyclers.
- For this reason, it is essential to progressively phase-out open dumpsites, and replace them with effective management practices and final waste disposal methods, within the framework of integrated waste management strategies that promote waste prevention and minimization.
- The closure of dumpsites is a complex process which needs to be properly planned, including technical, environmental, economic and social considerations. It also requires an alternative waste management system, adequate institutional capacity, social support and political consensus.
- The proposed Roadmap provides an overview of the different elements and practical steps to be considered for the progressive closure of dumpsites in the LAC region, including: diagnostic and evaluation of dumpsites; identification of alternatives, priorities and targets; development of a closure and post-closure plan; the stakeholder engagement process; and the implementation, monitoring and evaluation. Reference is also made to existing guidelines and information resources, which contain more detailed technical information.

The following is recommended on the way forward:

- Countries in the region of Latin America and the Caribbean should accelerate the process to eradicate dumpsites and inadequate waste management and disposal practices, and promote the transition towards waste prevention models.
- The LAC Forum of Ministers of Environment is encouraged to consider and adopt this Roadmap as a reference guidance on the considerations and steps to be followed for the progressive closure of dumpsites.

- National and local governments are encouraged to adapt and implement the Roadmap according to their specific baseline situation, conditions and circumstances, with the overall goal of phasing-out dumpsites no later than year 2030.
- The Voluntary Coalition for the progressive closure of dumpsites should continue to support the implementation of the Roadmap, by developing or tailoring specific technical guidelines, facilitating capacity building and exchange of information and practical experiences, and promoting awareness raising.
- Additional resources and efforts need to be mobilized at different levels to facilitate the closure of dumpsites, enhance technical capacity at national and local level, and implement and sustain integrated waste management systems.

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ACRONYMS AND ABBREVIATIONS

AIDIS	Asociación Interamericana de Ingeniería Sanitaria y Ambiental. Spanish
GHG	Greenhouse Gases
GMWO	Global Waste Management Outlook
IDB	International Development Bank
ISWA	International Solid Waste Management
MSWM	Municipal Solid Waste Management
NIMBY	Not In My Back Yard
SDG	Sustainable Development Goals
SWM	Solid Waste Management
UNEA	United Nations Environment Assembly
UNEP	United Nations Environment Programme

GLOSSARY

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

Collection: Gathering of waste, including the preliminary sorting and preliminary storage of waste for the purpose of transport to a waste treatment facility.

Composting: The controlled, biological decomposition of organic solid waste materials under aerobic conditions.

Controlled site: Dumpsite that has been upgraded to incorporate some of the practices associated with sanitary landfills such as siting with respect to hydrogeological suitability, grading, compaction in some cases, leachate control, partial gas management, regular (not usually daily) cover, access control, basic recordkeeping and controlled scavenging.

Disposal: The discharge, deposit, dumping, spilling, leaking or placing of any solid waste into or in any land. The final handling of solid waste, following collection, processing or incineration. Disposal most often means placement of wastes in a dump or a landfill.

Disposal site: A site where solid waste is finally discharged and deposited.

Dumpsite: A disposal area wherein the solid wastes are indiscriminately thrown or disposed of without due planning and consideration and health standards.

Environmentally sound waste management: Waste management which must go beyond the mere safe disposal or recovery of wastes that are generated and seek to address the root cause of the problem by attempting to change unsustainable patterns of production and consumption. This implies the application of the integrated life cycle management concept, which presents a unique opportunity to reconcile development with environmental protection.

Informal sector: The part of an economy that is characterised by private, usually small-scale, labour-intensive, largely unregulated, and unregistered manufacturing or provision of services.

Integrated solid waste management: Refers to the strategic approach to sustainable management of solid wastes, covering all sources and all aspects, including generation, segregation, transfer, sorting, treatment, recovery and disposal in an integrated manner, with an emphasis on maximising resource efficiency.

Leachate: Liquid that has percolated through solid waste or another medium and has extracted, dissolved or suspended materials from it. Because leachate may include potentially harmful materials, leachate collection and treatment are crucial at municipal waste landfills.

Municipal solid waste: All solid waste generated in an area except industrial and agricultural wastes. It sometimes includes construction and demolition debris and other special wastes that may enter the municipal waste stream, and generally excludes hazardous wastes, except to the extent that they enter the municipal waste stream. It is sometimes defined to mean all solid wastes that a city authority accepts responsibility for managing in some way.

NIMBY: 'Not in my backyard'. An expression of resident opposition to the siting of a solid waste facility based on the particular location proposed.

Open burning: The practice of setting fire to waste.

Recyclables: Items that can be reprocessed into feedstock for new products. Common examples are paper, glass, aluminium, corrugated cardboard and plastic containers.

Sanitary landfill: An engineered disposal facility designed, constructed, operated in a manner that minimizes impacts to public health and the environment. An engineered method of disposing of solid waste on land, in a manner that meets most of the standard specifications, including

sound siting, extensive site preparation, proper leachate and gas management and monitoring, compaction, daily and final cover, complete access control and recordkeeping.

Solid waste: Any of a wide variety of solid materials, as well as some liquids in containers, which are discarded or rejected as being spent, useless, worthless or in excess. Solid wastes, as defined in Agenda 21, include all domestic refuse and non-hazardous wastes such as commercial and institutional wastes, street sweepings and construction debris. In some countries, the solid waste management system also handles human wastes such as night-soil, ashes from incinerators, septic tank sludge and sludge from sewage treatment plants. If these wastes manifest hazardous characteristics they should be treated as hazardous wastes.

Valorization: The entire process of extracting, storing, collecting, or processing materials from the waste stream in order to extract and divert value and direct the material to a value-added stream.

Waste: “Substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law”.

Waste collection: The act of picking up wastes at homes, businesses, commercial and industrial

plants and other locations; loading them into a collection vehicle (usually enclosed); and hauling them to a facility for further processing or transfer or to a disposal site.

Waste management: Collection, transport, recovery and disposal of waste including the supervision of such operations and the aftercare of disposal sites, including actions taken as a dealer or broker.

Waste management hierarchy: The hierarchy indicates an order of preference for action to reduce and manage waste. The waste hierarchy is presented as a pyramid that specifies that preventing the generation of waste is the preferred action, followed by reduction (e.g. through re-use), recycling, recovery and as the least preferred action, disposal. Different versions of the hierarchy have been adopted by different countries.

Waste picker: Person or family who salvages recyclable materials from streets, public places or disposal sites.

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

ANNEXES

List of technical guidelines and information resources.

	Type of Document	Scope	Title	Author	Year	Description of the content	Access to documents
1	Roadmap	Dumpsites	<i>"A Roadmap for closing Waste"</i>	International Solid Waste Association (ISWA).	2016	Orientation and considerations for the process and procedures required to close dumpsites and to develop a sound waste management alternative	English
2	Technical Guideline	Dumpsites	<i>"Guía Técnica para la clausura y conversión de botaderos de residuos sólidos"</i>	Ministerio de Salud / CONAM por el Desarrollo Sostenible Lima, Perú	2004	A guide addressed especially to local officials and technicians, as well as to specialists working on solid waste management programmes and projects for dumpsites closure and conversion.	Español
3	Technical Guideline	Dumpsites	<i>"Guía para el cierre Técnico de Botaderos"</i>	Ministerio de Medio Ambiente y Agua, Bolivia.	2012	Tools and information for the technical closure of dumpsites and their rehabilitation.	Español
4	Study cases/Environmental	Dumpsites	<i>"Climate benefits due to dumpsite closure: three case studies"</i>	International Solid Waste Association (ISWA)	2019	A series of case studies highlighting the impacts of dumpsites on the planet.	English
5	Technical Guideline	Dumpsites	<i>"Saneamiento y cierre de botaderos a cielo abierto"</i>	Ministerio del Medio Ambiente, Colombia.	2002	Contribution to the mitigation of the negative environmental effects that inadequate waste disposal generates on natural resources and the health of the population located in the area of influence	Español
6	Technical Guideline/Regulatory	Dumpsites	<i>"Hacia una Política Nacional de Clausura de Botaderos"</i>	Programa APGEP-SENREM, Perú.	2002	<input checked="" type="checkbox"/> Characterization of the current status of the inadequate final disposition. <input checked="" type="checkbox"/> Establishment of regulation proposals addressed to support the required policy guidelines	Español
7	Study case	Final disposal	<i>"Investigación del sitio de disposición final de residuos sólidos de la ciudad de San Cristóbal de las Casas, Chiapas"</i>	Revista AIDIS de Ingeniería y Ciencias Ambientales	2012	Description of the characteristics of the disposal site for special management urban solid waste through field visits and interviews.	Español
8	Technical Guideline	Landfills	<i>"Diseño de un relleno sanitario"</i>	CEAMSE, Argentina	2012	Development of all the phases of the implementation of landfill technique.	Español
9	Technical Guideline	Landfills	<i>"Guía para el Diseño, Construcción, Operación y Cierre de Rellenos Sanitarios"</i>	Ministerio de Medio Ambiente y Agua, Bolivia.	2012	Focused on landfills and capacity building of human resources.	Español
10	Technical Guideline	Landfills	<i>"Landfill Operational Guidelines, 3rd Edition"</i>	International Solid Waste Association (ISWA)	2019	It details the operating elements of a landfill	English
11	Technical Guideline	Landfills	<i>"Manual para la supervisión y control de rellenos sanitarios".</i>	Secretaría de Medio Ambiente y Recursos NTURALES (SEMARNAT), México	2006	Supervision, control, and responsibility within the framework of each stage in the establishment of a sanitary landfill.	Español

13	Technical Guideline/Regulatory	Landfills	<i>"Guía de cumplimiento de la NOM-083-SEMARNAT-2003"</i>	Secretaría de Recursos Naturales, México.	2004	To offer information on the legal (regulatory) requirement that exist in the country for final disposal.	Español
14	Technical Guideline	Landfills	<i>"El caso trágico de los basurales. Una amenaza para la salud"</i>	International Solid Waste Association (ISWA).	2015	It highlights the several health risk that represent dumpsites for people	Español