Bridging the Gap in Solid Waste Management

Governance Requirements for Results

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Purpose and audience

Bridging the Gap in Solid Waste Management discusses good practices for the governance of the solid waste management sector in a context of pressing need.

It aims to impress the need for integrated waste management systems across all levels of government with clearly assigned institutional responsibilities, roles and functions, adequate policies and economic incentives and financing, local capacities for service provision, and proactive inclusion of community, public and private stakeholders.

The publication aims to contribute to the body of knowledge and experiences in organizing and managing municipal solid wastes. It provides practical information, guidance and advice that seeks to inform and complement the work of national and local authorities and practitioners.

The document contains numerous country and city examples. An attempt has been made to present a geographically balanced distribution of case countries across all continents. The country examples span unitary and federal states and exemplify differences in sector governance across institutional tiers. Finally, the case studies include low-, middle- and high-income economies in order to highlight potential solutions in contexts that differ in level of capacity, resources, services and objectives.

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Table of Contents

Text Boxes

List of Figures

List of Tables

Conveyor belt at a recycling facility: Photo: Hroe

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Abbreviations

AD	Anaerobic Digestion
BOOT	Build, Own, Operate, Transfer
BOT	Build, Operate, Transfer
CBEs	Community Based Enterprises
CEN	European Committee for Standardization (Comité Européen de Normalisation)
CII	Commercial, Industrial, Institutional
CDW	Construction and Demolition Waste
DBFO	Design, Build, Finance, Operate
DBO	Design, Build, Operate
DRS	Deposit Refund System
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EIA	Environmental Impact Assessment
EPR	Extended Producer Responsibility
EU	European Union
EWL	European List of Waste
FIDIC	International Federation of Consulting Engineers
GDP	Gross Domestic Product
GHG	Greenhouse gases
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
IFC	International Finance Corporation
IFIs	International Financial Institutions
IMA	Inter-municipal Association
IMF	International Monetary Fund
ISO	International Organization for Standardization
IWMP	Integrated Waste Management Plan
LDPE	Low-density polyethilene
MBT	Mechanical-Biological Treatment
MoE	Ministry of Environment
MSW	Municipal Solid Waste
NEF	National Environmental Funds
NGO	Non-governmental Organization
NWMP	National Waste Management Plan
OECD	Organisation for Economic Co-operation and Development
PET	Polyethylene terephthalate
POPs	Persistent Organic Pollutants
PPP	Public Private Partnership
PRO	Producer Responsibility Organization
PSP	Private Sector Participation
R&D	Research and Development
RDF	Refuse-Derived Fuel
RFID	Radio Frequency Identification
RVM	Reverse Vending Machine
SEA	Strategic Environmental Assessment
SRF	Solid Recovered Fuel
SUP	Single-use plastic
SWM	Solid Waste Management
VAT	Value Added Tax
WEEE	Waste Electrical and Electronic Equipment
WFD	Waste Framework Directive
WM	Waste Management
WMP	Waste Management Plan
WtE	Waste to Energy

Recycling Day in Antigua, Guatemala. Photo: Stephanie Jolluck Photography / Stockimo / Alamy Stock Photo

Executive summary

The urgent global waste management situation

The world faces unprecedent challenges in waste management. Growing populations alongside urbanization, economic development, and associated levels of consumption are accelerating waste generation at a concerning pace. By 2050, waste production will be 73 percent higher than in 2020. This increase will be mostly driven by middle-income countries in which waste generation will nearly double in the next three decades, though low- and many- high income countries will contribute significantly to the growing volume.

Only 77 percent of global solid waste is collected and 33 percent of it is openly dumped. The situation in low-income countries is particularly alarming, where only 40 percent of the generated waste is collected and 93 percent is dumped or improperly managed.

The extraordinarily large quantities of waste that either go unmanaged or are inadequately managed, and the increasingly higher quantities of waste generated globally gives a serious reason for concern. Namely, global improvements in waste management practices at their current speed will likely not be sufficient to offset the adverse impact of poorly managed waste. In a business-as-usual-scenario, the gap between the waste that is currently generated and the waste that is managed properly will widen further based on the projected growth in waste generation.

There are serious repercussions of the growing waste burden. Poorly managed waste poses threats to both the environment and human health. It hinders human development and economic activity, serving as a barrier to national and local governments' ambitious goals for prosperity. Beyond significant local impacts, inadequately managed municipal solid waste is a major source of marine litter and contributes to greenhouse gases. Marine pollution and greenhouse gas emissions from the uncontrolled burning and disposal of municipal waste are now increasingly seen as major intruders on global public goods.

Significant investment and development support will be needed to simply maintain the status quo. A cumulative improvement to public health and environmental conditions locally and globally will require significantly enhancing investment and support programs to scale up waste collection, disposal and treatment capacity to both cover rising waste generation and progressively narrow the existing service gap. Without a dramatic improvement in waste collection coverage and waste recovery and disposal practices, the scale of current environmental impacts will increase markedly.

The 'gap' in solid waste management

Against this background, widespread national ambition to improve waste management and transition towards more advanced circular economy models, as recorded in national strategies and plans, is high and commendable. National governments, including in low- and middle-income countries, have recorded their aspirations to quickly curb pollution, extend services to underserved areas, and increase recovery and recycling. However, actual performance and achievement of national targets and objectives remain limited.

The achievement of national targets and objectives depends on the ability of sub-national authorities to provide waste management services on a reliable basis. Yet, many local authorities struggle to deliver waste services to their constituencies that meet national aspirations and wide ranging environmental, financial and social objectives.

When a disconnection or 'gap' exists between aspirations of the central level waste policy and the ability to meet the aspirations through waste management services at the local level, ambition as expressed in national strategies or international commitments remains unfulfilled. A 'gap' between intent and actual performance usually points to a failure in institutional frameworks and the enabling environment.

Central authorities often regard solid waste management as a local function and beyond their mandate. Line ministries often do not see it as being either their role or practical for them to provide the guidance, support and resources needed by local authorities to implement national policy. Yet, the primary responsibility for setting the overall institutional, policy and legislative framework for the municipal waste management sector belongs with central governments.

The primary responsibility for providing on-the-ground services and for ensuring the controlled management of solid waste, on the other hand, lies with the local authorities. Often fiscally constrained with many competing priorities beyond waste, local authorities may have limited ability to deliver adequate services. Their technical and operational capacities may be stretched, resulting in sub-optimal arrangements for service delivery, or in poor engagement with stakeholders that are crucial to implementation of local services, including the general population and other waste generators, the private sector, and the informal sector.

While this paper focuses on the disconnect between ambition and performance, arguably there is more than a single 'gap'. There is the gap in waste management outcomes across countries of different income levels, there is a funding gap for services and infrastructure, and there is a technical and operational capacity gap at all government levels, among others. This paper argues that enabling the waste sector to perform at the desired level requires integrated waste management systems across all levels of government with clearly assigned institutional responsibilities, roles and functions; adequate policies and economic incentives and financing; local capacities for service provision; and proactive inclusion of community, public and private stakeholders. It discusses good practices for the governance of the solid waste management sector in a context of pressing need. The document is organized along seven chapters.

First, requirements for a sound institutional structure for waste management are presented by discussing the functions, roles, responsibilities and inter-relationships at and between each tier of government that serve as a foundation for a cohesive and coordinated sector.

Second, the policy and policy actions needed to guide the planning process across local and central government authorities are outlined, along with the legal framework required to enable the achievement of policy objectives and actions.

Third, financing – the single most critical requirement for sustained operations – is discussed at length, along with the roles and responsibilities of each tier of government in securing investment and sustained operational funds.

Fourth, the paper outlines organizational models for service delivery and the need to align them with local context, need and objectives.

Fifth, special focus is given to stakeholders engagement, communication with constituencies, and informal sector integration as components of a well-functioning waste management system.

Finally, the paper closes with mechanisms and policies that responsible central authorities may orchestrate in order to advance public objectives, influence the behaviour of waste producers and handlers, and make step changes in service level and performance at a national scale

Together, these chapters aim to give practical guidance on waste management governance to national and local authorities as well as practitioners. The key messages of the paper are summarized by chapter below.

Creating the right institutional structures

An integrated waste management system relies on a network of formal roles and responsibilities across every tier of government. These roles must cover functions that include policy-making, strategic planning, regulatory enforcement, service operations, and finance.

An effective institutional structure is the foundation for delivering a well-functioning waste management system. It creates an enabling framework that encourages different institutions to work together to deliver services and infrastructure, in line with national objectives and priorities but reflecting local needs and constraints.

There are two key aspects of an effective institutional structure for waste management: clarity of roles and functional responsibilities at different levels of government, and clear and open collaboration, coordination and exchange amongst those institutions.

Chapter 2 is dedicated to these structural issues, firstly, by exploring the characteristics of institutional frameworks, and secondly, by describing the responsibilities that lie at each key tier of government. The Chapter zooms in on the critical functions within each waste management role and sets the stage for the discussion in subsequent sections.

Critical functions within each waste management role can be summarized as follows:

The **'policy maker'** role is responsible for defining strategic objectives for the sector and for establishing the legislative and regulatory framework for waste management; defining responsibilities of institutions, waste generators, and owners and operators of waste management services and facilities; and ensuring coordination with

other sectoral policies. Policy makers also define the frameworks for technical and performance standards, set basic rules for the organization, and guide the implementation and financing of waste management. Establishing effective enforcement mechanisms is another key policy maker role.

The **'planner'** role includes responsibilities for developing and implementing a strategic implementation plan that establishes how the overarching policy objectives and targets will be achieved. This planning role covers multiple waste management aspects, including waste prevention and service delivery, future options for waste management, procurement procedures, and management information systems. Monitoring and evaluation by planners also enables revisions to implementation approaches. At the central government level, the planner role is normally closely linked to the policy maker role.

The **'regulator'** role is required to ensure oversight and follow-up to the activities of service providers, and to enforce the general implementation of legal requirements. The regulator role deals with permitting and/or registration of waste facilities and operations, control over various waste generators and holders, and contract administration.

The **'service provider'** role involves the actual delivery, or assurance of the delivery, of waste management services and facility operations. The 'operator' function can be delegated to third parties, such as the private sector, under the control of contracting public authority, which acts as the 'client'. Alternatively, the local authority may have its own operational unit or establish a public company to provide certain services. The assignment of both the 'client' function and the 'operator' function to the same public authority, in case of direct public provision of services, requires appropriate mechanisms of accountability, independent controls, and recognition for good performance.

The **'financing'** role ensures that appropriate financial flows are in place to cover operational costs and to fund capital investment for infrastructure development.

The different roles above can sit across administrative units and between administrative tiers.

Policy, planning and legal frameworks

Policies are needed to guide the planning process across local and central government authorities; a corresponding legal framework is required to enable the policy objectives and actions to be achieved.

The formulation of a strategic plan for waste management that conforms with government policy and legislation is a fundamental prerequisite for a successful waste management system. Strategic plans set objectives and targets, are consistent with baseline conditions, reflect an analysis of development options and identify credible financing sources. Central governments have overall responsibility for strategic planning of waste management to meet national policy objectives.

Developing sub-national plans is an essential function of local authorities but is one that is often overlooked due to their primary focus on operations. A planning process is needed to align national and sub-national strategies. Individual municipalities should be encouraged to follow the national plan, especially when building new infrastructure and facilities, to ensure that the development of the sector is consistent and properly coordinated across the country and makes efficient use of public resources.

Chapter 3 discusses the considerations and processes of planning in terms of guiding principles and policy objectives, situation analysis, minimum required treatment and disposal capacities, and the scope and content of formal plans. Legislation that establishes the overall planning framework and that creates the context within which plans could be implemented is also discussed. The different categories of legislation as well as the legal requirements typically covered in the legislative framework are presented as well.

It should be noted that policy objectives should develop progressively over time in step with gradual improvements in waste management, alongside proper regulation and financing. International experience confirms that transitioning the sector towards resource efficiency and the concept of the circular economy are largely not market driven but depend on regulation and require significant financing. This aspect is often misunderstood, and there could be a desire to emulate approaches that are seen to work in well-regulated, high-income countries with the expectation that they will work equally well elsewhere. This is commonly reflected in a tendency to set objectives that are overly ambitious, unrealistic and unachievable.

Options analysis could be used to test to what extent local goals and ambition is practically feasible in the current circumstances. The analysis serves to formulate and compare different technical, financial and institutional alternatives to deliver defined objectives and determine the optimal future waste management system. It is also used

to assess whether objectives are realistic and can feasibly be achieved within specific deadlines over the planning period.

Having clarity on the near-term and long-term national or regional goals is highly relevant for local authorities and aids the process of waste management planning at the local level. National plans and strategies can serve to inform local authorities of the intended sector landscape in terms of infrastructure, facilities and their projected capacities, and the desired level of regionalization on service delivery.

It should be emphasized that waste management is increasingly seen as an important sector for climate change mitigation and adaptation which makes sector policy and planning frameworks especially relevant. Waste management practices are associated with climate benefits leading to both local adaptation outcomes, such as improved community health, environment and economic opportunities, and global mitigation outcomes such as reduced greenhouse gas emissions. This means that cities could access climate finance to reduce emissions generated by the waste sector and to improve adaptation outcomes.

Indeed, the waste management sector offers sizeable greenhouse gas emission abatement potential both directly – by reducing dumping, burning and better landfill gas management, and indirectly through increased source separation and recycling. Low-income countries often have very high greenhouse gas emissions from waste, reaching 30 percent or more of a city's greenhouse gas inventory. This is due to higher relative proportions of organic waste, high quantities of dumped waste, and low energy intensity compared to middle- and high-income countries. When basic waste collection and disposal with landfill gas management are in place and countries start to transition upwards along the 'waste hierarchy' towards greater recycling and waste prevention, the sector offers larger potential for emission abatement through recycling, which reduces new virgin material production and associated energy consumption and emissions.

Waste sector planning also ties directly to the global ambition to curb plastic ocean pollution. Over 80 percent of ocean plastics come from unmanaged or poorly managed municipal solid waste. Given that plastics production and use is projected to increase significantly in coming decades, some proportion of this material will inevitably make its way into the environment unless waste management systems improve. To that end, international organizations and other financiers have mobilized resources to assist countries in their efforts to curb marine plastic litter. As these efforts reply on municipal waste systems, public authorities might streamline their planning efforts to access international plastic pollution reduction finance that support both 'downstream' and 'upstream' solutions focused respectively on waste management and waste prevention.

Financing for sustainability and as an incentive

Waste management is costly, and the availability of investment and operational finance is arguably the single most critical factor in determining the sustainability of municipal waste services. Whilst revenues from recycled materials and energy tariffs can provide revenues for operational costs, they are typically far smaller than the full costs associated with operating waste management systems.

There is therefore a need for close interaction and collaboration between central government authorities and local authorities to ensure that service objectives are realistic, achievable, and financially viable.

Chapter 4 discusses financial aspects of municipal waste service. It covers the requirements for defining the full costs of the services, the need to recognize the opposing constraints of affordability and financial viability, the sources of finance used to fund investments in waste management services, and the annual revenue required to cover the full costs of municipal waste service.

The Chapter outlines several key policy decisions that must be taken at the national, regional, and municipal levels when defining and preparing the optimal waste management strategy and its associated financing strategy, as summarized below.

First, countries should consider whether to apply the 'polluter pays' principle and to what extent it impacts affordability, cost recovery, and the behaviour of waste generators.

Second, a key policy decision is whether to implement a traditional charging mechanism with the objective of meeting cost recovery and revenue stability objectives or a quantity-based charging mechanism aimed to give users incentives to minimize waste generation and separate their waste for recycling.

Another key policy decision is whether the services will be provided directly by the local authority or delegated to private sector operators, and how the related service costs will be financed and charged to households and legal entities. Tariff structures and charging models related to this

decision can have a bearing on performance and fee collection efficiency.

Policy may also be needed to formalize the support given to low-income or vulnerable households, to apply a value-added tax on waste services, and to organize the provision of waste services to legal entities.

Finally, it may be necessary to consider policy regarding the revenue consequences of primary waste collection that occurs outside the domain of the formal local authority service, such as through community-based enterprises. A key policy decision municipalities face is whether to introduce a separate user fee to cover the costs that it incurs for subsequent transportation, treatment and disposal.

As international experiences indicate, costs are a frequent barrier to the realization of national waste management ambitions. In particular, while local governments are tasked with the implementation of waste management plans, they are often resource-strapped and ill-suited to fund the necessary capital and operations required. It is critical for both central and local governments to participate in an integrated planning process that identifies financing sources to meet policy objectives.

Organizational models

Effective organizational models – the structures that underlie waste management service delivery – should respond to the administrative needs of the desired waste management system, and not the other way around. Waste management service delivery models should be based on local financial, operational, and administrative requirements and policy objectives. The alternative, fitting waste management actions to an existing organizational model, leads to capacities and coordination structures that may not be suited to policy objectives.

Good organizational models reduce financial limitations, sustain investments in waste management facilities, and may capture opportunities for cooperation and economies of scale between local authorities. The organization of services may also make waste management operations attractive to the private sector in order to harness its potential for investment, new technologies, and technical know-how in service delivery.

Although waste services are mainly implemented by local authorities, organizational success can be aided significantly by supportive arrangements from the central government, namely in the form of enabling legal frameworks for intermunicipal cooperation and private sector involvement, specific guidance, or incentive structures.

Chapter 5 considers three main models for municipal waste management service provision: models for service delivery by local authorities (directly or through municipally owned companies), intermunicipal cooperation between local authorities, and private sector involvement.

Intermunicipal cooperation is often considered by local authorities because most waste treatment and disposal installations demonstrate significant economies of scale with rising plant capacity. The Chapter discusses the main models of intermunicipal cooperation as well as factors that have an impact on the form of cooperation.

The Chapter further presents models for private sector involvement. A prerequisite for involving the private sector is a guarantee to private companies that they can recover all legitimate costs incurred in financing, constructing, and operating waste services. This assurance requires a recovery of the full costs of service provision, such as by setting tariffs on a full cost recovery basis and ensuring that the resulting charges are affordable to users.

Potential benefits and considerations for public-private risk allocation are also discussed as well as the contractual relationships between public and private partners.

Public participation and stakeholder engagement

The success of waste management depends on the participation of stakeholders and the presence of a 'social contract' with citizens and the population-at-large. Waste management systems are much more successful in contexts in which core stakeholders engage in and support waste policies and services. Where the public accepts and participates in waste management by abiding to guidelines in handling waste and by paying for services, waste management operations can excel. In contrast, when users or operators are disengaged or even opposed to the waste management system, performance suffers.

Waste management involves a diverse range of stakeholders and local authorities must take them into account in designing an effective waste management system. Their perspectives can not only help foster positive behaviours that allow the system to function smoothly, but also help local authorities build a more equitable and just public service that is sustainable in the long-term. By ensuring that the waste management system serves all stakeholders,

local authorities may nurture a widespread sense of 'ownership' of the waste management system that leads to positive social, environmental, and economic outcomes.

Chapter 6 builds on the basic principles and approaches of citizen engagement and focuses on three aspects of particular importance for the waste sector: effective public outreach and communications, integration of the informal sector with the rest of the sector chain, and gender-inclusivity in waste management practices.

Waste management requires public participation when it comes to proper waste placement, source separation, waste minimization, and siting of infrastructure. Gaining public buy-in requires on-going and financially-backed communications and awareness-raising activities that are sometimes overlooked but essential to successful waste management systems. Public communication programs in waste management are most effective when they focus not only on informing users of basic rules and processes, but also on citizen empowerment, feedback generation, and collective ownership. This Chapter describes key considerations for national and local waste administrators in planning and executing public communications. These considerations include audience identification, messaging, partnerships, inbound communication, and outreach channels.

A particularly important stakeholder group that must be engaged in waste management is the informal sector. The informal sector consists of workers that are not formally charged with waste management activities. Yet, the informal sector often plays a key role in delivering basic waste collection services and achieving resource sustainability in low- and medium-income countries, often at low direct cost, while generating local employment. However, despite the benefits of the informal sector, informal waste workers generate challenges and points of tension for local governments, especially as waste systems formalize in rapidly urbanizing contexts. Several solutions for efficiently integrating the informal sector into a modernizing waste sector are presented in this Chapter, including through policies, organization and cooperation, and occupational recognition.

Another important consideration is the distinction between how people of different genders experience the waste management sector. While waste management is a universal service that effects all citizens, social structures, traditional household roles, and gendered disparities in employment opportunities in both formal and informal capacities can strongly influence social and economic outcomes for a large population. There are several actions that can be taken toward gender-inclusive waste management that include learning through consultations, providing fair employment structures, and equalizing access to capital and economic resources. Options and examples of successful practices are discussed in the final section of Chapter 6.

Policy instruments

A careful mix of policy measures and an enabling legislative environment are required to ensure effective action at all levels of government to move waste management practices towards national objectives in a cohesive and coordinated way. To be effective, policy instruments should preferably be applied by the central government and cover the entire territory of the country.

Policy instruments must be appropriate to the context. Experience illustrates that only once the basic foundations of a waste management system are in place it is feasible to fully implement progressive policies to move up the 'waste hierarchy' that advances from traditional disposal to reuse and prevention, and towards sustainable resource management. To make this possible, it is important that the market failures associated with poor waste management (especially waste dumping) are corrected first.

Chapter 7 provides international examples of policy instruments for sustainable resource management. The examples presented should be considered potential tools and be evaluated within each country-specific waste management context. A different mix of policy instruments will be required in different contexts and at the different stages of development if the waste management system.

The key policy mechanisms available for supporting the transition to sustainable resource management should be pursued in line with the 'waste hierarchy'. First, policy instruments related to waste collection and controlled disposal should be secured, followed by measures to support the transition to sustainable resource management, and finally tools to move towards a circular economy.

For example, policy instruments for landfill diversion include landfill taxes, landfill bans, disposal sites inventories, and limits on landfill financing. Measures to establish effective landfill management are essential for moving up the 'hierarchy' and could be considered when dumping is not practiced and alternatives to landfilling could be considered. Collectively, these instruments create conditions for reducing dependence on landfilling and transitioning along the 'hierarchy'.

Instruments towards increased recycling and recovery, including recycling and recovery targets, standards

Organic waste at a compost plant. Photo: AnSyvanych

for recycled materials, design for recycling, and taxes related to recycling content are also discussed in Chapter 7. Extended producer responsibility for packaging waste is presented at some length. Reuse and repair as well as waste prevention and minimization are also explored briefly with various examples of policy instruments.

The Chapter concludes with a short description of the circular economy. The transition to the circular economy is likely to advance at different speeds in high-, medium- and low-income countries and will depend on their baseline conditions, economic development, national income and financial capacities. There is a concern that the waste management 'gap' between countries, including in waste prevention and waste material re-utilization, will widen further before it begins to converge. This is due largely to dramatically different conditions across countries with different income levels, with most high-income countries implementing advanced waste management technologies and some circular economy policies whilst low- and many middle-income countries continue to struggle with implementing and sustaining the most basic of waste management services.

In a business-as-usual scenario, and given projected waste generation growth forecasts and the ways in which municipal waste management services are currently organized and financed, a progressive worsening of the imbalances between higher and lower income countries seems almost inevitable. In the meantime, pollution of the air, soil and oceans is becoming a major environmental emergency that demands immediate attention.

A business-as-usual scenario is not sustainable and must change. Extending municipal waste collection services and providing for the safe disposal of wastes must be the immediate priority for countries that contribute to local and global pollution, along with concerted efforts to enhance the environmental awareness of constituencies and inspire behaviour change.

These 'downstream' solutions (postconsumer, such as recycling and disposal), though regarded as transitional, are a foundational prerequisite for a transition upwards on the 'hierarchy' and towards a circular economy. Expanding waste collection services in low- and middle-income countries, providing support to the informal sector, and building facilities as an intermediate solution to dispose of waste materials that cannot be recycled economically, must be applied together with circular strategies focused on waste prevention and reduction.

Concerted effort will be required. Active collaboration between governments, businesses, the manufacturing industry, entrepreneurs, the research and development community, and philanthropic and citizens' organizations will be needed. Above all, an environmentally aware and inspired world population must drive the change towards sustained environmental practices – demanding action from administrations and individually practicing sustained consumption and utilization behaviour.

This executive summary captures concepts from the full Bridging the Gap publication but is not a complete portrayal of the requirements of effective waste management governance. For details, case studies, and sources, please refer to the main text.

'Solid waste management' and 'waste management' are used interchangeably in this document.

About 1,500 people from various communities participated in Indonesia's National Waste Awareness Day. Photo: © Gholib Marsudi Draemstime.com.

1 Introduction

The quantities of municipal solid waste are increasing[1]

By 2050, in a business-as usual scenario, the world is projected to generate 73 percent more municipal solid waste than in 2020. The increase in waste generation is driven by economic development, urbanization and population growth.

High-income countries produce the most waste per capita, where rising incomes and consumption have gone hand-in-hand with higher waste generation. Going forward, waste generation rates in most high-income countries are expected either to remain stable or to slightly increase. For countries with the highest per capita GDP, a slight negative correlation between per capita income and waste generation is expected, with waste production beginning to curve down recently.

Middle income countries, on the other hand, are projected to see the largest increase in both per capita waste generation and total waste generation over the next 30 years. This waste generation will be driven by high levels of growth in both economic activity and population. Urbanization will additionally contribute to this process as higher urban consumption patterns replace rural ones. Waste volumes are projected to grow by more than 2.5 times for low-income countries and nearly double for middle-income countries

Waste collection rates vary widely with national income levels. In high-income countries, collection rates are close to 100 percent. However, in lower-middle-income countries, collection rates are 51 percent, and in low-income countries, only 39 percent. Uncollected waste in low-income countries is typically managed independently by households and is openly dumped, burned, or less commonly, composted. Collection rates are substantially higher in urban areas than in rural areas as waste management tends to be an urban service. In lower-middle-income countries, waste collection rates in cities are more than double those in rural areas.

Globally, 33 percent of waste is openly dumped, 37 percent is disposed of in various types of landfills, 19 percent is recovered via recycling and composting, and 11 percent is treated in incinerators. Open dumping is prevalent in low-income countries, where 93 percent of the waste is burnt or dumped.

Wide-spread poor waste management practices have large environmental impacts and pose direct risks for human health. Waste burning is a significant source of air pollution when it occurs in open dumps or in facilities that emit pollutants and fine particles that are particularly dangerous to human health.

Littering and disposal of waste through open dumping leads to soil contamination and pollution of rivers, lakes and underground water, and of human living environments. Waste discarded into drainage systems leads to blockages, creating risks of flooding and breeding grounds for disease. Significant risk is associated with landslides and fires at landfills and larger dump sites.

Dump sites and landfills occupy valuable agricultural land and locating new sites for treatment and disposal facilities becomes increasingly difficult with growing levels of urbanization. Scattered dumping also drives market and real estate values downward and negatively impacts tourism and local economic development.

Globally, the state of the sector is a matter of concern

The environmental impact of inadequate waste management practices and the growing quantities of globally generated waste gives serious reasons for concern.

The extraordinarily large quantities of waste that either go unmanaged or are inadequately managed are unacceptable. At the same time, quantities are only increasing. Global improvements in waste management practices at their current speed will likely not be sufficient to offset the adverse impact of poorly managed waste given the rapid increase in quantity. This rapid increase in quantities alone will require significant effort just to maintain the status quo.

Waste management practices in lower-middle and low-income countries is of particular concern. There has been a notable increase in the quantity of municipal waste generated annually in these countries while future growth is projected to result in an additional 550 million tonnes in 2040 over 2020 levels, an average annual increase of 27.5 million tonnes per year.[2] Given the gap between the waste currently generated and the small share of that which is managed properly, the projected increase in waste generation will only widen this gap further in a business-as-usual-scenario.

[1] Section is based on Kaza, S., Shrikanth S. and Chaudhary, S., More Growth Less Garbage, World Bank, 2021 and What a Waste 2.0, World Bank, 2018 (Note that as of July 15, 2021, the waste generation estimates have been updated with the final publication on More Growth, Less Garbage).

[2] Ibid

Beyond significant local impacts, municipal solid waste is a major source of marine litter and contributes to greenhouse gases. Marine pollution and greenhouse gas emissions from the uncontrolled burning and disposal of municipal waste are now seen increasingly as a major intruder on global public goods.

Studies suggest that millions of tonnes of plastic leak into the ocean every year. It is estimated that over 80 percent of ocean plastics comes from unmanaged or poorly managed municipal solid waste on land.[3] Three-quarters of that quantity is found to come from uncollected waste with the remaining quarter leaking from within the waste management system due to poor controls and secondary pollution, such as unauthorized dumping of collected waste.[4] Given that a third of the municipal waste generated globally is currently dumped and that waste generation rates continue to increase, a business-as-usual scenario would result in a global emergency.

Beyond pollution, solid waste contributes to greenhouse gases (GHG) emissions. An estimated 1.6 billion tonnes of CO_2-equivalent of GHG emissions were generated from solid waste in 2016, some 5 percent of global emissions, primarily due to open dumping and unmanaged landfill gas. Without improvements in the sector, solid waste related emissions are anticipated to increase to 2.6 billion tonnes of CO_2- equivalent by 2050.[5]

The global impact of proliferating waste on the public good has made it increasingly apparent that a business-as-usual scenario is neither sustainable nor desirable and the current trajectory must change.

Making a cumulative improvement to public health and environmental conditions locally and globally will mean significantly enhancing investment and support programs to scale up waste collection, disposal and treatment capacity, systems and capacities to cover both the rising waste generation and progressively narrow the current service gap. Without drastic improvement in waste collection coverage and waste recovery and disposal practices, the scale of current environmental impacts will increase markedly.

The calls for action and emerging global partnerships are a promising start. Internationally, several important initiatives have been launched with aims of reducing pollution and the loss of resources. The G20 Action Plan on Marine Litter[6] is an example. Several individual or group of governments have adopted regional plans. International and philanthropic organizations, notably the Ellen McArthur Foundation, are spearheading policy dialogue and innovation in this important area whilst others are supporting grassroot initiatives and social action.

A call for a global UN Treaty on Plastic Pollution was recently made by the Ellen McArthur Foundation, World Wildlife Fund (WWF) and Boston Consulting Group, drawing parallels with the experience gained from the Montreal Protocol[7,8,9]. The proposal calls for global goals and binding targets in order to 'harmonise policy efforts, enhance investment planning, stimulate innovation and coordinate infrastructure development'. It recognizes that 'while voluntary initiatives can deliver change among market leaders, an international binding approach is needed to deliver the necessary industry scale change.'

Major businesses also issued a call for a UN treaty on plastic pollution to address the fragmented landscape of regulation and to complement existing voluntary measures. A manifesto[10] urges governments to negotiate and agree on a new global agreement on plastic pollution, highlighting that 'there is no time to waste'. This is the first collective corporate action calling on governments to adopt a treaty on plastic pollution.

The 'gap' in solid waste management

Against this background, widespread national ambition to improve waste management and transition towards more advanced circular economy models, as recorded in national strategies and plans of governments in countries around the world, is high and commendable. National governments, including in low- and middle-income countries, have recorded their aspirations to quickly curb pollution, extend services to underserved areas, and increase recovery and recycling. However, actual performance and achievement of national targets and objectives remain limited.

[3] Stemming the Tide: land-based strategies for a plastic free ocean, Ocean Conservancy and McKinsey Center for Business and Environment
[4] Ibid
[5] What a Waste 2.0, World Bank, 2018
[6] Available at https://g20mpl.org/wp-content/uploads/2020/11/G20mpl_20201214_IGES_second-edition.pdf
[7] The Montreal Protocol on Substances that Deplete the Ozone Layer
[8] See https://www.ellenmacarthurfoundation.org/news/ngos-and-businesses-call-for-un-treaty-on-plastic-pollution
[9] See https://www.worldwildlife.org/press-releases/ngos-and-businesses-call-for-un-treaty-on-plastic-pollution
[10] Available at https://www.plasticpollutiontreaty.org/

The achievement of national targets and objectives depends on the ability of sub-national authorities to provide waste management services on a reliable basis. Yet, many local authorities struggle to deliver waste services to their constituencies that meet national aspirations and wide ranging environmental, financial and social objectives.

Although municipal solid waste management is a critical — yet often overlooked — activity in the process of planning sustainable and healthy cities and communities, it has typically and historically been regarded simply as a local issue. Previously, concern over the cross-border impacts of waste focused mainly on trans-frontier shipments. These perceptions are now rapidly changing with growing concern over the contributions made by municipal solid waste to marine litter and climate change. These matters of global interest now create opportunities for renewed partnerships and collaboration at the national and local levels.

The primary responsibility for setting the overall institutional, policy and legislative framework for the municipal waste management sector belongs with central governments. The primary responsibility for providing services and for ensuring the controlled management of solid waste lies with local authorities.

The enabling environment provided by the central government should empower, motivate, guide and provide local authorities with the resources that they need to perform their institutional waste mandate effectively. It should support the achievement of national objectives whilst recognising local needs and constraints.

When a disconnection or 'gap' exists between the aspirations of the central level waste policy and the ability to meet them through waste management services at the local level, ambition as expressed in national strategies or international commitments remains unfulfilled. This widens disparities between the capacities of low, middle and high-income countries to achieve their aspirations and their readiness to progress towards more advanced forms of waste management, material handling, waste prevention and circularity.

While this document focuses on the disconnect between ambition and performance, arguably there is more than a single 'gap': there is a gap in waste management performance between countries of different income levels, there is a funding gap for services and infrastructure, and there is a technical and operational capacity gap, among others. This paper argues that a 'gap' between intent and actual performance usually points to a failure in institutional frameworks and the enabling environment. This may result from a failure to effectively assign roles and responsibilities within the institutional framework, such as through a mismatch between the high level of ambition within policy and legislative frameworks and regulations and the availability of investment and operational financing. It may also be the case that the central authorities or line ministries do not see it as being either their role or practical for them to provide the support and resources needed by local authorities to implement national policy. This typically points to a significant failure in the enabling environment for the sector.

Similarly, local authorities, which are often fiscally constrained with many competing priorities beyond waste, may in practice have limited ability to deliver adequate services – particularly in low- and middle-income level countries. Their technical and operational capacities may be stretched, resulting in sub-optimal arrangements for service delivery or in poor engagement with the sector stakeholders crucial to successful definition and implementation of local services, such as the general population and other waste generators, private business, and the informal sectors.

This document argues that addressing the 'gap' and enabling the waste sector to perform at the desired level, requires integrated waste management systems across all levels of government with clearly assigned institutional responsibilities, roles and functions; adequate policies and economic incentives and financing; regulation, monitoring and enforcement; local capacities for service provision; and proactive inclusion of community, public and private stakeholders.

Purpose and audience

Bridging the Gap in Solid Waste Management discusses good practices for the governance of the solid waste management sector in a context of pressing need.

It aims to impress the need for integrated waste management systems across all levels of government with clearly assigned institutional responsibilities, roles, functions and tasks, adequate policies, economic incentives and financing, local capacities for service provision, and proactive inclusion of community, public and private stakeholders.

The document aims to contribute to the body of knowledge and experiences in organizing and managing municipal solid wastes. It provides practical information, guidance and advice that seeks to inform and complement the work of national and local authorities and practitioners. The document has been designed to be read in full so that the

insights from each section can be interpreted in complete context, though it can also serve as a reference document with topics separated by chapter.

Bridging the Gap in Solid Waste Management was prepared at an opportune time. The Covid-19 pandemic unlike any other crisis put the world on pause, not only resulting in a significant global loss to GDP but also highlighting the importance of proper sanitation systems, essential workers, and government preparation in the event of an emergency. The pandemic also provided an opportunity. There has been an unparalleled call for action and resource mobilization for recovery. Many see an opportunity, unrivalled in scale, to rebuild in greener and better ways. Ensuring that the solid waste management sector is incorporated in the growing call to promote more sustainable, low carbon urban growth is critical to changing the current urbanization trajectory. An energized, well-organized and adequately resourced municipal waste sector is also an opportunity for improving the livelihoods of marginalized community members and for bringing better economic prospects for communities, businesses and the public sector.

This publication is organized as follows:

CHAPTER 2 presents the requirements for a sound institutional structure for waste management. It addresses functions, roles, responsibilities and inter-relationships at and between each tier of government as a foundation for a cohesive and coordinated sector.

CHAPTER 3 outlines the policy and policy actions needed to guide the planning process across local and central government authorities and the legal framework needed to enable the policy objectives and actions to be achieved.

CHAPTER 4 discusses financing and the need to recognize it as the single most critical requirement for sustained operations. Particular attention is given to underlying conditions and practices to secure operational financing.

CHAPTER 5 outlines organizational models for service delivery and the need to align them with local context, need and objectives.

CHAPTER 6 is about stakeholder engagement with particular focus on public outreach and communications, the informal sector and gender in waste management.

CHAPTER 7 provides a list of targeted policy instruments to advance policy objectives, influence behaviour.

The paper contains numerous country examples. An attempt has been made to present a geographically balanced distribution of case countries across all continents. The country examples span unitary and federal states and exemplify differences in sector governance across institutional tiers. The case studies also include low-, middle- and high-income economies in order to highlight potential solutions in contexts that differ in level of capacity, resources, services and objectives. While the case studies cover a variety of approaches and results achieved worldwide, they are not meant to be directly emulated as best practices but rather to provide illustrative examples that can inform locally driven design.

While critical to the evolution of the waste management sector, the role of technology is deemphasized in this publication in order to provide a dedicated focus on governance. The reader may explore considerations around technology, infrastructure and innovation in solid waste management through several companion publications from the World Bank, which include:

- What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050, (2018)
- Decision Maker's Guides for Solid Waste Management Technologies, (2018)
- Municipal Solid Waste Management: A Roadmap for Reform for Policy Makers, (2018)
- Financing Landfill Gas Projects in Developing Countries, (2016)
- Sustainable Financing and Policy Models for Municipal Composting, (2016)

'Solid waste management' and 'waste management' are used interchangeably in this document.

"Keep Ghana Clean" sign on trash removal tricycles in Accra, Ghana.
Photo: © bdodane / Alamy Stock Photo

2 Creating the right institutional structures

2.1 Recognizing the need for enabling institutional framework

An effective institutional structure is the essential foundation for delivering a well-functioning and integrated waste management system across all levels of government. Waste management service delivery is typically a local authority responsibility with central government setting policy and the overarching legislative framework. However, this simple description obscures the much more complex division of roles and responsibilities that sit across different tiers of government, functions that include policy and strategic planning, regulatory enforcement activities, monitoring and data reporting, financing and communications.

The institutional structure that is applied to deliver these different functions needs to recognise this complexity and be organized in such a way as to guide, empower, influence, incentivize, and resource subnational authorities. The structure needs to create an enabling framework that encourages different institutions to work together to deliver effective waste management services and infrastructure, in line with national objectives and priorities but reflecting local needs and constraints.

There are two key aspects of an effective institutional structure for waste management: clarity of roles and functional responsibilities at different levels of government; and ensuring clear and open collaboration, coordination and exchange amongst those institutions and between different tiers of government.

This chapter discusses these issues further, firstly exploring the characteristics of institutional frameworks that support collaborative and effective waste management, and secondly describing the responsibilities that are encountered at each key tier of government. It zooms in on the critical functions within each waste management role and sets the stage for the discussion in subsequent chapters.

2.2 Institutional roles and functions

Achieving coordinated and effective waste management requires that the roles and tasks of different institutions are clearly defined and integrate well with each other, both between institutions and between different tiers of government. Where there is ambiguity or overlap, there are often problems associated with duplication of effort, gaps in responsibilities and confusion. The responsibilities held by each institution need to be matched by financial and technical capacity. When the capacity does not match the role, national ambitions for waste management are unfulfilled at the local level.

It is important to recognise that there is no 'one size fits all' way to structure institutions for waste management, in the same way that there are numerous ways to plan, operate and finance waste management systems. The structure used needs to fit the context and constraints. A range of factors will determine the appropriate institutional framework, such as size of territory and population, geographic characteristics, predefined administrative and political division, the level of development of the waste management system, technical and financial capacities and demands, and existing institutional structures. There are also interactions with other stakeholders that are important, particularly the private and informal sectors who play a key role in service delivery.

The institutional structure will need to evolve as the waste management system itself develops. As consumer behaviour alters, affordability improves, technologies develop and wider issues affect waste management systems, the institutions and the roles that they fulfil need to adapt. As the concept of the circular economy gains prevalence, the links between waste management and other aspects of government, such as industrial strategy and commerce, become increasingly important.

The roles and responsibilities of different institutions in the context of waste management can be defined as[11]:

- **Policy maker –** responsible for setting the overall strategic direction for the sector, defining targets and objectives, and establishing the necessary legislative framework
- **Planner –** the body (or bodies) that are responsible for making and implementing a long-term strategic implementation plan that will meet the defined policies for waste management, and for monitoring progress against that plan. This role will also often have data management function, establishing the framework for monitoring performance and collecting data
- **Regulator –** responsible for ensuring that environmental, technical and financial standards are enforced, and for administering contract requirements to ensure that waste management services and infrastructure commissioned from third parties meets defined standards

[11] Based on Wilson, D., Whiteman A., Tormin, A., World Bank: Strategic Planning Guide for Municipal Solid Waste Management, World Bank, 2001

- **Service provider –** responsible for delivering waste management services and ensuring the controlled management of wastes
- **Financier –** the institutions that are responsible for collecting and distributing the financial flows for supporting waste management services, both in terms of operational finance and capital finance

In addition, stakeholder engagement and communication are considered cross-cutting issues that require involvement from all roles.

Each key role is described in further detail below.

Setting the policy for waste management (the 'policy maker' role)

The policy maker is responsible for defining strategic objectives for the sector (the overarching aims and targets) and for establishing the necessary legislative and regulatory framework for waste management, defining responsibilities of institutions, waste generators and holders and operators of waste management services and facilities, and also ensuring coordination with other sectoral policies. It also defines the framework for technical and performance standards and basic rules for the organization, implementation and financing of waste management. Establishing effective enforcement mechanisms is also a key part of the policy maker role.

Key functions of the policy maker are:

- Policy development
- Establishing the legislative framework for waste management
- Defining specific regulations for waste management

Developing and implementing the strategic implementation plan ('planner' role)

The planner is responsible for developing and implementing a strategic implementation plan that sets out how the overarching policy objectives and targets will be achieved. This planning has to cover different waste management aspects, including waste prevention and considering all aspects of service delivery, including the collection of waste and its final treatment, recovery and disposal.

Planning also needs to address appropriate waste management data collection techniques, analysis of waste composition, waste generation projection and assessing future options for waste management, procurement procedures and management information systems for effective monitoring, evaluation and planning revision.

Improvement of the planning process for waste collection services and waste disposal systems should be undertaken concurrently with improvements to the overall organisational structure for waste management at the different planning levels. At the central government level, the planner role is normally closely linked to the policy maker role. Often many of the planner and policy functions are fulfilled by the same unit in the central government.

Key functions of the planner are:

- Develop the long-term strategy/plan for the sector
- Planning of waste infrastructure
- Identifying site locations for waste management infrastructure
- Assessment of development of specific waste infrastructure
- Coordination with other authorities, administrative units and sectors
- Data management
- Capacity building

Permitting, inspection and enforcement ('regulator' role)

The waste management regulator role is required at different levels to assure appropriate oversight and follow-up to the activities of service providers, and to enforce the general implementation of legal requirements as per the strategy/plan. The regulator role deals with permitting and/or registration of waste facilities and operations, control over various waste generators and holders, and contract administration.

The contracts administration function normally addresses waste management project development and tendering, contacts management, and contractor payment and penalty control. The associated technical inspection function normally has the responsibility for monitoring compliance with facility construction works and operational requirements in contractual and associated local regulatory documents.

Key functions of the regulator are:

- Permitting of waste facilities
- Environmental monitoring of waste management operations

- Setting environmental, social and technical standards for waste management activities
- Contract management and performance supervision

Waste management service delivery ('service provider')

The 'service provider role' involves the actual delivery, or assurance of the delivery, of waste management services and facility operations. The fact that the local authority usually holds the overall and ultimate responsibility for waste management system implementation within its boundaries does not mean that it has to carry out the operation of the system itself. In many cases, it engages the private sector to do this or establishes a public company for the provision of certain services.

The 'operator' function can be handed over to third parties under the control of contracting public authority which then acts as the 'client'. Alternatively, the local authority may have its own operational unit which acts at the waste management operator. The assignment of both 'client' function and 'operator' functions to the same public authority, in case of direct provision of services, requires development of appropriate mechanisms of accountability and independent controls and recognition for good performance.

Key functions of the service provider are:

- Operational planning of waste management services (e.g. determining the details of waste management operations such as vehicles routes, collection locations, etc)
- Setting and monitoring service standards (often referred to as the 'client' function)
- Procurement of waste management infrastructure, service contracts or related equipment
- Operation and maintenance of waste management facilities
- Communications and awareness-raising
- Engaging with the informal sector and protecting welfare and livelihoods

Ensuring the sustainable financing of waste management (the 'financing' role)

The financing role is essential to ensure that appropriate financial flows are in place to cover operational costs and also to fund capital investment for infrastructure development. Operational financial flows can be generated from one or more sources: direct user fees, local taxation, transfers from central government, revenue from sales of electricity and heat, and fees from Extended Producer Responsibility (EPR) schemes. Revenues from the sale of recyclable materials can also provide a revenue stream but are very unlikely to cover the overall costs of providing waste management services. Capital funding can also come from various sources including central governments, commercial bank finance, donors and the private sector.

Key functions of the financing role are:

- Operational financing of waste management services, user fees, taxation, other revenue from sales of waste derived products, transfers and/or EPR fees
- Setting fees and tariffs
- Capital finance for development of waste infrastructure and purchase of equipment and vehicles

The different roles can sit across administrative units and between administrative tiers. For example, the 'regulator' role is often split between central government (for the control of waste management installations) and local authority (for the control of collection services). Similarly, 'financing' can be split across central government (for the provision of capital finance) and local authority (for the collection of user fees to provide revenues for the operational costs of service provision). Other roles are often more discrete in terms of where they sit in terms of administrative tiers (for example, the 'service provider' role almost always sits at local authority level).

Different institutions or administrative departments at the same administrative tier can have different roles, keeping their separate functions and not allocating them to the same administrative unit. For example, different units within a local authority are often responsible for developing the long-term strategic implementation plan for waste management ('planner' role) and the provision of day-to-day waste management services ('service delivery' role).

Different administrative levels and their interaction with roles in terms of waste management are discussed in the sections below.

2.3 Administrative tiers

The roles and functions described above are normally spread across different administrative tiers. The number of tiers and the way in which responsibilities are split between different tiers of government, varies substantially between countries. The set-up is dependent upon a

range of factors including wider (non-waste management specific) governance frameworks, historical and political factors, and geographical characteristics.

A simple institutional model for waste management roles and functions comprises two administrative levels where at national level the Ministry of Environment (or equivalent) is responsible for overall waste management policy and local authorities are responsible for organizing waste management services within their territories. Such two-level administrative structures are common in countries with relatively small population and/or geographical area.

Countries with larger populations and/or large geographical areas typically have some form of intermediary level authority to plan, implement and monitor the much greater scale of infrastructure and resources that are required in this context. Because capacity constraints within local authorities may prevent them from undertaking the planning and development of large-scale waste management infrastructure, which is also not a practical role for central governments, an intermediary tier becomes necessary. The intermediary level authority may be in the form of state level government (in the case of federal countries) or regional, provincial or county level tier in non-federal countries. It is important to appreciate that there may be more than three tiers though rarely in these cases are all tiers engaged in waste management.

For the purposes of considering the different institutional roles and functions with respect to waste management, this paper will consider three main administrative tiers:

- *Central government tier*, where responsibility for policy making, legislation and regulatory oversight roles normally sits. Planning, fund management for capital expenditure and data management roles also often sit at this level.
- *Local authority tier* is typically responsible for waste management service delivery, local policy making, monitoring and regulatory activity. A local authority may be split into a number of subsidiary levels (e.g. district and municipal authorities).

  Local authority is defined differently by countries. In **Moldova** for example an individual settlement or very few closely located settlements are local authorities, whereas in **Belarus**, local authorities comprise of a significant number of settlements around a local administrative centre and have a territory of several thousand square kilometres. The size of the local authority can also differ significantly — from villages with a few hundred residents to mega cities. These characteristics require different institutional structures and divisions of roles and functions. The territory of large cities is usually divided into smaller zones and waste management functions or tasks are delegated to separate administrative units below the central administration of the city. For example, the city of Bucharest, **Romania** is divided into six district administrations and each district is organizing independently the waste collection services while the treatment and disposal operations remain at the responsibility of the central city administration.
- *Intermediate level tier*, in the form of state, provincial or regional authority. This level of government differs distinctly between federal and non-federal countries: In *federal countries*, states normally take on some of the responsibilities that, in non-federal countries sit at the national level, such as the responsibility for setting legislation and enforcing regulations. Examples include **India** and **Brazil**, where central institutions have responsibility for waste management but where many responsibilities are delegated to state level. In some countries, such as **Belgium**, waste management functions are delegated to entity governments and are minimal at the central level.
- In *non-federal countries*, this intermediary tier is often comprised of some form of regional, provincial or county level authority. For example, the **Republic of Korea** has 17 provincial governments and 226 municipalities. The primary responsibility to manage municipal waste lies with the municipal governments while the provincial and national governments provide technical, financial and institutional support.

It is important to recognise that, in some countries, the intermediary tier for waste management does not correspond to existing administrative borders. For example, **Bulgaria** has 28 administrative regions whereas only 16 Regional Inspectorates for Environment and Water deal with issuing permits for certain waste management operations and implementing control over waste treatment and disposal facilities. Some counties do not have an intermediary tier at all.

A very specific case is the **European Union** (EU), where common policy and legal requirements obligatory for EU Member states is defined by EU Institutions, such as the EU Commission and the European Parliament, which sit above the national level.

In the context of tiers, economy of scale is an important factor, particularly for small local authorities which do not have the capacity to properly plan, implement and finance

waste management services. Economies of scale are important considerations when establishing waste treatment and disposal infrastructure where economic efficiency depends on being able to meet minimum capacity requirements. In this regard, it is common that countries with large numbers of small local authorities face difficulties in organizing waste management services, especially in rural areas. A common solution to this problem is intermunicipal cooperation, whereby local authorities cooperate to jointly plan and deliver services. In many cases this is a voluntary collaboration, albeit often with incentives and encouragement provided by national and intermediary level government.

For example, in **Brazil**, municipalities are responsible for the delivery of solid waste management services. However, with over 5,000 municipalities, approximately 90 percent of which have populations below 50,000 inhabitants, the National Policy on Solid Waste[12] encourages the formation of public consortia to deliver more cost-effective and efficient solid waste management services. The policy also states that municipalities that choose to enter into consortia arrangements for waste management have priority access to national government resources[13].

2.4 The division of roles and functions between administrative tiers

There are broadly four different models for the arrangement of waste management roles and functions across different administrative tiers:

- *Two tier system*, with central government setting policy and the legislative framework, and local authority being responsible for service delivery. For example, in **Morocco**, the Ministry of Energy, Mines and Environment establishes the legal and regulatory framework for the sector and has certain monitoring functions; and the Ministry of Interior provides technical and financial support to local authorities which are in charge of all operational aspects.
- *Federal three tier system*, with central government typically setting the overarching policy context and legislative framework but with much of the responsibility for policy-making, planning and regulation delegated to state level government, while local authorities are responsible for service delivery. For example, in **Australia**, the national government is responsible for setting the strategic direction for waste management through national legislation, policy and strategies. The eight State and Territory governments set sector targets and implementation plans for their territories. The State/Territory governments also set out the statutory responsibilities for local authorities within their jurisdictions. While the roles and responsibilities of local authorities vary from state to state, local authorities are generally responsible for the provision of waste services consistent with the policies and obligations set by the upper tiers.
- *Non-federal three tier system*, with central government setting policy and the legislative framework, an intermediary tier providing planning and co-ordination, and local authority responsible for service delivery. For example, **South Africa** has a tree-tier system (called 'spheres') with national, provincial and local levels of government. The local level distinguishes between metropolitan, district and municipal levels of government (see **Box 1**).
- *More than three tier system*. Some countries have four administrative tiers, but the fourth tier does not have significant responsibilities for waste management. For example, **Chile** has a four-tier system of government comprising the national level, regions, provinces and municipalities. Regional and provincial administrations function as branches of the national government, have some territorial planning responsibilities but play only a minor role in environmental management. At the national level, the Ministry of Environment is responsible for policy, regulation and information management. The Environmental Assessment Service is a decentralised technical agency under the Ministry of Environment, based at the regional level, responsible for environmental impact assessments (EIA), including an information system on environmental permits. The Environmental Superintendence office is responsible for compliance monitoring and enforcement of certain activities. Municipalities are responsible for land-use planning and solid waste management services, among others.[14]

[12] Brazil Law No. 12,305, August 2010 and Decree No. 7404, December 2010

[13] Firmino Silva, W., Imbrosi, D., Madeira Nogueira, J., Municipal Solid Waste Management: Public Consortia as an Alternative Scale-Efficient? Lessons from the Brazilian Experience, 2017

[14] Environmental Performance Reviews: Chile 2016, OECD 2016

Box 1 South Africa – three-tiered government responsibilities for waste management

In South Africa, the 1996 Constitution establishes three tiers of government: national, provincial and local. Local authority is further subdivided into metropolitan, district and local municipal levels of government. The mandates of each tier of government are outlined in Schedules 4 and 5 of the Constitution and further defined in the Municipal Structures Act[15]. Institutional roles with respect to waste management are set out in the Waste Act (2008).

At the national level, the Department for Environment, Forestry and Fisheries (DEFF) is the lead agent for waste management-related functions, including developing policy, national strategy and legislation, setting norms and standards, establishing and maintaining the National Waste Information System, monitoring, auditing and review, licensing waste disposal facilities and capacity building. There is a designated national waste management officer, authorised to coordinate matters related to waste management on a national level.

Other central government departments with waste-related responsibilities include: (i) the Department of Cooperative Governance, responsible for supporting municipalities to prepare integrated waste management plans. This department also coordinates the strategic framework for local authority capacity building and engagement with traditional Chiefs in rural areas regarding waste management within their territories (the Chiefs are normally responsible for financing the waste collections in their areas); (ii) the Department of Public Works which oversees the setting of norms and standards for the municipal infrastructure grants; (iii) National Treasury responsible for fiscal policy with respect to waste management.

Provincial and local governments may develop their own legislation and strategies, in line with national policy, to meet their specific needs. Provincial governments ensure that the national waste management strategy and national norms and standards are implemented at provincial and local level. Responsibilities at provincial level include development of provincial guidelines and standards, which are in accordance with the national strategy and standards; assistance to local authorities in the development of municipal waste management plans; enforcement of provincial regulations for general waste collection, and support to local authorities in the implementation of waste collection services; implementation and enforcement of waste minimisation and recycling initiatives and, promotion of the development of voluntary partnerships with industries; support to DEFF in planning for and assessing the feasibility of regional waste treatment; quality assurance of the 'Waste Information System'; supports the development of local authority capacities. As required by the Waste Act, each of the 9 provincial governments has a designated waste management officer, authorised to coordinate waste related matters in the respective province.

Trash can on the beach in the borough of Umhlanga, Durban, South Africa.
Photo: © Timothy Hodgkinson | Dreamstime.com.

Local authorities are also obliged to designate a waste management officer in their administration. The local authority level is split between district and local municipalities. Typically, 3-4 local municipalities are located within a single district. Local authorities are responsible for providing waste management services and the management of waste disposal facilities. Other responsibilities include preparation and implementation of integrated waste management plans; implementation of waste minimisation and recycling initiatives; collection of data for the Waste Information System; and delivery of public awareness campaigns.

Responsibilities such as policy making, legislation, regulation and distribution of funds remain within the authority of the national and the respective provincial government.

[15] Local Government: Municipal Structures Act, updated July 5, 2011, http://www.saflii.org/za/legis/consol_act/lgmsa1998425/#:~:text=To percent20provide percent20for percent20the percent20establishment,established percent20within percent20each percent20category percent3B percent20to

Another example is the **United Kingdom**, which has three levels of local authority - county, district, and parish councils. Local authorities are also classified according to their waste management structures and responsibilities, as either Waste Collection Authorities (WCA), Waste Disposal Authorities (WDAs) or Unitary Authorities (UAs). WCAs are District or Borough councils and are responsible for the collection of household, commercial, and industrial waste in their area. WDAs are typically county councils and are responsible for the disposal of waste collected from their corresponding WCAs. Several district and borough councils (i.e. WCAs) can be under the jurisdiction of one county council (i.e. WDA). Single-tier authorities, i.e. Unitary Authorities (UA), manage both the collection and disposal of waste and do not have an overarching county council. Parish councils, the lowest tier of local government, do not typically have any responsibilities for waste management.

Table 1 summarises the typical split of waste management roles and functions described in section 2.2 between different administrative tiers.

Table 1: The division of roles and functions between different administrative tiers of government

Role and function	Central government tier	Local government tier	Intermediate tier
Policy maker			
Policy development	Overarching policy for waste management needs to be developed at the national level together with targets and objectives for the sector.	Some policies may be developed at the local level where they relate to local targets and objectives for waste management.	In federal countries, overarching policy for waste management can be fully or partly delegated to the state level.
Establishing the legislative framework	The legal requirements for waste management need to be developed at national level.	–	In federal countries the state level may have some responsibility for establishing the legal framework for waste. In non-federal countries, the intermediate tier rarely has the power to establish the legal framework.
Defining specific regulations	National legislation typically defines the obligations and responsibilities at the different administrative levels and for the different actors (e.g. government, business, waste management operators, waste generators, etc).	Local authorities typically have responsibility for adopting local regulations and orders (i.e. bylaws or ordinances) setting the specific requirements on how waste services are organized within the specific territory. Obligatory sanitary cleaning schemes can also be a form of local regulation. Local regulations are also used to define service charges (tariffs).	In federal countries state government often has the power to establish regulations on waste management. In non-federal countries the intermediate tier does not usually have powers to create regulations, albeit there are some exceptions[16].

[16] For example, in Belarus the regional government can set tariff.

Role and function	Central government tier	Local government tier	Intermediate tier
Planner			
Develop the long-term strategic implementation plan (also referred to as strategy or sector plan).	Central government develops the national strategy/plan for the waste management sector. This sets out how the national policy is to be implemented. The general planning and policy tasks are often combined at the national level.	Development of an implementation plan at the local level is important to ensure that appropriate long-term planning is undertaken. Several local authorities can develop a common waste management plan.	In federal countries, waste management plans developed at the state level can be combined and avoid the need to prepare a national waste management plan. In non-federal countries, regional plans are often developed to define priorities at the regional level and as an intermediate step for coordinating local planning. If regional waste management plans provide sufficient detail, the need to develop local waste management plans can either be avoided or the scope of the plans can be simplified significantly (e.g. they become more like local action plans)
Planning of waste management infrastructure (i.e. determining the capacity and treatment requirements in specific areas and identifying prospective investment projects for development).	Waste infrastructure planning in some countries is done at the national level.	Planning for specific waste treatment and disposal facilities is usually done at local level. It can be undertaken by groups of local authorities operating under inter-municipal cooperation agreements. Planning for major installations can be done within local waste management plans but also as part of a wider municipal planning framework or for a more detailed infrastructure-specific analysis, such as a feasibility study.	The planning of necessary disposal and waste recovery capacities is often delegated from the national to the regional level (e.g. for defining the types of facility that are appropriate for specific service areas) The development of feasibility studies (detailed planning) can also be moved from the local to the regional level.
Identifying site locations for waste management infrastructure Identifying and deciding on waste facility location	National authorities are not typically responsible for selecting site locations for waste management infrastructure but they are involved indirectly through their responsibilities for defining site selection and approval procedures (e.g. for Environmental Impact Assessment).	Local authorities typically identify potential sites for waste infrastructure and ultimately make the choice of the preferred option.	The site selection planning process is not possible without the involvement of the local authorities. Regional authorities can have a role in leading and coordinating this process, particularly when it is intended that several local authorities should use common waste facilities.
Assessment and development of specific waste infrastructure (e.g. feasibility studies and contract procurement)	Central government is not normally involved in assessing and developing specific waste infrastructure. Nevertheless, such practices exist in limited cases usually related to implementation of government priority investment programs or under agreements with international financial institutions (IFIs) providing financing for the sector	Local authorities typically lead the assessment and development of waste infrastructure unless this responsibility is passed to the intermediate tier or an intermunicipal cooperation entity.	Assessment and development of waste infrastructure is often led by regional institutions where it involves several local authorities.

Role and function	Central government tier	Local government tier	Intermediate tier
Planner (cont.)			
Coordination with other authorities, administrative units and sectors	Central government must coordinate waste management policy with other sector policies, instruments and initiatives. It must also ensure there is effective coordination between activities at the local and regional levels for implementing national waste management policy objectives	The success of intermunicipal cooperation arrangements depends on effective coordination mechanisms at the local level	Regional authorities can be involved in organising effective coordination arrangements with local authorities, particularly when waste management planning is organized at the regional level.
Capacity building	Central government has oversight of the capacity requirements for the sector, and often takes the lead in engaging with research and professional institutions to develop waste management-focused training, education and research initiatives.	Improving the capacity of local authorities – in terms of both personnel and skills – to plan, manage and implement municipal waste management services is a core requirement.	The intermediary government normally has a key role in providing capacity-building support to local authorities. It can take the form of direct technical assistance or training support to local authority personnel.
Data manager	Central government sets the framework for collecting and managing waste management monitoring data and may also coordinate data collection at the national level.	Data collection is typically undertaken at the local level.	The intermediate level and state governments typically play a key role in coordinating data collection and managing waste management data.
Service provider			
Operational planning of waste management services (including collection, transport, treatment and disposal).	National authorities are not usually involved in planning waste collection and transport. However, they can have an important role to play in defining obligatory requirements or technical standards to be followed.	The responsibility for the planning of waste collection and transportation usually belongs to the local level.	The regional authorities can have coordination functions for planning waste collection and transport.
Setting service standards and requirements	Central government set standards and requirements for specific aspects of services (e.g. source segregation).	Local authorities have primary responsibility for implementing the waste management service standards and for ensuring that these are met by their local service providers (public or private).	Intermediate government can have a role in setting service standards but primarily from the perspective of coordinating activity and for making service standards consistent across the local authority area.
Procurement of waste management infrastructure, service contracts or related equipment	This is not a typical function of national authorities. They may have coordination and supervisory roles for the procurement of infrastructure, equipment or services financed by national public funds or implemented according to agreements with IFIs at the national level.	The procurement of waste management services and, when necessary, works and equipment is usually implemented at local level.	Part of the procurement functions of local authorities can be transferred to the regional level, especially in cases where several local authorities are served by a common treatment or disposal facility.

Role and function	Central government tier	Local government tier	Intermediate tier
Service provider (cont.)			
Operation and maintenance (O&M) of waste management facilities	No such functions are implemented at the national level.	Organized almost entirely at the local level. Operation and maintenance can be delegated to a single local authority or to an intermunicipal entity in the case of a partnership between several local authorities	The operation and maintenance of waste facilities can be organized at the regional level in a limited number of cases when the regional administrative unit acts as a contracting authority.
Communications and awareness-raising	Central government can have a role in initiating, supporting and coordinating public awareness raising and educational initiatives. This ensures consistency but generally only relates to cross-cutting issues and messages (e.g. the importance of waste reduction). The coordination and monitoring of information and awareness raising measures implemented through Extended Producer Responsibility (EPR) schemes is relatively common.	An essential role of the local authority and operators of waste management services due to their direct interface and point of contact with households and other customers	More rarely are public awareness measures provided at the regional level but they can help provide a consistent message across local authorities.
Engaging with the informal sector and protecting welfare and livelihoods	Where the informal sector plays a key role in waste management, national level government typically sets the framework for protecting it and integrating it into the formal waste management framework (e.g. through specific legislative provisions to protect the livelihoods of informal sector workers and to engage with organisations representing the informal sector).	Local authority typically has the lead role in engaging with informal sector workers as part of its waste management planning and service delivery functions.	Intermediary level government normally plays a supporting role on informal sector issues, helping the local authority to fulfil its role in engaging with the informal sector, and implementing national policies related to it.
Regulator			
Permitting of waste facilities	The permitting of waste management treatment and disposal facilities is usually organized or coordinated at the national level.	Permitting of facilities or operations is generally not conducted at local level. Nevertheless, the local authorities can impose equivalent mechanisms through the procurement procedures and contracts with service providers.	In federal countries, responsibility for permitting of both facilities and operations can be delegated from national to state level. This responsibility is also sometimes delegated to intermediate level in non-federal countries.
Environmental monitoring of waste management operations and the enforcement of regulations	The monitoring data from treatment and disposal facilities such as landfills and incineration plants are usually reported and controlled at the national or state levels.	Monitoring of waste collection services is usually conducted at the local level. Local authorities also have control functions over littering and illegal dumping of waste. The local authorities also receive monitoring data from waste recovery and disposal facilities on their territory.	In federal countries, environmental monitoring is typically conducted at the state level. In non-federal countries, monitoring can sometimes be undertaken at the intermediate level but more commonly this level serves as the basis for coordinating monitoring data rather than for conducting monitoring activities.

Role and function	Central government tier	Local government tier	Intermediate tier
Regulator (cont.)			
Setting environmental and technical standards for waste management activities	Technical standards are typically set at national level by a dedicated unit or body. This links closely to regulations set by the policy-maker but standards are typically not set in law.	Not typically regulated at local authority level. Such environmental and technical standards can be established through technical specifications set for the procurements of waste management services	In federal countries, technical and environmental standards may be set at state level.
Contract management and performance supervision	This is not typically undertaken at the national level.	Administering and monitoring service and infrastructure contracts and ensuring that third party service providers meet contract requirements are typically local government responsibilities	Contract monitoring may be conducted by intermediate government where that tier is the contracting authority.
Financing			
Operational financing	The operational financing of waste management services is primarily a local responsibility. Nevertheless, many countries support operations at the local level via transfers from the state budget or from other sources of public finance. EPR is also a key potential revenue source.	Primary responsibility for financing waste management services sits with the local level. Funding can be provided from earmarked local taxes, service fees or direct transfers from the local budget.	In some countries funding support for operational expenditures is provided via intermediate level government transfers to local authority budgets.
Setting fees and tariffs	The rules for setting tariffs for waste management services are usually defined at national level.	Local government has responsibility for determining and levying user charges (tariffs), assessing their affordability to users, and deciding on the appropriate mix (if any) of user charges and budget transfers needed to operate the services on an affordable and sustainable basis.	In some countries the fees applied at local level are regulated at regional level.
Capital finance for development of waste infrastructure and purchase of equipment and vehicles	Central government will often provide grant support to part finance municipal investments in waste management infrastructure. Support can be in the form of transfers from the state budget or financing through various state managed programs or funds	Local authority has prime responsibility for funding capital infrastructure but will often do this by seeking support from intermediate tier or central government and/or through private investment.	Intermediate level government often provides support towards capital intensive waste management projects.
Other			
Appointment of personnel	Institutions at all levels are responsible for the appointment of necessary personnel		
Training of personnel	Institutions at all levels are responsible for the training of necessary personnel		

2.5 Critical functions within each role

Where waste management and infrastructure need to be improved, and especially where a step change in service level is needed, attention should be paid to those critical functions and issues within each institutional role and administrative tier with most bearing on sector performance. These are briefly outlined below and discussed in further detail in subsequent Chapters.

2.5.1 Policy maker role

The policy maker role is responsible for formulating, defining and coordinating a coherent policy direction for the sector and setting the overarching legislative framework for its implementation. Critical functions and issues that need to be addressed include:

- Waste management, almost universally a local authority responsibility, needs to be identified as a priority by the central government, (*central government tier*)
- A clearly assigned institutional leader should be assigned with responsibility for waste that is adequately resourced, (*central government tier*)
- A streamlined legislative framework and supporting regulatory system is needed and should be established to support the overarching policy objectives for the sector, (*central government tier, intermediate tier*)
- Local policies to help achieve national priorities and local regulations are needed to spell out the requirements for organizing the services and assigning responsibilities, (*local tier*)

Identifying waste management as a priority issue at central government level

It is critical that waste management is recognised by central government as a priority activity. Central government must understand and communicate the impacts of poor waste management on society, environment and the economy, and the benefits of improved waste management. If waste management is not seen as a priority issue, then it is unlikely that there will be the motivation (or resources) to support effective action. This situation is observed in countries where waste management is still a fringe service which has not yet been identified as a priority by central government. Treating waste management as a priority must go beyond formal political declarations and be supported through the allocation of sufficient administrative resources within the competent authorities at different levels and, when necessary, increased public spending to support the sector's development.

Treating waste management as a priority must go beyond formal political declarations and be supported through the allocation of sufficient administrative resources within the competent authorities at different levels and, when necessary, increased public spending to support the sector's development.

For example, the **Republic of Korea** went through a dramatic improvement of its waste management sector. Over the course of few decades, it managed to decouple waste generation from economic growth, on account of fully committed leadership, a large cadre of technical staff with expertise, supported by a conducive legal, institutional and financing environment and intense communications and public outreach. The world's most populous country, **China**, often criticized in the past for not adopting strict environmental standards, has recently implemented an ambitious program to improve waste management in the country with particular focus on plastics. Within a period of less than two years a new Solid Waste Law[17] was adopted together with more than ten pieces of secondary regulations and policy opinions setting up a broad scope of requirements that prohibit the use of specific single-use plastics, establish obligatory separate collection requirements, define minimum recycling targets and develop new standards and requirements for sustainable use and consumption.

The importance of defining a clear lead ministry for waste management

When considering institutional structures that oversee waste management at national level, different roles could be concentrated in one government institution or divided between several authorities. A key factor that enables central government to provide clear direction for the sector is the designation of a single ministry or government department as the clear institutional 'lead' to formulate needs, lead reform, drive change, provide direction and galvanise the sector. This is particularly important given

[17] Law of the People's Republic of China on the Prevention and Control of Environmental Pollution Caused by Solid Waste ('Solid Waste Law'), amended, September 1, 2020

the fact that waste management is inherently a cross-cutting issue, likely to impact upon the activities of other ministries or government departments, including environment, local authority, land use planning, industry/business and finance/treasury.

For example, in **Estonia**, the Ministry of Environment is the national lead authority in the field of environmental protection and, specifically, waste management. The Ministry is responsible for the development of national waste management legislation and national plans and programs in the field. The functions of the Ministry of Environment at national level are supported through several executive bodies: the Environmental Board that issues environmental permits for waste recovery and disposal facilities and gives opinions on local waste management plans, the Environmental Inspectorate[18] that supervises all areas of environmental protection and as part of these functions implements control over waste management operations and facilities, the Environmental Agency that deals with the documentation, reporting and analysis of waste data, and the Environmental Investment Centre that collects landfill tax and other pollution charges and provides financing to local authorities, private companies and NGOs to implement projects in the field of waste management.

Sometimes responsibilities are split between different ministries. For example, the Ministry of Environment might be responsible for setting up policy objectives while a separate institution is responsible for regional development, housing and services, coordinating implementation, and providing technical support for local governments. This division of responsibilities can be effective, provided that remits are clear and that the structure promotes positive collaboration and partnership. For example, in **India**, at the national level, the Ministry of Environment, Forests and Climate Change (MoEFCC) is the central government body dealing with environmental matters. It is responsible for planning and overseeing the implementation of India's environmental policies and programmes, including solid waste. However, there is an important interaction with the Ministry of Housing and Urban Affairs which has authority over the formulation and administration of the rules and regulations and laws relating to urban development.

Where responsibilities sit across ministries, coordination can be achieved by establishing an executive body with representation from across government. Such is the case in **Chile**, where the National Waste Executive Secretariat was created in 2018 to discuss and define objectives, goals and actions for the sector. The Secretariat is chaired by a representative of the Ministry of Environment and includes representatives of the Ministry of Health, the Undersecretary of Regional and Administrative Development of the Ministry of the Interior, the Ministry of Social Development, and the Ministry of Housing and Urban Planning. It may include additional representatives of municipal associations and other authorities. A similar secretariat exists at the regional level to disseminate the National Waste Policy and its action plan to all levels of the State and to other stakeholders such as civil society and the private sector.

A key role of central government (and state-level governments in federal countries) is to create the legislative framework that enables policies and objectives to be achieved. Local authorities have an important role in setting policy and regulations, in the form of local bylaws or ordinances, particularly where these relate to the requirements placed on waste generators.

A legislative framework that supports policy objectives

A key role of central government (and state-level governments in federal countries) is to create the legislative framework that enables policies and objectives to be achieved. In countries with federal government structures, the responsibilities associated with state level governments are similar to those placed on central government, with key legislative responsibilities sitting at this tier, albeit within a framework determined at the national level.

Specific central government policy tasks include, for example, establishing requirements and standards towards collection, recovery and disposal or waste, defining policies on technology choices such as landfilling and incineration, setting up recycling targets for certain waste streams, defining responsibilities of local authorities for organizing waste management services on their territory, forming extended producer responsibility schemes, and creating mechanisms for the financing of services.

[18] The Environmental Board and the Environmental Inspectorate have merged into a single agency as of January 2021 following decision issues by the Estonian Parliament. The merger forms part of a wider program of governmental reforms and is aimed at both cost saving and reduction in bureaucracy for citizens needing to engage with government.

Countries seeking to advance their waste management systems need to embark on a process to review and streamline their legislative framework as it relates to waste management so that it provides a clear enabling environment for the sector. The body of law comprising primary and secondary legislature as well as executive orders and other statutory regulations needs to be aligned in its treatment and provisions on waste management. Complementarity and consistency of legal provisions needs to be achieved.

For example, in 2018 **Azerbaijan** adopted a new, comprehensive National Waste Management Strategy. To facilitate its implementation, the lead ministry embarked on a comprehensive review of the accompanying legal framework. It reviewed, evaluated and proposed modifications to the existing legal and regulatory framework related to waste management in the country. The scope of work covered municipal solid waste, hazardous, construction and demolition waste and included an inventory of existing laws and regulations to identify gaps in the legislation, deficiencies or contradictions. A set of new legal instruments – laws, secondary legislation and contractual tools – required to achieve the objectives of the country's National Strategy were drafted with corresponding amendments to the existing legal and regulatory framework.

A supporting regulatory system is also required to implement legislation. It needed to ensure control and monitoring of the activities of all service providers, and to follow up on the general implementation of local waste-related and cleanliness ordinances. The framework needs to be clear and recognise the different elements of regulation relating to waste management: setting environmental and technical standards, permitting of waste facilities, monitoring of operations and wider activities such as illegal dumping and littering. The responsibilities for different elements of regulation may be split between tiers and between different executive agencies within each tier (see 'Regulator' role below).

Using local policies and regulation to achieve national priorities and to govern service delivery

Local authorities have an important role in setting policy and regulations, in the form of local bylaws or ordinances, particularly where these relate to the requirements placed on waste generators. Local regulation should outline the roles and responsibilities of the local authority, service providers, and waste generators, including households and commercial and institutional generators (referred to as CII generators[19]). Local regulations may remove the need for individual contracts between the service provider, who holds a geographic monopoly, and individual households. Fee setting procedures and fee collection methods should also be defined, as well as penalties for noncompliance. Specifying the need for source separation of recyclables from other wastes, or other policies associated with the way that waste generators must present their waste for collection, is also regulated locally.

Local regulation enables local service provision and is an effective way for local authorities to achieve the specific requirements set out in national policy. As such, it is important that local policies are developed within the overarching national policy framework.

For example, in the **United Kingdom**, local authorities can set policies that require householders to store their waste in a container provided by the local authority. This container will be of a specific size. Excess waste not within the container (e.g. presented alongside in separate sacks or uncontained) will not be collected. The use of these policies has been effective in driving waste minimization.[20]

In the **Republic of Korea**, the national Framework Act on Resource Circulation[21] requires municipalities to develop local ordinances for specific issues, including the method of discharging residential waste, the method of fee collection (Republic of Korea operates a 'pay as you throw' system, established in 1995), the selection of the private waste hauler for collecting municipal waste, the imposition of a tipping fee on wastes of nearby municipalities, and the businesses not allowed to use disposable goods.

2.5.2 Planner role

The planner role is to formulate and coordinate the preparation of strategic plans for municipal waste management that conform with government policy and legislation, and for ensuring effective coordination of plan implementation across all tiers of government, including performance monitoring and data collection. Critical functions and issues that need to be addressed include:

- Establishing a clear framework for waste management planning (*central tier*)

[19] CII includes commercial, non-process industrial and institutional generators of municipal solid waste.
[20] Analysis of recycling performance and waste arisings in the UK 2012/13, 2015, WRAP
[21] Framework Act on Resources Circulation, Act No. 14229, May 29, 2016, latest amendment in 2018, https://www.law.go.kr/LSW/eng/engMain.do

It is important to develop and adopt a long-term strategic plan for waste management that sets realistic objectives and targets, is consistent with baseline conditions, reflects a thorough analysis of development options and identifies credible financing sources.

- Adopting a long-term implementation plan for the sector (*central government tier or intermediate tier in federal countries*)
- Waste management planning at local authority level (*local or intermediate tier*)
- Aligning local plans with national plans and policy objectives (*all tiers*)
- Establishing a data management framework (*central government or intermediate tier*), data collection and reporting (*local tier*)
- Ensuring sufficient capacity at all levels (*all tiers*)

Establishing a clear framework for waste management planning

Effective waste management planning is a fundamental prerequisite for a successful waste management system. Planning should relate to the entire waste management cycle, starting from collection and transportation of waste and all pre-treatment and recovery operations through to its final disposal in sanitary landfills. Planning addresses appropriate waste management data collection techniques, analysis of waste composition, waste generation projection and scenario techniques, formulation of equipment specifications, procurement procedures and management information systems for effective monitoring, evaluation and planning revision.

Planning is a cyclical process and involves all tiers of government. It is also a basis for engagement with other stakeholders. Implementation plans define the priorities, targets and objectives for the sector, and describe a roadmap and timeline for them to be achieved. It is a key mechanism for ensuring that sub-central government planning is aligned with national policies and priorities.

A planning framework must be established to determine the types of plan needed at each tier of government, ensuring coordination and alignment of inputs and objectives. Often the requirement to develop a strategic plan will be mandated by central government and will include specific requirements and frequencies.

In large federal countries intermediate tier plans may replace the need for national plans or, if sufficiently detailed, may replace the need for local tier plans. The role of intermediary government can also be to ensure that local authorities develop strategic plans that are in line with central government priorities and targets. The intermediate authority may then be able to offer a combination of technical support and financial incentives to help achieve those priorities and targets (i.e. making financial support for waste infrastructure contingent upon local authority strategic plans meeting national and state priorities).

For example, in the **Republic of Korea**, under Articles 11 and 12 of the Framework Act on Resources Circulation[22], the provincial government is required to develop a five-year implementation plan that shows how national goals and policies will be implemented in the provincial context. This implementation plan sits under the 10-year masterplan for waste management developed at national level by the Ministry of Environment. The implementation plan must include targets in line with national targets, but whilst also taking the local context into account, such as capacity of collection and treatment systems. Waste management targets include 'final disposal rate', 'effective recycling rate' and 'energy recovery rate'. The provincial government must report progress against targets to the central government annually.

In **Brazil**, the legally binding National Policy on Solid Waste[23] regulates the type, hierarchy and content of waste plans. The National Plan for Solid Waste sets objectives and targets for the Federation which are then defined further in State Plans. The State Plans include targets for reduction, reuse and recycling on their territories. Having an operational state plan is a condition for accessing federal resources for solid waste projects. State Plans are reviewed every 4 years. Municipal Solid Waste Plans are developed by individual municipalities. Preference for access to federal and state resources is given to municipalities that have entered into regional arrangements with other municipalities or to agglomerations.

[22] Ibid
[23] Brazil Law 12305, August 2, 2010

Adopting a long-term strategic implementation plan for the sector

It is important to develop and adopt a long-term strategic plan for waste management that sets realistic objectives and targets, is consistent with baseline conditions, reflects a thorough analysis of development options and identifies credible financing sources. Central government has overall responsibility for strategic planning of waste management to meet national policy objectives. This role relates closely to the waste management policy making role and is often undertaken by the same government unit or body. Central government's strategic planning process also serves to make sure that waste management sector policy complements other sector policies, instruments and initiatives.

It is important that strategic plans are realistic in terms of what can be achieved over the given timeline, taking account of the given baseline conditions, the necessary institutional and legal changes, the ability to finance investments and cover operation al costs, and the potential to secure public participation and support. Where plans are overly optimistic, setting unrealistic objectives and targets, there is a high probability that they may not be achieved and that actions taken to implement them may fail.

A data review and options analysis should precede the formulation of national plans. This involves a situational assessment, defining and analysing scenarios of potential options, and assessing the costs and benefits associated with alternative approaches to developing the waste management sector. The options analysis should cover legal, institutional, financial, operational and capacity issues, and examines the various technical options, including their financial requirements and whether the country can afford them.

It is common to engage external technical specialists and research institutions to help develop the strategy and plans at key points during the strategic planning cycle.

The importance of waste management planning at local authority level

Effective long-term planning is an essential function of local authorities but is one that is often overlooked due to their primary focus on operations. It is necessary to ensure that sufficient infrastructure is put in place to provide and improve services over the longer term. Long-term planning is necessary to define the specific need for improvements, to program future waste infrastructure capacity requirements and to identify other initiatives needed to support implementation of the plan the long term, including capacity building, public awareness raising and communications campaigns. The plan might also specifically identify the locations of new infrastructure, although this can be left as a subsequent step to be decided during the actual implementation plan. The plans should be prepared at the local level but, if regional waste management plans provide a sufficient level of detail, the need to develop local waste management plans could be avoided or plans could be simplified significantly and based primarily on action planning.

The planning function comes at the beginning of the project planning cycle and is therefore critical to successful waste management project development and implementation.

Aligning local plans with national plans and policy objectives

A planning process is needed to align municipal and regional waste management plans with national plans. Individual municipalities should be encouraged to follow the national plan, especially when building new infrastructure and facilities, to ensure that development of the sector is consistent and properly coordinated across the country and makes efficient use of public resources.

For example, the National Waste Management Plan for the period to 2025 adopted in **Romania** requires all 41 counties[24] and Bucharest municipality to develop regional waste management plans for establishing waste management technical infrastructure and for developing institutional and financial models for achieving the long-term waste management objectives. Similarly, in **Morocco**, which has 12 regions that are further subdivided into 13 prefectures and 62 provinces, since 2006, municipal waste management plans have to be fully aligned with provincial/prefectural plans. Morocco provincial plans are established under the responsibility of the Wali (i.e. province governor). While approval of provincial plans has been generally slow hindering the overall process, this approach has ensured consistency in planning infrastructure at local, regional and national level. In addition, by law, municipal waste management plans are a prerequisite to obtaining financial support from the central level, making planning a pivotal element in achieving policy objectives in the waste sector.

[24] At NUTS-II level, Romania is divided into 8 regions that consist of 42 NUTS-III units, namely 41 counties and Bucharest Municipality. The NUTS meaning is Nomenclature of Territorial Units for Statistics.

In principle, planning of waste facilities and operations depends on having appropriate administrative structures and capacities which allow investment projects to be identified, formulated and developed.

In some cases, planning and development of waste infrastructure can be undertaken by intermunicipal cooperation bodies or by the intermediary tier of government. For example, in **South Africa**, municipalities are required by the Waste Act[25] to prepare Integrated Waste Management Plans (IWMP). The IWMP should identify infrastructure requirements, and set priorities, goals and targets for the municipality. A municipality should submit its IWMP to its respective Municipal Council for endorsement and include the approved IWMP as part of its Integrated Development Plan (IDP). The integration of the IWMP with the IDP is critical for gaining access to funding. IWMPs are to be reviewed every five years. To assist municipalities, in 2012 the national Department for Environmental Affairs developed a Guideline for the Development of Integrated Waste Management Plans[26].

Effective long-term planning is an essential function of local authorities but is one that is often overlooked due to their primary focus on operations.

Site selection for waste infrastructure is a key but often contentious element of the planning process. Waste infrastructure is often unpopular with local communities due to concerns over potential pollution, odour, noise and disruption. This commonly causes significant challenges and delays in developing appropriate waste infrastructure in appropriate places. Sufficient time and resources are needed to enable a thorough assessment of site needs and potential sites to be made. The operations of waste treatment and disposal facilities for a lifespan of 20-30 years should be considered during planning, and site plans must be consistent with population growth, urbanization projections, spatial developments. This aspect is often overlooked. Proactive and sustained community engagement is essential to ensure that the need for waste infrastructure is clearly demonstrated and understood, and that waste infrastructure is developed in ways that mitigate negative impacts as far as possible and provide positive community benefits.

As changing the behaviour of waste generators takes time, it is important that the plan provides the basis for this long-term endeavour. Planning is an opportunity to positively engage with and gain the support of other stakeholders, including communities and the informal and private sectors.

Establishing data management framework that supports adequate data collection and reporting

Strategic planning must be based on good data. This is essential to allow robust analysis of development scenarios for the sector. It supports monitoring of progress against targets set out in the plan and provides the basis for on-going strategic planning. It can also be used for creating incentives (or penalties) for sub-national authorities to meet local targets on the path towards meeting national policy objectives.

The overall requirement for collecting and reporting data is normally set by central government. Data collection and reporting requirements should be defined and standardized across data entry points (service providers, operators and local authorities) to ensure consistency and allow data amalgamation. Cross checking and verification processes should also be put in place.

Data depository systems are typically placed with agencies on behalf of the central government, examples being the national statistics service, the national environmental regulator and environmental funds.

Specific examples are the **United Kingdom**'s Waste Data Flow (WDF) system[27] and **South Africa**'s Solid Waste Information System (SAWIS). The United Kingdom's WDF is a web-based system for local authorities to report their waste data. It serves as the official data collection system for the Department for Environment, Food and Rural Affairs' Municipal Waste Management Survey. It allows the government to monitor progress towards national and local targets, to produce national statistics on municipal waste, and to provide an evidence base to guide government policy. It has also grown to become a useful resource for local authorities, which often use it to benchmark their performance against other local authorities. Similarly,

[25] Act No. 59 of 2008: National Environmental Management: Waste Act, 2008
[26] Available at https://www.environment.gov.za/sites/default/files/legislations/integratedwaste_management_guidelines_0.pdf
[27] See https://www.wastedataflow.org/

Municipal solid waste treatment plant in Thailand. Photo: PlotPhoto

in **South Africa**, SAWIS[28] was created by the Department of Environmental Affairs and is used by government and industry to capture data on waste generation, recycling and disposal in the country on a monthly and annual basis.

Ensuring appropriate capacity at all levels of government

One key, often overlooked, element of the strategic planning process is the need to carefully consider capacity needs in terms of technical skills and human resources. As the responsibilities local authorities have for waste management evolve and grow over time as the system develops, so do capacity requirements. However, whilst this issue is most acute at the local authority level where responsibility for service delivery sits and capacities are often the weakest, it is prevalent also at the national and intermediary levels of government. It is unlikely that an ambitious national strategy will be achieved without ensuring that the skills and resources are in place to deliver it. As such, the strategic planning process should include consideration of the capacity needs of each tier of government and include adequate provision and mechanisms to enable them to develop. In the context of a situation whereby a step change in waste management service provision has been successfully achieved, change has often been accompanied by a wide range of support initiatives and accompanying incentives.

Capacity needs assessments should be undertaken as part of overall planning activities. In federal countries or countries with many small local authorities, the intermediary tier normally provides technical capacity-building support. This ensures consistency in approach amongst local authorities. Professional organizations, technical institutes and non-governmental professional associations often play a significant role as technical advisors and trainers for government institutions.

2.5.3 Regulator

The regulator is responsible for formulating standards and procedures pertaining to the permitting, monitoring and regulatory enforcement of municipal waste management facilities and operations and for supervising their effective application and enforcement. Critical functions and issues that need to be addressed include:

- Permitting of waste management facilities and operations (*mostly central government or intermediate tier*)
- Control and enforcement of legal requirements (*mostly central government or intermediate tier*)
- Contract administration and inspection (*mostly local tier*)

Permitting of waste management facilities and operations

The responsibilities of approving environmental impact assessments, issuing environmental permits, performing environmental monitoring of waste management facilities and of industrial waste generators are typically also functions of the two upper tiers. At the central level, these functions may be split between the responsible ministry and separate executive agencies engaged specifically in permitting, monitoring and regulatory enforcement. For example, in **Ghana**, the Environmental Protection Agency (EPA) under the Ministry of Environment and Science acts

[28] See http://sawic.environment.gov.za/

as the regulatory authority, supervising and monitoring the activities of service providers within the metropolitan, municipal, and district authorities. The EPA is also responsible for the management of hazardous waste and issuing permits for waste treatment and disposal facilities. In **Morocco**, the development of any waste management facility is subjected to a comprehensive EIA, since 2003. The Committee for Environmental Impact Studies is in charge or organizing public consultations as well as reviewing and approving the study. This Committee is an inter-ministerial entity and includes local administrative entities ensuring broad stakeholder participation. Surveillance and reporting regarding facilities is organized at the central level by the Ministry of Energy, Mines and Environment. An environmental police force has been formed to reinforce the monitoring capacity of the Ministry. It is worth noting that, until now, all municipal waste facilities are developed by public entities, leading to a relatively easier dialogue and enforcement as compared to other sectors.

Control and enforcement of legal requirements

Monitoring and enforcement are often split between tiers of government. A common division of activities is that the local authority focuses on taking enforcement activity against waste generators (i.e. for littering or illegal dumping) whilst central and intermediary levels of government focus on enforcing compliance of facilities' operations (i.e. discharge or emission limits). For example, in **England** waste management operations, such as landfill operations, are regulated by the national environmental regulator, the Environment Agency. The Environment Agency also takes enforcement action against large scale illegal dumping and illegal activities involving hazardous waste. However, enforcement against small scale dumping of waste and littering is conducted by local authority enforcement officers.

It is important that the regulatory function is separated within the municipal administration from the waste management services or activities which must be overseen and regulated. This is fundamental, as it must avoid any real or perceived conflict of interest between those regulating a service and those providing it.

Central authorities should consider establishing appropriate coordination and enforcement mechanisms to support the compliance at local level. For example, these can include reporting obligations for local authorities, procedures for consultation, and approval and monitoring of the implementation of local waste management plans. Such enforcement mechanisms should also be combined with guidance, training and financial support to local authorities.

Contract administration and inspection

At the local level, the 'regulator' role is required to assure control and follow-up to the activities of all third-party service providers, and to follow up on the general implementation of local waste-related and cleanliness ordinances. Administering or enforcing the terms of contracts signed by a municipality with waste management facility operators or service providers is typically a local authority function. The contracts administration role addresses the waste management projects development and tendering, contacts management and contractor payment and penalty control of the project cycle. The associated technical inspection function normally has the responsibility for monitoring compliance with facility construction works and thereafter operational requirements in contractual and associated local regulatory documents.

It is important that the regulatory function is separated within the municipal administration from the waste management services or activities which must be overseen and regulated. This is fundamental, as it must avoid any real or perceived conflict of interest between those regulating a service and those providing it.

For example, in **Brazil**, responsibility for contract administration and inspection depends on whether the contract is funded by municipal or federal funds. If the work is carried out using municipal funds, each municipality should designate a municipal secretariat to supervise the work. If the work is carried out with federal government funds, monitoring and inspection is done by the Caixa Econômica Federal, a public bank dedicated to financing environmental infrastructure. Operational supervision remains a responsibility of the municipality and is typically carried out by the secretariat responsible for solid waste management.

2.5.4 Service provider

The service provider is responsible for the actual delivery or assurance of delivery of the waste management services and facility operations. Critical functions that need to be fulfilled include:

If there is a consistent message on waste management coming from all tiers of government, then it is easier for the local authority to establish a 'social contract' with generators, thus encourage positive behaviors in waste management.

- Operational planning, operations and maintenance of waste management services and infrastructure, (*local tier*)
- Dividing client and operator functions in service delivery and operation of facilities, (*mostly local tier, or intermediate tier on behalf of local authorities*)
- Communication and awareness-raising (*mostly local level*)
- Local authority's key role in engaging with the informal sector (*local level*)

Operational planning, operations and maintenance of waste management services and infrastructure

Local authorities are typically solely responsible for operational planning, operation and maintenance of waste collection and transportation. Treatment and disposal planning can also be their responsibility but may be transferred to the intermediate tier. Operations and maintenance of such facilities may similarly be done entirely by local authorities or be transferred to the intermediate tier or to an intermunicipal entity on behalf of the local authority.

Operational plans need to provide ample detail on how the service will be organized and financed. Various models exist and the authorities need to determine the horizontal split (zoning or a single service area), vertical split (single or multiple providers along the service chain from collection through disposal), interface arrangements (when waste changes hands between, for example, primary and secondary collectors or secondary collection and transfer point), service levels (in high-rise and sparsely populated areas) and method of collection (comingled or separated waste), thresholds for serving CII generators, waste diversion level and treatment methods[29].

Operational planning also includes budgeting where projected costs, revenues and financing sources must be identified. Costs need to comprise direct operational, amortization, and overhead costs, and be based on an accounting system identifying the cost components separately for each type of activity from street cleaning and collection through treatment and landfilling. Realistic financing sources need to be identified for both operating expenses and capital investments. Financing is ideally based on the principles of polluter pays, affordability, full cost recovery, and economic efficiency (see Chapter 4).

Dividing client and operator functions in service delivery and operation of facilities

The operational plan will typically determine where private sector participation will be sought as a source of additional capital, technical expertise (especially for treatment facility operations), and efficiency gains. When the private sector is engaged to deliver public services, the client local authority is expected to have capacity to carry out tendering procedures and perform contract management functions. Key metrics and performance indicators are included in the contracts.

For example, in the **United Kingdom**, contracts between the local authority and the operator will typically include metrics for monitoring the service that directly link to the local authority's national reporting requirements. Similarly, in **Ghana**, where the National Procurement Act (2003) makes competitive bidding for the selection of private waste companies mandatory for the Metropolitan, Municipal and District Assemblies (MMDA) tender boards, contracts include metrics and key performance indicators (KPIs) and are monitored by the MMDAs[30]. Similarly, **Morocco** has over the past 20 years succeeded in engaging the private sector in waste management operations, with more that 70 percent of the urban population serviced by private operators. Through this process, municipal entities have acquired extensive experience in structuring their relationships with private operators, developing performance-based contracts and use of technology to monitor performance. While operator's remuneration still primarily relies on tonnage, contracts increasingly include a comprehensive suite of indicators. Performance indicators systematically reflect recycling objectives and include incentivized remuneration for diverted volumes. Other indicators emphasize the quality of services such as regularity and container cleanliness. Indicators on energy use and carbon emissions are

[29] For further discussion on models for operations of waste management services, see: Operator Models. Respecting Diversity. Concepts for Sustainable Waste Management, GIZ, 2018

[30] Sampson Oduro-Kwarteng, Meine Pieter van Dijk and Kafui Afi Ocloo, Urban Governance in the Realm of Complexity, Chapter 6: Governance and Sustainable Solid Waste Management in Ghana, 2017

rarely used. The largest contracts in Casablanca and Rabat leverage information technology such as closed-circuit cameras, fleet tracking, radio frequency identification badges, in order to monitor performance and reduce potential disputes.

Where the local authority is both the client (i.e. the body that sets the scope and standards for the service and ensures that it is delivered to the required standard) and the operator (i.e. the service provider), the separation of these two functions within the institution is important. This could be achieved by establishing a public company with separate local budget financial statements or by ring-fencing the activities of the service unit and possibly its accounting systems for dedicated cost allocation. For example, in **Bulgaria** a dedicated municipal enterprise was set up in Sofia municipality to operate the city's 410,000 tonne per year residual waste mechanical-biological treatment (MBT) plant and installations for composting and anaerobic digestion of separately collected green and food waste. The Waste Management Directorate is the unit within the municipal administration responsible for the overall planning of municipal waste management whereas control activities over providers of waste collection services are designated to the Municipal Inspectorate.

Coordinating communication and awareness-raising activities between different tiers of government

Communications need to be tailored to local cultures and contexts. As such, local authorities are typically charged with leading on communicating with waste generators. At a basic level, communication might simply focus on informing householders of the nature of waste management services and the cost. However, it is likely that the local authority will need to engage with generators on behaviour change issues, encouraging generators to reduce waste generation and to participate in recycling schemes. This is a critical, and often overlooked, element of waste management service provision. Without positive engagement from the households, businesses and institutions generating waste, the waste management system is likely to encounter challenges, often with widespread dumping and burning of waste, limited engagement in recycling initiatives and lost opportunities to reduce waste.

For example, when Ningbo, **China**, embarked on an ambitious separation at source program, it managed to achieve high citizen participation rates and good performance over a very short period of time, which was largely attributed to intense community awareness and engagement campaign.

Communication campaigns need to be carried out on a continuous basis. Local authorities should ensure they have specialized staff and a dedicated yearly budget allocation for this activity. Alternatively, the communication activities could be delegated to the waste management company or could be a required function of the industry under EPR schemes.

There are considerable benefits associated with support on communications issues coming from central government and/or intermediary government. If there is a consistent message on waste management coming from all tiers of government, then it is easier for the local authority to establish a 'social contract' with generators, thus encourage positive behaviours in waste management. This ensures consistency is more economic where awareness-raising materials and radio or television campaigns for instance can be created much more efficiently, with local authority able to tailor materials for local use.

Local government's key role in engaging with the informal sector

The informal sector plays a significant role in waste recycling and diversion. Many countries have no formal separation at source or recycling system in place yet still achieve good recycling rates and diversion through the informal sector. Integrating informal workers with the rest of the waste chain improves the interface between operators, reduces competition among collectors and may reduce litter and secondary dumping. It promotes social inclusion and better health and safety conditions.

Local government has the lead role in engaging with the informal sector when planning and providing the service. Many and diverse schemes exist for organizing community-based organizations and social enterprises and they are highly dependent on local culture, tradition, socio-economic conditions. Often these schemes differ greatly not just within a single country but within large cities.

Local government could actively research, document and promote successful models in terms of defining the service zones for primary collection, zone boundary modification and expansion over time, setting and collecting service charges, incentives for service expansion into low-income and slum areas, monitoring and enforcement of residual waste disposal, examples of intermediary associations/non-governmental organizations (NGOs) to facilitate the dialogue between informal workers and local administrations.

For example, in **Liberia**, the municipality of Monrovia established zones for primary waste collection that were assigned to community-based enterprises (CBEs) registered with the municipality. The area assignment was made following extensive research of existing practices. The baseline of customers was determined and each CBE committed to gradually expand collection to previously unserved households. Performance indicators were agreed on, including number of households served, and adjusted on an annual basis to allow monitoring against set targets. CBEs charged generators directly while the municipality provided training and tools.

Community-based measures of stakeholder engagement for solid waste management have been implemented successfully also across **India**. Such is for instance the inclusive model of engaging women self-help groups like Harith Karma Sena (Green Task Force) under Kerala State's women livelihoods mission (Kudumbshree). The integration of women self-help groups into the waste management system has been formally recognized in the State's solid waste management policy and the groups' activities are recognized as part of the State's efforts related to information and education campaigns, waste collection, segregation and various waste management activities. The engagement modality specifically aims to develop green eco-friendly enterprises around Kerala and assist Haritha Karma Sena members in getting additional income and promoting the local level entrepreneurship while contributing to waste management activities. This involves establishing local women enterprises of 4 to 10 members for ward-level activities and creating a consortium of such enterprises at the level of the urban local body (ULB) to ensure the rights of Harith Karma Sena members and coordinate enterprise activities with these by the ULB. In coordination with ULBs, the consortium has the right to take decisions, establish a fund for purchase of equipment, determine user fees, and carry out other administrative and entrepreneurial decision making responsibilities to streamline the integration of such groups in the overall waste management system.

2.5.5 The financing role

The institutional structure in charge with financing is responsible for all financial aspects of preparing and delivering affordable and financially sustainable municipal waste management service and facilities. Critical functions and issues that need to be addressed include:

- Defining an affordable and financially sustainable waste management service
- Deciding how initial investments and also medium and long-term capital costs are to be financed
- Deciding on cost recovery policy and how the recurrent costs of service delivery are to be funded
- Maximising revenue collection
- Establishing capacities for developing large-scale investment projects and for applying for financing

Waste management is a net cost activity which has ultimately to be paid for – in one form or another – by residents. It follows that the services provided should be affordable to most users.

Defining an affordable and financially sustainable waste management service

As indicated in Table 1 above, responsibility for financing municipal waste management rests primarily with the local authorities[31]. Responsibility for formulating tariff policy, legislation and related guidelines falls typically to central government. Central government, and sometimes intermediate government, also have a key role to play in determining the amount and conditions of any grant support which may be provided to a municipality, particularly if it is to be from national or international sources. Under these circumstances, preparing the funding for a waste management project should ideally be a collaborative process between the municipality and the central government (and the intermediate tier if appropriate).

Waste management is a net cost activity which has ultimately to be paid for – in one form or another – by residents. It follows that the services provided should be affordable to most users. This is a critical objective which provides a focus for decision making on the scope of the services that can realistically be provided and funded on a sustainable basis. In preparation for making this decision, it is necessary for a municipality to undertake a high level of detailed

[31] Variations exist depending on how responsibilities for the core waste management activities are allocated. For example, larger municipalities may be responsible for funding all of waste collection, treatment and disposal, whereas smaller municipalities may have responsibility only for waste collection (with onward treatment and disposal at regional or inter-municipal facilities being covered by a gate fee).

technical analysis, key aspects of which are referred to below and considered in greater detail in Chapter 4.

Considering that true costs are often hidden among other non-waste related services or are simply unknown, identifying costs fully and transparently is key to organizing services in a cost-efficient manner.

Defining an affordable service entails undertaking a thorough technical and financial feasibility assessment of project options, calculating indicative tariffs based on recovering costs in full, comparing these with tariffs calculated through a separate household incomes and affordability assessment, and identifying a preferred technical option. This is detailed and specialised work that may best be undertaken by external consultants working closely with a municipal project team. It is crucial that the analysis is based on the full investment and operating costs of the services being proposed and that the affordability constraints on what can realistically be achieved are fed back into the analysis and used in the design of the system.

When full cost recovery through waste management service tariffs is not realistically achievable, subsidies and budget support could be necessary to achieve policy objectives.

Deciding how investment costs can be financed

Funding for waste management investments is potentially available from sources including municipal reserves, central and regional government transfers, local and international capital markets and International Financial Institutions (IFI) funding. Significant involvement is likely to be required from the municipal accounting team for deciding on the mix of funds that might be used, including a municipality's own reserves, debt and grants and for gauging the implications of alternative funding mixes for the municipality and for tariffs.

This is the time also when a decision may need to be made on whether the services should be provided and financed by a municipal public collection company or by a private operator. Decisions at this stage can influence how the related service costs will be financed and charged to households and legal entities.

Also, if grant funding is available and can be used in the financing mix, it should be decided how the grant funded assets will be refinanced at the end of their economic lives. This has important implications for setting the rate of the tariff. For example, grant funding may enable a lower tariff to be introduced at the beginning of operations and for it to be progressively increased to the full cost recovery level when major assets come to be replaced. A skilled economics and accounting team is needed to undertake this kind of analysis.

Deciding on cost recovery policy, user charges and municipal funding

National legislation typically sets the requirements or mechanisms for levying waste management fees and taxes

Motorbike for waste collection in Avepozo, Togo. Photo: Africanway

consistent with national policy and strategy on the user (polluter) pays principle. It may also define thresholds for affordability analysis and the conditions to apply on providing income-based support to low income and vulnerable households (possible based on population deciles). The actual fee and tax rates are generally determined from local authorities' unit rates and established in local ordinances following approval by local councils.

While many countries have adopted the user (polluter) pays principle, in practice it is often applied only to a proportion of operational costs with the balance being covered by general municipal revenue. Clearly defining its cost recovery policy, objectives and charges, based on a full understanding of its costs, enables a local authority to manage its services on a more commercial basis in line with their being affordable to users and financially sustainable. This important aspect is considered further in Chapter 4. In order to manage the financial function in this way the local authority will require the services of a competent accountant/financial manager, clerical support, and well-organised data bases on the operational and financial performance of the waste service.

Improving revenue collection

The types of administrative structure and procedures needed for revenue collection vary between the types of charging mechanisms used. For example, raising revenues through local taxation depends on the local administration having the capacity to collect taxes from residents and to manage budgets across the breadth of services within its remit, including waste management. Adding a municipal charge to a pre-existing taxation system should require only limited additional administrative capacity, especially if it is already linked to an appropriate property or population register.

If fees are collected by the waste management operator, possibly a private company, then different administrative mechanisms and structures will be needed. In this case, the local authority must provide oversight and monitoring of the fee collection service to ensure that the operator is performing in accordance with agreed contractual terms, whilst the operator itself must have the mechanisms and personnel needed to collect fees from households.

A different approach again is needed if fees are to be charged and collected by a third-party, such as a water or electricity utility. Key factors to be considered here are the need to (i) effectively relate the municipal housing and population register to the utility client register and to (ii) 'ring-fence' the fees collected and transfer them to the relevant financial administrative unit within the local authority.

There are many instances of local authorities within the same country collecting either fees or taxes depending on the specific local regulations approved by their local councils. In **Bosnia and Herzegovina**, for example, some local authorities collect fees directly from households whereas others have assigned this function to private collection operators. In **Veneto, Italy**, fees are collected in some municipalities under pay-as-you-throw volume-based schemes whereas taxes apply in others where volume-based charges do not apply.

Establishing capacities to develop large investment projects and apply for financing

At the local authority level, additional administrative capacity is needed to attract investment finance for the development of local or regional waste treatment and disposal facilities. For this it is important to have staff with the skills needed both successfully to apply for funding and to manage large investment projects. This requires knowledge of international procurement rules and of internationally recognized framework contracting procedures, such as the International Federation of Consulting Engineers (FIDIC).

For example, in 2008 the Government of **Azerbaijan** launched an Environmental State Program aimed at addressing the wide-spread pollution of the Absheron Peninsula that surrounds the capital city, Baku. Waste management was one of the priority sectors within the State Program. Large scale funding was secured from the state budget, IFIs and the private sector for the re-development of the entire waste sector in the city. This included the construction of a new sanitary landfill, a materials recovery facility and a waste-to-energy facility in addition to policy and regulatory reforms. To drive this ambitious agenda, the Government established a new joint stock Solid Waste Management Company (SWMC) to own and manage assets related to waste management. Over the following decade, the company and its personnel received significant long-term capacity building, training, study tours and knowledge exchange as well as on-going advisory assistance from industry experts. By 2018, when the construction of all new facilities was completed, the SWMC had evolved into a professional operator with excellent capacities to plan and operate its assets and manage the waste services comprehensively.

The critical functions within each role are discussed further in subsequent Chapters.

Artwork designed to collect plastic bottles at the seaside in Portsmouth, Hampshire, United Kingdom.
Photo: © Gary Hider | Dreamstime.com

3

Policy, planning and legal frameworks

3.1 Recognizing the need for change

Recognizing the need for action and mobilizing the political support for change locally and nationally is the first step towards improving the performance of the sector. Giving priority to improving municipal waste management services should however go beyond political declarations and be supported by giving the competent authorities at each tier of government the authority and resources needed to do it.

The process of moving from a current situation of minimal waste services to a future one of sustainable resource management can be approached in terms of three building blocks[32]:

- Establish waste collection services to protect public health
- Improve waste treatment and disposal services to provide environmental protection
- Implement systems and incentives to enable the transition to sustainable resource management in a financially/fiscally sustainable manner

Organizing basic waste management services creates a foundation upon which more advanced waste management system can be built, based on the longer-term aims of resource use efficiency. As such, policy objectives must be measured and be realistic, guided by a complete and dispassionate understanding of the current context and focussed on clearly defined problems and achievable outcomes.

As policy objectives develop progressively over time in step with gradual improvements in waste management, they guide the planning process across central and local authorities. Central governments have the overall responsibility for strategic planning of waste management to meet policy objectives. Developing sub-national plans is an essential function of local authorities. A planning process is needed to align the two.

Legislation defines the legal and policy frameworks which govern the sector, allocate and define institutional responsibilities, and assign and empower regulatory oversight. It should be recognized that although necessary, the adoption of legislation, regulations, waste management strategies and plans is not immediately reflected in tangible improvements to municipal waste services. Progress is achieved if the legal requirements and policy measures are implemented and enforced.

[32] Based on Wilson D., Development Drivers for Waste Management, 2007

The present chapter focuses on policy and legal aspects and considers:

- The central level responsibility for creating a policy and legal framework which enables local authorities to deliver on their waste management mandate; and
- The local level responsibility for aligning their planning and regulatory functions in a way which enables them to achieve the national objectives.

3.2 Waste management strategies and plans

3.2.1 Type of policy documents

Waste management policies, strategies and plans are needed to provide a clear view of the development trajectory of the sector, set up the objectives and ideology for a desirable waste management system, and define the necessary implementation measures and coordination requirements. Policy documents are not legally binding and enforceable so the adoption of specific legal requirements is necessary for policy implementation. Legislation can also establish the overall planning framework. Waste management plans or strategies are typically prepared either at the national level or at the regional/state level, where combined regional plans cover the national territory. They can be prepared either as part of an overall environmental strategy or as separate documents. The most common approach is to adopt a national waste management strategy together with a separate action plan for implementing it, or for the two to be combined into a national waste management plan.

Depending on specific needs, national waste management strategies/plans can take the form of a single document or be a combination of several documents setting out separate plans for the management of specific waste streams. The scope of the strategy could be limited to municipal waste or might cover several waste streams, including hazardous waste, industrial waste, construction and demolition waste, agriculture waste and sewage sludges.

Organizing basic waste management services creates a foundation upon which more advanced waste management system can be built, based on the longer-term aims of resource use efficiency.

Waste management plans can be required at the state, regional and/or local levels depending on the administrative division of the country and the responsibilities of the competent authorities.

3.2.2 National waste management strategies and plans

A national waste management strategy or plan aims to ensure that waste management practices are responsive to need, appropriate to context and sustainable. Their purpose is to define the strategic objectives for future development of the sector, create the enabling conditions necessary to achieve the objectives and include guidance for local and regional authorities on organizing, implementing and financing their responsibilities relating to waste management within their territories.

Large variations exist between countries in the form, scope and content of national waste management strategies and plans.

In some countries, national strategies include a policy statement and provide a strategic overview of the sector. Strategies are focused on the principles and objectives for developing future waste management systems and key policy actions are defined without giving guidance on specific aspects such as capacity requirements or investment and implementation costs. In such instances, detailed planning is left to the local authorities, which have the flexibility to decide on practical implementation aspects of compliance with the national objectives. The planning process is intended to ensure integrity, consistency and complementarity between planning documents developed at different levels of government.

In other countries, national waste management plans are far more detailed and prescriptive concerning aspects such as investment requirements, implementation costs and the measures assigned to local authorities. Such plans might pre-define the boundaries and type of regional cooperation, define the type of facilities to be built in a specific region or municipality, set specific requirements for the type of collection system to be established, or allocate financing for priority investment projects and so on.

For example, in the **Republic of Korea**, the Ministry of Environment approves a ten-year Master Plan for Resource Circulation which guides, at the strategic level, the development of the waste sector. Provincial plans (drafted by provincial government research institutes) must be aligned with the national plan (drafted by a government-funded research institute) and include further detail. The environmental impact assessment of the strategic plan is carried out by a separate impact assessment agency. The strategic plans for the provincial governments are first reviewed by the government investment agency (Korea Environment Corporation) and finally approved by the Ministry of Environment. The construction of waste treatment facilities, such as incinerators and landfills, that demand broad cooperation and significant investments within short timescales receive national government financial support only if the construction of such facilities has been included in the strategic plan. The preparation of a waste management strategic plan is seen as a mechanism to assess past performance and inform future objectives and implementation.

3.2.3 Sub-national strategies/plans

The adoption of a waste management plan at the national or state level should be followed by the development of waste management plans at the regional and local levels. The reverse sequencing is sometime observed, whereby local authorities develop plans in the absence of national guidance which are then combined to become a national plan with arguably little complementarity between them.

The planning requirements at regional and local levels should not be self-serving but should be equivalent to and achieve the objectives of the national strategy or plan. For that purpose, local and regional waste management plans are subject to consultation with the national authorities and, in some cases, specific approval procedures are established for that purpose.

The national competent authorities are expected to provide guidance to regional/local authorities on the development of regional/local waste management plans and to establish procedures with them for monitoring, consulting and coordinating the development process, the content of such plans and their subsequent implementation.

The requirements and practice of developing waste management plans at the sub-national level differs between countries according to their size, administrative divisions and how waste management functions are allocated between the different tiers of government.

In some countries, including **Bulgaria** and **Estonia**, municipal waste management plans or programs are prepared at the local level and not at the regional level. On the other hand, in **Ukraine** and **Romania**, regional authorities are responsible for preparing regional waste management plans, only after which local waste management plans may be developed at the municipal level. Similarly, in **Belarus**,

waste management plans are developed at the regional and not at the municipal level. Nevertheless, the municipalities (raions) are responsible for developing sanitary cleaning schemes which, as they define the type of collection system, the locations of container sites and collection frequencies, may be considered to be waste management plans but with limited scope.

Availability of regional and/or local waste management plans could be a condition for the allocation of national financing. For example, **Morocco** has adopted a strict approach, initially making municipal solid waste plans and further compliance with a provincial plan a condition on eligibility for funding from the national subsidy scheme. This process was led by the Ministry of Interior through the Directorate of Water and Sanitation, which also provides technical assistance for planning and support for engaging the private sector. This requirement provided a strong incentive for municipalities to comply with the main policy objectives. More recent eligibility requirements cover inter-municipal cooperation and the inclusion of informal workers into the proposed activities. On meeting these criteria, a municipal or inter-municipal entity could have up to 60 percent of its waste management costs paid in subsidies, capped at 30 percent over a period of 5 years.

Regional and local waste management plans should cover all activities that fall within the responsibility of the region or local authority as defined by the relevant national legislation, strategies and plans. At a minimum, such plans should include:

- Analysis of the existing situation in the field of waste management in the respective area.
- Objectives and aims to be achieved.
- Analysis of the grounds on which the optimal waste management system was selected, with reference to the collection, separate collection, recycling, treatment and disposal infrastructure and the operational practices to be established.
- List of the priority institutional, economic and technical measures and actions to be taken.

Some key elements and steps in developing waste management plans are considered in more detail in the sections below.

3.2.4 Scope and content of the plan

Waste management planning needs to identify the main policy measures and actions in terms of institutional, technical, financial and communications aspects of waste management. The different elements and key questions to be addressed in the plan are presented in the following table. These elements should be broadly reflected in national plans and partly in local plans.

The plan should propose actions, specifying responsible institutions or stakeholders, implementation deadlines, and the amount and source of financing required and indicators for measuring achieved results.

Belarus. Trashcans ready for shipping. Photo: Aksakalko

Table 2 **Key issues considered in the waste management plan**[33]

Framework issues addressed in the plan	Key questions
Legal and institutional	
▪ Existing legal framework ▪ Functions at each level of administration ▪ Allocation of responsibilities between public and private actors in waste management ▪ Role of private sector in service delivery ▪ Regionalization and intermunicipal cooperation ▪ Producer responsibility ▪ Role of informal sector ▪ Data collection, reporting and information management ▪ Planning and permitting ▪ Enforcement and monitoring procedures and penalties ▪ Envisaged changes in legal requirements	▪ Are roles and responsibilities clearly defined – policy maker, planner, regulator, service provider, financier? ▪ Should municipalities work together, e.g. on establishment of common treatment and disposal infrastructure? ▪ Should private sector participation be encouraged? ▪ Is there need for a new institutional set-up? ▪ What institutional capacities are needed to organize and implement the plan? ▪ Is there a need for new legislation to drive improvements? ▪ How can regulation and control be improved? ▪ Should there be stricter penalties for illegal dumping of waste?
Technical and service delivery	
▪ Waste streams to be covered ▪ Type, quantity and sources of waste generated within the territory ▪ Assessment of existing waste collection schemes ▪ Existing major disposal and recovery installations, the available treatment capacities per type of waste management operation and waste stream ▪ Type and quantities of waste imported or exported ▪ A forecast and evaluation of the development of waste streams in the future ▪ Objectives and targets ▪ Service standards and performance ▪ Technologies and environmental compliance ▪ Measures to improve the operation of existing collection schemes for different waste streams and of the need for new collection schemes ▪ Non-compliant and illegal dumping ▪ Historical contaminated waste disposal sites and measures for their rehabilitation ▪ Assessment of the need for closure of existing waste installations ▪ Measures to combat and prevent all forms of littering and to clean up all types of litter ▪ Necessary additional waste installation infrastructure ▪ Tendering and contracting of waste management services and treatment infrastructure ▪ Measures to develop professional competence and certification of services ▪ Measures and any special arrangements for specific waste streams requiring particular attention	▪ What specific waste streams should be included in the strategic part of the plan? ▪ Is available information sufficient and reliable? ▪ What measures must be taken to improve waste prevention and environmentally sound re-use, recycling, recovery and disposal of waste? ▪ What type of collection systems are considered to be progressive and appropriate? ▪ How can the coverage and performance of waste collection services be improved? ▪ To what extent is the transport of waste for disposal acceptable? ▪ What role should recycling play in the strategic planning? ▪ What are the appropriate waste treatment, recovery and disposal technologies? ▪ What environmental standards of waste disposal are appropriate, what standards should be aimed-at? ▪ How urgently do existing waste disposal sites need to be brought in compliance or closed? ▪ What should be the location criteria for site identification and on the capacity of future disposal or major recovery installations? ▪ What are the appropriate qualitative or quantitative objectives, targets and performance indicators, including on the quantity of generated waste and its treatment? ▪ What are the waste streams that require particular attention and specific measures?

[33] The presentation is generally guided by the scope of waste management plans as defined in EU Waste Framework Directive.

Table 2 Cont.

Framework issues addressed in the plan	Key questions
Financing and cost recovery	
▮ Current financial flows ▮ Future costs and investment demand ▮ Guiding principles and cost recovery objectives for achieving financial sustainability ▮ Taxes, service fees and tariffs used for the financing of waste management services ▮ Affordability and cross-subsidy ▮ Use of economic and other instruments in tackling various waste problems ▮ Measures to guarantee transparency of public costs ▮ Responsibilities for budgeting of waste management system costs and revenues ▮ Sources of financing	▮ In relation to economic issues, what are the general problems at the national and local level? ▮ What are the priorities for improving the economics of waste management services? ▮ Is the current level of investment restricting performance of services? ▮ What is the affordability threshold for the fees or taxes for waste management services paid by households? ▮ Issues with the collection of fees or taxes for waste management services and how to improve the revenue collection? ▮ What system of revenue collection and allocation shall apply? ▮ Should local tariffs paid by households fully cover the costs or should subsidies from local and/or central budgets be used in addition? ▮ Should households and legal entities pay the same tariffs or should cross-subsidization be permitted? ▮ Is public grant or loan financing needed for the development of waste collection, recovery and disposal infrastructure? ▮ Should additional instruments, such as EPR schemes be introduced for financing specific waste streams? ▮ Is there need for additional regulation of local fees or taxes for waste management services? ▮ How should efficiency be measured?
Awareness and communication	
▮ Public consultation and participation ▮ Communications strategy ▮ Use of awareness campaigns and information provision directed at the general public or at a specific set of consumers ▮ Incentives and penalties	▮ Is the public satisfied with services? ▮ What should be the key communication objectives, target groups and what communication channels should be used? ▮ Who should take the lead in improving public awareness? ▮ What are the expected costs for raising public awareness and how they will be financed? ▮ What incentives for rewarding good practices to use?

3.2.5 Guiding principles

Guiding principles, situation analysis, the definition of policy objectives and option analysis are closely inter-related aspects of the process of formulating the strategy/plan. They are discussed in this and the sections that follow.

The guiding principles are adopted at the national level and support the setting of objectives and the formulation of implementation measures. They also guide later decisions and practical measures intended to assist in the achievement of the objectives. The typical principles followed in the waste management sector are summarized in **Box 2**.

Box 2 Common principles in waste management

- '*Waste Hierarchy*'[34]: Defines a preferred order of waste management practice, subject to technical feasibility, affordability and financial sustainability constraints: prevention, (preparing for) reuse, recycling, recovery and, as the least preferred option, disposal (which includes landfilling and incineration without energy recovery). Departing from the 'hierarchy' may be considered for specific waste streams if justified by life-cycle analysis of the overall impacts of the generation and management of such waste[35].
- *Polluter Pays*: Polluters and consumers cover the full costs to society (including external environmental costs) resulting from their activities.
- *Affordability*: Service costs should be affordable to users.
- *Financial Sustainability*: Financial sustainability means having a positive cumulative cash flow in every year. This refers to the minimum revenue needed annually to sustain a waste service and relates directly to service costs. The affordability and financial sustainability principles influence the setting of realistic targets and system design: its scale, scope, and implementation scheduling.
- *Involvement of the Private Sector*: The private sector can mobilise investment finance and provide the operational experience needed to implement efficient waste management services.
- *Proximity*: The principle that waste should be treated as close to its source as possible. This principle can conflict with cost-effectiveness criteria and the economies of scale often associated with larger, centralised, treatment or disposal facilities.

Conveyor belt at recycling facility in Nairobi, Kenya. Photo: REUTERS / Alamy Stock Photo

- *Self-Sufficiency*[36]: The principle that an integrated and adequate network of waste installations should be established to enable a country to move towards self-sufficiency in waste recovery and disposal, subject to best available technology (BAT).
- *Sustainable Development*: The principle that developments undertaken today should not compromise the needs of future generations. Waste management systems should be appropriate, implementable, and affordable to society.
- *Integration*: The principle that environmental protection must be an integral part of the development process.
- *Precautions*[37]: Where evidence of environmental risk exists, appropriate precautionary action should be taken even in the absence of conclusive proof of causes.

[34] Based on Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives, EU Waste Framework Directive.
[35] For instance, waste from international flights and airports or specific waste streams as identified locally.
[36] Bases on EU Waste Framework Directive
[37] Ibid

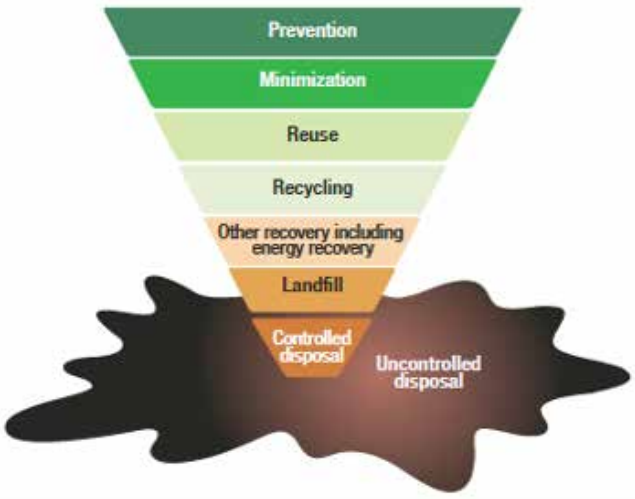
In practice, different countries give more priority to some principles over others or may have different interpretations of some of the principles. For example, strictly following the polluter pays principle in low-income countries could be challenging. Some countries chose to introduce user fees only for institutions and business establishments whereas service provision to households is funded directly from general revenue. Another common practice is to utilize user fees to cover operating expenditures and to finance amortization and depreciation costs from other sources. Targeted support is also frequently targeted at low income or vulnerable households by exempting them from direct charges.

Another example is achieving self-sufficiency in the treatment of special waste stream categories, such as electrical and electronic waste (WEEE) that may be impractical for small island countries, technically feasible or economically justified.

In many cases affordability considerations limit the scope for implementing advanced, higher cost but more environmentally acceptable technologies which sit higher on the 'waste hierarchy'.

Among all, the 'waste hierarchy' is the most widely adopted principle. The concept places environmentally sound waste disposal at its base, with the preferred options of waste recycling, reuse, minimisation and avoidance above it (see **Figure 1**). It is important to recognise that, by focusing on environmental benefit and not costs or social, economic and institutional requirements, it represents a simplified framework.

Figure 1 **'Waste Hierarchy'**



Source: Global Management Outlook, ISWA, UNEP, 2015

The experience of countries that have moved up the 'hierarchy' demonstrates that progress has not been achieved in a single step but has required concentrated effort and resources over several decades (see **Box 3**). Moving up the 'waste hierarchy' requires a mix of policies that take account of institutional, social, economic and financial aspects as well as technical and environmental ones. It brings environmental benefits but increases the financial costs for the sector. For instance, the net cost of recycling, including collection, sorting and treatment operations, is typically significantly greater than controlled disposal or sanitary landfill.

The two most immediate and important issues faced by many low-income countries are incomplete waste collection service and the proliferation of uncontrolled dumping. Establishing waste collection services to protect public health and improving waste treatment and disposal services to protect the environment should therefore be the first objectives of the waste management strategy or plan.

The two most immediate and important issues faced by many low-income countries are incomplete waste collection service and the proliferation of uncontrolled dumping. Establishing waste collection services to protect public health and improving waste treatment and disposal services to protect the environment should therefore be the first objectives of the waste management strategy or plan. Policy aspirations supporting a transition to sustainable resource management should also be set out, but with the caveat that, in practical terms, climbing further up the 'hierarchy' can only happen once effective collection and disposal systems have been put in place.

The 'hierarchy' is not a rigid structure but a guiding framework that should be used flexibly. Different treatment solutions coexist within the treatment mixes of different countries; whereas the 'hierarchy' provides the conceptual direction for the development of the sector and guides longer term planning. It should also be appreciated that when treatment capacity of any type is introduced, it comes with a lock-in effect for the life of that capacity. For example, countries may find themselves practically constrained from achieving more recycling if they have established large energy recovery facilities which compete for the same waste material; i.e. high-calorific value plastics or carboard are also the focus of recycling efforts. The sizing of facilities is therefore an important aspect of planning as it affects the overall treatment mix in the medium term.

3.2.5.1 Linkages with GHG emissions

Policy actions in many countries are increasingly impacted by linkages between waste management and GHG emissions. When defining measures and developing action plans to meet the objectives of the Paris Agreement, countries and cities must identify contributing sources and designate sectors to achieve emissions reductions. While

Box 3 The evolution of the 'waste hierarchy' concept

The 'waste hierarchy' as a conceptual framework was first applied in the EU. Since 1975, EU waste management legislation has focused on reducing and avoiding risks to the environment and human health. Implementation of the 'waste hierarchy' and the objective of increasing waste recycling became a priority at a much later stage. Recycling targets for packaging waste were introduced in 1994. General recycling targets for municipal waste were not introduced until 2008. In 2015, the European Commission went further by adopting an ambitious Circular Economy Action Plan[38], which includes measures which seek to stimulate Europe's transition towards a circular economy, boost global competitiveness, foster sustainable economic growth and generate new jobs. The Plan established a concrete and ambitious program of action, with measures covering the entire life-cycle of products, from production and consumption to waste management and the market for secondary raw materials. The new Circular Economy Action Plan[39] adopted in 2020 announced initiatives along the entire life cycle of products, targeting their design, promoting circular economy processes, fostering sustainable consumption, and aiming to ensure that resources used are kept in the economy for as long as possible

[38] Closing the loop - An EU action plan for the Circular Economy, COM (2015) 614 final
[39] A new Circular Economy Action Plan - For a cleaner and more competitive Europe COM (2020) 98 final

energy generation, transportation and industry remain the largest GHG emitting sectors, waste management is increasingly seen as an important contributor with emissions abatement potential. GHG emissions reductions from waste contribute to the global public good in addition to significant local benefits related to community health, environment, flood protection and local economic. GHG emissions reductions from municipal waste is also considered to require relatively easier adjustments compared to structural changes to transition a country economy to, for example, renewable energy sources or public transportation modes.

Globally, an estimated 1.6 billion tonnes of CO_2-equivalent of GHG emissions were generated from solid waste in 2016, some 5 percent of global emissions. This reflects downstream effects mostly from open dumping and unmanaged landfill gas. In a business-as-usual scenario, solid waste directly related emissions are anticipated to increase to 2.6 billion tonnes of CO_2- equivalent by 2050.[40]

Global averages of direct emissions differ significantly between low- and middle-income countries. Low-income countries have higher relative proportions of organic waste, high quantities of uncollected and dumped waste, and low energy intensity. Food waste volumes in low-income countries are as high, or higher, than middle- and high-income countries[41]. Consequently, average contributions of municipal waste in GHG inventories of cities in low-income countries are much higher than those in middle- and high-income countries. In some low-income countries, municipal solid waste represents as much as 30 percent of a city's GHG inventory as in the case of Dar el Salam, **Tanzania**[42]. C40 city GHG inventories confirm these relatively high contributions from the waste sector, e.g. Accra, **Ghana** (2015) 44 percent; Lagos, **Nigeria** (2015) 25 percent; Nairobi, **Kenya** (2016) 33 percent; Rio de Janeiro, **Brazil** (2017) 20 percent; Kolkata, **India** (2017) 35 percent.[43]

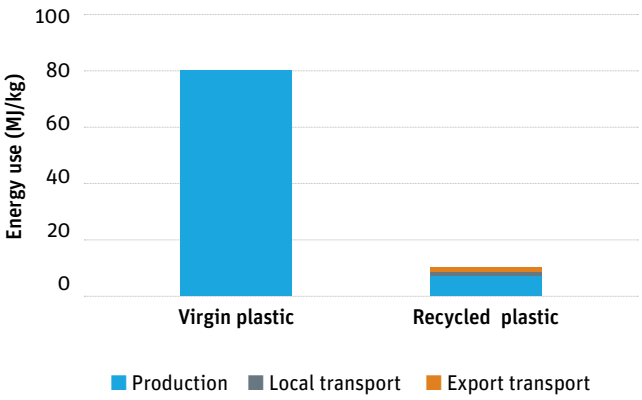
This means that low-income cities may have a significant potential to access climate finance to reduce emissions generated directly by the waste sector. In absolute and global terms, abated GHG emissions may be small, however, given the projected increase in generated quantities in these countries, establishing high-performing waste management systems with landfill gas capture and management, and limiting waste dumping will be core to 'future-proofing' the sector.

Where basic waste collection and disposal with landfill management are in place and the sector starts to transition upwards of the 'waste hierarchy' towards greater

[40] What a Waste 2.0, World Bank, 2018
[41] Food Waste Index Report, UNEP 2021
[42] Sugar, L., Kennedy C. and Hoornweg D., Synergies between climate change adaptation and mitigation in development: Case studies of Amman, Jakarta, and Dar es Salaam. International Journal of Climate Change Strategies and Management, Vol. 5 No. 1, 2013
[43] C40, BASIC Emissions (stationary energy, transport and waste) as defined in the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC). See https://www.c40knowledgehub.org/s/article/C40-cities-greenhouse-gas-emissions-interactive-dashboard?language=en_US Accessed 16-3-2021

recycling and waste prevention, waste management offers a great potential for emission abatement. Recycling offers benefits in terms of resource efficiency and associated GHG emissions. When materials are recycled, GHG emissions are reduced from avoiding new virgin material production which is associated with higher energy intensity and GHG emissions. **Figure 2** shows the energy intensity of virgin and recycled plastics production.

Figure 2 **Relative energy intensity of virgin and recycled plastics production**[44]



Note: Data is for plastic resins only.
Sourece: Wong C. (2009), "A Study of Plastic Recvycling Supply Chain 2010", http://www.ciltuk.org.uk/portals/0/documents/pd/seedcornwong.pdf (accessed on 28 March 2018).

For example, recycling 1 tonne of plastics is estimated to reduce emissions by 1.1-3.0 tonnes of CO_2 compared to producing the same tonne of plastics from virgin fossil feedstock.[45,46] Steel recycling uses only 10-15 percent of the energy required in the production of primary steel.[47] Plastics, together with steel, cement and aluminium, if recycled, could help reduce overall GHG emissions by 40 percent in 2050.[48] This very significant emission reduction potential would be possible if the materials are captured and reintroduced in the economy. To a very large extent the success of GHG avoidance depends on how well organized the waste management systems are.

Good collection systems and separation at source to ensure high-quality recycling materials that are minimally contaminated are important factors that will determine the extent to which GHG abatement potential could be met. Good quality separate collection systems to capture materials and to reintroduce them into the economy should be promoted as a matter of policy over lower treatment options within the 'hierarchy', but minimum conditions discussed above must be in place and the system should be financially affordable if it is to be sustained. Countries at this stage of development, typically middle-income countries, may have significant potential to access climate finance for activities such as separate collection and recycling in addition to waste prevention and minimization.

3.2.5.2 Linkages with marine plastic litter

National and city planning has been impacted lately by international calls and local objectives to curb plastic ocean pollution, the most significant source of which is municipal solid waste. It is estimated that over 80 percent of ocean plastics comes from unmanaged or poorly managed municipal solid waste on land.[49] Three-quarters of that quantity is found to come from uncollected waste with the remaining quarter leaking from within the waste management system due to poor controls and secondary pollution, such as unauthorized dumping of collected waste.[50] Given that a third of the municipal waste generated globally is currently dumped and that waste generation rates continue to increase, a business-as-usual scenario would mean an exponential increase of ocean pollution with devastating effects on the ecosystem, the marine environment and our food chain.

Internationally, a consensus has emerged that a combination of policies and system investments are needed to address the ocean plastic debris challenge. That will include: (i) improved waste management systems to reduce and eliminate leakages of plastic waste into the

The extraordinary amounts of waste that leak into the environment in real-time, especially in low-income countries, calls for immediate attention to prioritize these hot spots and minimize the leakage.

[44] Environmental Policy Paper No. 12: Improving Plastic Management: Trends, Policy Responses and the Role of International Cooperation and Trade, OECD, 2018
[45] Completing the picture how the circular economy tackles climate change, Ellen MacArthur Foundation, 2019
[46] The new plastics economy: rethinking the future of plastics, Ellen MacArthur Foundation, 2016
[47] Ibid
[48] Ibid
[49] Stemming the Tide: land-based strategies for a plastic free ocean, Ocean Conservancy and McKinsey Center for Business and Environment
[50] Ibid

environment; (ii) upstream solutions to reduce unnecessary use of plastics and promote the use of more recycled and recyclable materials; and (iii) clean-up operations of already accumulated debris. Clean-up operations of already accumulated waste could be important in specific locations (e.g., river deltas, beaches) and are relevant for certain environments. However, large-scale clean-ups make little sense if the leakage of new plastic debris continues. Emphasis is therefore required on a combination of 'upstream' (pre-consumer, such as material redesign, plastic reduction, and substitution) and 'downstream' solutions (postconsumer, such as recycling and disposal).

It should be noted that the extraordinary amounts of waste that leak into the environment in real-time, especially in low-income countries, calls for immediate attention to prioritize these hot spots and minimize the leakage. Given that plastics production and use is projected to increase significantly in coming decades, some proportion of this material will inevitably make its way into the environment unless waste management systems improve.[51] To that end, international organizations and other financiers have mobilized resources to assist countries in their efforts to curb marine plastic litter. As these efforts are central to municipal waste systems, countries could access international plastic pollution reduction finance that support both 'downstream' and 'upstream' solutions. Related metrics could be included in municipal waste management plans as discussed in the next section below.

3.2.6 Situation analysis

A thorough understanding of all aspects of the existing waste management situation both locally and nationally is essential for setting realistic objectives and for reliable planning.

A common problem faced in the planning process is the lack of data or that data are incomplete or unreliable. It is not uncommon to find that the competent authorities are strictly focused on using officially published data and are reluctant to address inconsistencies and deficiencies in such data. Recognizing and understanding the problem is important. Improving data quality and its completeness must be considered when planning future activities and addressed in the respective action plans.

Estimates and assumptions can be used for the purpose of planning when justified and reasonable. An absence of data, though, increases uncertainty and reduces the reliability of planning. In such cases, authorities should consider postponing certain decisions until the necessary information is available and, in the meantime, consider introducing shorter periods between reviews and updates of the plan.

Setting objectives is usually based on problem analysis. The purpose of situation analysis is to provide information to readers on the main characteristics of the waste management system and, most importantly, to identify the problems and challenges faced by the sector, and the aspects which require particular attention and improvement.

An analysis of political and institutional risks and the risks related to vested interests that could hamper adaptation and implementation of the strategy or plan is also relevant.

The periodic review of the management strategy/plan must assess progress made towards achieving the initial objectives, identify the key issues and obstacles that have been faced and draw on this experience to inform and guide the forthcoming objectives setting process. The review should be critical and correctly identify reasons for the failed or delayed implementation of planned activities or for the non-achievement of planned objectives or investment levels. It is commonly observed that when reviewing previous activities, the authorities tend to be more focused on actual achievements rather than being inquisitive about, and-critical, of the failures. Another common deficiency of the situation analysis is to identify problems without carefully considering and analysing their causes.

For example, in **India**, national solid waste management rules require cities to formulate their city level integrated solid waste management plans, covering various categories of waste, in line with a city's long-term waste infrastructure and service delivery needs. These city level plans serve to establish the baseline of cities' waste generation, waste characteristics and signpost waste growth profiles considering local socio-economic and demographic parameters. The plans enable city governments to establish the infrastructure and service delivery needs, assess the financing needs and set the user charge, as part of local by-laws, for various categories of waste generators. In addition, national rules require State Governments to develop a state level waste management strategy as well as focused plans for various streams of waste, such as plastic waste, construction and demolition waste, domestic hazardous and e-waste and domestic bio-medical waste that serve as the basis for compliance monitoring against the National Environmental Protection Act. In Kerala, the provincial Government has

[51] Improving Plastics Management: Trends, policy responses, and the role of international co-operation and trade, Policy Perspectives, OECD, 2018

developed and is in the process of adopting an integrated solid waste management strategy along with a plastic waste management action plan aimed at reducing mismanaged plastics. The background assessment included a scenario-based option analysis as well as material flow analysis.

3.2.7 Definition of policy objectives

Countries and local authorities should define their objectives in terms of what they realistically believe can be achieved over the planning period after taking account of the existing situation and of any specific constraints. Objectives may be relatively simple, such as organizing and extending waste collection services, providing safe waste disposal services or improving cost efficiency, or they may extend to encouraging waste prevention, setting recycling targets or reducing greenhouse gas emissions.

Objectives develop progressively over time in step with gradual improvements in waste management. International practice confirms that transitioning the sector towards resource efficiency and the concept of the circular economy are largely not market driven but depend on regulation. Waste management companies operate in markets under contract with the objective of fulfilling their contractual obligations and making a profit on their investments. Regulation of the waste sector on the less preferred management options of landfill and incineration therefore create the conditions whereby alternative treatment options that sit higher on the 'hierarchy' become financially viable and hence attractive opportunities for private sector waste companies to invest and operate in.

This aspect is often misunderstood, and there could be a desire to emulate approaches that are seen to work in high-income countries with the expectation that they will work equally well elsewhere. This is commonly reflected in a tendency to set objectives that are overly ambitious, unrealistic and unachievable. For example, a local authority is unlikely to attract private sector investment in a pay-as-you-throw collection scheme if a large percentage of its residents do not pay for waste services. Similarly, high recycling rates cannot be achieved in the absence of large-scale separate collection systems and community participation.

Setting realistic objectives is a fundamental component of the national and local authority planning process as it governs downstream decisions and is crucial for the proper organization and implementation of the waste management system. When setting policy objectives and targets, waste management authorities should distinguish between what is desirable and what is realistically achievable. Objectives and targets should be[52]:

- *Specific:* defined as precisely as possible
- *Measurable:* possible to be evaluated on fulfilment
- *Achievable:* possible to be achieved
- *Timely:* linked to a deadline for achievement

Indicative objectives typically include:

- To extend the scope and improve the quality of waste collection services.
- To reduce the risk to public health and safety and to the environment from abandoned and/or unlicensed waste disposal sites.
- To optimise opportunities for waste prevention and minimization.
- To increase the quantities of waste that are re-used, recycled, and recovered where it is economically and financially viable to do so.
- To develop capacities for waste treatment, recovery and disposal that are consistent with the most recent technical standards.
- To strengthen institutions responsible for waste management at the national, regional and local levels.
- To provide sufficient and reliable data on waste generation, treatment and disposal.
- To increase investments in the sector and expand application of the 'extended producer responsibility' and 'polluter pays' principles.
- To increase public awareness of, and involvement in, efforts to address the core waste management issues facing the country.

Waste management plans should also define quantitative targets to be met by specific dates, the timing of which reflect, as far as possible, the agreed guiding principles, strategic objectives, and constraints.

[52] Preparing a Waste Management Plan. A methodological guidance note. European Commission, Directorate-General Environment, 2012

Box 4 Indicators used in municipal plans in Japan

Category	Objective to be measured	Indicator	Unit
Establishing recycling-based society	Wate generation	Waste generation pero person-day	kg/person-day
	Recycling date	Recycling rate from waste	% (ton/ton)
	Thermal recycle	Energy recovered from waste	MJ/ton
	Final disposal	Proportion of waste sent to to landfill site	% (ton/ton)
Prevention of global warming	GHGs emission	GHGs emission per person a day associated with waste disposal	kg/pwerson-day
Public service	Residents' satisfaction for waste treatment	Degree of satisfaction of residents	–
Economy	Cost-effectiveness	Annual waste treatment cost per person	JPN yen/person-year
		Cost of recycling	JPN yen/ton
		Cost of thremal recycling	JPN yen/MJ
		Cost associated with wsate reduction service	JPN yen/ton

Source: Municipal Solid Waste Management: A Roadmap for Policy Makers, World Bank 2018

Targets are usually determined for waste collection coverage, separate collection coverage, separately collected materials (cardboard, plastics, glass, and metals), specific treatment and disposal, environmental performance and efficiency (see **Box 4**). Specific targets for individual waste streams, including packaging waste, WEEE, batteries and accumulators, end of life vehicles, and waste oils might also be defined.

3.2.8 Options analysis and cost estimates

Options analysis is commonly used in the development of investment projects and is usually undertaken at the feasibility analysis stage. Ideally, though, option analysis should be carried out at two levels: options analysis as part of national or regional waste management planning focused on strategic decision making regarding future waste management systems; followed by options analysis at the project level.

First, strategic alternatives are compared on an economic basis. For example, comparing alternative mixes of national waste treatment measures, different methods of waste management or varying degrees of regionalisation of waste treatment and disposal facilities. Sometimes other criteria related to technical, managerial and logistical aspects are incorporated into the analysis. Examples of strategic alternatives are:

- The comparison of centralised and decentralised systems for the treatment of separately collected biowastes in a regional waste management system: one large centrally located plant versus two or more smaller plants located closer to the main collection zones.
- Comparison of technological alternatives for the treatment of residual mixed waste collected after the separation of recyclables: mechanical-biological treatment with composting of the biological fraction versus thermal treatment in a waste-to-energy facility.

Second, the analysis of possible sites and more specific technical alternatives for individual projects are generally compared on the basis of costs, technical complexity, social considerations and other criteria. Example for such analyses are:

- Comparison of alternatives for transporting waste to a central treatment or disposal facility from distant collection zones: transport with or without a waste transfer station for the reloading of waste from small refuse collection vehicles to vehicles with larger payload and/or compaction.
- Comparison between technologies for a mechanical and biological treatment plant or technologies for anaerobic digestions.

Quite often the option analysis is missing or not sufficiently elaborated when developing national waste management plans. This could result in unrealistic objectives, uncertain environmental benefits or lower economically efficient solutions.

The purpose of the option analysis is to formulate and compare different technical, financial and institutional alternatives to deliver defined objectives and determine the optimal future waste management system. It is also used to assess whether objectives are realistic and can feasibly be achieved within specific deadlines over the planning period. Having clarity on the planned national or regional set up is highly relevant for local authorities and aids the process of waste management planning at their level. It informs them of the intended sector landscape in terms of infrastructure, facilities and their intended capacities, and intended level of regionalisation on service delivery.

Typical issues addressed by option analysis as part of national or regional waste management planning include:

- How rapidly to extend waste collection services to the entire population, how much it will cost, how it will be financed.
- Over what period will existing disposal sites either be brought into compliance or closed, and what intermediate measures will be implemented until technical compliance is achieved.
- How rapidly separate waste collection be organized, how many residents must be provided with separate collection services, what quantity or what percentage of generated waste must be re-used or recycled.
- Whether garden and kitchen waste should be collected separately and what composting and anaerobic digestion capacities will be needed.
- What should be the role of waste incineration and, more generally, what should be the overall mix of treatment technologies within the country or region.

Various considerations are in play when deciding on these issues, including the existing context and baseline, how much the respective measure will cost, how they will be financed and over what period, and who will be responsible for implementation.

The scope of the option analysis could differ depending on the type of plan that is developed and the specific issues faced by the country or region. In any case, selecting the optimal waste management option requires the identification and comparison of technical alternatives taking waste collection, separate collection, treatment, recovery and disposal into account.

Ideally, option analysis should be carried out at two levels: options analysis as part of national or regional waste management planning focused on strategic decision making regarding future waste management systems; followed by options analysis at the project level.

The options for the future waste management system should be prepared using projections and mass balances of the quantities of municipal waste collected, separately collected, sorted, treated, recycled, recovered and disposed of to landfill. The analysis of waste flows and the projections form the basis for determining capacity requirements and for sizing the different collection and treatment alternatives.

Detailed investment and operating cost estimates are developed for each option on annual basis. Investment costs should include not only the initial investments but also future investments in the replacement of equipment, for the construction of new landfill cells, landfill cell closure and cultivation, and aftercare costs arising over the entire plan implementation period.

Based on the investment and operating costs calculated for each component and for the entire system, unit costs can be calculated, for example, per tonne of waste generated, separately collected, sorted and treated and per capita and per household served.

The waste management options are then compared according to their relative costs and affordability to users. Comparisons made with present cost levels is appropriate when analysing alternatives. **Box 5** presents the options analysis done in the process of developing **Azerbaijan**'s National Waste Strategy.

At the project level, the criteria for selecting the optimal alternative for the future waste management system should include economic, environmental, technical and social considerations. The following indicative criteria might be used for the evaluation and ranking:

- Track record of technology considered.
- Technical complexity vs. available capacities.

Box 5 Azerbaijan National Waste Management Strategy

The Azerbaijan National Waste Management Strategy was approved via Presidential Decree in 2018.

The Strategy aims to (i) improve core collection and disposal processes including the development of regional landfills and transfer stations that will provide disposal services for various groupings of rayons (regions) throughout Azerbaijan; and (ii) ensure the efficient use of available resources in setting up the investments and development schemes that would improve solid waste collection, recovery and disposal in all of the country's rural and urban areas.

The Baku Waste Management Strategy is a separate document developed prior to the National Strategy and part of the overall country planning effort.

The development of the National Strategy followed a thorough and comprehensive process, comprising data collection, diagnostic studies, options analysis and site investigations. This process is summarized below:

Based on demographic data, waste generation and composition, topography and distances, the draft Strategy proposed to establish eight waste zones in Azerbaijan, each of about 300 tonnes/day, considered the minimum quantity needed to achieve economies-of-scale in a sanitary landfill facility.

Technical options related to collection and transfer, recycling and resource recovery and landfill types were developed taking into consideration economies of scale based on local unit rates.

As a next step, the enabling framework was analyzed against its ability to support and enable the delivery of identified technical activities. Options were developed with regards to legal requirements, institutional changes, financial systems, cost recovery mechanisms, market incentives and private sector incentives.

The technical and enabling environment arrangements were then overlaid and broken down into phases, each phase with a duration of six years.

Three levels of activities were formulated, each one with a different degree of effort, complexity, cost and achievement. Level 1 arrangements provided a minimum amount of upgrading activity. Level 2 arrangements provided a medium amount of upgrading activity. Finally, Level 3 arrangements provided a maximum amount of upgrading activity.

Finally, scenarios were developed comprised of various Level 1, 2, or 3 arrangements for each topic. Six scenarios were developed for the 3 Levels of technical arrangements and 3 Levels of enabling framework arrangements. They were compared on the basis of cost (capital investment cost, recurrent cost affordability, market demand for by-products) and sustainability (environment quality protection, public health protection, natural resource conservation, skill capacity need). The scenarios, when developed to reach Level 3, would enable greater market revenues from recyclables and resource recovery, highest level of private sector investment, and strongest regulatory protection against adverse environmental and health impacts.

Artwork made by students in Baku, Azerbaijan, using paper, plastic, rubber products, and various household waste. Photo: © Adil Celebiyev | Dreamstime.com.

The scenario that was chosen by Azerbaijan, following intensive consultations, presented the most cost-effective option, balancing both costs and sustainability within the context of the country's level of income and stage of infrastructure development. It aims to ensure:

- On the technical side: Long term integrated waste management system based on a regional approach with 8 waste sheds consisting of 8 regional sanitary landfills and 38 transfer stations; upgraded and properly managed collection system; and closure/rehabilitation of existing dumps.
- Institutional arranangements: Establishment of institutional structure to ensure institutional support and operational capacity; strengthened sector monitoring and control; intermunicipal cooperation for collection/transportation.
- Financial provisions: Cost recovery of operations with increased tariffs and improved payment collection and development of national financial and waste accounting systems.

- Reduction of quantities landfilled or bio-degradable waste landfilled.
- Minimum space required and required distance from population centres.
- Recycling recovery rate achieved and sensitivity to increased recycling/recovery requirements in the future.
- By-products, markets for products of treatment plants, dependency on markets.
- Energy utilization/recovery and energy demand.
- Wastewater discharge, emissions.
- Sensitivity to waste quantity changes.
- Implementation timeline versus that of the alternative.

The options analysis frequently reveals that the option that best meets the environmental and resource efficiency objectives of the strategy has high implementation costs that would be unaffordable to society and investment requirements which exceed significantly the financial capacity of the local authority. If it is concluded that implementation of the option is infeasible owing to financial or other social constraints, then either the period set for achieving the specific objectives might be extended or the targets might need to be reduced.

In principle, the development of the plan should be thought of as an iterative process based on feedback between objectives, technical options, implementation costs and organizational models.

3.2.9 How to deal with minimum required treatment and disposal capacities

Some countries use the national or regional waste management plans to determine waste treatment and disposal facilities and their capture area. In this case waste generated within the defined service area is delivered to a specific facility defined in the respective plan. Such approaches presuppose that the country or region is sub-divided into service zones and that local authorities will cooperate in establishing and using common treatment and disposal infrastructure created in their respective zone. This type of centralized approach is typically used when the development of waste treatment and disposal infrastructure relies on public financing. Defining service zones in this way can guarantee the supply of waste quantities to the facility, be a tool and driver in support intermunicipal cooperation, and reduce considerably the potential resource risks faced by the future operation of the facility.

Proposals to divide the country or territories into service zones and for the associated treatment and disposal facilities should be set out and justified in the respective waste management plans on considerations of, for example, efficiency, equity and access.

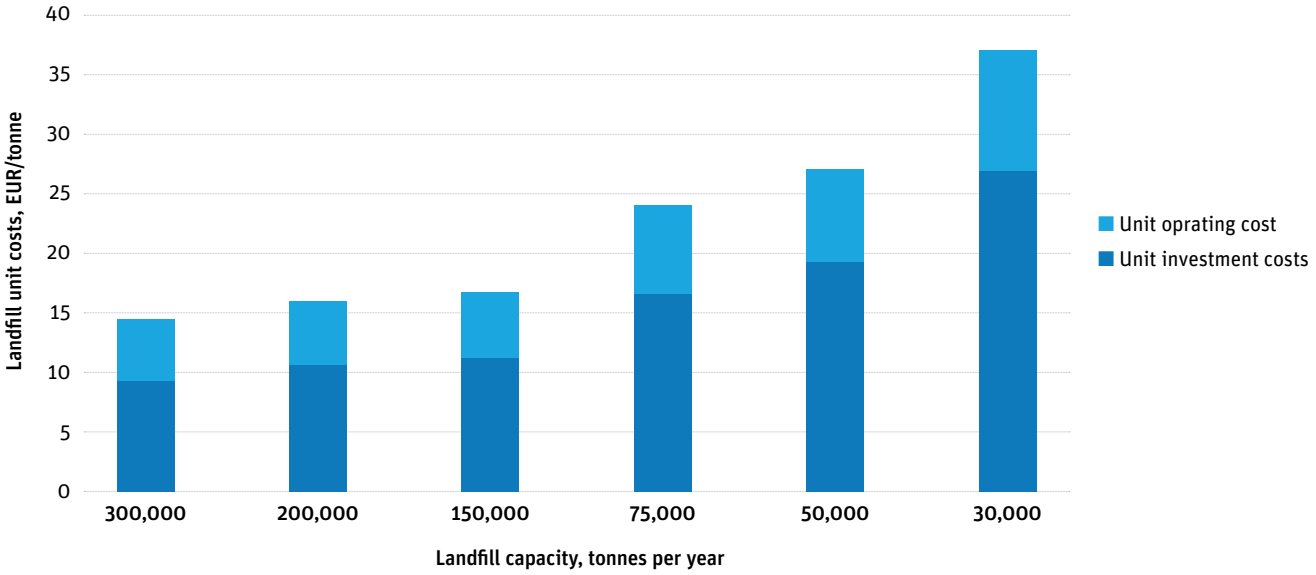
For example, in **Romania** the National Waste Management Plan provides an estimate of the necessary treatment, recovery and disposal capacities whereas the regional waste management plans define the precise type, capacity and service zones (local authorities) of the facilities. Similarly, in **Ukraine** each administrative region is obliged to prepare a waste management plan. The regional waste management plan must divide the territory into several waste management service zones (clusters) following the completion of an options analysis comparing technical alternatives.

In some countries free competition exists on the waste disposal and treatment market and local authorities or service providers are free to choose which between competing facilities for treating and disposing of their waste. Waste management plans in this case are more focused on ensuring that the necessary treatment and disposal capacity is developed at the national level without considering the capacities of individual installations.

The waste management plans developed at the different administrative levels must take into consideration the significant economies of scale associated with larger landfills and some treatment plants (see **Figure 3**). Such economies of scale can have a major impact on total waste management costs per tonne of waste collected and on the cost per household as reflected in the tariffs. As the affordability of waste services is critical to the decision-making process, optimising landfill size and waste treatment capacity to maximise economies of scale and minimise costs is a key objective of the options analysis.

The identification, selection and approval of regional landfill sites and other waste treatment facilities is a crucial element of the implementation process and should be given the highest priority from the beginning of the planning period. The planning process must address all applicable legal and planning requirements concerning the proximity of a landfill to urban zones, water flows and protected natural areas. Other limiting factors on site location can include specific provisions on land use, geological and hydrogeological conditions, access to the site and others. Usual practice in the site selection process is to identify

Figure 3 Cost curves for landfill sites with different capacity - variation in unit costs[53]



Source: Own estimates

[53] The unit landfill costs are calculated as Average Incremental Costs (AIC) per tonne of waste deposited under the same operating conditions: lifetime of the landfill of 20 years, landfill comprising of 4 landfill cells each in operation for five years, discount factor used 5 percent. Typical unit costs for civil works, materials, machinery, equipment and consumables used (Ukraine).

and assess several potential sites against a set of preliminary criteria. If feasible, the option of extending an existing landfill in combination with site rehabilitation measures is almost always considered to be a priority. A final site selection decision is usually made according to and following the completion of an Environmental Impact Assessment (EIA).

Identification of appropriate sites for waste treatment and disposal facilities could be a significant challenge in densely populated metropolitan areas. The neighbouring local authorities are usually resistant to accept such large-scale facilities on their territory and compensatory measures could be needed to create a financial incentive for the hosting municipality. The central government authorities could also facilitate an inter-municipal cooperation and site allocation process through financial support policies for shared waste management facilities. These arrangements need to be made very clear before the municipal management master planning process begins.

The waste management plan should consider the scope for applying methods and processes from higher up the 'waste hierarchy'. For example, it should evaluate measures for implementing a system of separate collection and sorting of recyclable waste fractions and encourage the collection and use of organic waste separately from other types of solid waste. The planning of separate collection and recycling systems should be realistic and rigorously examine the technical and financial viability of these measures, together with their overall environmental, public health, economic and social impacts. The potential for using alternative measures for treating residual waste should also be analysed and implemented when technically justifiable and feasible within existing financial constraints.

3.2.10 Financing strategy

The waste management plan should indicate the scale of the investments needed to implement it, how they might be funded and the measures needed to secure financing for its annual operating cost requirements. Total annual expenditures relative to GDP can be a useful indicator for gauging how realistic a proposed strategy is from a financial perspective.

High level political commitment towards investment in MSW infrastructure is needed to unlock prospective investment finance from within government and administrative sources and to give support to government policy on the introduction of effective cost recovery mechanisms to ensure the long-term financial sustainability of improved

municipal waste management services.

Potential domestic sources of investment finance include grant finance from national or regional budgets; municipality and municipal public utility waste management company capital reserves; and investment by private sector waste management firms (retained earnings, equity finance) with potential access to loans from commercial banks. Access to grant finance from the state budget for the design and construction of waste treatment infrastructure may be necessary to initiate the implementation of the strategy as well as to help keep tariffs within affordability limits.

IFI funding via long-term loans is a potential source of co-finance for implementing the strategy. International waste management companies may be interested in financing or co-financing investments in waste management equipment and facilities but will expect to make commercial returns commensurate with the risk associated with the investment. Guarantees and counter-guarantees on investments are typically required especially in higher risk environments.

Grants, long-term loans or both might also be available from bilateral or multi-lateral sources to support strategy implementation. Governments should engage with the international community to identify areas of mutual interest, potential cooperation and assistance.

These aspects are considered in more detail in Chapter 4.

3.2.11 Paying for services and affordability

The process of defining and preparing an optimal waste management plan depends on key policy decisions being taken on a range of key issues at the national, regional and municipal levels, transposing those decisions into relevant laws, regulations and ordinances, and on strong political commitments towards implementing the legal framework at all levels. From the financing perspective the immediate focus is often on how the initial investment costs of the improved services should be financed, but equally important is the question of how the recurrent annual revenue required to sustain the services is to be funded.

A wide range of issues must be addressed and decided before this question can be answered effectively, many of which are inter-related. They include the role (if any) proposed for involving the private sector in providing and financing the services; the type of waste collection service to be used (which can directly affect charging policy); cost recovery and charging policy; and determining policy on the support to be provided to low-income or vulnerable households. These and others are addressed in detail in Chapter 4.

National legislation i.e. the waste law typically establishes the powers at national and local government administration levels needed for determining payments to waste service providers and charges payable by waste service users. National government commonly has powers to define and approve the methodology to be used for calculating (i) the unit tariff relating to the cost per tonne of waste service provision, and (ii) the fees to be applied to waste service users. Local government has powers (i) to calculate and approve the unit tariff payable to waste service providers, and (ii) to determine the waste service fees payable by users, both calculated according to the approved methodologies.

The waste law will also usually define how waste service users will be charged (for example, per household, per person, per m^2 of floor area, per kg of waste), how revenues may be collected (for example, via a municipal tax, via municipality direct billing, via third-party billing by a public utility, via a housing association), and how service fee revenues may be accumulated in local government budgets.

3.2.12 Institutional structures and organizational models to implement the strategy

The plan should define the overall institutional structures and administrative arrangements through which the waste management system will be planned, constructed, operated and regulated. It should also describe the responsibilities of the various institutions and organizations associated with implementing the measures envisaged by the plan, and identify actions planned for strengthening the administrative capacities of various stakeholders. The administrative costs estimated for implementing the strategy and their possible sources of funding should also be indicated.

Close cooperation, coordination of effort and clear lines of communication between the competent authorities and local administrations are needed to ensure that decisions taken to invest in collection and treatment infrastructure for improving municipal waste management services are appropriate to local conditions and compatible with the aims and objectives of the waste management strategy.

Organizational models for waste management services are considered in Chapter 5.

3.2.13 Communication and public awareness

Waste management plans developed at the national, regional and local levels should recognise the need for resources and responsibilities to be allocated for preparing and implementing long-term communication strategies or similar measures for raising public awareness. Typically, public outreach campaigns aim at:

- *Changing attitudes towards litter and especially dumping.* This is a necessary step to gaining public support for improving the performance of the waste sector and its transition up the 'waste hierarchy'. It aims to reduce social tolerance towards indiscriminate dumping and litter, and reinforce the resolve of regulatory bodies to enforce regulations that forbid such behaviour.
- *Improving the environmental awareness of the population.* Waste management, traditionally seen as having only localized effects, is nowadays regarded as having significant adverse effects on global public goods – from land and marine pollution through deteriorating air and drinking water quality.
- *Raising awareness of the need for improved municipal waste management and what it involves in terms of costs and the need to finance it.* Public support is essential to implement planned activities and provide continuous financing through user fees. Recovery of costs through user charges is the most effective mechanism, so long as tariffs are affordable, are introduced progressively, and low-income or vulnerable households are protected from unaffordable fees.
- *Promoting sustainable use and consumption models.* The promotion of responsible consumer behaviour in support of initiatives for waste prevention and separation at source.
- *Managing expectations.* Specific communication activities are needed to inform the public about sectoral achievements and balance stakeholder expectations on the time and complexity involved in setting up a system that works for the community.

Tools and measures for communications campaigns for increasing public awareness are considered in Chapter 6.

3.2.14 Public consultations

The general public, stakeholders and local authorities should have a right to participate in the preparation of waste management plans, through public meetings, committee involvement, commenting on draft text and similar. A starting point can often be to call a public meeting for conducting a structured problem analysis. Draft plans should be published and open for comment. This level of involvement in the planning process aims to ensure that there is general acceptance of the waste policy and that interested parties can genuinely contribute to and influence the attainment of its objectives.

3.2.15 Strategic environmental assessment

A Strategic Environmental Assessment (SEA) must be carried out for plans and strategies prepared at the national or regional level. The purpose of SEA is to assess the potential impacts on the wider society and environment of proposed policies and strategies, to formulate alternatives and mitigation strategies, and to improve the decision-making process around the design of the plan. It also offers a platform for consultations with a broad range of national and sub-national stakeholders, including potentially affected communities, to integrate social and environmental concerns into the upstream policy-making process.

The results of the SEA and associated consultations are reflected in modifications made to the policy, strategy or plan before its final adoption. The SEA process can be time consuming and can go through many iterations before final agreement is reached.

For example, in **India**, SEAs are carried out to enable the identification of environmental impacts and the risks associated with proposed sector interventions; to assess the policy, legal and institutional framework and its capacity to manage identified impacts; and include a set of recommendations by which these impacts can be addressed to enhance the environmental sustainability of the proposed sector interventions continually, by also specifically focusing on regional environmental differences. A recent SEA conducted in the State of Kerala followed a participatory and consultative approach and included mapping of key determining environmental, social and demographic characteristics of the State; review of existing technological solutions used in urban sanitation, demand supply gap assessment, the environmental opportunities and scope for various potential technological options; review of capacities of institutions, agencies and departments; and estimation of regional impacts related to GHG, legacy dumps, waste accumulation in sensitive environmental components, leachate accumulation etc. The SEA then

proposed recommendations focused on policy level interventions (such as land strategies, integrated management of waste sheds, recycling, reuse and EPR, institutional capacities), alternatives and inputs to improve existing waste facilities in the state (such as improvements to dumpsite/legacy sites, treatment options), directions for designing and managing facilities considering regional environmental conditions (such as planning for integrated waste management, regional/clustered facilities), necessary inputs to waste management institutional strategy (such as co-ordination and planning, professional development of women's groups, awareness and participation, monitoring of waste infrastructure and services, linking physical planning to infrastructure development, effective partnership inter-agency participation).

3.2.16 Evaluation and review of strategies, plans and programs

Every plan has a limited lifespan. As events unfold, even after detailed project level feasibility studies and investigations some planned activities or infrastructure projects will not be implemented. The plans can be affected by unpredicted changes in economic and market conditions, such as the recent fall in fossil fuel prices or the ban imposed in 2018 by China on imports of waste materials. Knowledge also grows as research and development (R&D) efforts advance and new technologies are developed that replace or improve existing facilities. National waste strategies and plans must therefore be subject to regular reviews and updates.

Reporting progress on implementing plans or strategies is usually done on a periodic basis. The review and revision process is typically most intensive during the years immediately following release of the plan. For example, a first review may be made after three years and then less frequently after that. This encourages realistic short to medium term targets to be set in the plan which can motivate action, build momentum and help avoid the possibility of the plan becoming stale.

For example, municipalities in **Japan** are required to develop local solid waste treatment plans over a 10-15-year planning horizon. The plans are reviewed, evaluated and updated every 5 years. A similar approach is followed in the **Republic of Korea**. **South Africa** on the other hand does not set a fixed plan duration but municipalities are advised to set goals and targets within a 5-year planning horizon.

Some countries use the national or regional waste management plans to determine waste treatment and disposal facilities and their capture area.

3.3 Legal framework

3.3.1 What needs to be regulated

The legal requirements are a core element of any national waste management system. They create the binding framework to implement plans and strategies, assign roles and responsibilities, and regulate and enforce rules. Countries looking to achieve step changes in waste management need to carefully consider to what extent the body of legislation permits the implementation of set goals, whether it creates a favourable enabling environment for the sector or presents legal barriers. This is pertinent especially for the ability to bring in the private sector as owner, operator and financier of large infrastructure and operations. Where the legislative framework and individual acts and regulations are restrictive or contradictory and therefore limit the ability of the sector to perform, legislation needs to be reviewed, updated and amended. In the absence of a favourable legislative environment, sector objectives may be difficult to achieve.

The following categories of waste management legislation could be considered:

- **Framework legislation** sets out the general principles, procedures, and requirements in the field of waste management. Other legal acts must conform to the general requirements of the framework legislation. The main elements of such legislation are comprised of:
  - Common definitions and waste classification distinguishing between hazardous and non-hazardous waste;
  - Basic requirements towards waste prevention, collection, separate collection, preparation for re-use, recycling, recovery and disposal;
  - Bans and restrictions, e.g. uncontrolled dumping of waste; and requirements in the case of waste imports and exports;
  - Legal objectives and targets; and planning requirements;
  - Responsibilities of institutions, waste generators and holders, including documentation and reporting requirements; control and enforcement provisions;
  - Requirements for obtaining permits or licenses for

DBV landfill disposal company, composting and recycling Velbert GmbH. Photo: mauritius images GmbH / Alamy Stock Photo

waste treatment and disposal activities and operations;
- Allocation and financing of waste management costs.

- **Legal requirements towards facilities** define provisions towards landfilling, incineration and other treatments facilities. These includes regulations on the siting of new facilities, discharge and emission standards, and minimum performance criteria.

- **Legal requirements regarding specific products and waste streams.** The waste streams and categories requiring particular attention usually include municipal waste, construction and demolition waste, packaging waste, certain categories of plastics, WEEE, batteries and accumulators, sewage sludge, end of life vehicles, used tyres, waste oils and textiles.

Other legal requirements may also have an impact on waste management. The subjects of legal regulation are typically product requirements, activities and production processes, environmental quality protection, procedures, responsibilities and rights.

Waste management legislation should be coordinated with legal provisions and procedures which pertain to the fields of environmental and social protection and related areas, including EIA, prevention of industrial hazards, urban planning requirements, and legislation on chemicals and hazardous substances.

3.3.2 Types of legal acts

The legal requirements relating to waste management may be introduced through different forms of legal act. The type of legal acts chosen depends on the legal and administrative system of the country in which the legislation is being enacted and the subjects that are to be regulated.

The framework requirements should in principle be endorsed at the highest regulatory level and common practice is the adoption of a Framework Waste Law or equivalent.

For example, **EU** the Directive 2008/98/EC[54] (Waste Framework Directive)[55] sets the basic concepts and definitions related to waste management, such as definitions

[54] Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives, last amended by Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018.

[55] The first Waste Framework Directive was initially adopted in 1975 (Directive 75/442/EEC on waste) and following that period several amendments and revisions occurred.

Clean-Up Day in Estonia. Photo: © Maigi | Dreamstime.com

of waste, recycling, recovery. It explains when waste ceases to be waste and becomes a secondary raw material (i.e. end-of-waste criteria), and how to distinguish between waste and by-products. The Directive lays down some basic waste management principles: it requires that waste should be managed without endangering human health or harming the environment, and in particular without risk to water, air, soil, plants or animals, without causing a nuisance through noise or odours, and without adversely affecting the countryside or places of special interest. Waste legislation and policy of the EU Member states should apply as a priority order the following waste management 'hierarchy': the Directive introduces the 'polluter pays principle' and the 'extended producer responsibility'. It incorporates provisions on hazardous waste and waste oils[56], and includes recycling and recovery targets to be achieved. The Directive requires that Member states should adopt waste management plans and waste prevention programs. EU member states must adopt specific national legislation in accordance with the Waste Framework Directive.

Other provisions are usually introduced through secondary legislation that, depending on the specific legal system, might comprise of decrees, governmental regulations or ministerial orders. Some countries however choose to adopt specific laws for subjects of particular interest. For example, in **Estonia** the requirements for EPR and for management of packaging waste are established through a separate Packaging Act[57]. In **Chile**, a Plastic Bag Ban Law[58] was adopted in 2018. The Law imposes a ban on single use plastic bags in stores and businesses nationwide; and puts local authorities in charge of supervising compliance with the obligations provided by Law. Similarly, in **Japan**, there are separate laws on treatment of waste and promotion of recycling – the Waste Management and Public Cleansing Act[59] and the Law for the Promotion of Effective Utilization of Resources[60] (see **Figure 4**). Overarching to these two laws is the Basic Act on Establishing a Sound Material-Cycle Society[61] which focuses on reduction of environmental impacts from waste and material circularity. It also specifies the roles of different entities: national and local governments, business operators and consumers and implements the polluter pays principle.

The legal requirements can be supported by various implementation guidelines, instructions and supportive methodological procedures and administrative rules. In Japan for example, six recycling regulations target individual products governed under EPR arrangements.

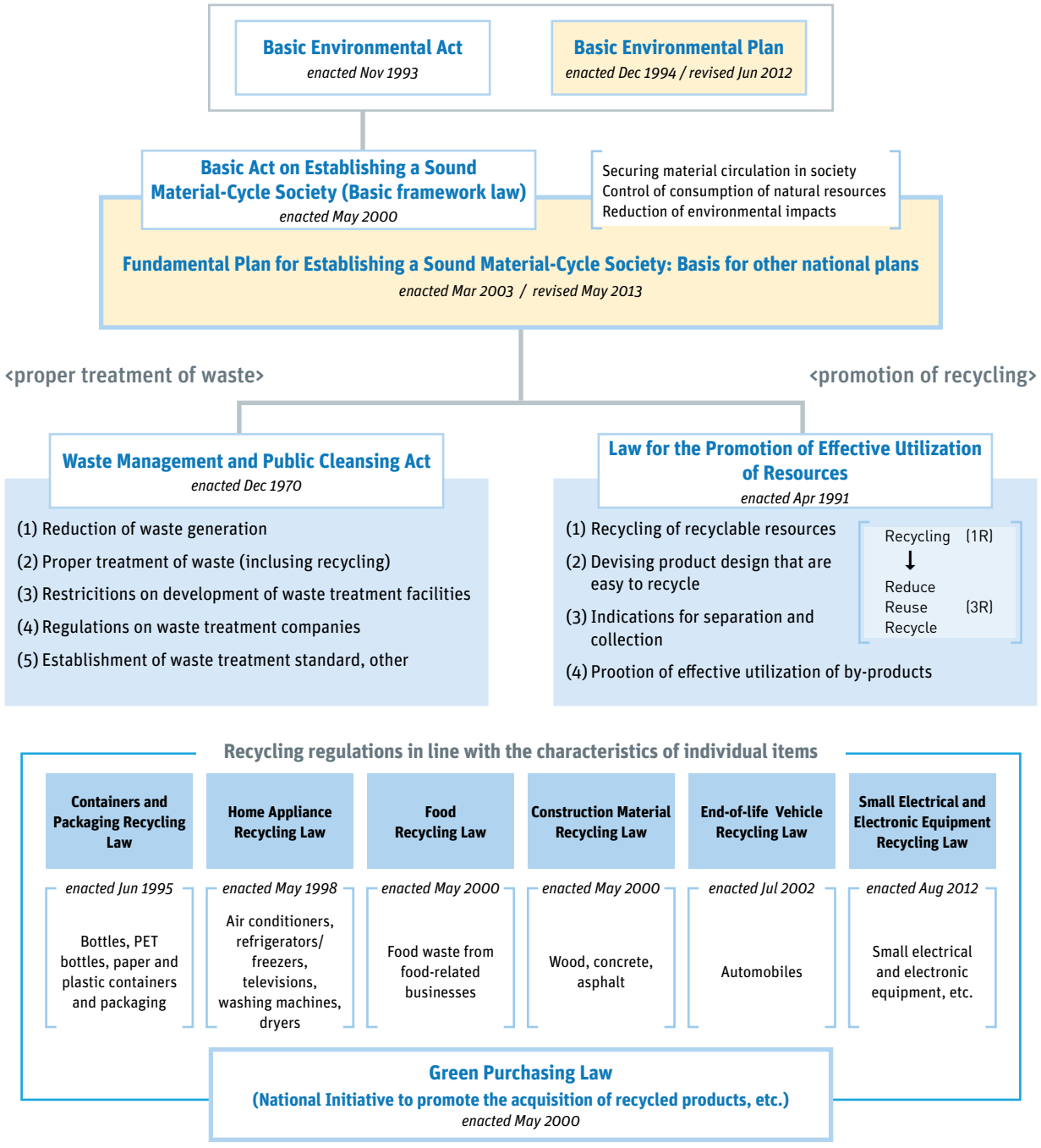
Quality and procedure standards, such as ISO[62] and CEN[63] or other relevant national standards, are in principle not considered part of legislation, except when the use of a specific standard is mandated by specific legal provisions. Nevertheless, such standards might also have a supportive role in the implementation of legislation.

Local authorities also regulate municipal waste management on their territories. Local ordinances outline the roles and responsibilities of waste generators and other stakeholders within their territories, define the specifics of waste collection and set up local taxes or service fees to finance the respective services.

Countries should also recognise the obligations arising from several international treaties. The Basel, Rotterdam and Stockholm conventions are some of the multilateral environmental agreements which share the common objective of protecting human health and the environment from hazardous chemicals and wastes (see **Box 6**).

[56] Older Directives on hazardous waste and waste oils were repealed with effect from 12 December 2010.
[57] RTI, 29.06.2014, 50, https://www.riigiteataja.ee/en/compare_original/524102014004
[58] Law 21100, https://www.bcn.cl/leychile/navegar?idNorma=1121380
[59] Law No. 137 of 1970, last amended 2001
[60] Act No. 48 of 1991
[61] Act No.110 of 2000
[62] International Organization for Standardization, https://www.iso.org/home.html
[63] Comité Européen de Normalisation (CEN) or European Committee for Standardization is the official standardization body of European Union, https://www.cen.eu/Pages/default.aspx

Figure 4 Japan legal framework for waste management and the promotion of recycling



Source: MOE, History and Current State of Waste Management in Japan, 2014

Box 6 Selected International Conventions related to wastes

The **Basel Convention**[64] on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was created to protect people and the environment from the negative effects of the inappropriate management of hazardous wastes worldwide. It is the most comprehensive global treaty dealing with hazardous waste materials throughout their lifecycles, from production and transport to final use and disposal.

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was adopted on 22 March 1989 by the Conference of Plenipotentiaries in Basel, Switzerland, in response to a public outcry following the discovery, in the 1980s, in Africa and other parts of the developing world of deposits of toxic wastes imported from abroad.

The overarching objective of the Basel Convention is to protect human health and the environment against the adverse effects of hazardous wastes. Its scope of application covers a wide range of wastes defined as 'hazardous wastes' based on their origin and/or composition and their characteristics, as well as two types of wastes defined as 'other wastes' - household waste and incinerator ash.

The provisions of the Convention center around the following principal aims:

- the reduction of hazardous waste generation and the promotion of environmentally sound management of hazardous wastes, wherever the place of disposal;
- the restriction of transboundary movements of hazardous wastes except where it is perceived to be in accordance with the principles of environmentally sound management; and
- a regulatory system applying to cases where transboundary movements are permissible.

The first aim is addressed through a number of general provisions requiring States to observe the fundamental principles of environmentally sound waste management (article 4). A number of prohibitions are designed to attain the second aim: hazardous wastes may not be exported to Antarctica, to a State not party to the Basel Convention, or to a party having banned the import of hazardous wastes (article 4). Parties may, however, enter into bilateral or multilateral agreements on hazardous waste management with other parties or with non-parties, provided that such agreements are 'no less environmentally sound' than the Basel Convention (article 11). In all cases where transboundary movement is not, in principle, prohibited, it may take place only if it represents an environmentally sound solution, if the principles of environmentally sound management and non-discrimination are observed and if it is carried out in accordance with the Convention's regulatory system.

The regulatory system is the cornerstone of the Basel Convention as originally adopted. Based on the concept of prior informed consent, it requires that, before an export may take place, the authorities of the State of export notify the authorities of the prospective States of import and transit, providing them with detailed information on the intended movement. The movement may only proceed if and when all States concerned have given their written consent (articles 6 and 7). The Basel Convention also provides for cooperation between parties, ranging from exchange of information on issues relevant to the implementation of the Convention to technical assistance, particularly to developing countries (articles 10 and 13). The Secretariat is required to facilitate and support this cooperation, acting as a clearing-house (article 16). In the event of a transboundary movement of hazardous wastes having been carried out illegally, i.e. in contravention of the provisions of articles 6 and 7, or cannot be completed as foreseen, the Convention attributes responsibility to one or more of the States involved, and imposes the duty to ensure safe disposal, either by re-import into the State of generation or otherwise (articles 8 and 9).

The Convention also provides for the establishment of regional or sub-regional centres for training and technology transfers regarding the management of hazardous wastes and other wastes and the minimization of their generation to cater to the specific needs of different regions and subregions (article 14). Fourteen such centres have been established. They carry out training and capacity building activities in the regions.

Starting from December 2019, the Ban Amendment to the Basel Convention prohibits shipments of hazardous waste from OECD countries to non-OECD countries for disposal or recovery. The Basel Convention was amended to include plastic waste in a legally-binding framework which will make global trade in plastic waste more transparent and better regulated, whilst also ensuring that its management is safer for human health and the environment. At the same time, a

[64] See http://www.basel.int/

Box 6 Cont.

new Partnership on Plastic Waste was established to mobilise business, government, academic and civil society resources, interests and expertise to assist in implementing the new measures, to provide a set of practical supports – including tools, best practices, technical and financial assistance.

The **Bamako Convention**[65] is a treaty of African nations prohibiting the import into Africa of any hazardous (including radioactive) waste. The Bamako convention is a response to Article 11 of the Basel convention which encourages parties to enter into bilateral, multilateral and regional agreements on Hazardous Waste to help achieve the objectives of the convention.

The **Rotterdam Convention**[66] on the Prior Informed Consent Procedure for certain hazardous Chemicals and Pesticides in international trade provides Parties with a first line of defence against hazardous chemicals. It promotes international efforts to protect human health and the environment as well as enabling countries to decide if they want to import hazardous chemicals and pesticides listed in the Convention.

The **Stockholm Convention**[67] on Persistent Organic Pollutants (POPs) is a global treaty to protect human health and the environment from highly dangerous, long-lasting chemicals by restricting and ultimately eliminating their production, use, trade, release and storage.

The International Convention for the Prevention of Pollution from Ships (**MARPOL Convention**[68]) initially adopted in 1973 is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. The Convention includes regulations aimed at preventing and minimizing pollution from ships – both accidental pollution and that from routine operations – and currently includes six technical Annexes. Annex V Prevention of Pollution by Garbage from Ships deals with different types of waste and specifies the distances from land and the manner in which they may be disposed of. One of the most important features of the Annex is the complete ban imposed on the disposal into the sea of all forms of plastics.

[65] See https://treaties.un.org/pages/showDetails.aspx?objid=0800000280093 85c
[66] See https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVII-14&chapter=27&clang=_en
[67] See https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVII-15&chapter=27&clang=_en
[68] See https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx

3.3.3 Legislation as a process

The development of national legislation should be viewed as a process that requires periodic revisions and amendments to accommodate the needs of an evolving sector.

Significant differences exist between countries in their national laws, legislative procedures, structure, and the forms, scope and content of legal acts that regulate the waste management sector. The process is also influenced by the different historical practices and traditions of the respective legal system. In this regard, similar legal provisions could be established in different ways according to national requirements.

Logically the process should start with adoption of framework legislation that is later supplemented with further requirements for specific facilities and operations and focusing on special waste streams and product categories. In practice however since a body of legislature is always in place, the process consists of review to identify main areas of concern or in need for update, followed by revisions of respective legal instruments. As such, rarely is the process of reviewing and revising the sector-relevant legislature a one-off activity but rather a continuous process (see **Box 7** with an example from **Morocco**).

The usual approach is to designate a competent authority or authorities at national level to take overall responsibility for the coordination of the entire process and further implementation.

The process of reviewing national legislation presupposes as a first step the preparation of a complete and precise assessment of the legislative and administrative 'gaps' which need to be filled.[69]

[69] Guide to the Approximation of European Union Environmental Legislation, European Commission, 1997

The coordinating authority should consider the choices to be made and the content of national legislation, as, for example, in deciding if new legislation is needed or whether existing legislation should be amended. The involvement of different levels of government and different institutions must be planned carefully, as should the downstream effects of legislative change on associated fields. A road map for drafting new legislation identified through this process is typically prepared and incorporated into the legislative program of the government and the national legislative body (when relevant) and/or other regulatory bodies.

Box 7 **Legal reforms in Morocco with regards to waste management services**

Legal reforms in Morocco have closely followed the processes of urbanization and decentralization. A fundamental reform of the decentralization framework governing local authorities (referred to as 'communes') came with the Decentralization Law of 1973 and the adoption of the Charter of 1976. The Charter provided the communes with more responsibilities for the management of local affairs and transferred the power to execute Council decisions from central government representatives (e.g. Caïds) to the elected Presidents of the Councils.[70] The Chapter was the first step in defining the roles and responsibilities of councils in terms of sanitation. This initial step was followed in 2002 by a second Charter, which devolved all services in relation to municipal waste to the communes. The possibility of delegating services to private operators was also provided for, which opened the door for service privatization that was subsequently initiated in major cities such as Fès, Rabat, Oujda and Casablanca.

The Charter of 2002 also unified the management of cities with more than 500,000 inhabitants, which had previously been hampered by a fragmentation across district councils, under the authority of a central council. In 2008, the Government of Morocco initiated a revision of the Charter in order to provide, inter alia, formal legal status to groupings of municipalities and to enable them to act as special purpose vehicles. The adoption of the amended Charter by the Parliament took place in December 2008. These reforms provided the possibility for cohesive municipal management over larger territories. For example, the territory of Casablanca was united under one entity, instead of the prior 28 communes.

With regard to waste management, the main legal evolution occurred in 2006, through Law 28-00, which established national policies and the two main principles of (1) implementing integrated and affordable waste management systems and (2) reducing adverse impacts on health and the environment. More specifically, the law establishes the institutional framework for the sector, the planning principles for infrastructure and services, adopts specific fiscal instruments to finance waste management, requirements for sanitary disposal facilities and surveillance and monitoring of waste related activities.

By 2006, waste management had become a national priority, calling for strategic actions. In this context, in 2008 the Government of Morocco launched the *Programme National des Déchets Ménagers* (PNDM)[71] with the support of international donors, the objective of which was to operationalize Law 28-00 by providing technical and financial support to municipalities. The specific objectives of PNDM were to improve collection rates and develop modern disposal facilities. Leveraging the private sector was identified as the best way to rapidly achieve operational objectives. The PDNA provided communes with assistance towards financing the cost of delegated services. A total contribution of USD 4 billion over 15 years (2008 to 2022) was secured for both capital and, partially, operating costs.

As a result of the PDNA, more than 90 private contracts covering 80 percent of the urban population have been signed. Morocco has reached a collection rate exceeding 85 percent, compared to 45 percent in 2008, and 73 percent of collected municipal waste is disposed of in sanitary landfills as compared to 11 percent in 2008. However, some objectives have not yet been achieved, examples being the rate of recycling is only 4.3 percent and only 22.7 percent of dumpsites have been rehabilitated.[72] The PDNA is expected to close in 2022.

[70] World Bank, Decentralization and Deconcentration in Morocco: Cross-Sectoral Status Review. Washington, DC, 2009

[71] The PNDM was formally adopted by the newly appointed Government in its program announced in October 2007 and sets out, among other objectives, service and disposal standards for urban areas, quantitative goals for collection coverage (90 percent by 2021), the introduction of sanitary landfills (100 percent of urban areas equipped by 2021), and the closure and rehabilitation of 300 existing open dumps as well as the promotion of solid waste reduction, recovery and valorization. Source: Ibid

[72] Etude relative à l'Evaluation du Programme National des Déchets Ménagers (PNDM), Ministère de l'Energie, des Mines, de l'Eau et de l'Environnement, 2019 and Ministère de l'Interieur, Portail des Collectivités Locales, (2019)

Recycling paper in Curitiba, Brazil. Photo: Marcelo Rudini / Alamy Stock Photo

3.4 Legal requirements and Implementation

There are linkages between legal acts and key policy and administrative questions that need to be addressed in order to secure effective regulation. As such, legal regulation of the waste management sector can be considered as comprising of three elements[73]:

- To develop and formally adopt the respective legal acts.
- To provide the institutional structures and financial means needed to implement the legal acts adopted.
- To provide the controls and penalties needed to ensure that the law is properly and fully complied with (enforcement).

3.4.1 Legal requirements established at national level

National legislation provides the framework for all activities in the waste management sector. It should be based on established definitions and prescribe the responsibilities of the competent authorities at national and local level. National legislation must also define the obligations of stakeholders, beginning with the requirements for the prevention of waste generation up to its final recovery or disposal. Legal requirements should differentiate between waste producers and holders and may also include provisions for EPR.

Legislation should also provide for administrative procedures related to the classification, reporting, authorization and control of waste activities. The introduction of technical requirements for the various activities and categories of waste treatment facilities and installations must ensure the protection of the environment and the prevention of risks of pollution and damage to human health. To this end, mechanisms should be authorised in law and implemented to control and impose sanctions as necessary.

Legislation should distinguish between the specific requirements of specific waste categories, taking account of their quantities and properties, the risk they pose to the environment, their potential for reuse and recycling and related factors.

Responsibilities for funding waste activities and how they are to be financed are also subject to legal regulation. Regulation may cover such activities as levying service charges on users, the provision of financial support to low-income or vulnerable households, regulating the provision of state aid and the use of economic instruments.

Legislation should also mandate the provision of information to the public and service users on, for example, the aims of government policy on waste management, discouraging anti-social practices such as illegal dumping, and promoting more desirable and sustainable patterns of waste management.

A long list of legal requirements typically adopted at the national level is presented in **Box 8** (guided by the Waste Framework Directive[74]).

[73] Based on Guide to the Approximation of European Union Environmental Legislation, European Commission, 1997

[74] Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives

Box 8 Legal requirements typically reflected in national-level legal instruments

Definitions

When preparing national laws, particular attention is given to definitions. Terms such as 'waste', 'treatment', 'disposal', 'recovery', 'recycling' and 're-use' need to be carefully and accurately defined. Special attention is usually given to distinguishing 'hazardous waste' form other wastes and to providing clear definitions of the different waste types and categories, including 'municipal waste'.

According to OECD, 'municipal waste' is defined as waste collected and treated by or for municipalities. It covers waste from households, including bulky waste, similar waste from commerce and trade, office buildings, institutions and small businesses, as well as yard and garden waste, street sweepings, the contents of litter containers, and market cleansing waste if managed as household waste. The definition excludes waste from municipal sewerage networks and treatment, as well as waste from construction and demolition activities.

Waste classification

In addition to waste definitions a clear system for classification of waste must be established. Presently there is no common classification of waste that is recognized by all countries and that is fit for all purposes. The internationally used classification systems such as the Basel Convention categories and lists of waste[75] and OECD Green and Amber lists[76] are mainly used in the case of transboundary movements of hazardous and other waste types. In parallel, separate and more detailed national waste classification systems – which typically distinguish waste by origin, type, chemical composition and characteristics – apply for general purposes. An example of such a classification system is the European List of Waste (EWL)[77].

General provisions

A central obligation is for competent authorities to ensure that, where waste arises, it is recovered and disposed of without causing harm to the environment or endangering human health. They must also ensure that the abandonment, dumping and uncontrolled disposal of waste is prohibited.

Requirements prohibiting dilution of hazardous waste, mixing of hazardous and non-hazardous waste must be established.

Responsibilities and powers of competent authorities

Competent authorities should be designated at the national, regional and local levels and have the technical capacity to control waste management in the national territory.

The responsibilities at different tiers of government must be defined according to specific institutional roles with respect to waste management policies and regulations, organization of waste management operations and services, registration and control over various generators and holders of waste, issuing waste management permits and licenses for facilities and operations, implementing documentation and reporting requirements, control and enforcement of legal requirements. The legislation might also provide for establishing new coordination and consultation bodies, such as councils and inter-ministerial working groups, for tackling specific waste management issues.

Responsibilities of waste generators and holders of waste

The legislation should prescribe in detail the obligations, responsibilities and requirements to be followed by waste generators and holders. For the management of municipal waste the specific responsibilities should relate to households and other commercial, institutional or industrial entities.

Such requirements should cover the entire product and waste chain and focus on waste prevention, the safe storage and treatment of waste, maximizing the potential for re-using and recycling waste, and obligations for transferring waste to professional recovery or disposal operators.

In some cases and for specific categories of waste the legislation can require the transfer of waste to be based on written contract.

The legislation must also allocate responsibilities for dealing with abandoned waste in cases where the previous waste holder or generator cannot be identified.

A legal definition of waste ownership could support smooth allocation of responsibilities between waste generators, holders, service providers and local authorities.

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[75] The classification of waste according to Basel Convention is based on following Annexes: Annex I - Categories of wastes to be controlled; Annex II - Categories of wastes requiring special consideration; Annex III - List of hazardous characteristics; Annex VIII - List A and List B. See https://www.basel.int/portals/4/basel%20convention/docs/text/baselconventiontext-e.pdf

[76] Established by the OECD Council Decision (OECD/LEGAL/0266). See https://www.oecd.org/env/waste/theoecdcontrolsystemforwasterecovery.htm

[77] Established by Commission Decision 2000/532/EC

Box 8 Cont.

Permit requirements

The entities providing waste treatment, recovery and disposal services are in principle required to obtain a permit or license for their activities and for the operation of related facilities and installations. The permit requirements must also cover the collection and transport of hazardous waste and, if appropriate, other waste types.

The procedures for applying for, obtaining, amending and withdrawing permits or licenses must be precisely defined with respect to specific waste management operations.

The permit procedure should start with an application submitted to a competent authority. It should contain detailed information on: the types, characteristics and quantities of waste intended for treatment; waste origin; information on the site where the facilities are to be located; the technologies and equipment envisaged; measures proposed to protect human health and the environment during operations; expected emissions and resulting residues from the operations; the availability of qualified personnel for site monitoring plan, justification and other relevant information. The legislation must the specific information that must be provided in the application related to treatment and disposal facilities such as landfills, incineration plants and others. Additional information and clarifications might be requested during the permitting process.

Following the review of the application and site visit as relevant, the competent authority must ensure that the applicant is an appropriate and competent waste management site operator. The permit issued must include specific conditions on future operations, including requirements concerning site closure.

The competent authority should also take responsibility for monitoring site activities and for responding to complaints from affected parties.

The environmental impact assessment procedure may be integrated into the permitting procedures for landfills, waste incineration installations and other waste treatment operations.

The waste management permit procedure may also be combined and/or incorporated into a general environmental permit.

HDPE liner for new landfill cell construction. Photo: © Mike Kleist | Dreamstime.com

Registration procedures

The legislation might exempt certain waste management activities and operations from permit requirements. Such exemptions are usually provided for transport and collection of non-hazardous waste and could be combined with quantitative thresholds. For waste management activities not subject to permit requirements a registration procedure might need to be established.

Obligations for documentation and reporting

Operators of waste collection, separate collection, recycling, treatment, recovery and disposal services must keep records and provide information to competent authorities about the quantities of waste collected, recycled, recovered and disposed of.

The documentation and reporting requirements can also be extended to local authorities.

The responsibilities of the national authorities for preparing annual reports and for analysing various aspects of waste management must also be established.

Data sources available on municipal waste can include written surveys, administrative data, data collected from waste treatment facilities and data collected from municipalities[78].

Information on municipal waste should distinguish between municipal waste quantities generated and collected. If collection services do not cover the entire population then estimates of the amount of waste generated by the excluded part of the population must be made.

[78] The information in this section is based on Guidance on municipal waste data collection, Eurostat – Unit E2 – Environmental statistics and accounts, Sustainable development, 2017

Box 8 Cont.

The good practice is to allocate data on waste generated and collected by its origin to: (i) households, (ii) commerce and trade (small businesses, office buildings, institutions), and (iii) municipal services (street and market cleaning, yard waste, litter containers). The data could also be distinguished according to household waste and similar, bulky waste and other categories as appropriate. Estimates of the quantities of waste composted at home should also be considered.

The reporting should also include details on the composition and sources of household/municipal waste. For that purpose, many countries have standardized the requirements and published methodological guidelines on municipal waste composition surveys. Responsibility for conducting periodic composition surveys can be an obligation of local authorities/service providers or may be organized and contracted at the national level.

If an EPR scheme for packaging waste is in place then the data reported must distinguish between packaging and non-packaging materials and between the different sources of packaging waste (households, businesses).

Information collected is also appropriate to include data on the amounts of waste directed towards and managed by the various treatment operations.

Information collected should include data on the amounts of waste directed towards and managed by the various treatment operations.

Reporting on municipal waste treatment may be sub-divided into four treatment operations, for instance: landfill, incineration (with or without energy recovery), recycling and composting. If waste is pre-treated (e.g. at a sorting or MBT plant), outputs from the pre-treatment processes should ideally be reported according to their intended treatment by one of these operations.

If data are based on inputs, estimates should be provided on the recycling efficiency of pre-treated material. That is, data should distinguish between the share that is recycled and the share that becomes sorting residue to be disposed of to landfill.

Reporting could be done according to municipal waste codes and categories that cover paper and cardboard, plastic, glass, metals, textiles, biodegradable kitchen and garden waste, market waste, bulky waste, street cleaning residues, household hazardous waste and any other relevant fractions.

In addition to the above, data must be included on any separately collected fractions of municipal waste that have been imported or exported. In this case, the analysis must explain how the reuse and recycling rates attributed to these amounts have been derived and monitored/validated.

The data analysis provided by the competent authority responsible for data management must describe the data validation processes used and comment on the level of accuracy of the data presented.

Cost coverage and financing of waste management

Clear responsibilities for how waste management costs are to be covered by waste generators or waste holders must be established.

Underground containers, Delfgauw, the Netherlands. Photo: Dafinchi

Box 8 Cont.

Legislation commonly gives local authorities powers to establish and determine local fees and taxes. In these circumstances clear rules or guidance are needed on tariff calculation methodologies; the problem of competing affordability and financial sustainability constraints and the potential role of grant funding in resolving it; and cost recovery policy and its related implementation and charging mechanisms.

It is also in the interests of protecting public health and the environment that responsibilities should be allocated for cleaning up abandoned waste sites and for funding the costs of doing so.

Waste collection requirements

Legislation may prescribe specific responsibilities for organizing waste collection so that waste generators are either served by a professional waste collection operator or have available to them a designated place in which to discard their waste.

Municipal services commonly provide for the collection of the following categories of waste: residual/mixed household waste; recyclable waste fractions, including paper and cardboard, plastics, glass and metals; biodegradable waste fractions such as food and garden waste; household hazardous waste; bulky waste; construction and demolition waste originating from households; and textile waste.

Legislation may define the municipal waste fractions that must be collected separately and the timeframes within which the separate collection services must be implemented. Such requirements may cover the entire national territory or be limited to specific settlements based on population size. In some cases, rural or isolated areas are excluded either partially or entirely from the separate waste collection requirements.

Minimum standards, such as the collection frequency of residual waste, are sometimes defined in national legislation but this is uncommon, with such requirements usually being set at the local authority level.

Setting targets for waste collection can also drive local government performance (for example, by requiring local governments to provide collection services for a set proportion of the population or for a specific waste category by a fixed date).

Prevention of waste

Consistent with 'waste hierarchy', the prevention of waste is a desired outcome. National legislation should establish mechanisms for supporting the achievement of this outcome and, and when relevant, specific requirements. Waste prevention targets, prevention programs and policies on green public procurement are examples of waste prevention measures.

Other legal requirements, such as the introduction of quantity-based charging mechanisms to reflect the polluter pays principle, can have an indirect impact on waste prevention.

Preparation for re-use, recycling and recovery

The legislation should set out objectives relating to the preparation of municipal waste for re-use, recycling and recovery, objectives which are closely linked to the provisions in the law related to the 'waste hierarchy'.

In addition to the objectives, the responsibilities of waste generators, waste holders and competent authorities must also be established.

Quantitative targets can be set for the separate collection, re-use, recycling and recovery of municipal waste and for specific waste fractions. The procedures for calculating and/or measuring the targets to be achieved must be defined and aligned with the requirements for documentation and reporting as set in the law. Responsibilities for achieving the targets can be designated to specific authorities or stakeholders. Prevention, re-use, recycling and recovery targets can also be established for specific waste streams, including packaging waste materials, biowaste and WEEE.

Disposal of waste

Requirements for the safe disposal of waste must be established. The legal provisions which govern waste disposal must be linked to waste permit requirements and illegal disposal must be criminalized.

The legislation should also define responsibilities for establishing a system of disposal facilities which is considered necessary and appropriate to national circumstances.

Developing clear standards for landfill (and for other waste treatment and disposal facilities) is a key mechanism for improving waste disposal practices and for addressing the uncontrolled dumping of waste. This crucial factor has to be addressed, as uncontrolled dumping damages the local environment of large numbers of residents by polluting their local surface water, drainage channels and groundwater, and creating dust, litter, air pollution and foul odours. It is also a key measure for reducing plastics pollution, where plastics commonly escape into the environment and water courses from indiscriminate dumping of waste.

Box 8 Cont.

Technical requirements and procedures towards operations, facilities and installations

The technical requirements for landfill, incineration, co-incineration, composting and other recovery and disposal operations should be defined as comprehensively as possible.

National government has the key role in setting the legislative framework for landfill standards. Either they are set out directly in legislation or responsibility for setting them is delegated to a government agency.

Standards should cover all activities undertaken at a facility across its lifetime. They cover planning, site selection, design, construction, operation, closure, site decommissioning and aftercare. They can also cover products, residues and emission discharges from the different categories of facility.

The competent authorities may decide to ensure that landfill operators are required to make adequate financial provision over the life of the landfill to enable them to guarantee the proper closure and aftercare of the landfill.

Standards could be implemented progressively in the context of widespread uncontrolled dumping. In the process of drafting of new legislation, careful attention should be paid to determining the transitional periods within which existing facilities either achieve compliance with the new legislation and regulations or cease operations.

Transboundary shipment of waste

The legislation must identify the appropriate competent authority or authorities to control the movement of wastes through national territory; these may involve a combination of customs, industry or trade, and environmental offices. It must give guidance to the competent authorities on the documentation, procedures to be followed for each type of shipment, and on the enforcement of the controls on the trans-frontier shipment of waste.

Control and inspection

The legislation should designate competent authorities to control the implementation and verify compliance, and define in detail the responsibilities and powers of the competent authorities at the various administrative levels.

A minimum period between site inspections should be defined for each category of facility.

A well-resourced and technically capable national environmental regulator is essential for conducting the enforcement activities needed to achieve compliance with standards and to tackle uncontrolled dumping of waste. Without adequate enforcement there is a high risk that the lowest cost option (i.e. dumping) may prevail, leading to a continued practice of dumping and uncontrolled landfill.

Penalties and sanctions

The legislation should lay down provisions setting the penalties and sanctions applicable to infringements of the provisions of the legal requirements and the designated competent authorities should take all the measures necessary to ensure that they are implemented. The penalties should be effective, proportionate and dissuasive.

Extended producer responsibility

Responsibility for the management of specific waste streams could be extended to producers and importers of products and packaging that become waste at the end of their life cycle. The product categories and waste streams typically covered by extended producer responsibility schemes are packaging and packaging waste, waste electrical and electronic equipment, batteries and accumulators, used tires, waste oils, and end-of-life vehicles. Other product categories, including textile waste and agricultural plastics, can be included.

Economic instruments

Economic instruments consistent with national waste management policy must be established by law. Such instruments might include landfill taxes, and taxes or deposits on specific product categories, etc.

Waste management strategies, plans and programs

It is advisable that the requirements for the preparation of waste management strategies, plans and programs by different administrative authorities and economic entities, and the scope and content of such documents, should be defined in legislation. The legislation thereby sets a common approach, scope and structure for document preparation across all administrations.

Other provisions

Other provisions typically covered by waste management legislation include: provision of information to consumers, households and other waste generators; procurement of waste management services by public authorities; specific rules for the use of public funds for financing waste management activities; and specific rules related to waste pickers and the sustainability of their livelihoods.

3.4.2 Legal requirements established at local level

Local authorities need the authority and capacity to define and implement the specific local waste management requirements of the sector. If national legislation does not assign to local authorities the legal powers necessary for them to do this, then this can become a significant barrier to them in organizing the services.

The scope and legal form in which waste management requirements are commonly defined at the local level can vary considerably. For example, the requirements might legally be defined by the actions of the local authority in defining the technical components of a sanitary cleaning scheme, such as collection methods, container site locations, collection frequencies and designated waste treatment and disposal facilities. In another example, the requirements might be satisfied via administrative orders that mandate the responsibility on households and legal entities to discard waste at designated places and to follow specific rules.

A more advanced form is to adopt local regulations whereby various elements of the waste management system are defined. These might define a requirement to separately collect different waste fractions, a responsibility to provide containers and other waste collection infrastructure, the size of local service fees or taxes or any other issue relevant to local waste management systems. Local regulations might in some cases also establish the penalties and sanctions to be applied at the local level. It should be noted that local regulations can prescribe additional and sometimes more restrictive requirements to those established at the national level. For example, many cities have banned the use of plastic bags and certain single-use plastics prior to adoption of similar legislation at national level. There are also examples where cities have decided to adopt more ambitious recycling targets than those assigned at national level.

It is important that local regulations provide residents and other users with the right to submit claims related to the quality of services received either directly to the local authority or to the service provider.

3.4.3 Implementation considerations

Successful implementation of the strategy and its legal requirements depends, crucially, as much on the effective implementation of its administrative requirements at the national, regional, and local levels as it does on having in

The adoption of legal requirements is a necessary but not sufficient condition for effective strategy implementation. There are many examples where visions created in legislation have failed to be implemented and translated into viable and beneficial outcomes.

place adequate infrastructure for the safe collection, sorting, transport, recycling, resource recovery and disposal of all types of waste. In terms of the timing of implementation, it is essential that the administrative requirements are introduced at all levels of government at the very beginning of the process, and that effort is placed heavily on ensuring that the necessary adjustments and improvements are introduced at the local level.

Implementation of the new legislation encompasses the need for changes to be made to public institutions, procedures and standards at all levels of government. Responsible ministries and authorities must recognise the scope and scale of these institutional changes and the costs associated with implementing them. They must also understand that early and effective implementation of these changes is a prerequisite for successful implementation of the strategy and for the achievement of its objectives.[79]

The costs of implementing administrative change are not inconsiderable. Looked at simply in terms of direct costs, it quickly becomes clear that the changes will have significant budgetary implications, especially for local governments. For example, how many waste management permits must be issued? Do the competent public authorities have the necessary human and technical resources? Is additional training needed for local authority waste management specialists? Are sufficient accredited laboratories available to conduct waste characterization analyses? Will specialized software be developed or purchased to allow for electronic submission and processing of annual waste management reports?

A thorough evaluation of the investment and operational costs of the institutional changes needed at all levels of government should be carried out and mechanisms identified for how these may be funded. This kind of evaluation must be made at all administrative levels in tandem with the preparation of strategies and plans. It is essential that the lead for assessing the financial consequences of the necessary institutional changes should come from

[79] Based on Guide to the Approximation of European Union Environmental Legislation, European Commission, 1997

Discussion about plastic recycling in Shenzhen, China. T. Photo: © Waihs | Dreamstime.com

central government and that coordinating mechanisms are put in place to ensure that all levels of government remain informed of activities and progress in this vital area.

It follows that the adoption of clear and detailed legal requirements is a necessary but not sufficient condition for effective strategy implementation. There are many examples where visions created in national legislation have failed to be implemented and translated into viable and beneficial outcomes, or where implementation has been achieved only after significant delay. A core reason for this is that insufficient attention is given during the strategy formulation process to recognising and resolving the many obstacles faced by local authorities in their efforts to implement the strategy. These aspects are discussed in subsequent Chapters.

3.4.3.1 Role of waste management associations in promoting sustainable waste management practices and enhancing capacities

Waste management associations and similar professional bodies could greatly facilitate the implementation of environmental legislation and policies and aide the process of professional capacity building.

National waste management associations could play an important supportive role through:

- Exchange of experience, promoting good practices, organizing conferences and seminars.
- Dissemination of information, issuing guidelines, publications, brochures, magazines, maintenance of specialized web sites.
- Trainings and qualification courses to increase the knowledge and qualification of their members.
- Assisting national and local authorities in improving waste management policies and regulations as well as streamlining their implementation.
- Establishing a consultation platform for the waste management sector.
- Following the developments of international trends in new and innovative practices, technologies and equipment.
- Supporting the establishment of markets for recycled materials.
- Supporting competition in providing waste management services and resource recovery.
- Attracting public attention to the waste management, increasing visibility and improving transparency in the sector.
- Providing broader advocacy on various aspects to support the development of the sector.

Such waste management associations have been proved to be valuable partners of state and local authorities in improving waste management practices.

The associations differ in terms of membership, objectives and core activities.

Some national associations involve wide spectrum of stakeholder such as local authorities, public companies, private waste management operators, producer responsibility organizations, research institutions, large waste generators, recycling plants, equipment suppliers, consultants and other interested parties. For example, the **Japan** Waste Management Association[80] was initially formed in 1947 with a membership of 33 cities and recently includes more than 700 members from the entire waste management chain. The members of the Waste Management and Resource Recovery Association of **Australia** (WMRR)[81] also range from large multinational corporations, small and medium enterprises, local and state governments, equipment and service providers, and individuals.

Other associations are focused on a subset of waste management aspects, like for example recycling or represent specific group of public or private stakeholders.

Some associations are mainly focused on local authorities and public utilities. For example, Verband kommunaler Unternehmen e.V. (VKU)[82] is the **German** Association of Local Utilities has 1,500 member utility companies primarily active in the fields of energy supply, water supply and sewage, waste management, municipal cleaning and telecommunication. In **Bulgaria**, the Association of Municipal Environmental Specialists (AESMB)[83] involves as members individuals working in the administration of all local authorities in the country. Its primary focus is the improving qualification of the municipal staff working in the field of environmental protection and waste management in particular, to develop the necessary institutional capacity at local level and assist both state and local authorities in developing and implementing environmental legislation and policies.

Other associations are more oriented to specific recycling industries. For example, **China** National Resources Recycling Association (CRRA)[84] is a state-level industry organization. CRRA is composed of over 1,200 members including processors and traders from the nationwide professional companies (groups), industrial and mining enterprises, waste trading companies and other companies that recycle the renewable resources, and it also includes members such as scientific research institutes, colleges, social organizations, individuals, etc. CRRA subordinates 16 directly-affiliated units like for example China Plastic Recycling Association (CPRA).

In some countries several organizations could exist. For example, Danish Waste Association[85] represents municipal waste units. It has 51 municipalities as members as well as inter-municipal waste management companies and facilities for hazardous waste in **Denmark** and the **Faroe Islands**. Waste and Resource Network Denmark (DAKOFA)[86] is an independent member-based organization and has roughly 250 members including national and local authorities, waste management service providers from both public and private sector, waste producers, waste handlers, consultants and suppliers, all of whom operate within the field of waste and resources.

The waste management associations could also play a regional role like for example the Institute of Waste Management of Southern Africa (IWMSA)[87], that was initially founded in 1976 in **South Africa**; since 1992 it expanded its activities into the neighbouring countries **Botswana**, **Zambia** and **Zimbabwe**. The Solid Waste Association of North America (SWANA)[88] is another example. It is the world's biggest professional waste organization of more than 10,000 public and private sector professionals in the **US**, **Canada** and the **Caribbean**.

The national waste management associations are also members of international or regional umbrella organizations. In this way exchange of information and partnership between the national organizations is achieved that supports the dissemination of good practice and latest developments in the world.

For example, Municipal Waste Europe (MWE)[89] is the European umbrella association of national public waste associations and its members provide services to over 60 percent of populations in their countries. representing public responsibility for waste. MWE promotes the

[80] See http://www.jwma-tokyo.or.jp/
[81] See https://www.wmrr.asn.au
[82] See http://www.vku.de
[83] See http://www.bamee.org/
[84] See http://www.chinacpra.org.cn/en/
[85] See http://www.danskaffaldsforening.dk
[86] See https://dakofa.com/
[87] See http://www.iwmsa.co.za
[88] See https://swana.org
[89] See https://www.municipalwasteeurope.eu/

interests of its members at EU level, through joint positions on waste management issues and legislation and keeps its members informed on the latest policy developments. The association encourages the sharing of information among its members, including the exchange of good practice in the local management of waste.

The international waste management associations could also provide support to state authorities in setting up sustainable waste management practices. Such support could be delivered either directly through dissemination of information, trainings or technical assistance or channeled through the respective national waste management associations.

The **International Solid Waste Association** (ISWA)[90] supports sustainable and professional waste management worldwide. Its members include waste management practitioners, local authorities and private sector operators as well national waste management institutions. The Association conducts a wide range of activities in support of the sector including promoting resource efficiency, sharing experience, knowledge and information on different aspects of waste management, providing support to developing and emerging economies, achieving advancement of waste management through education and training, promoting appropriate and best available technologies and practices, developing professionalism in waste sector through its program on professional qualifications. Together with the issuing guideline documents and policy papers, the ISWA through its digital library is providing access to scientific and technical information covering the latest developments in all aspects of waste management from the global waste community.

Another example is the **Bureau of International Recycling** (BIR)[91] which is the world largest recycling industry federation representing over 760 member companies from the private sector and 37 national associations, in more than 70 countries. BIR comprises four commodity divisions for iron & steel, non-ferrous metals, paper and textiles, and has four commodity committees dealing with stainless steel & special alloys, plastics, tyres and rubber, and E-scrap. The federation provides a dynamic forum for its members to share their knowledge and experience and serves as a platform to establish successful business relations and to promote recycling among other industrial sectors and policy makers.

3.4.4 Enforcement

Appropriate measures, mechanisms and systems are needed to improve monitoring and control of waste management services so as to ensure that legislation is properly implemented and eventually enforced. Strengthening inspection systems and introducing administrative and judicial measures are examples.[92]

Responsibility for enforcing legal requirements for waste management should be clearly defined at each administrative level and the capacities and resources needed to meet those responsibilities defined and established within the relevant competent authorities.

The control procedures established should primarily focus on large waste generators, companies providing waste collection services and waste treatment and disposal installations. Sufficient resources should be allocated for dealing with illegal waste dumping. In this regard, coordination and monitoring mechanisms must be developed to ensure that all local authorities comply with and implement their responsibilities as envisaged in national legislation.

Similar to GHG emissions, the quantities of solid waste generated and the efficacy of collection and proper recovery and disposal need to be credibly measured at the local government level and independently verified. For that purpose, appropriate reporting requirements should be established and key performance indicators defined and regularly monitored.

The number and costs of additional personnel, equipment, guidance and training needed by the relevant competent authorities should be carefully considered when deciding on the enforcement measures and procedures to be implemented.

A specific example of legal procedure at the supra-national level comes from the European Union (EU). EU Member states are obliged to incorporate EU directives into national law to ensure direct conformity with a directive's objectives, requirements and deadlines.

[90] https://www.iswa.org/
[91] https://www.bir.org/
[92] Based on Guide to the Approximation of European Union Environmental Legislation, European Commission, 1997

A specific example of legal procedure at the supra-national level comes from the EU. EU Member states are obliged to incorporate EU directives into national law to ensure direct conformity with a directive's objectives, requirements and deadlines. In transposing a directive a member state may choose how this will be done, but is bound by the terms of the directive as to the results to be achieved and the deadline by which transposition is to be achieved[93]. This process is known as transposition.

According to the EU treaties, the European Commission[94] may take legal action – an infringement procedure – against an EU member state which fails to implement EU law. The Commission identifies possible infringements of EU law on the basis of its own investigations or following complaints from citizens, businesses or other stakeholders. If the EU country concerned fails to communicate measures that fully transpose the provisions of directives, or does not rectify the suspected violation, the EU Commission may launch a formal infringement procedure. The Commission may refer the issue to the European Court of Justice, which in certain cases may imposed financial penalties[95].

If the Court finds that a country has breached EU law, the national authorities must take action to comply with the Court's judgment.

In 2019 the European Commission initiated 58 infringement measures against EU member states, representing 17 percent of all cases in the environment sector.

[93] At a glance - Implementation in action. Transposition, implementation and enforcement of Union law, European Parliamentary Research Service, 2018

[94] The European Commission is the executive body of the European Union, which has the power to propose legislation and is also responsible for implementing, monitoring and controlling the enforcement of Community law and policy.

[95] When referring an EU country to the European Court of Justice (ECJ) for the second time, the Commission proposes that the court impose financial penalties, which can be either a lump sum and/or a daily payment. These penalties are calculated after taking into account the importance of the rules breached and the impact of the infringement on general and particular interests; the period over which the EU law has not been applied; and the country's ability to pay, ensuring that the fines have a deterrent effect. The amount proposed by the Commission can be changed by the ECJ in its ruling.

Recycled plastic chips in Dhaka, Bangladesh. Photo: Muhammad Mostafigur Rahman / Alamy Stock Photo

Kuala Lumpur, Malaysia: Vertical garden made of in recyclied plastic bottles. Photo: © Aisyaqilumar | Dreamstime.com

4 Financing for sustainability and as an incentive

4.1 Recognizing the need for sustainable financing

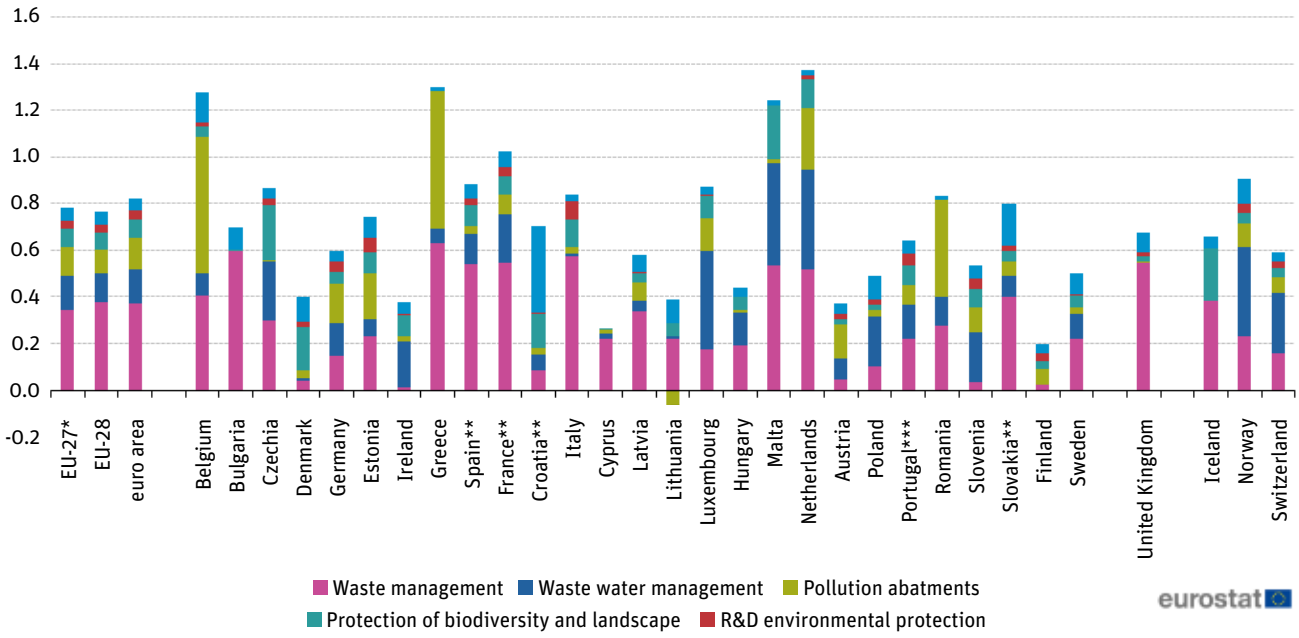
The provision of waste management services incurs significant financial costs. The availability of investment and operational finance is arguably the single most critical factor in determining the sustainability of municipal waste services.

International Monetary Fund (IMF) data on government budget expenditures indicate that as much as 0.8 percent of national GDP[96] is allocated to public expenditures on waste management, from a combination of local governments' own resources, grant support and transfers to local authorities from central or regional government budgets. A closer look shows that central, state and local government expenditures vary considerably. Within the EU, as a percentage of GDP, in 2018 Greece recorded the highest expenditure of 0.6 percent, with the average for the EU as a whole of 0.4 percent. It should be noted that in many EU countries public expenditure on waste management significantly exceeded expenditures on other environmental sectors, including wastewater, pollution abatement and biodiversity (see **Figure 5**).

The share of waste management costs in public expenditures at the local level is typically significantly higher than this, exceeding 20 percent of local budgets in low-income countries where services are provided directly by the municipalities. In middle-income countries, waste management costs account for some 10 percent or more of municipal budgets, and 4 percent in high-income countries.[97]

Experience shows that it is easier to mobilise funds for investment financing than it is to generate those needed to cover the recurrent operational needs of the system. Funding for capital assets has potential access to a variety of sources, from local and international capital markets, IFI funding and from across all tiers of government, including municipal capital reserves and central government transfers.

Figure 5 EU countries total general government expenditures on environmental protection, 2018 (% of GDP)



Source: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Government_expenditure_on_environmental_protection

[96] Interpretation of data on the percentage of public expenditure on waste management should take into account the specific conditions of individual countries. Countries which levy a municipal waste management tax could have higher public expenditures as a percentage of GDP when compared to other countries where charges are paid directly by households to service providers and which are not considered as revenues in the budget of local authorities. In such cases, countries with similar waste management costs could show quite different profiles for the proportion of public expenditure allocated to waste management.

[97] What a Waste 2.0, World Bank, 2018

The revenue flows needed to cover system operating, asset replacement and long-term liability costs must be covered almost exclusively out of municipal resources. Defining and generating the annual revenue necessary to maintain system and financial sustainability on a continuous, reliable and predictable basis is a far more complex and seemingly intractable issue that must be faced by the municipal authorities.

Financial aspects of municipal waste service addressed in the chapter are:

- The policy choices to be made in securing investment finance and in generating the operational revenues needed to achieve the long-term financial sustainability of the services
- Defining and understanding the significance of the full costs of the services
- Recognising the opposing constraints of affordability and financial viability that determine the scope and scale of the services that can realistically be provided on a sustainable basis
- The sources of finance used internationally to fund investments in waste management services
- The annual revenue required to cover the full costs of municipal waste service and the sources of funds used internationally for financing the requirements

The chapter emphasizes the close interaction and collaboration that is typically needed between central government authorities – especially the ministry of finance – and local authorities for ensuring that service objectives are realistic, achievable and financially viable.

4.2 Policy choices concerning sector financing

Several key policy decisions must be taken at the national, regional and municipal levels when defining and preparing the optimal waste management strategy and its associated financing strategy. Many policy decisions are reflected in the national or regional Waste Law (or equivalent) in the respective country or region, but others must be determined at the municipal level. Policy can be inter-related, with policy decided in one area often influencing the scope of policy in another.

The first aspect to consider is whether to apply the polluter pay principle and to what extent. This can cover a wide range of topics, including: (i) the basis for cost assessment (cash basis or full cost accounting); (ii) the sources of investment finance; (iii) the use of grants; (iv) sources of operational funds (primarily user charges, municipal taxes, and municipal and national budget transfers); (iv) full or partial cost recovery from users and financial sustainability; (v) affordability and measures to protect low-income and vulnerable households; (vi) deciding if the principal objective of charging policy is to achieve revenue stability or waste management objectives.

These policy issues relate to a range of guiding and sometimes conflicting concepts and principles, including the polluter and user-pays principles; the significance of affordability in defining service scope; the view of waste management as having the characteristics of both a public and a private good; meeting the objective of full cost recovery and the practicality of setting aside funds for financing future capital expenditures.

Second, a key policy decision is whether to implement a traditional charging mechanism with the objective of meeting cost recovery and revenue stability objectives or a quantity-based charging mechanism aimed at giving users incentives to minimise waste generation and separate their waste for recycling. Selection of a scheme based on the quantity of waste put out for collection has direct implications for the design of the waste collection system and its associated charging regime. In particular, it calls for a high level of municipal involvement in waste collection, user charging, fee collection operations and administration. This and other charging options are considered further below.

Third, a key policy decision can be whether the services will be provided directly by the municipality or delegated to private sector operators, and how the related service costs will be financed and charged to households and legal entities. Tariff structures and charging models related to this decision can have a bearing on performance and fee collection efficiency.

Fourth, policy may be needed on the kind of support to be given to low-income or vulnerable households. This is a crucial area which, unless recognised in advance, can create significant problems to the effective delivery of waste services. Even though waste services may be affordable to a large majority of households, there is always a small number of households which need support from the State. This should ideally take the form of general support provided through a social welfare department (or similar) covering all municipal service sectors and not be specific to a single service, such as waste collection. A register of households supported

through specific measures (such as income support) provided by the municipality is commonly kept. This is considered further below. Revenue losses arising from the non-payment of fees by vulnerable households should not be reflected in the municipal waste management tax or charge calculation (i.e., losses should not be transferred to the cost of other users).

Fifth, policy may need to be defined on the treatment of value added tax (VAT) on waste services. Some countries either exempt or zero-rate waste collection, treatment and disposal services from paying VAT. With VAT rates typically ranging from 15-20 percent, this is a significant benefit to users. Where waste fees do include VAT, public grant financing or subsidies paid towards municipal waste management services should be at least equal to the revenues paid into the state budget on account of VAT being charged on waste management activities.

Sixth, policy may be needed on the provision of waste services to legal entities (the CII sector). Some local authorities leave CII waste collection entirely to the private sector. Others offer services, exploiting economies of contiguity on domestic services, often competing with private firms. By operating over a compact area with short distances between collection points municipal operators have opportunities to offer services at lower rates than those provided by private companies focussed solely on commercial waste. Integrating the management of commercial waste into municipal waste management can contribute towards a municipality's fixed costs, thereby reducing its average costs.

Charges levied on legal entities are sometimes set at rates above the full cost of service with the objective of raising funds to cross-subsidize household services or to cover the costs of exempting vulnerable households from payment. Whereas CIIs should be charged the full cost of the services provided, they should not face unfair or distortionary charges. Support to vulnerable households should be provided from municipal sources and not be subsidized by economic entities.

Seventh, it may be necessary to consider policy regarding the revenue consequences for the municipality of primary waste collection being conducted outside the domain of the formal local authority service. In many low-income countries, waste collection is 'informally' divided between a primary collection service organized in a semi-formal way through community-based enterprises (CBEs) or similar and a secondary collection and disposal service provided by the municipality. In these circumstances, householders typically pay a service fee directly to the 'informal' primary collector. A key policy decision faced by the municipality is whether it should introduce a separate, formal charge to cover the 'secondary' costs it incurs in providing services beyond primary collection.

4.3 Defining the costs

It is crucial that the municipality and its waste management department knows the full costs of operating its waste management services and the individual components that comprise them. For it to determine its financing needs, a municipality must first establish the full costs of its current services, of its planned investments and of the associated operations. Although the largest single expenditure is likely to be on infrastructure investment, the most significant financial challenge almost always relates to estimating the annual revenue requirement and determining how it is to be covered. Operating expenditures are almost always higher than the annualised capital costs of investments, with estimates showing them to account for 70 percent or more of total budget requirements.[98]

Detailed cost estimates are needed for budgeting, defining tariffs, options analysis, strategic planning and for planning specific investments. Cost analysis is typically undertaken over periods of 5, 10 or 15 years for strategic planning and program budgeting purposes, and annually for accounting and tariff adjustment purposes.

Both investment and operating costs need to be considered when preparing cost estimates for strategic planning and program budgeting purposes. The analysis is usually conducted over a specified reference period and can involve the application of discounted cash flow (DCF) techniques. Some important considerations include:

- Investment planning accounts for both initial infrastructure and equipment costs and future investment costs related to asset replacement and long-term liabilities. The costs of subsequent landfill cells, plant and equipment replacement, landfill closure and aftercare[99]are examples.

[98] Ibid

[99] Properly accounting for future liabilities is a key aspect in the process of calculating the total costs of landfill. Future liabilities include cell replacement and landfill closure and monitoring. Note that including for depreciation and liabilities in the tariff implies setting aside the equivalent amounts of funds in reserve accounts to be drawn upon in the future, including for end of life landfill closure, remediation and monitoring. Accruals accounting of this kind raises profound issues in low and medium-income countries that commonly face extreme current income constraints.

- Cost estimates are needed on an annual basis for the respective planning period. Annual costs include for annual depreciation of assets and operation and maintenance (O&M) costs[100].
- For the purposes of calculating annualised costs, capital investment costs are generally depreciated over periods that reflect the typical economic operating lives of the assets.
- Operating costs are calculated for the waste management technologies and operations proposed, usually divided by component type and facility, and cost item (e.g. maintenance and repair, labour, consumables, administration, taxes).
- Costs should also be calculated separately for each waste management activity (e.g. mixed waste collection, separate collection, sorting, treatment and disposal).
- DCF analysis is used to calculate and compare the unit costs per tonne of waste for each option being examined and for the individual components of each option. These are calculated for each cost category and for each service area. Average unit costs of this kind provide powerful financial information about the various system components and for the overall system.

The cost analysis enables the annual revenue needed to recover the full costs of the collection, transport, recovery and disposal systems to be estimated (in total and by component). That is, the revenue required to cover operational costs, investment costs (return of capital) and profit (return on capital).

This enables the full cost of service per tonne of waste generated and/or collected and per person to be determined.

Unit costs calculated this way are indicators of the tariffs needed to recover the full costs of the waste system under consideration or for each component of the system over the planning period.

Typical waste management costs are presented in **table 3**.

Table 4 shows that the costs for similar activities range significantly between countries. These variations might be explained by various factors, including the types of waste collection or treatment method applied, the technologies used, the differing capacities of the reference installations, and local differences in the costs of labour, fuel, consumables and works, or tax policies and other factors.

Costs can also vary significantly within a country, even though the services may be similar and provided under similar conditions. Reasons why levels of service delivery efficiency differ between operators and local authorities are the varying levels of equipment utilization, equipment operating below planned capacities and poor planning. Lack of competition on the local market, sub-optimal procurement and contracting methods and risk allocation can also have significant local impacts on costs. For example, experience from in-country situation analyses reveals the potential for achieving reductions in collection and transport costs by optimizing service efficiency; at the same time, it is common to find disposal costs set below their estimated values owing to inadequate levels of operations and maintenance practices.

When preparing cost estimates it should be remembered that a solution based on low investment costs does not always lead to low service costs when considered over the entire period of the plan or contract.

Practice also shows that actual outturn service costs often differ considerably from initial cost estimates. Cost determination can suffer in both directions, resulting in

Table 3 **Typical waste management expenditures by type of activity, USD/tonne**

Operation	Low-income countries	Lower-middle-income countries	Upper-middle-income countries	High-income countries
Collection and transfer	20 – 50	30 – 75	50 – 100	90 – 200
Controlled landfill to sanitary landfill	10 – 20	15 – 40	20 – 65	40 – 100
Open dumping	2 – 8	3 – 10	–	–
Composting	5 – 30	10 – 40	20 – 75	35 – 90

Source: What a Waste 2.0, World Bank, 2018

[100] Note that it is necessary to carefully distinguish between investment costs and depreciation when undertaking DCF analysis.

Table 4 Capital and operating expenditures of incineration and anaerobic digestion, USD/tonne

	Incineration		Anaerobic digestion	
	Capital expenditures[a] (US$/annual tonne)	Operational expenditures (US$/tonne)[b,c]	Capital expenditures (US$/annual tonne)	Operational expenditures (US$/tonne)
Europe	$600–1000	$25–30	$345–600	$31–57
United States	$600–830	¢44–55	¢220–660	¢22–55
China	$190–400	$12–22	$325	$25

Source: Kaza and Bhada-Tata 2018.

Note: MWh = megawatt hour of energy

a. In Europe and the United States, predominantly mass-burn/moving grate technology is used for waste incinerator with energy recovery (waste-to-energy). In China, many incinerators use circulating fluidized bed (CFB) technology, which reflects the lower end of investment cost, although moving grate incinerators are also becoming more common.

b. Operating costs without accounting for revenues range between $100–200/tonne. The figures presented in the table are typical operating costs (net gate fees) taking into account revenues for electricity and heat sales and other revenues. In Europe, also including subsidies to energy from waste in some countries, these revenues are typically about $100/tonne, hence the resulting operating costs. In the United States, fee-in tariffs for electricity are typically lower, below $50/MWh.

c. Mixed e=waste in the United States and Europe is relatively low in organics and water content hence high in caloric value. As a consequence, operating costs for waste with high organics often seen in lower-income countries could substantially increase operating costs due to lower revenues.

Source: What a Waste 2.0, World Bank, 2018

over- and under-estimation. In this regard, preparing reliable cost estimates and achieving a good understanding of the actual costs of service delivery is of crucial importance to the local authorities responsible for deciding upon, implementing and providing waste management services.

4.4 Willingness-to-pay

An important factor typically examined by a municipality when proposing to introduce new or expanded waste management services, especially if household waste tariffs will be affected, is the concept of users' willingness to pay (WTP). Consideration of WTP usually forms part of the public awareness raising and communications activities undertaken during the development phase of a project. The concept is important not only because it encompasses users' concerns over affordability[101] but because it also takes account of users' perceptions of the value (benefits) of the proposed measures and of the capacity and likelihood of the municipality being able to implement them.

The willingness to pay for a service reflects the economic value an individual attaches to the service (the perceived level of satisfaction he derives from it). 'Willingness' encompasses both the 'ability' and the 'desire' of the user to pay for the service. Willingness-to-pay is thus a wider and arguably a more informative concept than affordability alone.

Willingness-to-pay can be assessed using a variety of research techniques, but the approach mostly used in the municipal waste sector is the 'contingent valuation' method, whereby survey and questionnaire-based tools are used to assess the willingness to pay by residents of a community for improved service levels. Face-to-face survey methods can be an effective and accurate way of gauging the willingness of a community to pay for a specific proposal or for comparing and ranking alternative proposals.

Perceptions of service quality crucially influence WTP. Households are typically only willing to pay more if they recognise and understand the benefits of improvements in the nature, quality and scope of services offered. A key constraint that has typically to be addressed when proposing higher tariffs are low levels of satisfaction with current services and poorly defined tariff setting processes. If households are unaware of the agency that is billing them or the purposes to which their fees are being put, then they are likely to have a low willingness to pay for new services (even if they are affordable).

Whereas households are likely to be concerned most about their immediate environment (e.g. keeping the streets and local environment clean) many of the benefits of waste management – efficient sanitary landfill or treatment – are

[101] Waste Management Costs & Financing and Options for Cost Recovery; Horizon 2020: a cleaner Mediterranean by 2020, Jean-Jacques Dohogne, August 2014

indirect. WTP techniques can capture both these aspects (direct benefits to individuals and wider indirect benefits to the community) but the analysis must be conducted as part of a wider public awareness raising and communications campaign.

By keeping households informed of the changes proposed to be made to their waste management services, of why the changes are needed and how tariffs will be affected, municipal public awareness raising and communications campaigns can be vitally important for influencing households' willingness-to-pay[102] for expanded services.

Even so, awareness raising and communications campaigns alone may not be sufficient to influence the perceptions of many households. In these circumstances it may be necessary to implement medium-scale pilot demonstration projects in tandem with the campaigns in order to change households' perceptions and raise their willingness to pay.

4.5 Affordability and financial sustainability criteria

Pre-requisites for a successful waste management service are its affordability and financial viability throughout the planning period. Affordability relates to households' ability to pay for waste services. Financial sustainability means always having some cash in the bank: having a positive cumulative cash flow in every year. These constraints are essentially in conflict: the affordability constraint brings pressure to keep tariffs low while the financial sustainability constraint brings pressure to make them higher.

A measure of affordability is given by the affordability ratio: the share of average monthly household income that households might realistically spend on municipal solid waste services. A ratio of 1 percent of average household income is commonly used, although some countries use lower ratios. Additional policy responses are often needed to protect the very poor or vulnerable from unaffordable charges, such as specifically targeted subsidiesor payment exemptions. As indicated, support measures should ideally be put in place by the municipality that all municipal service sectors and not be specific to a single service, such as waste collection.

The concept of an 'affordability threshold' can be helpful in designing and implementing affordable systems. For example, the affordability threshold for municipal waste services in the **Czech Republic** is established by central government to be 0.7 percent of average household income. In **Romania**, services should not exceed 1.5 percent of the income of the poorest households, defined according to the income of three lowest income decile groups. In **Bulgaria**, the adopted affordability threshold is 1 percent of average household income. In **Morocco**, user charges are levied as part of the municipal service tax that covers waste and other municipal services. The amount of the tax is calculated based on the property value leased or owned by each household. As the tax is not correlated to the cost of service, affordability cannot be directly calculated. However, estimates based on the income of households in the first decile, show that the municipal service tax does not exceed 1 percent of the income of the poorest households. In **India**, there is no formally defined affordability threshold and the affordability level varies from state to state, and even across cities, depending on varying range of incomes levels and economic growth. Local authorities conduct their own affordability analysis prior to establishing user charges for various categories of waste generators.

When conducting an affordability analysis, the competent authorities first establish a ceiling on the size of tariffs relative to average household income (the affordability ratio). Reliable data are then needed on average household incomes in the waste management area, and on projected real growth in those incomes over the planning period. From this, the indicative size of the maximum tariff can be calculated for each year of the planning period. This information enables a transitional period to be defined over which (low) current tariffs can be progressively adjusted until the affordable level is reached. Other rules might also be set, such as that tariffs should not be increased annually by more than a specified rate or that tariffs should not exceed the full cost recovery tariff. Under such an arrangement, other funding mechanisms, such as direct municipal transfers, will be needed until the tariff gap is closed.

Decisions on affordability policy take account of the differences in incomes and affordability of the highest and lowest income deciles, which can vary considerably between countries, regions and municipalities. Note that average household income is usually calculated as the mean (total household income divided by total number of households). This is not always appropriate in countries with high levels of income inequality as it tends to set the average disproportionately high. In this case it can

[102] A guide for local government in South Africa, Namibia and Botswana, Transparent Tariffs Toolkit, (Communicating Tariffs & Setting Tariffs), Published by www.skl.se, www.salga.org.za, www.alan.org.na, www.bala.org.bw, 2012

be better to use the median measure of average income (the level at which there are as many households below it as there are above it).

In most high-income countries, waste management costs are well-below the 1 percent threshold for the share of household income at which full cost recovery[103] tariffs are considered affordable. The affordability criteria have far greater relevance and influence on policy decisions in low- and middle-income countries where the full cost recovery objective can be difficult to achieve. In such countries, tariffs equivalent to 1 percent of household income might only partially cover the costs of collection and safe disposal of waste, whereas the future extension of services or the implementation of more advanced and costly treatment methods would make services unaffordable. For example, in **Vietnam**, increasing fees to 1.5 percent of household income would cover a maximum of only two-thirds of the costs of a basic service composed of full waste collection and sanitary disposal to landfill. Adding treatment facilities would reduce the proportion of costs covered by the tariff to one third[104].

Measures to address service affordability are relevant to low-income households and especially to those in rural areas. In many countries low-income households are either exempted from payment of service tariffs or other compensatory mechanisms apply. For example, in **South Africa**, the National Policy for the Provision of Basic Refuse Removal Services to Indigent Households[105] aims to address the basic service backlog amongst poor households, particularly those essential services such as refuse removal[106]. It incorporates basic solid waste services into a bundle of basic free services, endorsing the right to access solid waste services for those who cannot afford it. In **Tajikistan**, waste fees for low-income households, disabled people and war veterans are paid from the central budget and the list of households eligible for receiving state aid is provided annually. In another example, from **Brazil**, the most common form of waste management charge is a graduated fee linked to the property tax. A feature of the mechanism is a differentiated assessment defined by categories of property and use. An example from a medium-sized municipality in Minas Gerais applies four different tax categories according to four different property categories: 'property under construction', 'residential property', 'commercial property' and 'other commercial' (industry, hotels, supermarkets). Taxes are progressive, with 'under construction' properties being assessed at the lowest tax rate and 'other commercial' at the highest rate.[107] In **Chile**, local authorities charge residents a waste fee based on both the fixed and variable cost components of the service. Low-income households in dwellings having a tax assessment below a given threshold are automatically exempt from payment, resulting in revenues being collected from only some 20 percent of households[108].

The financial sustainability constraint refers to the tariff needed to generate the minimum amount of revenue needed annually to sustain the waste system and relates directly to the costs of the service. If tariffs calculated according to the financial sustainability constraint are higher than those calculated according to the affordability constraint, then – depending on the size of the gap between them – one of the following three scenarios might need to be considered:

- If the gap is small and occurs in the early years of the planning period, then it may be possible to progressively phase in the tariff until the gap is closed. Additional municipal funding sources would be required until that point is reached.
- If the gap occurs across the planning period, then either the scope and scale of the proposed system must be scaled back so that the costs of the revised system fall to an affordable level, or
- Additional policy measures will be needed so that the charges become affordable. These might include financing part or all of the investment from grants or by introducing municipal transfer payments to subsidise the tariffs.

Affordability, financial sustainability and grant fund availability determine the scope, scale and timing of implementing a realistic and achievable waste management strategy. Careful consideration of these factors can allow realistic targets to be set for achieving specific waste management goals. Responsible authorities with 'policy

[103] The full cost recovery revenue requirement refers to the funds needed annually over the reference period for the waste management system to be operated on a fully commercially sustainable basis. It can be influenced by the extent to which grants are used in the investment financing mix.
[104] Solid and Industrial Hazardous Waste Management Assessment, Options and Action Area to Implement the National Strategy, World Bank, 2018
[105] National Policy for the Provision of Basic Refuse Removal Services to Indigent Households, Gazette No. 34385, Notice 413, Department of Environmental Affairs, South Africa, 2011
[106] 2nd South Africa Environment Outlook (SAEO), Chapter 13, 2016, available at https://www.environment.gov.za/sites/default/files/reports/environmentoutlook_executivesummary.pdf
[107] 'Relatório Municipal de Coleta Seletiva do Município de São Lourenço' GESOIS, FEAM, 2020
[108] Environmental Performance Reviews: Chile 2016, OECD, 2016

maker' and 'planner' roles must define (i) the bounds of a socially affordable and politically acceptable tariff and its structure; (ii) how the minimum annual revenue requirement is to be calculated (thus defining the full cost recovery tariff); and (iii) the sources and availability of grant funds and the conditions under which they can be used.

4.6 Financing of investments

The waste management plan should indicate how the investments needed to implement it are to be funded. Sources of investment finance can include (i) municipal capital reserves; (ii) national and/or regional government capital transfers (grants); (iii) specific national government funds created to support the achievement of waste management or wider environmental objectives; (iv) commercial loans from local banks; (v) bilateral international grants; (vi) grants and/or loans from international financing institutions.

Whether funds from a particular source can be accessed in practice depends on the conditions set by the relevant funding agency and on whether the municipality/applicant can satisfy those conditions. An application for investment funding should be supported by an investment feasibility study or business plan setting out the information, data and analysis needed to demonstrate the viability of the investment for which the funds are being sought.

This should include an investment financing plan showing investment requirements and costs over the planning period and the sources of funds proposed for financing them. It should indicate which funding sources (including user charges) are proposed to cover operational costs and future liabilities, such as debt service obligations and future investment costs (e.g. equipment replacement, landfill cell closure and aftercare, opening new landfill cells). Details of the tariff analysis undertaken to calculate user charges, and the results of affordability analyses, should also be included.

It can be assumed that as a pre-requisite for investing capital IFIs and private sector companies will require assurances and guarantees that an effective cost recovery and charging system is in place and that alternative mechanisms are available for ensuring that loans will be serviced and contracts honoured.

Investments financed entirely by local authorities

Local authorities' primary responsibility for the delivery of waste management services includes provision of the necessary collection, treatment and disposal all infrastructure. Investment at the local level might be funded from

International practice shows that if full cost recovery tariffs are not in place and if municipalities have only limited financial capacity then the development of waste treatment and disposal infrastructure based entirely on investment by local authorities either faces considerable delay or does not proceed.

municipal investment programs financed out of the local budget or from the financial reserves (own funds) held by public utility companies providing waste management services. The availability of investment finance of this kind depends entirely on the financial capacity of the respective authority and the availability of adequate funds in the municipal budget.

Direct investment by local authorities is more common when making relatively small investments, such as to purchase waste collection containers and equipment or to establish civic amenity sites, than it is for investments in large-scale projects, such as landfills or treatment plants. It is usually only in the larger cities that local authorities might have the capacity to rely solely on their own funding sources for implementing such large-scale investments. Direct funding of such projects remains out of the reach of most smaller local authorities.

International practice shows that if full cost recovery tariffs are not in place and if municipalities have only limited financial capacity then the development of waste treatment and disposal infrastructure based entirely on investment by local authorities either faces considerable delay or does not proceed. Practice also shows that financially constrained local authorities might decide to invest in and build part of a project, such as a landfill cell, whilst leaving other vital infrastructure, such as leachate treatment, for a second stage of investment once additional funding becomes available. This is a highly undesirable situation that should be avoided.

Investments from private sector

In the absence of adequate financing capacity, an option is for a local authority to draw upon the resources of private sector waste management companies. Private sector firms have the potential to mobilise investment funds as equity finance from their own retained earnings as well as from having access to debt finance from commercial banks. However, private sector firms will only invest in waste

management facilities if the prospective returns on their investments are realistic and achievable. Achievement of this requirement depends fundamentally on tariff and charging policy, fee collection efficiency and the reliability and predictability of waste fee revenue streams.

International private sector waste management companies may be interested in financing or co-financing investments in waste management equipment and facilities. The type of involvement can take several forms: sole ownership of assets and provider of waste management services to a specific area; in partnership with a local private sector service provider; or in partnership with a local public sector company. International companies will demand at a minimum the same assurances and guarantees as IFIs regarding the financial viability of the proposed waste management schemes and the creditworthiness of the municipality and will expect to make a profit on its involvement consistent with market expectations.

The requirements for successful private sector involvement are considered in Chapter 5.

Investments financed by a combination of local authority and central/regional funds

Many countries provide support for investments in waste collection, treatment and disposal through centralized financing organized at the national or regional levels. The usual source of grant financing for such projects is the central budget and can be in the form of direct budgetary transfers to local authorities for specific projects or can be implemented via designated national investment programs. With high levels of political commitment and support, the amounts of such public investment in waste treatment infrastructure can be significant, bringing about rapid development and improvements of the sector.

This type of financing may cover initial investment costs entirely or may require a capital contribution from the beneficiary local authority. This can be a barrier to a local authority as it may lead to a breach of the local authority borrowing limits or other financing rules established by the ministry of finance.

Investments financed by central sources cover various types of equipment purchases and facilities. In some countries, government programs focus on the purchase of waste collection vehicles and containers while in others the focus is on large infrastructure projects or on projects dealing with the closure of non-compliant facilities and remediating past environmental damages.

For example, in **Morocco**, a central government program - PDNA (see Chapter 3) has introduced a subsidy scheme supporting both investment and operation for the modernization of municipal waste management systems. Typically, the PDNA has financed investment costs in full and up to 30 percent of operating costs. The support lasts for a maximum of 5 years, by which time local authorities are expected to have expanded their own sources of revenue.

Similarly, in the **Republic of Korea**, government funding is extended to certain types of waste treatment facilities, including incinerators, landfills, bio-gasification plants, material recovery facilities and food waste treatment installations. In the case of the Seoul incinerator, the national government provided financial support to 30 percent of the capital cost, the provincial government provided a further 30 percent, and the balance was funded by municipal governments. National and provincial government support is available only when municipal governments construct facilities for use jointly with other local authorities. If a waste treatment facility is needed but the municipal government is unable to make the necessary contribution towards the investment, the opportunity exists to involve private enterprises in the financing. In this case, the national government and the provincial government each cover 50 percent of the initial investment cost not funded by the private enterprise. The municipal government pays off the amount invested by the private enterprise via the tipping fee. See **Box 9** on spread of expenditures between tiers of government.

The sources and availability of national grant funds, and the conditions under which they are to be used, should be determined at an early stage of the planning process (see **Box 10**). Clear rules are needed to define the specific waste management sub-sectors (activities) to which grant funds will be allocated. This factor is decisive if private sector involvement is being sought in the provision of specific sub-sectors of municipal waste management. In particular, it is essential to avoid grant-funded public services competing directly with commercially funded private services operating in the same sub-sector.

Box 9 Expenditure on waste management by tier of government in the Republic of Korea

In the Republic of Korea, national government's expenditure on waste management includes support to local authorities, support to resource recycling projects, research and development, strategic planning and public relations. The source of income is mostly environmental improvement special accounting and national tax. Special accounts for environmental improvement are created for the purpose of being used in all environmental fields; the resources used for waste management are mostly waste charges for difficult to recycle products of the recycling obligation producers who have failed to achieve the government's recycling target, waste disposal charges for incinerated and landfilled waste, and post-management deposits for the waste treatment industry.

Provincial governments' spending on waste management include support to local authorities, construction and operation of provincial facilities, research and development, strategic planning, and public relations. The sources of income are financial supports from national government, tipping fees collected from waste disposal facilities, and local taxes.

Local authorities finance the operation of waste collection and transport, manpower and equipment, installation and operation of waste treatment facilities, building a discharger fee system, and education and promotion. The sources of income are mainly the collection of discharger fees for mixed waste, food and waste, large-sized waste, tipping fee of waste treatment facilities and sales of recycled products.

Box 10 Decision rules for balancing affordability with financial sustainability

Affordable tariff policy tends to push tariffs down and financial sustainability tariff policy tends to pull tariffs up.[109] The tensions inherent in these policy goals feed back into system financing and, ultimately, into how the scope of the waste management system is defined and its costs. If a funding gap exists between the revenue needed to meet the financial sustainability constraint and the revenue which can realistically be generated under the affordability constraint, then grant funding may be needed to fill the revenue gap between the affordable and the full cost recovery tariff paths. Alternatively, it might be necessary to reconsider the project scope, scale and costs.

Implicit in the concept of the funding gap is that the proposed service is currently unaffordable. Implicit in the decision to use grants to bridge the funding gap is the expectation that the services will become progressively more affordable over time; that is, per capita incomes are projected to grow in real terms. Taking this assumption into account, the aim is to find a tariff and financing structure that enables both tariff constraints to be met. Decision rules can be set to help achieve this aim by:

- Defining the input parameters needed to establish household waste tariffs that are socially affordable and acceptable. They help define an affordable revenue stream.
- Defining the minimum revenue needed each year to achieve system financial sustainability. They help define the tariffs needed to satisfy this constraint.

Example Decision Rules for Social Affordability:

- Define the average household income and income projections to be used in the analysis
- Define an affordability ratio to establish a ceiling on tariffs relative to average household income
- Define an appropriate starting tariff for tariff evolution
- Define a realistic period over which the affordable tariff is to be achieved, and/or
- Define the maximum permissible annual real rate of increase in tariffs
- Define the correct treatment of VAT
- Tariffs should not exceed the level appropriate to the affordability ratio
- Tariffs should not exceed the full cost recovery tariff

Example Decision Rules for Financial Sustainability:

- Grants to be used to achieve the long-term financial viability of the strategy whilst keeping tariffs affordable
- Grants to be used once only to co-fund initial investment requirements

[109] Text based on Faircloth, P. & Doychinov, N, Full Cost Recovery and Affordability in the Household Waste Management Service Sector, Ukraine, Case Study from Lugansk Oblast, South-West Sub-Region, Presented to Ukraine Communal Services Regulatory Commission, 2012

Box 10 Cont.

- **Replacement assets to be funded from retained earnings or loans or private sector contributions**
- **Tariffs to cover – at a minimum – O&M costs in full from the start of operations**
- **Tariffs to cover 100 percent of depreciation on all replaced assets**
- **Tariffs to cover a progressively increasing share of depreciation on initial assets**
- **Cumulative net cash flow to be positive in all years**

If real household incomes are not projected to rise then either alternative municipal financing sources and mechanisms must be identified and put in place for funding future asset replacements and other liabilities or the proposed services should be scaled back to a level at which they are both affordable and financially sustainable in the current financial circumstances.

Special purpose governmental or regional funds

State financing for waste management investment projects is commonly channelled through the special central or regional funds that have been established in many countries[110]. National Environmental Funds (NEFs), pollution abatement funds, regional development funds and similar are typically government funds created by national law, controlled by government and financed primarily through public sources of revenue (domestic budget and ear-marked taxes)[111]. Usually, the NEFs have broader objectives related to various elements of environmental protection, and waste management is only part of their activities.

Each NEF operates under specific rules defining the scope of activities, decision making processes, eligible expenditures, project identification and application procedures, rules for contracting of services, equipment supplies and works, mechanisms for project implementation and monitoring and performance indicators. Fund financing can be provided for specific projects or for large investment programs composed of multiple projects of similar type and purpose. Considering that NEFs are usually established under national authorities responsible for environmental protection it can be assumed that financing priorities are well coordinated with the relevant waste management strategies and plans.

For example, in **Estonia** the Environmental Investment Center (EIC) uses revenue from environmental taxes and EU grant financing to fund investment projects, including those for waste management. Various regulations and programs govern the provision of grants or loans from EIC to a range of actors, including municipalities, NGOs and private entities. The financing is split into subprograms, one related to waste management and the circular economy, where investments support capital and occasionally operational costs. Each such sub-program has detailed conditions and rules for application, approval, contracting, and implementation monitoring of eligible projects. These funds have been critical to solving numerous waste management problems, such as closure of landfills, re-cultivation of old landfills, clean-up of contaminated sites, and infrastructure development that includes landfills, sorting centres and local public amenity sites. Financing has also supported recycling projects developed by private companies as well as the provision of additional recycling capacity.

In **Brazil**, specialised financial institutions serve as conduits for federal resources to both states and municipalities. Two important lines of federally supported resources are the National Environmental Fund, coordinated by the Ministry of Environment, and Caixa Economica Federal – a public bank dedicated to financing environmental infrastructure. Both are designed to support waste management and recycling projects[112]. Brazil's National Development Bank (BNDES) is another leading financial institution supporting the national development agenda. In the waste sector it supports the construction of sanitary landfills. Since 2018 the Inter-American Development Bank and BNDES have established a partnership to create a pipeline

[110] Recently more than 200 specialized governmental funds operate worldwide in the field of environmental protection, pollution abatement, climate change, energy efficiency, biodiversity and forestry.

[111] Moye, M., Innovative Mechanisms to Manage Environmental Expenditures in Africa, Asia and Latin America and the Caribbean (LAC), WWF Center for Conservation Finance, Conference on Financing the Environmental Dimension of Sustainable Development, OECD, 2002.

[112] 'Gestion de residuos sólidos en Brasil' Ficha Sector Brasil, España Exportación e Inversiones (ICEX), 2018.

of municipal waste investments in several states focused on the closure of dumpsites, the construction of sanitary landfills and the development of resource recovery systems [113].

Another example is the Government of **India**'s flagship program 'Swachh Bharat Mission' (Clean India Mission) initiated in 2014 that provides national as well as state level grants for achieving universal sanitation coverage in urban areas (till recently focused mostly on sewerage). The program has an estimated cost of US$8.4 billion[114], of which the central government share is approximately US$2 billion, states and Union Territories contribution is estimated to be a minimum of US$660 million with the remainder to be financed by private entities, market borrowings, and user charges.

Potential international sources

Within recent decades achieving greater sustainability in the waste management sector has become a priority for IFI funding within their broader environmental, climate change and circular economy policies. See **Box 11** on investments by the World Bank in waste management.

[113] 'BNDES financiará com R$ 34 mi centrais de tratamento de resíduos sólidos urbanos do Rio Grande do Sul' BNDES, January 4, 2019. See https://www.bndes.gov.br/wps/portal/site/home/imprensa/noticias/conteudo/bndes-financiara-com-r34-mi-centrais-de-tratamento-de-residuos-solidos-urbanos-do-rio-grande-do-sul

[114] SBM-Urban Government of India, Centre for Policy Initiative, conversion rate used 74 INR/$US

Box 11 World Bank support to waste management

The World Bank has been supporting the waste management sector for decades. Since 2014, the World Bank has committed US$2.3 billion in waste management investments across 81 projects in all regions. Most commitments, totaling US$1.7 billion are in East Asia, Africa, and South Asia, which are also the fastest growing regions in terms of waste generation[115].

The waste management sector has changed significantly in recent years and generated waste is projected to increase with 73 percent by 2050 over 2020[116]. Waste composition has evolved with changing consumption patterns, and the environmental impact of mismanaged waste including plastics has become especially salient. As the waste burden grows, the need and demand for waste management support have increased. The World Bank's engagements have changed accordingly in conceptual framework. Projects have a growing emphasis on national sector development programs that include national policy development and support to multiple cities.

Many World Bank projects focus on putting in place waste management systems with adequate household and business waste collection, strong monitoring and enforcement, and financial capacity, in addition to meeting increasing demand for infrastructure facilities, recycling and composting systems. World Bank projects also coordinate between local governments to achieve economies of scale, help clients select and oversee service providers and facilitate partnerships with the private capital. At a community level, it is typical for the World Bank engagements to include local citizen engagement and education components, aide social inclusion amongst both laborers and beneficiaries. The adequacy of solid waste management services can heavily influence trust for local officials and in turn, government capacity. In addition to providing capital and technical insight, World Bank projects routinely help municipal governments manage local issues from strategic planning, to institutional coordination, to budgeting.

Looking ahead, as the role of waste management in sustainability, poverty, climate change, and local economic development will grow due to pressures from urbanization and waste generation, demand for funding, technical know-how and capacity building is expected to continue to increase.

[115] Kaza, S., Shrikanth S. and Chaudhary, S., More Growth Less Garbage, World Bank, 2020 and What a Waste 2.0, World Bank, 2018

[116] Ibid (Note that as of July 15, 2021, the waste generation estimates have been updated with the final publication on More Growth, Less Garbage).

Significant amounts of finance are also provided by international donors on a bilateral basis.

International financing takes the form of long-term loans and grants depending on the general policies of the respective IFI, the specific needs and conditions in the beneficiary country and the expected results and impacts. Applying for international loans requires coordination and support at national level as state guarantees are usually required as a condition for providing the finance.

The issuing of such loans usually follows the preparation of a feasibility study and a comprehensive analysis and assessment of the technical, economic, financial, environmental and social aspects of a scheme. It should be expected that the sustainability – financial and otherwise – of the proposed waste management services will be examined rigorously, as will the affordability of the proposed tariffs charged to waste generators and the willingness of waste generators to pay the proposed charges.

The potential use of international financing in the development of the waste management sector should be examined carefully by the competent national authorities. Cooperation with IFIs should be considered not only with respect to possible financing but also as an opportunity to gain access to new and advanced approaches and technologies and to gain from international experience in modernizing the sector. See **Box 12** on support by the World Bank to **Indonesia**.

Box 12 **Indonesia - Improvement of solid waste management to support regional and metropolitan cities**

The Government of Indonesia is partnering with the World Bank to improve solid waste management services for urban populations in selected cities across Indonesia. To that aim, a US$100 million loan has been provided and is expected to leverage additional financing by improving the enabling environment and capacities on the ground.

The project comprises of four components. The first component, institutional and policy development, will support institutional strengthening and capacity building of central government agencies responsible for various technical and administrative aspects of solid waste management services. The second component, integrated planning support and capacity building for local government and communities, will finance the costs of experts and community facilitators throughout the program cycle to support capacity building (including longer-term management support, training, workshops, and knowledge exchange events between cities as well as urban sub-districts) of local governments and communities to design and manage solid waste service improvements. The third component, solid waste infrastructure in selected cities, consists of two sub-components: (i) support for integrated solid waste management systems for Citarum watershed cities; and (ii) support for integrated solid waste management systems in selected cities, other than Citarum watershed cities. The fourth component, implementation support and technical assistance, finances the program management during the implementation, construction supervision consultants, monitoring and evaluation, and specific technical assistance for cities and district governments receiving the investment of component 3.

The project is expected to create a nation-wide, scalable platform for improving solid waste management performance that is adaptable for a variety of different urban contexts in Indonesia. It comprehensively supports solid waste management policy and legislation, financial sustainability, and stakeholder collaboration across all aspects of the sector (collection, treatment, disposal, recycling and waste generation); and is designed to support the implementation of existing sectoral programs, including MPWH's Acceleration of Urban Sanitation Development Program (Percepatan Pembangunan Sanitasi Permukiman) and Ministry of Environment and Forestry's Solid Waste Management Roadmap to 2025.

Although the project represents a small portion of the US$ 5 billion overall estimated sector investment needs over the next six-year period, it is designed to provide a strong foundation for future expansion when additional financing sources are available. The World Bank's value-added proposition in this program is to strengthen the outcomes of existing government funding in solid waste management through technical expertise, global knowledge, and strong governance controls for the Indonesian context.

4.7 Operational financing and operational revenues

4.7.1 Cost recovery policy

To be confident that services are appropriate in terms of their scope and scale, are affordable to users and financially viable over the longer-term, municipal officials must understand the implications of the *full costs of providing those services*. This means recognising future costs in advance, such as collection vehicle and waste treatment equipment replacement, construction of new landfill cells and longer-term liabilities, such as landfill closure and remediation costs[117]. This implies a degree of commercial management, based on the principles of full cost (accruals) accounting, that is often absent from municipal waste management planning departments, especially those in less well-resourced municipalities. This understanding, though, is crucial to developing a viable cost recovery policy.

Cost recovery policy aims to create a system of direct, regular and reliable revenue receipts that allows the services to be planned, managed and budgeted on a sustainable basis. The key element is predictability: the predictability of the revenue stream needed for financial sustainability[118]. Cost recovery does not mean that all costs must be recovered directly from users. It means that funding sources must be in place to cover all system costs now and in the future.

Most countries have introduced either ear-marked municipal taxes or charges for funding the operational costs of municipal waste services provided to households and other waste generators, and quite commonly they are a mix of the two. Typically, though, the cost recovery process is defined without an underlying policy base or objectives. A common example is for tariffs to be set to generate sufficient revenue to cover a specific funding objective (for example, to cover the direct cash operating expenditures) and for all other costs to be covered on an ad hoc basis from the municipal budget.

This general situation was remarked upon in the Municipal Solid Waste Tariff Strategy published by the **South African** Department of Environmental Affairs in May 2012 as follows:

'If such an approach [i.e. a combination of property rates and user charges] is adopted it should be formalised, i.e. an explicit proportion of the rates revenue should be set aside for solid waste services based on a well presented indication of the costs of public waste management services. At present this combined approach is applied by many municipalities on an ad hoc basis as the general rates account is used to subsidise any deficit accruing on the solid waste account. This approach, where any deficit (whether coming from public or private services or simply from poor management) is automatically funded out of the rates account, provides no efficiency incentives and should not be regarded as an acceptable tariff structure.'

The principal sources of recurrent funding are user charges and transfers from municipal budgets. Others include national and regional government transfers; receipts from the sale of recycled materials and compost, generating energy from waste; taxes paid on consumer goods such as plastic bags and batteries; funds raised from extended producer responsibility (EPR) schemes; and levying licensing fees on waste operators. Funds realised through these combined sources must be predictable and sufficient to meet the cost recovery objectives.

Of these sources, only user charges and municipal transfers are likely to be sufficiently predictable for system and financial planning purposes. National and regional transfers are unpredictable and should be used only as a temporary measure until more reliable sources are phased in. Recyclable materials markets and EPR schemes are potential sources of revenue but ones which typically have still to be developed and proven.

The purpose of cost recovery analysis is to establish the amount of revenue needed each year to ensure the long-term viability of the waste management services. From this the affordability of the services to users can be gauged. The proportion of this revenue requirement to be provided by users through the payment of tariffs depends on the overall policy objectives established by the national or municipal government. The part of the revenue requirement not funded through tariffs must be financed by the municipality from other sources (if the operations are to be managed on a financially sustainable basis).

[117] In many countries with advanced waste management legislation, a condition of the permit to operate a landfill is that adequate financial provision must be available to provide a guarantee that the costs of remediation, site closure and post-closure liabilities are not borne by the community in the event that the operator abandons the site, becomes insolvent or incurs clean-up costs beyond its financial capacity. The financial provision covers (i) costs arising from uncertain incidents specified in permit conditions; (ii) landfill closure costs; and (iii) landfill aftercare costs. Obligations on the landfill operator typically continue beyond landfill closure: financial provision must generally be in place for at least 30 years following landfill closure. Closure and post-closure cost estimates are to be prepared prior to commencement of facility operations. The total financial provision is to be accrued over a landfill's operating life. The adequacy of the provision is to be kept under continual review and is to be adjusted annually as necessary until all post-closure monitoring and maintenance has ceased.

[118] Financial sustainability is taken to mean that cumulative net cash flow after all cash expenditures is greater than zero in all years of the operational life of the waste management system.

Cost recovery policy needs to establish two things: the total amount of funds needed each year of the planning period and how these funds are to be provided. The minimum amount of recurrent funding is that needed to finance the direct operating expenditures and debt service obligations incurred in providing the service. That is, sufficient to cover annual operating cash outflows. If, on the other hand, the financial objective is for the agency to become self-sustaining over time, then the annual funding requirement should be sufficient also to recover capital expenditures, long-term liabilities and possibly to provide a return on investment.

Setting waste charges to recover operational expenses only, however desirable from a social perspective, can jeopardise the chances of the basic service becoming sustainable in the longer term or of privatising all or parts of it in the future. A system based on full cost recovery objectives introduced progressively is therefore preferable. This has direct implications for the scope of the waste management services to be provided and the opportunities available for funding them. Charges levied on users must be realistic and affordable to most households, with measures in place to protect low-income or vulnerable households from unaffordable charges.

While many countries have adopted the user or polluter pays principle, in practice it is often applied to only a proportion of operational costs, with the balance being covered by general municipal revenue. It is important that a municipality should clearly determine its cost recovery policy. Ideally, it should be based on the user-pays principle, with the objective of covering the full costs of providing the service. A key advantage of this is that it creates the opportunity for the waste management department to operate on a more commercial basis; for example, by establishing capital accounts in which to deposit funds collected by the charge to cover future liabilities. It also forces the department to examine and properly understand the full costs of its services, thereby helping it to decide if its services are affordable to users and financially sustainable in the longer term.

Alternatively, the municipality might decide on the revenue objectives for user charges (which may be less than full cost recovery) and, importantly, those for the specific mechanisms through which the balance of the annual revenue requirement will be funded out of municipal revenues. The disadvantage of this approach is that municipal funding may lapse over time. It is likely to be easier to set funds aside in such an account if they have been raised from users and are incremental than if they simply involve an internal transfer within a municipality's accounting department.

A mix of user charges and municipal transfers can however be useful as a transitional arrangement between a situation of there being no charges to one of full cost recovery. In this way charges can progressively be introduced to the affordable level. A similar situation arises if initial investment costs are financed by grants but must be refinanced by debt when they come to be replaced. Here the possibility exists to progressively increase the tariff over the life of the grant-funded asset until the year in which it comes to be replaced. This will enable some of the funds needed to finance its replacement to be generated in advance and thereby avoiding the need for a steep increase in tariffs at that time.

The division of operational funding between user charges and municipal transfers is a crucial one also from the perspective of municipal solid waste services being both a private and a public good. As noted in the Solid Waste Tariff Setting Guidelines for South Africa:

'Residential waste collection is a public good in the sense that it is hard to exclude anyone from the service without leading to illegal dumping and public health problems. There are also pure public services in the MSW system, such as street cleaning, which benefit all residents and firms. At the same time, MSW collection is a private good in that it is a service delivered to individual households, and it costs more to deliver the service the more households are served. Tariff approaches have to accommodate this dual nature of MSW services'[119].

In **South Africa**, the division is made on the legal requirement (see **Box 13**) that the costs of providing free 'basic refuse removals services' to indigent households should be covered by the State (the public good component) whilst the balance of households are obliged to pay user charges (the private good component) that 'reasonably reflect the costs associated with rendering the service'. In **Chile**, as mentioned already, local authorities charge residents a waste fee based on both the fixed and variable cost components of the service. Low-income households having a tax assessment below a given threshold are automatically exempted from payment (the public good), resulting in revenues from user charges being collected from only some 20 percent of households (the private good), with the balance being funded via transfers from the State.

[119] Based on: Solid Waste Tariff Setting Guidelines for Local Authorities, Department of Environmental Affairs, South Africa, May 2012

Box 13 **Tariff options from the perspective of municipal waste management as a public or a private good in South Africa**

The Municipal Systems Act of South Africa requires that 'tariffs must reflect the costs reasonably associated with rendering the service, including capital, operating, maintenance, administration and replacement costs, and interest charges'.[120] However, solid waste services are provided as a public good and the municipality has an obligation to provide certain waste services. The National Policy for the Provision of Basic Refuse Removals for Indigent Households incorporates basic solid waste services into the bundle of free basic services and this allowance needs to be factored into the setting of tariffs.

Perspective 1 – Financing of all solid waste services through property rates. Under this approach all municipal solid waste services are funded from general rates. The full cost of the service is defined and an appropriate charge is included in the general property rates to recover this cost. The argument for this is that solid waste is primarily a public good and that costs should be recovered from all citizens of the municipality.

Perspective 2 - Solid waste services funded by user charges. This approach is premised on the view that the solid waste operation is a separate, 'ring-fenced' service which is expected to recover all its costs from user charges. The use of user charges is based on the argument that a municipal solid waste service has significant private good aspects and stresses the principle that users should pay for their use of services.

Perspective 3 - combined approach. This approach is based on the argument that solid waste services have components of both public and private goods. A combined approach is aimed at recovering the private component through user charges while the public component is recovered either through a universal flat charge or through an explicit solid waste component incorporated into the property rates.

The mechanism proposed was based on the combined approach and reflected the cost recovery objectives of the Municipal Systems Act by introducing user charges that 'reasonably reflected the costs associated with rendering the service' whilst recognising that 'solid waste services are provided as a public good' by factoring into the cost recovery process the need to provide free basic solid waste services for indigent households (as set out in the National Policy).

[120] Ibid

The key to financial viability is the predictability and reliability of the revenue sources. If waste management costs are to be covered by a municipal tax on households, possibly linked to a wider household services tax, then sufficient flexibility must be built into the design of the tax to ensure that the tax rates are appropriate and can be readily adjusted to changing future conditions. If the revenue stream is to be based on user charges, then the fee base (e.g. household) must be secure, the fee rate must be correctly calculated and payment mechanisms must be simple and effective. It is important that there should be control. Some mechanisms meet these criteria better than others. These are described in the following section.

If it is decided that operational costs only should be covered by user charges and that the balance of costs should be covered by other municipal resources (e.g. investment grants or budget revenue transfers) then these future transactions should be recognised, planned and provided for in advance and based on an assessment of the full remaining costs to be covered over time.

For example, the situation might arise that a municipality decides to phase in the full cost recovery tariff over a given period. In this case, the future funding requirements should be fully recognised in advance and planned for. If, rather than doing that, a municipality relies upon future costs to be covered by unplanned and ad hoc transfers, it can be expected that service quality will steadily decline. A problem with the preferred approach, though, and which applies particularly to low and middle-income counties, is that it can be challenging for a municipal mayor to divert funds from municipal revenue to a capital reserve account at times when the municipality is facing serious financial pressures.

4.7.2 User charges

Local authorities typically charge waste fees or impose taxes on users of municipal waste services. The methods by which these are levied and collected are important for the overall efficiency of the services. It is essential that all

users of the services are charged and pay for the services they use. High revenue collection rates are an important measure of a successful charging scheme.

In many countries, the national government sets out in the Waste Law (or equivalent) how municipal waste services are to be charged for, by way of a tax or a charge. If a tax is used it will specify the mechanism through which the tax will be imposed, this typically being added to a pre-existing tax mechanism, such as a council tax or rates. If a charge is issued, the legislation will define the form of the charge base (such as a charge per property or resident) and set out and issue guidelines on the method for calculating the tariff and assessing its affordability. Typically, the municipality has authority for setting the level of the tax and the unit rates on which charge calculations are based. General concepts considered during the fee setting process include (i) the polluter and user pays principles; (ii) affordability and household incomes; (iii) financial sustainability and full cost recovery; and (iv) economic efficiency.

Although service users are legally obliged to pay their waste services bill, levels of non-payment can be high. This can be because services are unaffordable to some low income or vulnerable households but in many cases it arises from municipalities not having adequate legal powers to enforce payment. It follows that the payment mechanism should be convenient to users and that factors that deter payment, such as high transaction costs incurred in making relatively small monthly payments, should be addressed and remedied.

Setting appropriate levels for household waste service taxes and fees normally takes into account the social and economic conditions reflected in the 'affordability threshold', tariffs levied on CII entities should however be based on the full costs of the specific services provided.

Cost analysis should be based on the full costs of providing the services irrespective of whether full cost recovery charges are to be levied. This is necessary to establish whether the services are affordable and financially viable and to assess the implications of this for investment and recurrent financing needs. It is also a core factor in determining if the scope and scale of the services should be reconsidered. The cost and tariff analysis typically has two stages: a planning stage over a realistic time horizon in which annual waste flows, population parameters, system costs, revenue requirements and indicative tariffs are estimated; and an annual budget management phase in which the specific tax rate or tariff is calculated and proposed for consideration, recognising all relevant and eligible cost factors.

The principal objective of household waste charging mechanisms has traditionally been to satisfy budgetary requirements: to generate the revenue needed to maintain the long-term financial viability of the municipal waste service in a reliable and predictable manner. More recently, policy objectives have shifted and now include incentives to encourage users to minimise the amount of waste they produce and to optimise the recovery of materials from the waste stream.

As such, two broad types of charging mechanisms can now be recognised internationally: traditional fixed or variable-rate (cost recovery) schemes and quantity-based variable-rate (incentive) schemes. Hybrid fixed and variable rate quantity-based schemes are now also used, having evolved to address the consequences of quantity-based schemes on revenue stability[121].

Traditional charging schemes are designed to achieve revenue predictability and cost-recovery objectives and are unrelated directly to the level of service use. Quantity-based schemes aim to encourage users to comply with waste management objectives of waste minimisation and recyclable material recovery, they relate directly to the level of service use and vary between users. Complex hybrid schemes have evolved in response to the negative effect incentive-based schemes have on the stability of the revenue stream needed to maintain service financial viability.

4.7.2.1 Traditional charging schemes

Traditional charging schemes are used widely internationally to recover in full or in part the costs of municipal waste management services. They can be levied at a fixed or a variable rate. For example, as a fixed tax or rate per private household or apartment; or as a variable tax or rate per unit area of apartment floor space or number of residents.

Fixed rate taxes and charges apply uniformly to all users (the fee base) and result in a predictable revenue stream.

Variable rate taxes and charges relate to a variable physical attribute of the user (the fee base). The physical

[121] For a review and discussion of user charging systems and concepts relating to municipal waste management see Section 2, Waste Collection: To Charge or Not to Charge, a Final Report to IWM (EB), Eunomia, March 2003

attribute itself is typically fixed (such as apartment floor area), is unrelated to the use of the service and therefore also leads to revenue predictability. It does however introduce an added layer of administrative complexity and cost over the fixed rate alternative.

If, however, the charge base is itself variable, as it is if based on the number of household residents, this can lead to revenue instability, as well to significantly higher administrative complexity and costs.

Variable rate taxes and charges are believed to be more equitable insofar as the variable attribute against which the charge is calculated, such as apartment floor area, is to some extent a measure of ability to pay. Charging on a per capita basis is thought to be a fairer charge as it comes closer to the user or polluter pays principle. This additional degree of 'fairness' must be weighed against the added administrative complexity of maintaining an up-to-date population data base and the effect variations in this have on the projected revenue stream[122]. As noted later in the chapter, waste management services are characterised by high fixed costs. This means that the total household charge should, ideally, be adjusted for only the marginal cost change associated with a change in the variable factor. This is reflected in the hybrid schemes described below for which the charge consists of a larger fixed fee component and a smaller variable (quantity-based) component.

Mechanisms used widely for billing and charge collection purposes include:

- Indirect billing of a waste management tax linked to an existing property tax
- Direct billing and fee collection by the municipality
- Direct billing and fee collection by the service operator
- Indirect billing and fee collection by a third-party agent

Indirect billing via a waste management tax linked to a wider municipal tax

Indirect billing is a form of waste management taxation provided for in municipal bylaws and typically identified separately on the property tax (or similar) bill. It should be distinguished from the type of unbudgeted transfer payments sometimes made by a municipality on an ad hoc basis to cover urgent or even recurrent financing requirements.

To be confident that services are appropriate in terms of their scope and scale, are affordable to users and financially viable over the longer-term, municipal officials must understand the implications of the full costs of providing those services.

The waste charge is typically added to and itemised on the property tax bill, although this is not always the case. For example, waste charges are collected via the municipal council tax in **England** but are not itemised separately on the council tax form. The amount of the tax can be a fixed rate per property or a variable rate (e.g. linked to property values or property valuation bands). The **Bulgarian** system is an example of this. Advantages are that the taxes are relatively simple to administer, have low administration costs and high collection ratios, and offer revenue predictability and stability. Disadvantages are that tax rates can be difficult to adjust over time (e.g. indexed adjustments for inflation are politically sensitive) and funds may not be earmarked exclusively for the provision of municipal waste management services, and may cover other municipal services, including street lighting and maintenance of green areas. Ideally, the level of the municipal waste management component of the tax should be defined precisely in the budget assessment phase and hypothecated to be used solely for defined waste management purposes.

Direct billing by the municipality

Under this arrangement the municipality is responsible directly for all aspects of preparing and maintaining service population registers, establishing waste charges, billing users, collecting payments, chasing up arrears and enforcing payments. Unlike other public utilities, there are typically no sanctions for non-payment. Examples of fixed or variable household charges are:

- The fee base may be fixed as the property to which the bill is addressed. It is unrelated to the size of the household or the quantity of waste collected.
- The fee base is fixed per square meter of apartment or property area. The charge is calculated according to the property area and billed to the property address. A justification for the scheme is that property area is an

[122] For a discussion of 'fairness' in the context of municipal waste management services see 'how to design an appropriate waste fee', Principles, Practices, and Applications of Waste Management Fees', ISWA, 2011

indicator of the ability of its occupants to pay for waste services. A public register of individual property surface areas must be maintained.

- The fee base is fixed per person permanently resident at the address. The charge is calculated according to the number of permanent residents and billed to the property address. Charges are to some extent related to waste generated and hence to service use, and indirectly to the user and polluter pays principles. A register of permanent residents living at the property address must be maintained.

Advantages of a fixed fee (or constant variable fee base component, such as floor area) are that it is relatively simple to administer, revenues are earmarked to waste management services, a direct relationship is established with service users and municipalities gain a good understanding of all aspects of the service. Disadvantages are that administration and payment enforcement costs can be high relative to charge revenues and the potential exists for low charge collection rates. The relatively low level of municipal waste charges may – somewhat counter-intuitively – act as a disincentive to payment, this depending to some extent on the convenience of the payment mechanism.

This last point applies to all charging schemes. With web-based and automated teller machine (ATM) payment options becoming increasingly common throughout the world in recent years, problems with making small transactions have become greatly reduced. Cash payments collected by company staff at the customer's door, or made at the post office, the bank or at the premises of the waste collection company still happen in many countries, but their share is gradually decreasing.

There is often interest in introducing systems based on per capita charging based on the belief that this is a fair system from the perspective of the polluter pays principle. Taking the user population as the charge base does, however, have two significant drawbacks. One is that it depends on a municipality's capacity to maintain the population register on which the fee base depends. The other is that it brings a variable element into the charging process that adds a considerable layer of cost, complexity and uncertainty. Also, given that waste collection costs consist primarily of fixed costs, service cost variations resulting from population changes are likely to be small whereas the effects on revenue and administrative cost can be high. This applies to all traditional schemes.

In principle, revenue collection by local authorities gives them better control over their financial flows and more instruments by which to influence the quality of the services provided. Municipalities also have greater legal powers than individual service providers to enforce payment.

Direct billing by the operator

Under this arrangement, a municipality appoints a licensed private municipal waste management company to be responsible for both waste collection and fee collection. It also determines the waste fee to be charged per household. The operator signs service contracts with individual households or housing associations, provides services to and directly bills the contracted households, collects fees from them and enforces payment from those in arrears. Households and other legal entities are legally obliged to hold a valid signed contract with a licensed municipal waste collection company. The template for the standard service contract signed between contractor and households is agreed between the contractor and the authorities, and legal powers referred to in it should be sufficient to enforce the obligation on all waste producers to hold a valid contract in the waste collection area.

Alternatively, high-cost individual contracts are in some countries replaced by a local ordinance which mandates that households should register with and pay directly to a designated service provider. In such cases, though, the ability of the private sector service provider to chase for arrears and enforce payment by households and other generators can also be restricted. In **Belarus**, charging and waste fee collection is contracted out at the national level to a specialized company for a fee understood to be equivalent to 1-3 percent of total revenues collected.

Delegation of revenue collection powers in this way can lead to extra risk and cost to the waste service provider resulting from the non-payment of fees and from a lack of adequate legal powers to enforce payment. This can lead to 'cherry-picking,' where a waste company will provide services only in areas where households are willing to pay, an outcome of which can be illegal dumping and higher costs incurred by the municipality in maintaining public health and environmental quality.

In principle, revenue collection by local authorities gives them better control over their financial flows and more instruments by which to influence the quality of the services provided. Municipalities also have greater legal powers than individual service providers to enforce payment.

Nevertheless, many local authorities prefer to delegate responsibility for revenue collection to service providers. One reason for delegation can be longstanding established practice; another is a shortage in municipal administrative capacity to levy and collect charges directly. In some cases, direct contact between the service provider and users may support better customer relations, particularly if community confidence in the local authority is low. Examples include local authorities in **Estonia, Italy, Bosnia and Herzegovina, Cambodia** and **Pakistan**.

The main advantage of direct billing by the operator is that it removes responsibility for billing and fee collection from the municipality. Disadvantages can include[123]:

- Payment losses are typically higher when the fee is collected by a private entity rather than when the municipality is the fee collector
- Inability of the private sector contractor to secure contracts with all users and the consequent public health, environmental quality and revenue losses associated with 'cherry picking'
- Inadequate protection may be given to vulnerable households
- Administrative costs incurred by the municipality may not be recognised
- Related services may not be funded (e.g. separate collection and public relations)
- There may be unacceptable fee collection practices
- There may be difficulty in enforcing standards

Indirect billing by a third-party: charges linked to a utility

Under this arrangement a municipality contracts with a utility company for it to bill and collect waste management charges together with charges payable by registered users of the utility service (e.g. water, gas or electricity supply). A core requirement is that the municipal register holding the data needed by the utility to provide the billing service can be related to the utility client database. Using the electricity utility as an example, three possible charging mechanisms are:

- Setting the household as the fee-base
- Setting the number of residents in the household as the fee-base
- Setting electricity consumption (or consumption band) of the household as the fee base

Setting the household as the fee-base

Utility services are typically provided at the individual household level at a defined address. If municipal waste services are to be billed in a similar manner (i.e. per household), then such an arrangement should not involve a significant amount of additional administrative effort by either the municipality of the utility once the databases have been linked and procedures for keeping the data up to date have been agreed and implemented. A fixed waste fee can then be added to and separately identified on each utility bill.

Key operational steps between the municipality and the utility are to jointly relate the residential property address register used by the municipality to the utility service client property address register and for the municipality to inform the utility of the fixed charge to be added as a separate item on to each utility service bill. Alternatively, it could inform the utility of the individual (variable) charge to apply if, for example, it was based on the surface area of the household.

The advantages of this approach are its administrative simplicity once databases are linked, convenience for customers and the potential for high fee collection ratios. Disadvantages are that administrative costs can be high relative to the amount of revenue collected, the complexity of linking relatable databases, the scope being limited to the clients of the utility company and the lack of fee payment enforcement mechanism (this is common to all mechanisms).

Setting the number of residents in the household as the fee-base

If municipal waste services are to be billed not per household but against the number of permanent residents of a household then significantly more administrative effort is needed before a municipality can transfer to the utility company the data it needs in a form which is compatible

[123] ISWA, Guidelines on How to Design an Appropriate Waste Fee: Principles, Practices and Applications of Waste Management Fees, 2011

with its client register. The municipality must calculate the *variable* waste charge to be billed by the utility each month to each household. To enable the utility to charge households according to the number of people living at each address, it must do the following:

- Calculate the unit waste service cost per resident (fixed fee) within the waste collection area (calculated from the annual revenue requirement and the total number of residents in the area)
- Relate the fixed fee per person calculated above to the number of residents at each address
- Calculate the total charge for each household and transfer this data to the utility company for billing purposes

The municipality must have access to significantly more data than when the household itself is used as the fee base and introduces greater levels of unpredictability into the revenue projections.

Setting electricity consumption (or consumption band) of the household as the fee base

If electricity consumption is to be used as the fee base for differentiating waste charges between households, the municipality must calculate the waste service cost per kWh of residential electricity consumption within the waste service area. This value is then forwarded to the utility which relates it to the electricity consumption of individual waste service users and bills them accordingly. An alternate is to calculate the household charge according to consumption bands – this is preferred as it provides a greater degree of stability and predictability to the revenue projections.

Setting waste charges that are linked to a variable factor such as the number of citizens permanently resident at an address or the amount of electricity consumed at that address can, to some extent, be considered as being a 'fairer' charging mechanism as both can be thought of as proxies for waste generated and therefore consistent with the polluter and user pays principles. But the 'degree of fairness of a waste management fee imposed on users is one of the most debated aspects of the fee; and each fee model has its specific level of unfairness, depending on the stakeholder concerned'[124]. This section shows that introducing greater levels of detail into the user fee charge base typically leads to increasingly higher administrative costs and revenue instability.

The following two case studies are examples of charging systems linked to the local electricity utility company. In the Mongolian example, the utility acts simply as the billing and payments mechanism and the case relates to a shift from billing per household to billing per person per household. In the Georgian example, the case relates to a shift from direct municipal billing per person to charging and billing on an electricity consumption per household basis.

In Ulaanbaatar, for example, the capital city of **Mongolia**, the waste service fee collection method differs between the apartment and ger[125] areas of the city. The billing system in the ger areas was switched in 2011 from direct fee collection by waste collection companies to billing via the local electricity distribution company. A single fixed waste charge is added to the electricity bill of the electricity company customer registered at the geographical address. The switch led to a rise in fee collection rates from 28 percent in 2011 to 57 percent in 2014 (although a transaction fee of 23 percent is payable on the total amount of fees collected). The address relates to a single khashaa (or fenced area) in which two or three households live in separate gers (or yurts) which typically take an electricity feed from the supply of the registered user[126]. The effect of this is that only one waste fee is paid for perhaps two or three households. The Waste Law has recently been amended and now mandates that waste charges should be levied on a per capita basis. The city is currently looking at alternative charging mechanisms, one of which is to adjust its current arrangement with the electricity company to charge on a per capita rather than on a per registered household basis. This would involve significantly more administrative effort on the part of the local governments to maintain up-to-date population registers and in redesigning the software interfaces between the population / household registers and the electricity company's client database.

In another example, from Tbilisi, **Georgia**, the Tbilisi City Council (Sakrebulo) approved in 2011 a proposal by the mayor's office to tie the monthly waste collection fee to electricity bills. Under this system each household would have to pay a waste collection fee per kilowatt of

[124] Ibid (ISWA)

[125] Ger areas are informal settlements that expanded rapidly across UB following the intense rural to urban migration that occurred after 1990 and are home to some 58 percent of the population (Byamba, B. and Ishikawa, M., 2017).

[126] Byamba, B. and Ishikawa, M. Municipal Solid Waste Management in Ulaanbaatar, Mongolia: Systems Analysis, 2017

electricity consumed by the household each month. Prior to 2011, a flat fee per family member was charged. It was assessed that revenues from the new charging system would be double those of the previous system. It was also decided at that time that half of the fee payable by the most vulnerable in society would be covered by the Tbilisi government[127]. In 2015, the State Audit Office of Georgia reported that between July and December 2013 revenues from municipal waste collection in Tbilisi represented a fee collection ratio of 92 percent, the best outcome of all municipalities and self-governing cities in the country. This performance was attributed in part to the fact that the electronic accounting system was the same as the billing system and that it determines the exact number of paying customers. It noted that the Electricity Provider Company organizes the billing system and that every month the population receives electronically all printed utility bills in person, including the waste bill. If the waste fee is not paid by a prescribed date the person is restricted from the electricity supply.[128]

4.7.2.2 Quantity-based charging schemes

Quantity-based (variable-rate) charging schemes (also known as pay-as-you-throw schemes) relate to the amount of waste collected. They aim to give service users incentives to adjust their behaviour in ways that help meet governments' waste management policy objectives. Incentives take two forms:

- To encourage users to reduce the amount of waste they produce. The charging scheme is designed to meet waste minimisation objectives. Users can choose between the amount of waste they put out for collection and hence the amount they must pay to have it collected.
- To encourage users to reduce the amount of waste they produce and to separate their waste into recyclable and residual fractions. Users face choices related to both (i) the total amount of waste they put out for collection and (ii) the amounts they put out for recyclable material and residual waste collection, for which differential charge rates apply[129].

Users are commonly charged for residual waste only, this encouraging them to minimise the total amount of waste they produce and to maximise the amount they put out for separate collection. As intended, bills can vary between payment periods. As such, the schemes can lead to instability and unpredictability in the revenue stream. This is the principal reason why hybrid charging schemes have been developed, which typically include a large fixed-rate charge component. These are considered later in the section.

Unlike traditional charging schemes, quantity-based schemes are integral to the design and operation of the collection system. Choices between collection systems, container types, rate structures and billing systems are inter-related. The collection system and container types selected largely dictate the type of charge structure and billing system that can be used. Conversely, deciding to stay with an established charging and billing system will constrain the type of collection and container systems that can be used.

There are two types of quantity-based variable-rate charging scheme:

- Charging by waste volume, as set out in approved containers or bags of known volumes, and as approved by the municipality, i.e. users are charged per m3 of waste as measured by the capacity of the bin or bag in which it is contained and put out for collection.
- Charging by the weight of waste, as set out and weighed directly on the collection vehicle, i.e., users are charged per kg of waste put out for collection.

The two approaches have significantly different container, collection, charge calculation and billing requirements. It is important to understand the effects that quantity-based charging has on system costs and revenues as both involve high levels of municipal involvement.

Volume based schemes

Volume-based waste collection and charging schemes are designed around bins, bags, tags and stickers of types and capacities specified (and commonly provided) by the municipality. The measure used for charging purposes is the volume of the container and not the actual volume of waste contained in the container. Volume-based collection services and charging schemes used internationally come in many different configurations, offering users different levels of service and choice.

[127] Tbilisi Waste Collection Fee Tied to Electricity Bills, News, 24/06/2011
[128] Performance Audit Report of Municipal Solid Waste Management, State Audit Office of Georgia, February 2015
[129] This is typically zero-rated for separately collected recyclable material with the full charge being included in the residual waste component.

Some municipalities provide waste bins, waste bags, or stickers or tags to attach to approved containers or bags. Others are based on pre-paid bags, tags or stickers. Some offer choices over the number and/or types of containers that can be used, others over the frequency of collection. More choice leads to higher operational complexity, and higher administrative costs to be covered by the municipality.

The schemes depend on the willingness and ability of users to respond to the choices and price signals that confront them and on how municipalities respond to implement those choices. For example, a household may inform the municipality that it wishes to switch from a larger bin to a smaller bin (which may only be feasible following a sufficiently large reduction in the volume of waste produced). This calls for two responses from the municipality: an operational one (the supply and removal of bins, adjustments to on-bin or on-vehicle user data recording devices) and an administrative one (adjustments to charging and billing arrangements).

Schemes based on pre-paid bags, tags and stickers avoid the need for billing and offer financial incentives to minimise and separate waste. They might also encourage excessive compaction, illegal dumping, and fraud, calling for heightened levels of monitoring and enforcement of collection system conditions and standards (e.g. recyclable material specifications; appropriate use of bins, bags, tags and stickers) by the municipality and diligence by collectors.

For example, in 2000 Taipei, **Taiwan**, officially launched its 'Per-Bag Trash Collection Fee Program', a volume-based pay-as-you-throw scheme based on the polluter pays principle which obliges residents to purchase designated garbage waste disposal bags at convenience stores. Bags come in different volumes and prices. Recyclable materials are exempted from the obligation. Prior to implementing the scheme, Taipei adopted policies for reducing the quantity of waste produced and for processing resources recovered from the waste stream. These were backed up by a single policy initiative developed in the 1980s to favour incineration as the primary waste treatment method and landfill as the secondary option. Immediately after introduction of the pay-as-you-throw system, citizens demanded an exemption for kitchen waste. In response, the city government began a program to collect and recycle all household kitchen waste separately. Since 2003, household kitchen waste has been recycled for animal feeding (pig-feed waste) and agricultural use (compostable kitchen waste). It is important to highlight that such complementary measures were implemented to make the pay-as-you-throw policy successful. In 2000, the total waste generated per day was 2,970 tonnes; by 2011 it had fallen to 1,008 tonnes and waste generation per capita had fallen by 65 percent. Due to a combination of several policies, in December 2014 the waste reduction rate reached 67 percent and the recycling rate 56 percent. The rate of proper garbage disposal is 100 percent and the incineration rate of resources that cannot be recycled or reused has reached 99 percent.[130]

Weight-based schemes

Weight-based waste collection and charging schemes entail the waste set out by users being weighed directly on the collection vehicle. The measure used for charging purposes is the weight of the waste, the bin being weighed before and after emptying. Bins are fitted with electronic identification devices for logging household data relating to each waste bin uplift. The weight and household data are processed automatically, and the household is invoiced accordingly. Unlike volume-based schemes, weight-based schemes record a change in waste quantity automatically and immediately.

Weight-based schemes offer a direct waste reduction incentive. Each kilogram of waste avoided results in financial savings at the point of collection. This does not apply to volume-based schemes, where action from the municipality is needed in response to a request from the user; for example, to replace a large bin with a smaller one or to change the frequency of collection. But both schemes typically offer free collection of separated recyclable materials at the point of use, this being an incentive for users to divert more waste from residual to recyclable collection[131].

Weight-based schemes have a higher level of technical, operational and administrative complexity than volume-based schemes. They are more expensive to implement and operate. More labour is typically needed to manage and monitor the billing schemes (although the more complex volume-based charging schemes demand a high level of administrative input). Apart from the high costs, and possibly as a response to them, a negative effect of direct charging to the householder is that many

[130] The example is closely based on Waste charging system in Taipei, Taiwan, 'Per-Bag Trash Collection Fee Program'. Pocacito, European post-carbon cities of tomorrow, available at https://pocacito.eu/sites/default/files/WasteCharging_Taipei.pdf

[131] This description is based on Good Practice, Limerick/Clare/Kerry Region, Household Pay-per-Weight Charging System, September 2014

householders see an opportunity to avoid paying for their waste management and illegally dispose of their waste rather than pay for its collection and treatment[132].

Quantity-based charging schemes have an effect on the annual revenue stream needed to ensure the financial viability of the waste management services. To guard against revenue instability, hybrid charging arrangements are now more commonly adopted in some of the more developed countries.

Hybrid Charging Schemes

Quantity-based charging schemes are an example of the multi-objective dilemma: how to satisfy the dual objectives of (i) revenue stability and predictability and (ii) waste minimisation and waste separation. Due to the cost structure of typical municipal waste management services, a stable and predictable revenue stream cannot be achieved if the charging mechanism relates to a declining charge base (waste quantity). This is because the costs of waste management, and especially waste collection, are largely fixed. Fixed costs are incurred irrespective of the quantity of waste contained in the containers being emptied.

Typically, more than two thirds of total waste system costs are fixed, and the less technically advanced the waste system the higher the share of fixed costs in the total. This means that although a reduction in waste quantity results in a proportionately far smaller reduction in total waste costs, in a purely quantity-based charging scheme it will lead to an equivalent reduction in the charge (and hence in the amount of revenue collected). For example, if fixed costs are taken to be 70 percent and variable costs 30 percent of total costs, then a reduction of 20 percent in the residual waste presented for collection will result in a 6 percent reduction in total costs.[133] The weight-based charge paid by the user will however fall by 20 percent. Net revenue falls by 14 percent

It is for this reason that hybrid charging schemes have evolved which combine a large, fixed fee component with a relatively small variable component. A simple example for a volume-based hybrid scheme is of a local authority which supplies households with a fixed number of waste collection bags per year. The costs of the standard waste collection service (including bags) are covered by a fixed annual waste fee (fixed charge). Users can purchase additional bags separately from the municipality (variable charge). In economic terms, the price payable for an extra bag should reflect the marginal (variable) cost of collection plus the bag cost. Hybrid schemes can be significantly more complicated than this, involving complex charging and payment systems that can be confusing to users and expensive to implement and administer.

For example, municipal waste management services in **Ireland** are provided by private sector firms operating under competitive, open-market conditions. Individual firms offer weight-based, pay-by-use collection services and households choose between them depending on the service structures and the price schedules offered. The charges applied by waste management companies are a matter between those companies and their customers, subject to compliance with all applicable environmental and other relevant legislation, including contract and consumer legislation[134]. Some examples of charging structures are:

- Per lift charge (including weight allowance), plus per kg charge for excess weight above allowance
- Service charge, plus charge per lift per bin
- Service charge, plus charge per lift per bin, plus per kg excess charge
- Service charge plus per kg weight charge
- Service charge plus weight band charge
- Service charge, plus charge per lift per bin, plus per kg excess charge
- Service charge (including weight allowance), plus per kg charge for excess weight above allowance
- Charge per lift per bin
- Per lift charge (including weight allowance), plus per kg charge for excess weight above allowance

Experience shows that quantity-based pay-as-you-throw systems lead to a fall in the amount of waste set out for collection and a rise in the amount of recyclable material that is separately collected. At the same time, potential drawbacks of the schemes include:

- Higher operational and administrative costs and complexity

[132] Ibid
[133] ISWA, Guidelines on How to Design an Appropriate Waste Fee: Principles, Practices and Applications of Waste Management Fees (2011)
[134] Waste Collection Charges, Department of the Environment, Climate and Communications, 5 January 2021

- Revenue instability
- Heightened levels of monitoring and enforcement of standards
- Increased incidence of illegal dumping
- Greater diligence by collectors (excessive compaction, fraud, recyclable material specifications, appropriate use of containers, contamination of recyclables)
- Pay-as-you-throw models cannot readily be adapted to other council services, such as collections from street litter bins

4.7.3 Tariff regulation

The rules for calculating municipal waste tariffs are usually defined in national legislation, such as the Waste Law and its accompanying regulations. The Law typically sets out the scope of services covered; the costs eligible for inclusion in the charge; the fee base to be used for charging purposes; and the eligible charging and payment mechanisms.

The scope of services covered by the tariff differs considerably between countries. In some it may be limited to waste collection and disposal whereas in others it might also include the collection of street litter, street cleaning, green area maintenance, and winter cleaning and snow removal.

National legislation may prescribe the specific type and structure to be used for the municipal waste fee, or it may allow local authorities to choose between alternatives. For example, in **Romania** and **Moldova** a local authority may choose between a local tax to be collected by the municipality or a service fee to be charged directly by the service provider to each household individually. In **Bulgaria**, legislation specifies that the charge must be calculated according to the quantity of waste produced (municipalities may choose between volume or weight-based tariffs) but, as an exception to this, it may be determined either on a per capita basis or as a promille of the property value if the quantities of municipal waste cannot be defined.

National legislation might also define the forms of inter-municipal cooperation that may be adopted and the effects these may have on selected waste service charging models. In particular, the effects of mechanisms that provide for common regional tariffs to be set up by several local authorities. One effect of this type of arrangement would be to limit the ability of municipalities to continue independently to provide waste collection services.

In some countries, local authorities are free to make their own decisions on tariffs. In others, decisions are subject to the approval of designated regional or national authorities. For example, in **Belarus**, municipal waste tariffs must be approved and publicized by the regional administration for services. In **Brazil**, tariff setting mechanisms vary between the states, with the approach to assessing tariffs according to the size and function of a residence or business being the most commonly used. In **Ghana**, local government assemblies have powers to create by-laws for setting and collecting user fees and which require them to undertake annual reviews to adjust tariffs for inflation, exchange rates, fuel prices, etc. Specific tariffs are not set for municipal waste services in **Morocco** as these are financed through a municipal services tax established at the national level and based on the rental value of property owned or leased. Although based on clear criteria there is no direct connection between the tax and the volume of waste generated or the level of service.

4.7.4 Subsidies from central transfer/general municipal revenue

Charging for municipal waste management services is well established practice in developed countries, where implementation of the 'polluter pays principle' and the achievement full cost recovery objectives are key policy objectives. In low and middle-income countries, however, transfers from municipal consolidated revenues are commonly used partly or wholly to fund municipal waste service costs and are sometimes supported by transfers from central or regional government budgets.

Arguments for using municipal transfers for waste management operations vary. In many low-income countries, a significant part of the population lives below the poverty line, which makes charging households for waste services extremely unpopular and challenging. In low-income countries such as these, where income distribution is heavily skewed, it can be fairer to draw more heavily on

Many countries have adopted graduated schemes where the proportion of fee-based finance is progressively increased over time whilst the general revenue component falls.

consolidated income than on user charges, especially if an effective and progressive local taxation system is in place.

Other arguments in support of using municipal transfers can be the lack of comprehensive or up-to-date property registers that reliably cover the populations receiving waste services, as in the case of informal settlements; incomplete information on household numbers or residents living within specific areas (such as in slum areas); or an absence of an historical culture or practice of charging for waste and other services, as was the case in Eastern Europe prior to 1989. Direct funding from consolidated revenue also reduces administrative expenses.

For example, many local authorities in the **Philippines** do not charge households for waste services, the costs being fully funded out of municipal revenues. In **Ghana**, whereas municipal assemblies are expected to charge users the full costs of waste collection and disposal, general revenue is used to offset the costs of providing services to households that are not registered and which therefore do not pay for services. In **Chile**, local authorities must fund most of the costs of service as the majority of households are exempt from paying the fee based on the tax assessment of their properties. Even in **Japan**, many local authorities do not levy charges and finance waste services from property tax revenues, though this practice is now changing with a shift towards direct charges.

The main disadvantages of using municipal revenues to cover a significant share of waste management costs come from a long-term perspective. First, it places a significant burden on municipal budgets, a burden that is likely to increase as waste management costs increase in the future. Second, those who do not pay for the services are less motivated to engage in waste prevention and source separation activities, whereas those under pay-as-you-throw charging schemes are clearly incentivized.

Many countries have adopted graduated schemes where the proportion of fee-based finance is progressively increased over time whilst the general revenue component falls. This can be a valuable approach politically for gradually phasing in tariffs to their full cost recovery level within affordability constraints.

4.7.5 Extended producer responsibility financing

EPR schemes are a potentially important financing source for municipal waste management. They are an efficient resource management mechanism which enables producers to take responsibility for the end-of-life management of their products by becoming involved in their collection, sorting and treatment for recycling and recovery.

Their basic feature is that participants across the product and packaging value chain (manufacturers, importers and retailers) assume a significant degree of responsibility for the environmental impacts of their products across their life cycles. This relates to the 'upstream' impacts of products resulting from their production (e.g. materials selection and product design) as well as to the 'downstream' impacts related to their use and disposal.

EPR schemes can play an important role in the financing of separate waste collection, sorting, recycling and treatment of special waste streams, such as packaging waste, WEEE, batteries and accumulators, used oils and spent tires.

Establishing a producer responsibility scheme to deal with a specific packaging waste stream is premised on the assumption that the obligated industry will be responsible for financing the separate collection and sorting of the relevant packaging waste.

At the municipal level, Producer Responsibility Organizations (PROs) must establish and maintain the infrastructure needed for the collection (or take-back) and sorting of packaging waste. Citizens should have ready access to this infrastructure so that they can separate their waste daily and effective household waste collection services can be deployed. As packaging waste at the industrial and commercial levels is commonly collected directly by waste collectors, a minimum requirement of PROs must be that they establish systems both for monitoring packaging quantities that have been put on the market and collected and quantities that have been recycled.

The responsibility put on producers for waste management can be financial, organizational, or both. In the first instance, individual producers or EPR schemes pay fees to municipalities which remain responsible for waste management operations (usually the collection), whilst recycling is outsourced to specialist contractors. In the case of organisational responsibility, producers and PROs both finance and organise waste management operations and contract directly with recyclers.

Initial investments in separate collection containers is typically covered directly by the EPR scheme, with the collection vehicles and sorting infrastructure being provided by the companies contracted to undertake the respective service. In specific cases, the EPR scheme might invest in sorting facilities and transfer those assets to a specialized company contracted to operate the service. Given the limited financial resources of many local authorities, such practices could provide valuable support to improving waste recycling at the local level.

For example, in **Bulgaria**, the PROs for packaging waste have full financial responsibility for establishing systems for the separate collection, sorting and recycling of packaging waste. The PROs fund initial investments for separate waste collection containers and make payments for collection, transport and sorting of separately collected fractions. In this case, no costs are incurred by the local authorities and the separate collection services function in parallel with the collection services for residual and other waste fractions provided under municipal responsibility. A different approach is implemented in the **Czech Republic**, where separate collection is organized directly by the municipality and the PRO makes a financial contribution for each tonne of separately collected and recycled packaging waste. In this case, the upfront separate collection and sorting costs incurred by the municipality or service provider are later fully or partly reimbursed by the PRO. It should be noted that, in EU countries and in accordance with the provisions of the Waste Framework Directive, the EPR scheme should cover at least 80 percent of the respective costs for managing waste resulting from the product categories collected.

The possible use of EPR is considered in Chapter 7.

4.7.6 Revenues from the sale of recycled materials and energy from waste

Policies seeking to increase the amount of municipal waste recycled and to establish more advanced treatment technologies are often based on assumptions on the municipal revenue to be generated from the production and sale of recovered materials and energy. Although these revenues rarely cover implementation costs, they can be significant and should be taken into account when defining financing policies and estimating tariffs. It should also be remembered that by separately collecting recyclable materials the costs of having to collect and dispose of them to landfill are avoided. These should also be accounted for when assessing the net costs of the materials recovery system.

Revenue from the sale of recyclable materials is subject to two main risks: the quantity of valuable materials in the separately collected waste and the markets for the materials recovered. Unless driven by mandatory obligations, materials recovery systems should be considered only if there is a high degree of confidence that: (i) a realistic and predictable supply of recyclable material is available for collection, and (ii) proven markets either exist or can be created for the recycled materials. Markets for recyclable material are volatile and uncertain, and assumptions made on sales potential and selling prices can be speculative. For example, low-density polyethylene (LDPE) prices on the European market fluctuated by some 300 percent in the period January 2019 – September 2020.[135]

The quantity and quality of dry recyclable material can be significantly influenced by the activities of informal collectors. The informal sector collects significant quantities of recyclable material in the absence of any formal investment in separate collection by the local authorities. It also collects mostly higher-value recyclables, leaving those of lower value to the local authorities[136]. It is likely that the informal sector is better informed about conditions and prices in the recyclable materials markets than the formal sector.

International experience also shows that when local authorities install containers for separate collection of dry recyclables they are often targeted by the informal sector, which sells the material to traders or even via collection points established by the public authorities. In this way the local authorities incur financial losses on the separate collection systems they have installed even though increased quantities of recyclable materials are diverted from disposal. In Ningbo, **China**, for instance, after the city's dry recyclable open-top containers had been emptied daily by informal pickers, the city decided to replace them with picker-proof, smart containers. As a result, the amount of dry recyclable material collected through the public stream increased many-fold. Similar experiences are reported from **Spain**, where high-value cardboard purloined from the public stream imposes a financial cost on the local authorities.

Markets for materials recovered from municipal waste are poorly developed and organised in many countries, and

[135] Based on waste plastics market data at www.PalSticker.de

[136] Only about 20 percent of the municipal plastic-waste stream has enough value to incentivize waste pickers to collect it: Stemming the Tide: Land-based Strategies for a Plastic - free Ocean, Ocean Conservancy and McKinsey, 2018

assumptions on product markets, sales potential and selling prices can be speculative and uncertain. A reliable market analysis of the potential for recyclable material sales should be undertaken prior to final decisions being taken on introducing separate collection systems and constructing materials recovery facilities. This should include a thorough assessment of the activities of the informal sector.

Refuse Derived Fuel (RDF)[137] is produced in some municipal waste treatment processes. Different classes of RDF are produced, depending on their net calorific value, the content of specific chemical elements (such as chlorine and heavy metals), moisture content and particle size. Prices depend on local conditions and user requirements. RDF prices can be negative, or the product may only be accepted by industrial users if provided free of charge and meets strict requirements, such as for calorific value and moist content. This in most cases necessitates pre-treatment and drying. Transport costs from waste treatment plant to final recovery facility is another important factor in the RDF economy.

The sale of electricity and heat produced from waste treatment processes can also be a significant source of revenue, particularly from waste incineration plants and some anaerobic digestion facilities. Utilization of landfill gas for energy production from some large facilities can also be financially viable. State policy on renewable energy can have a significant impact on the financial viability of waste-to-energy schemes and their revenue generating capacity. Many countries apply preferential tariffs for energy produced from waste that can lead to substantial increases in revenues with which a significant share of a facility's operating costs can be offset. The payment of effective subsidies to facilities of this kind should however be supported by thorough cost benefit analysis which demonstrates that the economic benefits flowing to society from such investments outweigh their costs.

Some methods for treating biowaste also have revenue generating potential, particularly for high-quality compost, if local product markets exist. Nevertheless, the scale of any such revenues is likely to be small relative to those from the sale of recyclable materials such as paper and cardboard, plastics and metals.

Importantly, it must be recognised that from the financial perspective municipal waste management is a net cost activity. The extensive systems of waste material recovery found in the more affluent countries today result from governments mandating uniformly strict and binding waste management targets. For example, as part of its programme of measures to achieve these targets, the **United Kingdom** government levies a landfill tax on each tonne of waste disposed of to landfill. The tax currently stands at £94/tonne (US$126), in addition to the full cost recovery charges levied by landfill operators. The tax acts as an incentive for municipalities to find waste treatment and disposal routes that are environmentally preferable to landfill. Placing a tax on landfill makes these alternative routes relatively more financially attractive.

Put simply, this has led to a range of recycling, composting and other waste treatment facilities and services being offered by private waste management firms as lower-cost alternatives to landfill. Firms are motivated by the opportunity to make a profit on their investments. The cost of these services (including profit) is covered by the fees the firms charge municipalities for using them. These costs, in turn, are funded by the charges municipalities levy on households and businesses. Municipalities rarely make a profit. In the absence of government mandates, therefore, investment in such facilities should be made only after thorough analysis of material availability, technical systems and costs, markets, prices, risks and benefits to society.

Generally, costs rise as municipal waste services are improved and move up the 'waste hierarchy'. The availability of revenue from waste treatment activities should be assessed against cautious assumptions until such time as experience enables decisions to be made with a high degree of confidence. Realistic commercial pilot projects can be a useful starting point for this.

[137] The term Refuse Derived Fuel (RDF) is used in a narrow sense, referring to processed household and similar waste. The use of refuse derived fuels produced from municipal waste is a common practice in many countries. Whereas recovery and recycling of materials in waste has well developed over the years, remaining fractions still contain valuable energetic content. The energetic content is well used in modern mass burning incinerators (waste-to-energy plants). Alternatively, certain wastes can be used as fuel in dedicated plants such as cement kilns, lime plants, steelworks, combined heat and power plants and other power plants. Such fuels, when produced according to the requirements of the standards are referred to as Solid Recovered Fuel (SRF). In the EU, Solid Recovered Fuel (SRF) is a 'solid fuel prepared from non-hazardous waste to be utilized for energy recovery in incineration or co-incineration plants, and meeting the classification and the specification requirements laid down in EN15359'.

Recycling center in Chisinau, Moldova. Photo: © Fripturleac Roman | Dreamstime.com

5 Organizational models

5.1 Fit-for-purpose

International experience indicates that efficient and effective waste management systems are characterized by organizational models, the roles and coordination structures behind waste management services. Effective organizational models respond to the administrative needs of the desired waste management system, and not the other way around. Taking an objectives-driven organizational approach allows designs to be customized to core objectives. The alternative, fitting waste management actions to an existing organizational model, leads to capacities and coordination structures that may not be suited to policy objectives. Waste management organizational models should be specifically assessed against specific financial, operational, and administrative requirements based on policy objectives.

Good organizational models are those which seek to address financial limitations or investments in larger waste management facilities, including where cooperation between local authorities may be beneficial for the overall system. The organization of services might also focus on making waste management operations attractive to the private sector in order to harness its potential for bringing investment, new technologies and technical know-how into the delivery of services.

Although organizational models are mainly implemented by local authorities, their implementation can be aided significantly if supportive arrangements have been put in place by the central government, namely in the form of an enabling legal framework for intermunicipal cooperation and private sector involvement, specific guidance or incentives.

This chapter considers three main models for the provision of municipal waste management services:

- Models for service delivery by local authorities
- Intermunicipal cooperation between local authorities
- Private sector involvement

Specific examples for the provision of waste management services by national entities are also provided.

5.2 The role, mandates and responsibilities of local authorities

The organisational framework at the local authority level should encompass many tasks for ensuring the effective implementation and sustainability of the waste management systems (see **Table 5**). Effective coordination across administrative departments of local authorities is essential and requires:

- Clear division between 'planner' and 'regulator' roles and 'client' and 'operator' functions within the various administrative units of the local authority and service providers.
- A single administrative entity that is responsible for coordinating and overseeing all administrative waste management system tasks and that is adequately staffed and resourced.
- A waste management team with trained personnel and the financial resources to implement and maintain an efficient and environmentally sound waste management system[138].
- Authority and capacity to monitor performance and enforce compliance at all levels.
- Ability for day-to-day operational oversight of waste management tasks, ensuring full compliance with all relevant legal and planning requirements.
- Financial management systems that fully capture waste management costs and related data, including on waste flows and populations served.
- User tariffs that are affordable to residential customers, commercial enterprises and small businesses.
- Provision of public awareness raising campaigns on all aspects of the waste services provided.

Effective coordination of waste management tasks across administrative departments of local authorities is essential. The main tasks and coordination requirements are described under following categories in **Table 5**.

[138] E.g. to plan, tender and contract waste collection and disposal services, procure trucks and containers, establish new collection vehicle routes and systems, optimise container placement, prepare and implement projects for separate waste collection and recycling, provide for safe recovery and disposal of waste, create a waste management monitoring and management information system.

Table 5 The main waste management tasks for local administrations

Role assignment	Key tasks
General category	
Policy maker and specific tasks designated to other roles	▮ To meet all responsibilities of the local administration relating to waste management, including identifying and recommending waste management policies, legislation, strategies, plans and actions. ▮ Report periodically on the implementation and performance of the waste management system. ▮ Propose new or amended local ordinances/regulations as considered necessary to achieve the policy objectives. ▮ Take the strategic lead in developing a high-level approach to support private sector involvement in waste management financing, operations and ownership. ▮ Coordinate the management of waste management contracts to achieve an optimal and sustainable waste management system. ▮ Set performance standards. ▮ Provide general administrative, legal, communications and training support. ▮ Obtain and maintain necessary permits, approvals, and licences and assist the contractors in doing the same. ▮ Cooperate, coordinate and communicate and assure effective liaison with internal and external bodies on all issues requiring technical, financial, administrative, legal, regulatory or organisational follow-up.
Waste management planning	
Planner (participation of service providers in operational planning is possible)	▮ Prepare and update the waste management plan. ▮ Undertake and implement operational planning processes for waste collection, treatment and disposal corresponding to the needs. ▮ Develop estimates of the full costs of solid waste management and solid waste management fees. ▮ Carry out the planning of waste management projects where needed. ▮ Support the development of waste minimisation initiatives and markets for recycled products. ▮ Co-ordinate recycling, composting and waste reduction activities. ▮ Coordinate the development of municipal hazardous waste collection facilities. ▮ Formulate plant and equipment specifications.
Information and data management	
Planner	▮ Co-ordinate, update and maintain a waste management information system and the collection and analysis of statistics relevant to waste management services. ▮ Assure appropriate use and implementation of data collection methods, analysis of waste composition, waste generation projections. ▮ Monitor the achievement of performance standards.
Project development	
Service delivery (Client)	▮ Prepare (or co-ordinate/support the preparation of) high quality tender documents, carry out such tenders, negotiate, and conclude contracts with such parties. ▮ Co-ordinate and promote a high level of competition in waste services e.g. by arranging for the early publicity of upcoming tenders. ▮ Take the lead in co-ordinating the technical specifications of tenders and in the technical aspects of tender evaluation and contract negotiations. ▮ Define the service delivery quality requirements and performance indicators in the case that services are provided directly 'in-house' by the local authority

Table 5 Cont.

Role assignment	Key tasks
Financing and cost recovery	
Financier	▮ Develop and update the waste management investment program. ▮ Maintain up-to-date data on the current financial position, expenditures, revenues (including fee collection performance) and cash balance. ▮ Coordinate preparation of the annual budget for waste management. Ideally, prepare shadow accounts using accruals-based accounting (full accounts for municipal operating companies). ▮ Monitor implementation of the waste management budget. ▮ Advise on tariff policy, tariff calculation methodology, user charging and payment mechanisms, and prepare current tariff estimates for political approval. ▮ Coordinate, implement and monitor fee collection performance generally and by individual service users. ▮ Identify and evaluate options for using external finance in implementing the waste management plan and for priority investment projects. ▮ Prepare applications for investment finance and liaise with external financing institutions.
Project management and supervision	
Regulator	▮ Liaise closely with the internal or externally contracted waste management facility inspectors responsible for the supervision of works contracts. ▮ Verify the implementation of the works and services contracts, and endorse the regular/monthly prepayment verification sheets issued by the facility inspector. ▮ Enforce control and penalty mechanisms on service providers as required. ▮ Co-ordinate practical supervision activities across all waste management services and facilities and ensure that all supervision activities are carried out efficiently and effectively. ▮ Ensure that there is effective coordination between the completion of facilities construction (and infrastructure service provision) and the commencement of operations, including that all legal, financial and environmental conditions are met. ▮ Facilitate the resolution of disputes between service providers or between service providers and users.
Regulation enforcement	
Regulator	▮ Enforce regional ordinances/regulations for waste management and general cleanliness.
Communication and awareness raising	
Planner, service provider, regulator (for citizen complaints)	▮ Provide the public with information on their waste management responsibilities and ensure that users are kept fully aware of the scope and costs of the services provided. ▮ Maintain an up-to-date public website, complaints hotline and any other necessary public relations activities. ▮ Develop a public awareness and communications strategy, ensure the development and production of communications programs and materials. ▮ Coordinate, as appropriate, with contractors in their development of public information materials and media campaigns.
Capacity development	
All roles	▮ Be equipped with the resources and skills needed to act as a professional and experienced partner with the various participants involved in implementing the waste management plan. ▮ Hire personnel for operational tasks, and establish the technical units needed to meet specific requirements

The implementation of such an extensive list of tasks and activities requires significant human resources and administrative capacity at the local level.

In large municipalities the tasks are usually coordinated through a specialized waste management or environmental protection department and involve several other administrative units which deal with public finances, capital investment, public procurement and inspection. The proper organization of waste management planning, financing and service delivery is challenging in smaller local authorities where, in many cases, a single person is responsible for several services. Properly addressing waste management matters in municipalities such as these may require transferring some functions and responsibilities to service providers or establishing cooperative arrangements with neighbouring local authorities for the implementation of particular tasks.

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5.3 Direct provision of waste management services by local authorities

The direct provision of waste management services by local authorities (in-house model) is common practice worldwide. In principle, two models exist for in-house organization of municipal waste management services:

- *Municipalities directly responsible for services though municipal units*. The local authority unit responsible for service provision is not a separate legal entity. The services are implemented according to an annual plan and annual budget. In this regard the unit does not prepare a separate balance sheet and profit and loss statement. The assets used in the provision of services are directly owned by the local authority. The personnel are included on the municipal payroll. The opportunity for implementing this service delivery model depends to a large extent on the provisions of national legislation on the organization and financing of local authorities. This model is observed for example in the **Philippines** and **Vietnam**, where the local authorities provide the service directly to their constituencies.
- *Provision of waste management services through municipally owned companies*. The provision of waste management services by municipal companies is common practice. Arrangements can take the form of one municipal company being responsible for all waste management services or for a number of entities being engaged to provide various components of the system (e.g. collection, treatment, landfill, etc.). In some cases, the responsibilities of the company are limited to waste management and quite often include street cleaning. In others, the company might have a far broader scope of responsibilities, covering practically all publicly provided services, such as water supply, street lighting, maintenance of green areas, etc. The practice of engaging public companies also differs across countries. In some, contracting is done through public tendering arrangements where local authority companies compete on equal grounds with private service providers. Others allow for direct contracting of municipal companies established for the specific purpose. Another approach is to engage the local authority company through administrative order or decision of the local council.

The scope and procedures for the use by public utility companies of sub-contractors in service provision is also regulated in some countries.

For example, in **Brazil**, municipalities can form consortia for waste management. These consortia are independent bodies, funded by the member municipalities to deliver waste services. Most consortia focus on developing and running regional landfills, but they also have a remit to provide collection services. For instance, CTR Maquiné, Região Metropolitana de Belo Horizonte is a 30-year project designed to provide waste management services for the metropolitan region which includes the participation of 44 municipalities of the greater metropolitan area, and the municipality of São Sebastião. It has entered into a Public-Private-Partnership (PPP) agreement for the establishment of a mechanical biological treatment (MBT) plant[139].

[139] ''Integrated Management of Solid Waste by Means of public-private partnerships' v. 271, Revista de Direito Administrativo, jan./abrr. 2016

The above models represent cases where services are organized by local authorities. In the absence of organized waste collection services, locally grown solutions, though which citizens themselves initiate cleaning activities and increasingly become active players could serve as starting point. For example, in many countries, periodic public cleanings where residents participate for free are organized and actively promoted. Such private or community organized initiatives have a direct impact on public awareness and could become the first mover catalyst for organized waste management services in the respective area.

5.4 Intermunicipal cooperation

Most waste treatment and disposal installations demonstrate significant economies of scale with rising plant capacity. Achieving an economically efficient scale of facility operations depends on the supply of a minimum quantity of waste which, in most cases, is beyond the scope of a single municipality. Cooperation between several municipalities can therefore be beneficial for all participating municipalities.

Intermunicipal cooperation can have other beneficial policy outcomes, including shared experience, compliance with legal requirements, improved facilities operation, improved access to financing, streamlined monitoring, etc. The main aspects of inter-municipal cooperation are considered below.

5.4.1 Forms of intermunicipal cooperation

The objectives, scope and forms of intermunicipal cooperation can vary considerably. In practice, intermunicipal cooperation will be successful only if it brings benefits to all participating authorities and if they are recognized by all participating authorities. The main forms of intermunicipal cooperation are:

- *Common procurement of services*. The simplest form of intermunicipal cooperation is the common procurement of services. For example, in **Romania** the regional Intermunicipal Development Associations is responsible for the tendering and contracting of waste collection services on behalf of participating local authorities. This approach allows several local authorities to be included in one service contract, resulting in a larger number of residents being served than under a single local authority contract, and consequently results in higher-value contracts. The outcome is the higher level of interest shown by private sector companies in participating in tenders for contracting of services, promoting competition in the sector, and supporting the achievement of better contract prices that result in benefits to local residents as reflected in the tariff.

- *Cooperation agreement with a lead local authority municipality*. This form of intermunicipal cooperation is commonly used when municipalities of different size and capacity share common treatment and disposal infrastructure and, to a lesser extent, for the provision of collection services.

  The lead local authority in this case takes responsibility for establishing treatment and disposal facilities which are shared by smaller local authorities according to a cooperation agreement. This form of cooperation is used for large investment projects that have high upfront resource costs typically beyond the management, financial and administrative capacities of small local authorities, whereas larger authorities usually have specialized units for preparing investment and procurement projects and greater financial capacity. It is usually supported by specific provisions in the national or regional waste management plan which define the role of the lead local authority. Such cooperation is also used when a large city or local authority does not have a suitable site for locating a landfill or treatment plant on its own territory but when a smaller neighboring authority does have such a site on which a suitably sized facility could be located. A Cooperation agreement under these circumstances can be mutually beneficial to both municipalities.

  For example, the city Varna, **Bulgaria** with a population of 500 thousand residents established an MBT plant as PPP investment that was later extended to receive waste from 8 neighboring municipalities.

- *Inter-municipal association*. An intermunicipal association (IMA) is an advanced form of cooperation between several local authorities based on agreement. There are two forms of intermunicipal association:

  (i) IMA as consultative and supervisory body: In this case local authorities establish IMA as coordinating authority. The functions of IMA are focused on the development and coordination of implementation of regional waste management plans, assistance in preparing common investment projects, approval of common tariffs for use of regional waste treatment and disposal facilities

and other similar activities. The contracting of services, ownership over capital assets, development and implementation of investment projects remains the responsibility of local authorities. For example, in **Bulgaria** the municipalities within each regional waste management zone defined by the National Waste Management Plan are obliged to establish an IMA. The members of IDA can be only municipalities. The mayors of municipalities are represented in IMA general assembly. The IMA must operate on non-for-profit basis and does not acquire property. The purpose of IMA is to support member municipalities in performing their responsibilities, achieving agreement on common treatment and disposal infrastructure and tariffs for using such infrastructure. The establishment of IMA is pre-condition for providing state grant financing for local authorities.

(ii) IMA with delegated responsibilities: In this case the IMA has much broader functions as local authorities transfer partially or entirely their responsibilities. The IMA in this case could be responsible for organizing and contracting waste management services, and in some cases implementation of investment projects of common interest, including financing and ownership of treatment and disposal infrastructure.

- *Intermunicipal company.* Setting up an inter-municipal company to implement and operate common treatment plant or regional landfill is another form of regional cooperation. Such a company could also be involved in the provision of waste collection services.

  For example, in **Denmark** Vestforbraending is one of the largest waste management and energy companies initially founded in 1970 on a non-profit cost-coverage principle and owned by 19 municipalities in the Copenhagen area and Northern Zealand. Vestforbraending provides waste management services to more than 950,000 people and 60,000 businesses and handles upwards of 1 million tonnes of a waste each year, encountering 25 percent of the Danish municipal waste[140]. This form of cooperation could also apply on smaller scale like in case of Renosyd that is Odder and Skanderborg Municipality's joint waste company. The company handles waste from 34,000 private households and 3,000 companies. Renosyd also operates five recycling sites and combined heat and power plant in Skanderborg, which produces electricity and heat from the waste that cannot be recycled[141]. Similarly, in the **Netherlands**, small municipalities may cooperate to generate large quantities of waste in order to reduce costs. A typical example is an inter-municipal company initially established in 2001 by the municipalities of Voorburg, Leidschendam and Rijswijk with approximately 125,000 inhabitants and subsequently joined by four additional local governments (Wassenaar, Delft, Pijnacker and Midden-Delfland). The company currently serves about 325,000 inhabitants, collecting 140,600 tonnes of waste with 70 trucks.[142]

5.4.2 Regulation of intermunicipal cooperation

The different forms of intermunicipal cooperation are ideally regulated by law, although in practice national legislation often does not provide specific guidance on this matter.

In countries where the possible forms of cooperation are defined in law, provisions can be general or sector specific. Provisions can be established as general requirements governing any form of intermunicipal cooperation, defining the responsibilities, organization, powers and financing of local authorities. Alternatively, provisions can be formulated as specific requirements for waste management services.

For example, in **Bulgaria** the generic forms of intermunicipal cooperation are defined in the Local Governments Act[143] and, additionally, the establishment of regional waste management associations, their functions and responsibilities are specific requirements provided for in the Waste Management Act[144]. The established intermunicipal association is a pre-condition for local authorities to apply for public grant financing. In **Chile**, municipalities are free to associate, although the Strengthening Regionalisation and Decentralization Act[145] states that in the event of municipalities failing to reach agreement, the regional government will decide on the location of inter infrastructure. In the **Republic of Korea**, the central government does not provide financial assistance to treatment facilities unless they are to be used jointly by neighbouring municipalities and are reflected in the strategic plan.

In some countries, legislation may contain provisions that limit the possibility of local authority cooperation.

[140] See https://www.vestfor.dk/
[141] See https://www.renosyd.dk/
[142] Municipal Solid Waste Management: A Roadmap for Reform for Policy Makers, World Bank, 2018
[143] Bulgaria SG 69/06; suppl. – SG 15/10
[144] Bulgaria SG No. 86/30.09.2003
[145] Chile Act 21.074/2018

Regulation of the following key issues requires particular attention:

- Does national procurement legislation allow two or more local authorities to organize a common procurement of services with the same subject?
- Is there a limitation on local authorities investing in facilities outside their territory?
- Can local authorities delegate or transfer entirely or in part their waste management responsibilities to another legal entity?
- Does national legislation allow for the establishment of common regional tariffs for waste services or is tariff setting a local authority responsibility only?

The lack of clear and specific legal requirements can substantially limit the possibilities for intermunicipal cooperation or render them impossible.

5.4.3 Incentives for stimulating intermunicipal cooperation

Despite the potential benefits for participating local authorities, it is not easy to establish intermunicipal cooperation. Reasons for that include:

- Not all local authorities clearly recognize the benefits from cooperation. Quite often this is due to the lack of a clear understanding of current and future waste management costs.
- Local authorities do not want to lose -or delegate their powers.
- If not prescribed by a national or regional waste management plan, it is difficult to define the boundaries of regional cooperation. One local authority has several neighbours and the possible alternatives for regional cooperation are many.
- Small municipalities are concerned that large local authorities will play a dominant role as partners. At the same time, large local authorities that are able to organize waste management services without partnerships may be less concerned about issues faced by small authorities.
- Local authorities are reluctant to accept waste generated outside their territories. Finding sites for regional waste landfills or other treatment facilities can be difficult and usually faces objections from local residents.
- Despite future benefits, intermunicipal cooperation agreements can entail considerable upfront costs.
- Some municipalities do not respect their obligations within the agreed cooperation framework, leading to an unsatisfactory and dysfunctional agreement.
- Regional cooperation requires a reorganization of waste management services. This can create difficulties for local authorities which have existing long-term contracts with service providers. The existing companies serving a single local authority must in some cases cease their operations or reorganize their activities.

The role of central government and, when relevant, regional authorities is crucial for overcoming the above problems. This requires establishing an enabling framework to support intermunicipal cooperation, defining the scope for partnerships between local authorities within respective national and regional waste management plans, implementing effective enforcement mechanisms and providing incentives for local authorities to cooperate.

Possible measures at the national and/or regional levels include:

- Adoption of national or regional waste management plans that define the geographic areas served by regional treatment and disposal facilities. In this way, the local authorities served by specific facilities is pre-defined. For example, **Belarus** and **Azerbaijan** have divided their national territories into waste sheds to be serviced by regional facilities. Similarly, the island of Bohol in the **Philippines** has designated zones and municipalities to be served by regional facilities, this being included in the respective planning documents.
- Delegating a coordination role to national and/or regional authorities to support and monitor cooperation between local authorities.
- Designating public investment financing for the waste management sector for projects of regional importance only and not providing support to individual local authorities. Having an intermunicipal cooperation agreement could be set as an eligibility condition for access to public finance. As mentioned above, this applies in many countries, including **Bulgaria, Romania, Chile** and **Republic of Korea**.
- Introducing measures to support the establishment of common treatment and disposal infrastructure to serve

several local authorities, including incentives for municipalities to locate facilities on their territory. Such a measure can include granting state-owned land free-of-charge for the construction of waste management facilities and creating incentives for local authorities to host installations of regional importance. Incentives might take the form of a surcharge levied per tonne of waste disposed of to landfill in addition to the standard landfill charge, with the additional funds being transferred to the host municipality to compensate it for the externality costs of hosting the facilities.

5.4.4 Key factors having an impact on the form of intermunicipal cooperation

Two key decision points significantly influence the form of the institutional structure needed to implement the inter-municipal cooperation agreement for municipal waste management. They are:

- A decision on the scope of the intermunicipal cooperation. That is, whether the regional scope will cover all services or whether waste collection/transportation will remain a municipal responsibility. The latter point has implications for how the boundaries of the regional component are defined.
- A decision on whether the infrastructure subject to intermunicipal cooperation will be financed from a combination of grants and loans or from private finance. This has implications for the ownership of the infrastructure, its operations and tariffs.

These key decision points are considered below.

Regional system includes waste collection/transportation

The key prerequisite for successful intermunicipal cooperation is that the financial analysis demonstrates a lower costs per tonne of waste managed in a regional system for all participating entities than the equivalent cost per tonne of each entity providing its own services. This implies that a strong case can be made for having a uniform tariff for all users, divided into uniform collection and disposal components.

Institutional arrangements for implementing this organizational model presume that municipal waste collection/transportation, disposal and treatment are organized at the regional level and that the participating local authorities give up some of their decision-making powers and responsibilities.

This approach requires a new regional entity to be established that is responsible for organizing the waste management services for the whole territory. Existing companies would cease their current waste management operations and present contracts with existing service providers would be cancelled or allowed to expire. Municipal waste collection would be organized through a regional company or contracted via a public tender to a private operator or to existing companies.

The advantages and disadvantages of this approach are discussed below.

- The major advantages of including municipal waste collection into the regional system are (i) lower collection costs and (ii) a common tariff policy across the region. Municipal waste collection organized at the regional level can have lower total costs than if organised at the individual local authority level.
- A regional system makes it easier to extend municipal waste collection to small settlements not presently provided with the service.
- Implementation of municipal waste collection at regional level requires an agreement on common service standard to be applied (eg types of containers, container capacity provided per capita, collection frequency, etc.).
- A common tariff will most likely require significant changes to current revenue collection mechanisms. Practices such as direct operator charging are unlikely to be continued and users will make payments to a new regional entity. The revenues will be used to make contractual payments to the collection companies. A potential difficulty relates to the fee collection ratios achieved in each of the cities and settlements, especially since they affect the financial viability of the regional system.
- Optimisation of waste collection costs might require new investment in containers and waste collection vehicles.
- Organising waste collection at regional level can also increase the interest of the private sector in the provision of collection services.

Arguments in support of a regional approach to waste collection are the opportunities it provides for reducing administrative costs, improving the utilization rates of collection equipment and personnel and for optimising maintenance programmes. Organising waste collection at the

individual local authority level is associated with higher total costs than if it is organised at the regional level.

Regional systems that exclude waste collection

Participating entities may wish to retain municipal control over waste collection services and to share the benefits of a single regional waste disposal and treatment system. In this case the new regional entity is responsible only for the common regional waste landfill and treatment infrastructure and individual local authorities remain responsible for organising waste collection on their territories and for delivering the collected waste to the regional facilities.

Implementation of this model does not necessarily entail significant change to existing institutional arrangements for waste collection. Collection organised at the municipal level can be achieved without significant new investments if a transfer station system is to be established within the scope of the new regional system (as discussed below).

Although the regional solution can lead to lower average waste management costs, lower average landfill and treatment costs realised from economies of regional scale are partially offset by higher waste collection and transport costs associated with the higher average transport distances between the point of collection and the regional facility. Collection and transport costs for municipalities relatively close to the facility are unlikely to differ greatly from their current costs, whereas those for municipalities distant from it are likely to be significantly higher. That is, in a regional system, collection and transport costs depend on a municipality's proximity to the regional facility.

Municipalities distant from the regional facility may therefore attempt to avoid such high costs by continuing to use non-compliant sites in the vicinity of the municipality or to illegally dump their waste. This has two effects: the direct adverse environmental impact of such practice and the negative effect of the reduced waste flow on the projected revenue stream of the regional facility. Appropriate national regulations and enforcement mechanisms should therefore be established that provide for all municipal waste generated within a regional intermunicipal cooperation zone to be treated and disposed of at the designated regional facility and for severe penalties to be imposed on illegal dumping.

It nevertheless follows that participating municipalities that find themselves distant from the landfill will be unwilling to face high waste transport costs. A condition for acceptance of a regional landfill or treatment facility may therefore be that all entities should face broadly equivalent collection costs. One way to do this is to establish a system of transfer stations such that each entity pays broadly the same cost per tonne of waste transported either directly to the facility or to a transfer station. Transfer station and haulage costs from transfer station to landfill would be covered in the disposal part of the tariff.

This effectively defines the boundary between the regional system and the municipal collection systems. For example, in both the **Philippines** and **Bosnia and Herzegovina** local authorities share a landfill located within and operated by a single municipality. The shared facility accepts waste from other local authorities against a fee payable to the landfill operator. The transportation cost is born by individual authorities who operate their own transportation vehicles.

In another example, municipalities in Siargao, the **Philippines**, are considering whether to join a regional arrangement where the landfill operator will be responsible for long-haul collection from transfer stations operated by local authorities that provide collection services. Initial analyses show considerable savings are made if the long-haul transport is shared under regional arrangements rather than provided by individual local authorities utilizing their own trucks.

In addition to the decision on the scope of intermunicipal cooperation, it should also be decided whether the new regional system is to be financed through grants and loans (public ownership) or through private investment. As local authorities only rarely have the capacity to cover investment financing at this scale themselves, the potential for funding project capital costs from a mix of national (and possibly international) grants and IFI debt will be crucial to this decision.

For large waste sector investment projects, the preferred legal structure is the creation of a single legal entity as the owner of the project and of the assets created by it. However, for various reasons that include financial issues, historical factors and potential conflicts of interest, alternative arrangements may need to be considered. The key goal is not only the creation of an entity capable of successfully applying for IFI financing but of one having the institutional capacity to manage and sustain the waste management system during and beyond the technical lifetime of the investment project.

Regional system financed from loans and grants

Potential sources of grant funds are central, regional and municipal government transfers, IFIs and domestic and international bilateral agencies. Conditions attached to grant funding can impose limitations on the ownership

of the regional facility funded, typically requiring it to remain in public ownership.

Alternatives are for the landfill and related processing facilities to be owned by:

- The hosting local authority
- An association of local authorities (regional entity)
- A regional company
- The region (if relevant)

The optimal ownership arrangement must be agreed between the project partners. A cooperation agreement must provide for the allocation of liabilities and risks between the participating parties, and includes the allocation responsibilities for the design and construction of the facilities and for project management and contracting.

The agreement must state the beneficiary of the funds and nominate the entities responsible for preparing the grant or loan application and for arranging financial guarantees.

Matters to be addressed in the cooperation agreement include land ownership and land transference.

It is also appropriate that the parties to the cooperation agreement should provide guarantees for waste quantities to be delivered to the regional facilities or that alternative solutions for managing and allocating demand risk should be identified and defined in the agreement.

The agreement should also define the tariff setting procedure followed for common infrastructure or services and, as relevant, indicate how the grant funded element of the investment financing (if any) will be treated in the cost recovery and tariff calculation process.

The agreement might also set out a framework in which the host municipality is compensated for the social and environmental effects of having the regional facility located on its territory. As described above, this can take the form of a surcharge being added to the landfill/facility charge, the proceeds of which are transferred to the budget of the host municipality.

Regional system financed by private equity

If the regional project cannot be funded out of public sources (combinations of grant funds and loans) the option of involving the private sector in its financing, management and operations needs to be considered. The main issues to be decided in this case are considered below.

The intermunicipal cooperation agreement between the local authorities must establish the basis on which a contract between the entity created by the association agreement and the private partner will be agreed and who will be the signatory to the contract.

It is also important to determine the optimal type of contract to be used. The main types of contract used between public and private sector partners are considered later in this chapter. For large infrastructure investments these might be a separate Design and then Build, Finance and Operate (D/BFO) contract; a Design, Build, Finance and Operate (DBFO) contract; a concession; a special purpose joint venture; or a public private partnership (PPP) agreement based on relevant national legislation.

It shall be noted that local authorities usually have limited capacities and experience in successfully managing large private sector participation investment projects. Such multi-party arrangements with long-term commitments require a transaction advisor, mobilization of strong legal support and allocation of significant budget and time for contract negotiations and arrival at financial closure.

The contracting authority must select the optimal contracting procedure, the options for which are typically competitive bidding or direct negotiation, depending on specific legal requirements. Important actions to be taken early in the planning stage are to organize the bidding process, prepare preliminary surveys and studies, prepare bidding documents and decide how the initial costs are to be finance. Responsibilities for contract management must be clearly allocated between the public entities involved in the agreement.

The public authorities should have a clear perspective on the optimal contract duration, the estimated costs and tariffs under the contract and provisions for future price adjustments. The contract should also consider future demand risks and propose mechanisms by which revenues can realistically be protected, including minimum throughput guarantees if appropriate. Parties should agree on the guarantees, liabilities and insurances to be provided.

An important element to be decided by the contract is the mechanism by which the contractors will be paid; for example, will it be based on a gate fee or a monthly fixed or variable payment made by the local authorities.

Also, and as referred to above for publicly owned infrastructure, issues concerning land ownership must be addressed in the private partner agreement. A specific issue related to municipal landfills is to define the responsibilities and procedures for aftercare and long-term site remediation.

For all intermunicipal agreement options, arrangements must be made for how administrative and initial project development costs are reflected in the intermunicipal agreement:

- *Administrative costs to set up and maintain a regional office and carry out day-to-day functions.* Resource requirements, costs and how they are to be funded must be decided and agreed. Contributions of operating funds from the participating municipalities are typically made pro-rata to the population served.
- *Up-front project development costs.* These are expenditures incurred in preparing the project to the point at which it can be submitted for investment funding. They can be significant and include: (i) technical costs for site surveys, design, and environmental impact assessment (EIA); (ii) legal costs for drawing up agreements, contracts and bidding documents, and (iii) consultancy costs for preparing funding applications, etc.

Funding sources for these costs must be identified: e.g. funds provided pro-rata by the parties; national or regional government grant contributions; and international support, possibly from IFIs or bilateral donors.

5.4.5 Service provision options

The management of the waste stream must be considered in its entirety within the scope of the services provided. Three service provision scenarios are outlined below: separation, bundling and sharing.[146, 147]

Separating the services into several contracts. Separating the services (e.g. separating residual waste collection from recyclable material collection, and separating collection services from waste disposal) ensures price transparency for each service component, retains competition between providers and supports waste recycling. A common split used by the local authorities is to separate waste collection from treatment and disposal. Division is also possible between primary and secondary waste collection and between collection and waste transfer and long-distance haulage.

Bundling or integrating services within one contract. Bundling entails bringing several services under one contract. Bundling of services can offer price advantages and possibilities for cost sharing, but can also result in cross-financing between service components. In the absence of service monitoring mechanisms, bundling might also lead to issues related to service quality, the accuracy of reported data or excess claims on volume-based services. For example, if the same company operates services for both the collection and disposal/treatment of mixed waste it will be more difficult for the local authority to account for the actual quantities than if the two functions were provided by separate companies. When only a few contractors are available to provide a total service, sub-contractor relationships can be developed by the head contractor to provide the various service components.

Sharing services between several municipalities. The scope for sharing services between municipalities depends on many factors, such as the alignment of objectives, the similarity of the services, the location of the common treatment/disposal facility, the geographic locations of the population bases (affecting economies of scale), and the use and processing of recyclable materials.

Various tender mechanisms are used for shared services[148]:

- *Joint tender / contingent pricing:* separate contracts are prepared for each municipality, including aligned services and provisions for economies of scale and consistency. The tenderer can price some or all contracts. If he tenders for all contracts he can offer a 'combined contract' price. Each contract is administered separately by each municipality.
- *Single framework contract:* a single municipality enters into a contract as contracting authority on behalf of the others, these being nominated in the contract to receive services. This form of contract cannot easily accommodate differences in specification or service levels, or political alignment. Legal redress by the non-lead municipalities must be sought from the contracting authority, leading to potential conflict or disputation.
- *Joint municipalities contract:* a contract is awarded by all participating municipalities as joint contracting authorities. The resulting contract is managed by a management board, which takes all major operational and contractual decisions.
- *Joint venture legal entity:* a municipally-controlled legal entity is formed by issue of shares to participating

[146] Based on Private Sector Participation Guidelines, Environmental Infrastructure Support Programme (EISP), IMG, 2016
[147] Based on Guidance Principles: Best Practice for Recycling and Waste Management Contracts, New Zealand Ministry for the Environment, Manat- M- Te Taiao, 2007
[148] Ibid

municipalities. A single contract is entered into by the legal entity for the services the participating municipalities wish to tender and administer together.

Significant cost savings can be realised by bundling or sharing services when the potential for economies of scale exists. If a number of municipalities wish to share services, it is imperative that each municipality has the political mandate to do so. This can be formalised through an inter-municipal agreement signed by each participating municipality.

The key drivers of shared services are the desire to improve community services to realise social gains through exploiting efficiencies in service costs. The benefits can include improved service levels, service consistency making future regional initiatives easier to implement and cost efficiencies accrue to both the municipalities and the contractor.

In examining the feasibility of a shared services contract it is important to identify and mitigate risks. Benefits must be weighed against the remaining risks and an informed decision taken on whether a shared services contract is desirable or if an alternative approach is more appropriate.

Significant number of risks arise in shared services contracts. Some apply to all forms of contracts, but the levels of risk may increase with a shared services contract and be more difficult to mitigate.

For example, political or community resistance can result in implementation difficulties. Customer perceptions are another important factor as some local communities may feel a sense of loss if their services are to be operated from outside of their municipality and/or by another municipality.

Differences in municipal priorities can also reduce the likelihood of any efficiency improvements and cost savings. Problems can arise in the absence of a clear and unambiguous definition of the responsibilities of the staff of the participating municipalities for contract administration and management.

Inaccurate information in the contract can raise the risk of a contract variation being sought, with its associated cost implications. This risk will affect all municipalities even if only one municipality is responsible for supplying the inaccurate information. Under a shared service contract, all participating municipalities are exposed equally to all contractual issues, regardless of the source of the problem.

Finally, the tender evaluation process for a shared services contract is more complex than for other forms of contract owing to the need for it to satisfy all participating municipalities.

Most waste treatment and disposal installations demonstrate significant economies of scale with rising plant capacity. Achieving an economically efficient scale of facility operations depends on the supply of a minimum quantity of waste which, in most cases, is beyond the scope of a single municipality.

5.5 Nationally administrated waste management services

The role of the state in the provision of waste management services is limited. Nevertheless, several countries use state-owned companies to channel investment into the sector.

These can include:

- *Engaging an existing state-owned company to invest in waste treatment and disposal*. For example, the only municipal waste incineration plant in **Estonia** was built and operated by Eesti Energia AS, a public energy company wholly owned by the Government of Estonia. The plant has a capacity of 250,000 tonne/year, equivalent to approximately half of all municipal waste generated in the country.
- *Establishing a new state-owned company to invest and operate municipal waste treatment and disposal infrastructure*. The Solid Waste Management Company of **Georgia** Ltd established in April 2011 is a state-owned company governed by the Georgian Ministry of Regional Development and Infrastructure. It is responsible for constructing and operating all new regional landfills and treatment plants (other than in the Tbilisi and Adjara regions) and for closing and rehabilitating old dump sites. Similarly, in **Azerbaijan**, state-owned company Tamiz Shahar was established as the owner of a 500,000 tonne/year waste to energy facility, a 200,000 tonne/year material recovery facility and a sanitary landfill, all located near Baku, and with the capacity to serve the Absheron peninsula.

Such measures at national government level enable centralised coordination of investment programming and rapid development of treatment and disposal infrastructure but also depend on significant amount of public financing, which can probably also only be coordinated at the central level. The remaining elements of the waste management systems that underpin the supply of waste to the centralized facilities and the organization of services at the local level still need to be developed.

5.6 Private sector involvement

Waste management infrastructure cannot always be financed and operated entirely from national and international grant funds, loan funds or from municipal resources. Private sector involvement in the provision and operation of waste management services is common in many countries, especially where public financing is limited or where private sector skills, technology, and scale is valued. Private sector participation is invaluable for mobilising investment finance and for bringing the operational experience needed to provide and operate efficient services.

A prerequisite for involving the private sector is to guarantee that private companies can recover all legitimate costs (including profit) incurred in financing, constructing and operating the services. This depends on establishing the full costs of service provision, setting tariffs on a full cost recovery basis and ensuring that the resulting charges are affordable to users – the private sector will otherwise not enter the market or will withdraw.

Private sector involvement focuses on:

- Delivering services that are provided less efficiently by the public sector
- Activities where new technologies are needed (e.g. municipal waste treatment and recycling)
- Services that consume significant proportions of municipal investment and operations budgets

Key issues to be decided are:

- Whether to define some waste management activities as primarily public responsibilities (and eligible for grant funding) and others for implementation on a fully commercial basis by firms (public and private) competing on a fair and open basis

Merkato in Addis Ababa, Ethiopia, largest open air market in Africa
Photo: © Demidoff | Dreamstime.com

- Whether to establish centralised regional waste treatment and disposal facilities (where municipalities are obliged to use a designated publicly-owned regional facility) or to allow for competition in the treatment and disposal market established by the private sector (municipalities tender the collection services and the responsibility for the final disposal is transferred to the private collection company).

5.6.1 Private sector participation

Private sector participation (PSP) involves cooperation between public authorities and businesses with the aim of carrying out public infrastructure projects or providing services which have traditionally been provided by the public sector. It typically involves complex legal and financial arrangements, and is widely used in the transport, public health, public safety, water and waste management sectors.

The broad aims of PSP are to structure the relationship between the public and private sectors so that risks are borne by the party best able to manage them at least cost. Increased value for public services is achieved by exploiting private sector skills and resources. Hence, private sector entities become long term providers of facilities and services whilst public sector agencies increasingly become focused on regulation, service planning, contract management and performance monitoring. See **Box 14** on a waste-to-energy PPP project from **Serbia** and **Box 15** on a DBOF scheme from **Morocco**.

Box 14 Belgrade waste to energy PPP project[149,150]

Belgrade Waste-to-Energy (WtE) was designed to close and remediate the Vinca landfill, Europe's only remaining open dumpsite and a major environmental and social concern for the Serbian capital and its residents. One of International Finance Corporation's (IFC) first investments in the waste-to-energy sector, it is the first privately financed, large-scale WtE project in the Balkan region and among the largest PPP transactions in Serbia. It is also a first-of-its-kind PPP project supported by IFC and the Multilateral Investment Guarantee Agency (MIGA) with 260 million Euro in financing and guarantees, including blended finance.

Over four decades, Vinča has received more than 10 million tonnes of waste, with just one year of capacity remaining at the time of investment. With piles of waste towering as high as 70 meters, landslides were a risk. Methane emissions ignited fires, polluting the air over Belgrade, and trash was approaching dangerously close to the nearby Danube River.

Over the next several years, the dumpsite will be replaced by three new facilities: A sanitary landfill in compliance with EU standards, a waste-to-energy plant producing renewable heat and power from municipal waste and landfill gas, and a processing facility for construction and demolition waste.

Upon completion, the project is expected to provide enough electricity to reach approximately 300,000 households, in addition to 80 percent of the heat needed by the City of Belgrade in winters. The heat and power production will replace dirty fossil fuel generation, reducing an average of 354,200 tonnes per year of greenhouse gas emissions between 2021-2051. The WtE facility would treat 340,000 tonnes of municipal waste per year, with the residues and any excess waste sent to the sanitary landfill for additional biogas extraction.

In order to carry out the project the City of Belgrade decided to rely on a non-recourse project finance, suitable for large PPP projects, which proposed the operation of facilities for the duration of 25 years. Due to the lack of know-how in carrying out such vast projects, the city administration was assisted by IFC during the project preparation process and selection of private partner. With the support of external consultants in preparing project documentation an international tender was organized. The finalization of selection process took approximately two years. Five potentials bidders were pre-selected and the final contract was awarded following competitive dialogue procedure in five rounds.

This approach allowed for exchange of information in refinement of facility design and for defining PPP boundaries in distribution of project risks between the public and private partner. The design, construction, and overall performance criteria were assigned to the selected private partner, whereas the municipality of Belgrade had to secure connection to the heating system and land rights. As the city is also responsible for waste collection, it realized a payment scheme, which covered the public partner's financing and fixed operation costs. The final price of the project was 350 million Euro.

The final PPP contract was signed between the City of Belgrade and a consortium of Suez – Itochu, under the shared special purpose vehicle Beo Cista Energija d.o.o. (BCE). The newly created vehicle would receive 20-25 percent of the financing from its two partnering firms, with the remaining 75-80 percent coming from international funding organizations such as IFC and EBRD. The generated income from the project would be used to reimburse the investment of BCE.

Financing of the project by the city was designed in such a way that 60 percent of the total project revenues would be paid readily with the remainder being subject to fees coming from the energy and heat sales. In order to fund such availability payment, City will need to increase the waste disposal charge applied to households and businesses, currently at the level of 2 Euro/month/household. It has been calculated that the increased charge would not exceed 1 percent of the average household expenses, which is considered within the affordability range.

The electricity feed-in tax was set at 86 Euro/MWh along with an agreement with the national power operator for a duration of 12 years; this would provide approximately 30 percent of annual revenues. The price of the heat was designed at 30 Euro/MWh with a secured 56 MWh during the winter seasons over the entire project duration, which would add the additional 10 percent of project revenues.

MIGA guarantees of 97.3 million Euro are being provided for up to 20 years against non-commercial risks, including breach of contract. The guarantees cover up to 90 percent of investor equity in Beo Čista Energija d.o.o.

[149] Heddesheimer, S., Thevenet, V., Kervenoael, M., Dendoune, S., Belgrade Public – Private Partnership – How the private sector helps in converting Belgrade Dumpsite into and Integrated waste management facility, 2018

[150] Belgrade PPP project - How the private sector helps in converting Belgrade Dumpsite into and Integrated waste management facility, SUEZ, 2018

Box 15 Morocco Oum Azza provincial landfill[151]

The Oum Azza provincial landfill was developed as a PPP under the form of a Design-Build-Operate-Finance arrangement. The facility serves 13 communes of the Rabat-Salé-Skhrirate-Temara Province, representing a total population of 1.98 million.

The contract was signed with SEGDEMA, a subsidiary of the French leading operator Groupe Pizzorno Environment (GPE) and largest waste management operator in Morocco. The contract started in February 2007, for a duration of 20 years. It included the construction of a modern landfill equipped with landfill gas capture and flaring, leachate treatment, as well as sorting facility to separate wet waste from dry waste. The initial design capacity was 500,000 tonnes of mixed waste plus 120,000 tonnes of garden waste per year.

As part of the contract, SEGEDEMA had to build 3 transfer stations and reclaim the old dumpsite under a separate agreement.

Under the agreement, the operator financed the construction and operation of the facility, charging a gate fee of MAD 70 per tonne, equivalent to approximately USD 7.0 per tonne of incoming waste. The fee is intended to cover the initial investment (USD 35 million) as well as operating expenses (USD 7.5 million). Transfer and transport fees are charged separately at USD 3.0 per tonne.

The Government provided the land - approximately 250 acres of farmland - and a subsidy of USD 10 million spread over the first 4 years of the start-up phase to ensure financial viability.

In 2010, a MRF was added to the landfill under the same agreement. It was equipped with 2 sorting lines with a capacity of 215,000 tonnes per year, generating 5,000 tonnes of recyclable plastics each year. This facility was the first of its kind in the Kingdom and can process an average of 400 tonnes per day.

Rejects amount to 40 percent of throughput and are further transferred to a plant producing RDF for a cement plant operated by Lafarge Holcim. 90,000 tonnes are transformed into RDF each year.

Green waste is shredded to produce compost, sold as fertilizer for agriculture.

The facility provides jobs to 153 workers, formerly informally scavenging waste on the old Akreuch dumpsite. The workers were organized as a cooperative named Attawafouk and are remunerated by the proceeds from recyclables sales. A buy-back agreement with the landfill operator guarantees a stable income to the cooperative.

The substantial improvement of waste treatment and disposal in Rabat since 2007 has benefited from the know-how and technology brought by the private operator. However, in July 2020, the operator announced it would seek contract termination after 15 years of operation following a disagreement with the client over leachate treatment.

[151] The text box summary is based on publicly available design documentation and implementation reporting.

5.6.2 Potential benefits and risks of PSP

PSPs can bring higher efficiency through competition, accountability and transparency, and can also provide access to expert skills and know-how on implementing and operating projects.

Introducing private sector expertise, know-how and investment finance can improve service quality and minimise total costs over a project's life. Competition between private firms and an optimal allocation of risk between public and private parties provide strong incentives for private contractors to perform to contract specification. It can accelerate infrastructure and service provision and lead to improvements in the capacity of public agencies to plan and manage public service provision efficiently within tight budgetary constraints.

Potential sources of 'value for money' from PSP contracting arise from:

- Optimal risk transfer
- Long contract duration (full-life costing)
- Clear output specifications in the tendering process
- Contract performance measurement
- Private sector management skills
- Competition

To be successful, decisions to involve the private sector in the provision of environmental services must be based on detailed analysis and clear and unambiguous output specifications. The successful involvement of the private sector requires a realistic allocation of project risks between the private and public parties to the contract. A detailed appreciation of total life-time costs and financing requirements, including tariff and revenue implications is important.

Also, public agencies need the capacity (powers, resources and expertise) to manage a competitive contract preparation, procurement, management and regulatory control process.

In the absence of such safeguards – and depending on the type, scope and scale of the contract – the potential risks of PSP can be significant. They can include the loss of public sector control (and reduced transparency and accountability in service provision), negligible benefit arising from competition, labour relations problems, high costs and unaffordable tariffs. Disputes and litigation can lead to a fall in service quality or efficiency, and the loss of social and political support.

Contracting with the private sector requires fundamental change in municipal organisational arrangements and in the roles, responsibilities and attitudes of municipal staff. From being a service provider the municipality shifts to being a contract manager. This is a significant change in emphasis and function, and the reorganisation and reallocation of municipal responsibilities must be planned and implemented well in advance of the start of private sector operations.

5.6.3 When should PSP be considered?

The participation of the private sector should be considered when:

- The service cannot be provided with the resources or expertise of the public sector alone
- The involvement of the private sector is likely to increase the quality or level of service, or enable it to be implemented sooner
- There is scope for effective competition among prospective private sector suppliers
- There is broad support from service users for the involvement of the private sector
- The outputs of the service can be defined, measured and priced easily
- Costs of the service can be defined in full and recovered largely or fully through user fees
- The service offers scope for innovation
- There is a track record of partnerships between government and the private sector

Certain prerequisites must be satisfied if a PSP arrangement is to be properly structured, implemented and sustained. A supportive legal, institutional, financial and tax framework is of primary importance, and the procurement framework must specifically provide for competition. The public authorities must have the capacity to prepare, procure, manage and monitor PSP contracts efficiently. In addition, national and local waste management strategies and plans should be sufficiently well developed and integrated to enable potentially viable PPP projects to be clearly and unambiguously identified and defined. A proven tariff setting mechanism and operational charging system based on the full recovery of service costs is also an important pre-condition for private sector involvement.

5.6.4 Types of PSP contracts

PSP is a contractual arrangement between a government entity and a private firm for the delivery of an infrastructure facility or service. Contractual commitment reflects the level of a contractor's involvement in designing, constructing, financing, operating and owning the assets created and/or used to provide a service. This reflects the measure of risk the entity is prepared to accept. This, in turn, influences the level of financial return he expects for accepting the risk. This also has a bearing on other factors, including contract duration and payment terms (which determine the contractor's ability to cover his costs). Contract intensity, duration and risk rise as the private entity accepts increasingly higher levels of responsibility.

Factors that define the forms of PSP contract include how responsibilities are divided between the private and public partners and respectively how risk is allocated between the parties. What will be the financial compensation of the private contractor and how it is generated are of primary importance. The duration of the contract, asset ownership and transfer to the public entity and how the capital expenditures are financed also affect the cooperation model.

Six generic forms of PSP arrangement that reflect rising levels of responsibility, risk transfer and expectations of financial return are described below.

- *Outsourcing (management or service contracts, franchise):* A private firm is awarded a fixed-term contract to manage / operate a specific facility or service for an agreed period of time (e.g. municipal waste collection). It neither constructs nor finances the facilities. A technical specification defines the services to be performed. The contractor operates and maintains fixed facilities owned by the public agency. Such arrangements limit the entrepreneurial scope of the contractor as they remove his capacity to define the type and efficiency of the equipment used. Mobile equipment can either be owned by the contractor (e.g. waste collection vehicles) or by the public agency (e.g. landfill equipment). Under the *service contract* a direct payment is made by the public agency to the firm. A variation is the *franchise contract* where the public authority transfers responsibility and risk of customer billing and revenue collection to the contracting party. In the franchise example, the contracting authority awards, via competitive tendering, a limited monopoly to a private company to deliver a particular solid waste management service, in a defined area for a fixed period. The contractor is responsible for fee collection from householders and other users and has to consider late payment and bad debt.

- *Lease Arrangements:* A private firm is awarded a contract to operate and maintain a utility system for a municipality, usually funded from user charges levied and collected by the lessee. The firm leases the utility's assets from the public agency and takes responsibility for operating and maintaining them. Leases can be administratively complex to organise and represent a far bigger step for the public sector than outsourcing.

- *Design, build and operate contracts (non-finance):* A single private entity is awarded contracts to design, build and operate publicly-owned assets (such as a materials sorting plant). No long-term commitment is made by the private entity to finance capital investments. Examples are DBO (Design, Build, Operate) and BTO (Build, Transfer, Operate) contracts.

- *Private finance and transfer contracts:* A private entity designs, builds, finances, operates and owns assets for the length of a contract period. Investment is recouped via a contract with the public agency. Assets are transferred into public ownership at the end of the contract period. Examples are, BOT (Build, Operate, Transfer) BOOT (Build, Own, Operate, Transfer) and DBFO (Design, Build, Finance, Operate) contracts, but the terms tend to be used interchangeably.

Recycling center technician. Photo: Portra

- *Concession:* A private entity is granted an exclusive right by a public agency to manage, operate, finance and maintain the assets of an entire pre-existing infrastructure system over a specified period.

- *Private ownership:* arrangements through which a private entity finances, operates and owns a facility or service outright in perpetuity: assets are not transferred into public ownership at any stage. Examples are BOO (Build, Own, Operate) contracts and divestments/ privatization.

There are no legal or universally accepted definitions for these contract categories and types. Names and acronyms can differ between jurisdictions, even though the type of contract is fundamentally the same.

The following table considers in more detail the three most commonly used contract types: service contracts, DBO contracts and DBFO contracts.

Table 6 Key characteristics of service contracts, DBO contracts and DBFO contracts[152]

Key factor	Service contract	DBO	DBFO
Type of activities	Service contracts are typically used for waste collection, waste transport/ transfer, sorting and landfill operations.	With a DBO contract, a single contract is awarded to a single private entity for the design, construction and operation of a facility, such as a sanitary landfill, transfer station or waste treatment facility. The contractor first designs and builds a facility to public sector performance standards and then operates and maintains it for a predetermined period.	DBFO contracts are similar to DBO contracts with the important distinction that they include investment financing. They are used in large, complex projects, such as an integrated waste management facility. They are complex and time consuming to prepare.
Contractual relationship	The technical specification defines the service to be performed by the contracted firm (e.g. waste collection in a specified collection zone)	The contract specifies the tasks to be performed. The contracting authority covers investment expenditures through progressive payments to the contractor over the design and construction phase. Thus, a DBO contract creates a single point of responsibility for design, construction and operation. The facility remains in public ownership for the entire contract. Legal ownership is transferred to the sponsoring public agency once the facility has been commissioned.	A single entity bids to design, construct, operate, maintain and finance a facility or service during the contract period. Contractual responsibility rests with a single DBFO entity. The facilities are transferred back to the public entity at the end of the contract period.
Payment	The public agency pays the contractor for the services provided, either on a unit basis (e.g. the quantity of waste collected) or on a lump-sum basis. In some cases the contractor also has responsibility for – and bears the risk of – billing and fee collection.	The contract specifies a guaranteed payment schedule over the contract period. The contractor can thus expect a reliable and predictable revenue stream, subject to meeting the service requirements	The private entity is compensated by service payments made by the contracting authority from the point at which the contracted facility is available for use. The entity may demand guarantees from the public body, such as a 'take or pay' arrangement (i.e. payment may be independent of the quantities of waste delivered to a plant).

[152] Based on Guidelines for Successful Public – Private Partnerships, European Commission, DG Regional Policy, 2003

Table 6 Cont.

Key factor	Service contract	DBO	DBFO
Ownership and investment	The contractor operates and maintains fixed facilities owned by the public agency. Such arrangements limit the entrepreneurial scope of the contractor as they remove his capacity to define the type and efficiency of the equipment used. Mobile equipment can either be owned by the contractor (e.g. waste collection vehicles) or by the public agency (e.g. landfill equipment).	In pure DBO contracts, title to the facility lies with the contracting authority, which is also responsible for the investment. Capital expenditures on the facility are typically made in the first instance by the private contractor, which is later reimbursed by the contracting agency in accordance with the contractual terms. Public funding can be via grants from international donors or loans from international banks. Mobile equipment needed for landfill operations, for example, is typically provided (owned and financed) by the DBO contractor, which will receive appropriate financial compensation to cover operational costs (e.g. a defined payment / tonne of waste disposed of to landfill).	DBFO may include temporary ownership by the DBFO entity of the facility during its operational life but it reverts to public ownership on completion of the contract term.
Contract period	The contract period (for all contract types) is determined by the length of time needed for the revenue of the facility or service to pay off the firm's debt and provide a reasonable financial rate of return for its efforts and risks. This is typically 5 to 8 years for service contracts. Contract periods shorter than this can introduce uncertainty and lead to inefficient outcomes concerning equipment selection, quality and performance. Unreasonably short contracts make it unattractive for a firm to invest in cost-effective equipment as they introduce the risk of the contract being terminated before the equipment can be fully depreciated and financing costs covered. This can lead to higher unit costs of service.	Facilities covered by DBO contracts tend to have relatively long lives. Landfills typically have operational lives of 15-25 years. In this case, the contract must recognise and provide for the construction and financing of new cells needed over landfill life (e.g. in 5-yearly stages). Similarly, it must recognise and provide for landfill closure and aftercare. The aftercare period over which management and monitoring costs must be met by the site owner can be 20-40 years. It must also specify the asset maintenance and replacement schedules that apply to other waste management facilities (e.g. MBT plants).	A long contract period is necessary, typically 15-25 years and above.

Table 6 Cont.

Key factor	Service contract	DBO	DBFO
Risk allocation	The contract typically specifies the level of fees to be paid by the contracting authority to the service provider. The contracting authority thus bears the revenue risk of securing fee collection from service users (or via financial transfers from the municipal budget). The contractor, on the other hand, bears the operating risk. Service quality consistent with the technical specifications has to be achieved if the contractor is not to face financial penalties (all else being equal). Such contracts are exposed to the risk of the risk allocation profile agreed in the contract being violated by the public agency, either by delaying or suspending service payments on account of municipal budget constraints. This effectively transfers financial risk to the service provider, leading to disputation and litigation which can seriously disrupt service provision. Contractual difficulties can also arise when the parties cannot agree on whether expenditure should be made on asset maintenance or on asset reinvestment. This can also leads to disputation, litigation and service disruption. Having the private contractor responsible for levying and collecting charges from users transfers financial risk from the public agency to the contractor. This raises significant issues: whether private firms are prepared to bid for such contracts; the level of tariff needed to compensate the contractor for accepting this financial risk.	Risk associated with facility design, construction and operation is transferred to the DBO contractor. The contractor bears none on the investment financing risk and can proceed in the expectation of a reliable and predictable revenue stream. DBO contracts are exposed to issues regarding asset maintenance and asset replacement.	A DBFO contract means that the private party bears both the design and construction risk and either the availability risk or the demand risk: for waste projects, the public sector will normally take the demand risk under, for example, 'take or pay' provisions. Given that investment financing is a task of the contractor, he has to carry considerably higher risks than those which apply to a DBO contract. He will not receive a payment in parallel to the construction (as is applicable in a DBO contract), but has to charge for his investment during the whole lifetime of the facility by requesting a defined payment for each tonne. He also has to carry risks related to unpredicted interest or inflation rates. The appraisal and implementation of DBFO projects are time-consuming and expensive exercises. This is why potential contractors must be able to assess quickly whether a project is commercially feasible under the proposed arrangement. The implementation of DBFO contracts is strongly dependent on political risks related to specific country: economic stability, political will and capital markets The private entity must be able to show that the project will generate sufficient revenue to repay loans and provide a reasonable return to investors. The project must be large enough to secure the development capital and the timeframe long enough for the contractor to generate revenues. The public sector client must be able to honour the agreed payment terms to the contractor. This is crucial because such payments constitute the only source of income for repayment of project loans to banks and dividends to investors. The client's credibility to honour its payment obligations will influence investor and lender confidence in the project.

Once the scope of the services to be procured is defined the municipality must decide on the most appropriate contract model to use in procuring the services.

Residual waste collection, separate waste collection and recyclable material sorting are typically procured through service contracts. Waste treatment and disposal infrastructure consisting of long-lived assets is typically procured via DBO or DBFO-type contracts. The various contract models differ in terms of contractual obligations, risk sharing and contract duration.

Contract intensity refers to the extent to which functional responsibility, risk acceptance, financing and ownership are transferred from the public sector to the private contractor. As contract intensity grows, so does the response needed from the public sector to address the structural adjustments and provide the capacity needed to effectively prepare, manage, monitor and regulate such contracts.

The allocation of responsibilities for various PSP options is indicated in the following table.

Table 7 **Allocation of responsibilities for various PSP options**[153]

Contract Type	Asset ownership	Operations and maintenance	Capital investment	Commercial risk	Duration (years)
Service	Public/Private	Private	Public	Public	4-8
Management	Public	Private / Public	Public	Public	3-5
DBO	Public	Private	Public	Shared	15-30
DBFO	Public	Private	Private	Private	15-30
BOO	Private	Private	Private	Private	Indefinite
Divestiture	Private	Private	Private	Private	Indefinite

5.6.5 Risk allocation

Although PSPs are well established as a public procurement method, their benefits depend on how the private sector manages the risks transferred to it and on the success of the public sector in supervising the contract. Government agencies have a critical role to play. PSPs are neither a panacea for successful and efficient public service provision nor a substitute for strong, accountable and effective governance.

Each stage of planning, designing, constructing, financing and operating a facility or service involves risk of some form or other.

The political risk is typically the first a company will consider before investing in a country or sector. Consideration will be given especially towards the risk of unfair competition, and unequal treatment of market participants from the public and private sectors (e.g. for financing and cost recovery).

The lack of reliable information can lead to socio-economic data and waste and material flow projection risks that result, for example, in wrong decisions being made on capacity requirements, leading to poor operating performance, higher costs and revenues lower than planned.

Significant risks are associated with the design and construction phases that can lead to delays, non-performance of facilities and increased investment costs.

Risks during commissioning and facility operation should also been considered as they can affect plant availability, operation and maintenance costs, the achievement of planned objectives and performance indicators and, in the worst scenario, can cause damage to the installation.

Financial risks are usually of primary importance for the private partner, particularly the revenue risks associated with demand, user charges and charge collection performance.

Waste management operations and facilities containing a significant recycling or materials recovery component face market risks associated with the quality and quantities of separately collected or sorted materials, compost or RDF, the availability and long-term consistency of markets, and the volatility of market prices.

[153] Based on World Bank Mediterranean Environmental Technical Assistance Programme (METAP) Solid Waste Management Project, Private Sector Participation Guideline, prepared by GTZ – ERM – GKW, 2002

Changes in legal requirements can create regulatory risks. In a similar way, compliance risk also faces existing facilities and installations. The issue is particularly important for landfill operations where responsibilities for previous (public) activities and future private operations should be clearly divided.

A broad aim of the PSP contract is to structure the relationship between the public and private sectors so that risks are borne by the party best able to manage them at least cost. This is a crucial and time-consuming part of contract preparation. The table below indicates how major contractual risks might be allocated between the public and private partners.

Table 8 **Major risks and how they might be assigned**[154]

Type of Risk	Indication of how to assign the risk
Waste Management Data and Predictions	Waste management data on quantity and quality need to be assessed, described and predicted carefully during the preparation of the bidding documents (population growth, increase of waste quantity). The Contracting Authority should be responsible for these data. Clauses relating to the adjustment of payments for adjusted waste quantities should be included. (e.g. payment based on unit prices for each tonne of waste collected and disposed of or for population growth.)
Operation Risks	Under a service contract operation risk is assigned to the Contractor. He is obliged to fulfil the contractual obligations and must cover the related risks (especially cost overruns, exceeding agreed operating costs). A condition of the contract is that the Contractor himself and his subcontractors have adequate liability insurance to cover these operational risks. This must be supported by verifiable evidence. Operational standards (traffic, health and safety, environmental protection) and performance standards should be well justified and defined. Penalties should be imposed in the event of standards being violated or of a failure to meet quality specifications.
Revenue Risk	For contracts in which the contracting authority pays the contractor for the provision of services or works the revenue risk is assigned to the contracting authority. Cost recovery must be assured by the contracting authority, defined by cost calculations and secured through the collection of taxes or charges during the project implementation period. Services that are not affordable to the contracting authority and its customers should never be tendered! Making the contractor responsible for fee collection will result in considerably higher costs per unit owing to bad debts and late payments.
Financial Risks	The financial risk of unpredicted rises in interest rates and inflation should be shared by the contracting authority and the contractor. Respective clauses for price adjustment should be included.
Legal Risk	Legal risks, such as changes to national or local government legislation (e.g. to impose higher standards or to introduce new or higher taxes) which lead to considerable additional costs for the contractor should be assigned to the contracting authority as the private sector has no ability to influence them. A clause including options for comprehensive claims and negotiations should be anticipated. The legal risks for the private partner could also be tied to the legal procedures for settlement of contractual issues in the case that the public counterpart doesn't meet contractual obligations, especially if the matter must be addressed in a national court.
Residual Value Risk	Residual value risk is an important factor for privately financed projects in which ownership is transferred to the public sector at the end of the concession period. The physical condition of the facility, and the quantity and quality of its outputs (e.g. a materials processing plant) at the time of transfer must be clearly identified in the contractual agreement. In particular, a schedule of operation and maintenance requirements and their timing is agreed.

[154] Based on World Bank Mediterranean Environmental Technical Assistance Programme (METAP), Regional Solid Waste Management Project in Mashreq and Maghreb Countries, Regional Guidelines, Volume 4 Private Sector Participation Guidelines and Aids to Implementation, prepared by GTZ – ERM – GKW, 2004

5.6.6 Contractual relationship between public and private partners

For a PSP project to be successful, both partners must have the same understanding of the scope and quality of the services to be provided, the tendering procedures and the type of PSP contract to be used. They must also be aware of the contractual risks and the approach through which such risks will be minimised and assigned appropriately between them.

A thorough understanding of the full commercial costs of providing waste management services, and of their implications for the level and affordability of user tariffs, is a crucial requirement of municipalities preparing proposals for possible private sector involvement.

A clear specification of the works and services to be provided under each project phase is crucial. Rules, regulations, standards and norms subject to change over a long contract period must be identified and the contractual responses to such changes defined.

Standard procurement procedures and contract templates are needed to support local authorities in contracting with the private sector. It is also strongly recommended that toolkits for project preparation, service tendering, contract performance monitoring, and basic economic regulation of the sector should be prepared.

Equal treatment of public and private sector providers of waste management services must be guaranteed via a common tariff determination policy and contracting procedures.

Only by clearly defining and undertaking a thorough analysis of each contract item can a contract be prepared which satisfies both parties and which can realistically be expected to achieve the project aims in an effective, correct and fair manner.

Depending on the type of contract, contract clauses differ considerably in terms of ownership, responsibility for investment, operation, share of risks and contract duration. Although some issues are common to each type of contract, other specific issues arise with increasing levels of contract complexity. Some of the more common 'critical contract issues' are outlined in **Box 16**.

Box 16 **Critical contract issues**[155,156]

Contract period. **All contracts with the private sector should be of sufficient duration to make them bankable – that is, they should be for a period which is long enough to enable the contractor to service the finance that he has organised to purchase the equipment or refinance the facilities for the work. Appropriate contract periods increase the attractiveness of the work for private sector participants and lower the costs considerably. Generally, the contract duration should not exceed the lifetime of the longest-lived assets envisaged for private investment. For equipment needed for waste collection, waste transport or landfill operations this is likely to be a period of 5-8 years. Durations of 15 – 30 years agreed in contracts signed between some municipalities and private operators for waste collection services are disproportionally long relative to the life of the assets used (containers, collection vehicles). Contracts of this length are entirely unnecessary as by creating effective monopolies they remove the competitive pressures and incentives needed for the contractor to remain efficient and cost-effective.**

The very short periods of 1 or 2 years for waste collection contracts are not recommended.

The periods for contracts that involve construction and operation of facilities are considerably longer, from 15 to 25 years or more. A 10-15 year term is considered suitable for a material recovery facility. Contract periods of 15 – 25 years apply to waste treatment plants and landfills.

Longer contract terms are allowed on an exceptional basis for investment-heavy contracts, provided that the expected life of major assets subject to contract is significantly longer than specified period. In this case, a provision for periodic review of the contract clauses is usually written into the contract. If the contract duration is considerably shorter than the expected lifetime of fixed assets then a provision can be made in the contract for the municipality to compensate the contractor at the end of the contract period for the residual value of any fixed assets. Longer-term contracts can also

[155] Ibid

[156] Based on Guidance Principles: Best Practice for Recycling and Waste Management Contracts, New Zealand Ministry for the Environment, Manatū Mō Te Taiao, 2007

Box 16 Cont.

contain provisions that set specific contract review dates or which enable the contractor / contracting authority to initiate a review at any time over the contract term. This provides the opportunity for improved technologies to be introduced, at the initiative of either party. The reviews also encourage investment and upgrading of plants. A disadvantage concerns the potentially large capital investments involved, the need for this to be amortised over a relatively short timeframe, and the impact of this on the contract price.

Start of operations. The start of operations should be clearly defined and must take account of the complexity of the contract and the necessary preparatory measures and actions. The more complicated the contract, or the length of time needed for equipment supply, the longer the period between contract signing and start of operations. The contract should recognise the possibility of delays in supply owing to circumstances beyond the contractor's control. Examples include customs clearance and the acquisition of permits. For complex contracts, such as collection contracts which cover several collection zones, a step by step approach might be needed so that operations can be introduced progressively on a zone by zone basis. If there is an incumbent operator, then it is also important to allow time for operations to be transferred smoothly from one operator to another.

Allocation of key risks. Sound project preparation and a well-defined contract can help reduce risks considerably and achieve low and fair prices. As noted above, risks should be assigned following a clear identification of the party with the greater level of control over the risk. A detailed risk analysis should be performed during preparation of the contract documents.

Requests for additional services and adjusted framework conditions. In the event of additional services being requested by the contracting authority after contract award, or of a change in the legal framework, a fair mechanism is needed to adjust prices. An example is a decision to change the site proposed for a disposal facility as part of a collection contract that leads to longer transport distances and higher transfer costs. This will affect the Bill of Quantities rates. As a condition of its approval, the contracting authority will establish a right to inspect records that show the need for an adjustment to the Bill of Quantities rates. Such negotiations might be simpler if, at the tendering stage, unit prices for additional services are drawn up. These can include unit prices for incremental transport distances, or unit rates for day works (e.g. for vehicles, machines and workers). The more that potential changes can be anticipated and addressed in advance in the contract specifications the easier it will be to reach agreement on them during the contract period.

Contract extension and termination. Contracts that contain provisions for periodic extensions are far less appropriate than contracts that define long contract durations (but which provide for early termination in the event of unsatisfactory performance). Contract extensions should be limited to unforeseeable circumstances, such as force majeure events. Reasons for early termination of a contract, by either the contracting authority or the contractor, should be clearly defined. Although this should be a rare exception, there may be circumstances when a contracting authority has to terminate a contract, such as for fundamental changes to waste management policy. A clear procedure must be defined and applied in such circumstances. This might include obligations to compensate the contractor for reasonable and justified losses. Other default events which allow the contracting authority to terminate the agreement without compensation can include insolvency or bankruptcy, serious breaches of the contract, etc. The option for the contractor to terminate the contract should broadly be restricted to the failure of the contracting authority to pay the contractor according to the contractual terms.

Measurement and payment. Payments in general should be linked to a measure of the work completed in combination with a defined unit price for all types of contracts. Unit prices are usually a better solution than lump sum prices. For contracts of longer durations, a fair price adjustment clause should be included. Contractors are highly motivated if payment is made punctually, according to the time schedule defined in the contract.

Penalties and incentives. Well-defined performance standards can reduce the possibility of conflict between the parties. Penalty clauses are intended to enforce the provisions of the contract (not to reduce the costs to the contracting authority). In general, penalties should be capped in order to avoid misuse. The penalty regime is not designed to cover all cases of bad performance. In particular, clauses on performance guarantee (or bond) and on early contract termination are intended to cover instances of critical or extensive poor performance. Incentive clauses are intended to encourage the contractor to maintain a high level of performance and to motivate him, especially if the solid waste management services are not yet fully developed and require continuous improvement.

Box 16 Cont.

Guarantees. In a typical service contract in which the contractor is obliged to provide and finance his equipment, the need for the contractor to lodge a performance bond should be carefully considered in terms of the risks assigned to both parties. There are two reasons for seeking a bond: one is to ensure that the contractor performs according to contract specification and the other is to ensure the contracting authority receives some form of compensation if the contractor walks away from his obligations. The contracting authority must consider that the bank that issues the bond will want payment, a cost ultimately to be covered by the contracting authority. Here, an option might be to limit the duration bond to the first year following contract signing to cover the start of operations and critical service implementation. A typical value for the performance bond is 10 percent of annual contract value, although this is fundamentally determined by how risks are allocated between the two parties. The situation is quite different when operational equipment is provided by the contracting authority. Here, a performance bond is needed to ensure that the contract is fulfilled according to the specifications and to cover the risks borne by the contracting authority. The same situation occurs in DBO or construction contracts in which specific works must be performed.

Performance Standards and Contract Monitoring. Minimum acceptable levels of performance relative to a Service Specification or a Technical Requirement must be defined and details provided on how they will be monitored. Note that not all works can be carried out perfectly to specification all of the time. Human errors do occur, a fact that should be recognised and dealt with in the standards in an acceptable way. Regarding monitoring, it is important to set out clearly how the work will be monitored. It could be done by a contract monitoring unit, with relevant procedures applied by the contracting authority. Alternatively, a self-reporting regime could be implemented, with full details provided in the contract documentation.

There are a number of recognised systems for measuring contract performance through the use of key performance indicators (KPIs). KPIs can be based on either incentives for good performance or penalties for poor performance, although incentives are the preferred approach. The objective of KPIs is not to structure or assess them to score the contractor down to save money. The emphasis is on assessing performance by the quality of service delivery. The set of KPIs should be limited in number, specific, measurable, easy to administer, transparent, objective and agreed. The content of KPIs varies with the contract service, but generally waste management contracts cover performance for most of the following: customer satisfaction, quality of the service, health and safety, compliance with legislative requirements, relationships with other stakeholders, reporting, maximisation of diversion of waste from landfill, minimisation of waste disposal costs.

Dispute resolution and arbitration. Involving the private sector introduces the potential for conflict. Two common reasons are difficult or inadequate framework conditions and the lack of experience on the part of the contract parties. Conflicts range from disputes over technical performance (e.g. achievement of performance targets, reliable provision of services, timely commissioning of facilities) to financial issues (e.g. reaching agreement on an amount to be invoiced, punctual payment by the contracting authority). Conflict avoidance is best achieved through clear and unambiguous technical specifications and contract clauses. However, even when technical specifications and contract clauses are as clear and reasonable as possible, appearance of disputes and need for arbitration is still possible. In case that a dispute cannot be solved in mutual consultation between the two contract parties, the contract could envisage engaging an experienced and competent adjudicator to improve the prospects of early resolution without recourse to formal arbitration proceedings. If such provision is not applicable, the parties must enter into arbitration proceedings in accordance with national or international rules. This is time consuming, expensive, damaging to the contractual relationship and may jeopardize the delivery waste services.

Amager Bakke, heat and power waste-to-energy plant in Amager, Copenhagen, Denmark. Photo: © Boggy | Dreamstime.com

There is no best PSP option. The selection of an optimal PSP model depends on having a thorough understanding of the local situation and on a careful analysis of all the financial, technical, social and environmental factors that are relevant to it.

No matter which PSP model is chosen, its success is likely to be strongly influenced by a common set of factors:

- A sustained commitment to the project at the highest levels
- Clear, realistic goals and expectations
- All parties affected by the project to be involved and kept informed
- All risks to be identified, assessed and assigned to the most appropriate parties
- Sufficient commercial potential to attract an external service provider
- A transparent bidding and awarding process
- Regulatory and administrative capacity to manage and monitor PSP contracts
- A positive partnering attitude between all involved players

The contractual relationship between the public and private sectors must be clearly defined and systematically applied. Successful, cost-effective PSPs depend on fair competition, full transparency of information and assiduous contract monitoring.

Beginning with PSP projects with relatively low investment requirements – such as a waste collection, transfer and haulage contract – can help strengthen the capacity of the contracting authorities and encourage the development of a national market. The possibility of implementing facilities and services via outsourcing (or possibly DBO) contracts might be the most promising approach initially.

Comprehensive PSP projects that involve large investment outlays by the private sector depend upon a fully elaborated implementation framework, a clear financing concept, and contracting authorities with the capacity to manage the contract preparation process and to monitor project implementation and operation. Large projects can expose an inexperienced contacting authority unknowingly to high legal, financial and service supply risks.

Workers in Rizal, Philippines, sort through plastic waste and segregate them for proper recycling. Photo: © junpinzon / Shutterstock.com

Public participation and stakeholder engagement

6.1 The need for public participation and stakeholder support

The success of waste management depends on the participation of stakeholders and the presence of a 'social contract' with citizens and the population-at-large. Waste management systems are much more successful in contexts in which core stakeholders engage in and support waste policies and services. Where the public accepts and participates in waste management by abiding to guidelines in handling waste and by paying for services, waste management operations can excel. In contrast, when users or operators are disengaged or even opposed to the waste management system, performance suffers.

Waste management involves a diverse range of stakeholders[157]. Some are planners, some are users, and others are operators. Each participant engages with the waste management system in a unique way and experiences different impacts from the design of the waste management system. While some stakeholders simply seek dependable waste collection services in their neighbourhood, others may depend on the waste management sector for their livelihoods and employment. For some, the waste management system can be a source of convenience and empowerment, for others, the waste management sector may become a source of marginalization.

Local authorities must take different stakeholders into account in designing an effective waste management system. Their perspectives can not only help foster positive behaviours that allow the system to function smoothly, but also help local governments build a more equal and just public service that is sustainable in the long-term. By ensuring that the waste management system serves all stakeholders, local governments may nurture a widespread sense of 'ownership' of the waste management system that leads to positive social, environmental, and economic outcomes.

This chapter builds on the basic principles and approaches of citizen engagement and focuses on three aspects of particular importance for the waste sector: effective public outreach and communications, integration of the informal sector with the rest of the sector chain, and gender-inclusivity in waste management practices. Each section provides context on the importance of each of these three pillars and explores constructive actions for local governments.

6.2 Public communication and engagement in waste management

6.2.1 The importance of communication in waste management

Waste management is a public service that is especially dependent on public participation for success. To be successful, waste management initiatives require buy-in from waste generators, especially when it comes to proper waste placement, source separation, waste minimization, and siting of infrastructure. Public engagement requires not only adequate knowledge of processes and environmental impacts, but also a positive perception of the waste management system as a whole.

On-going and well-resourced communications and awareness-raising activities are sometimes overlooked but are essential to successful waste management systems. The goal of public communications in waste management is not only to inform users of systems and processes, but also to empower people, obtain feedback, and foster a sense of belonging amongst residents that shapes their attitudes and willingness to take ownership of waste management outcomes. Communication programs can also give voice to the needs of different populations, including vulnerable and marginalized groups.

Even in the most basic waste management contexts, municipalities must communicate with citizens to build healthy and safe communities. It is important for residents to understand the linkages between how waste is treated and the impacts on water pollution, air quality, flooding, and health outcomes. Public communications can motivate the public to dispose of waste in bins rather than dumping waste into rivers or openly burning garbage in neighbourhoods.

As cities mature in waste management practices, they may aspire to more ambitious goals on public cleanliness, waste minimization, and recycling. Governments often begin to adopt mandatory source-separation programs for recyclables or food waste. Communication is vital at this stage to achieve acceptance and behaviour change, such as to put food waste in a separate bin or to bring recyclables to a central drop-off point. Since costs may increase as waste management systems grow, governments must communicate with residents to build trust and motivate them to pay for services.

[157] Waste management stakeholders include waste generators, including residents, institutions, commerce and industry; private waste management service providers; PROs; non-governmental organisations; professional associations; community groups; informal waste collectors; administrative units in local, regional and central government; state-owned enterprises as service providers; international agencies as partners and financiers; commercial banks; utility providers involved with waste fee billing and collection, such as water and electricity companies.

Communication is also critical for waste management infrastructure initiatives. New facilities, such as a landfill or a recycling center, are often resisted by residents living close to the proposed site for fear of smells or noise. Especially as cities urbanize and land becomes scarcer, cities will need to communicate and collaborate with residents to design solutions that are acceptable to the public.

Cities also need a consistent communications program as part of basic service provision. Waste officials must communicate with the public regarding disposal guidelines, to announce service changes, and to understand ad-hoc problems with dumpsters or collection routes. Ongoing service monitoring requires inbound communication channels for citizen complaints and questions, which must often be managed by a permanent and responsive helpdesk.

Regardless of the stage of waste management, communications should be integrated into public planning at the earliest stages and be supported with an appropriate budget. Strong communication will not only increase the chances of success of waste management programs, but also strengthen the relationship between the public sector and citizens and build widespread ownership for the waste management outcomes.

6.2.2 Public engagement and financial outcomes

While public engagement is important for social and environmental considerations, it can also lead to a significant positive return on investment for public agencies. Importantly, public engagement can increase revenues or reduce costs such as by improving recovery of sellable materials, reducing clean-up costs, and increasing user fee payments (see **Table 9**). Therefore, effective communications are directly linked to financial outcomes.

Table 9 **Financial impact of waste management campaigns**

A Campaign that....	Results in financial impact through...
Encourages people to recycle more and recycle correctly	▮ Increased volume of material capture leading to higher income from the sale of those materials ▮ Increased material quality and purity that increases the value of materials recovered Savings from avoided disposal costs, where final disposal is costly
Motivates people not to dump waste illegally or drop litter	▮ Reduced municipal operating costs ▮ Reduced healthcare costs through fewer dumpsites and healthier living conditions ▮ Beautification leading to increased tourism and inward investment ▮ Preserves real estate and land market values
Wins buy-in for new waste treatment facilities and infrastructure	▮ Fluid and timely delivery of infrastructure, unhindered by protests and public resistance
Reduces the amount of waste that people generate	▮ Reduced waste management operations and disposal costs ▮ Reduced utilization of land for waste
Builds trust between the public and the private sector	▮ Higher and more consistent user fee payments ▮ Enhanced public participation in planning efforts
Encourages citizen feedback	▮ Early resolution of overflowing containers, litter, and improper dumpsites ▮ Efficient and acceptable service designs that encourage participation and payment

Given that waste management services are often funding-strapped, government officials may hesitate or be constrained in allocating funding to communications activities when investments in infrastructure and services are much more tangible. However, adequate funding is central to successful public communications campaigns and should be seen as an investment as much as an expenditure. Public agencies should include communications as an ongoing line item in public budgets, and funding should be aligned with the magnitude of change outlined in a city's strategy and plans.

Governments should develop realistic expectations around costs in order to develop the right budgets. Communication costs may be highest when launching new services or programs. Costs per unit may also be higher at the smaller scale than at larger scales due to the fixed costs required to develop or deliver content. For example, local authorities in the **United Kingdom** set a communication budget

of US$1-2 per household for ongoing communications[158]. Expenditures per household made by local authorities in **Ireland** were estimated to Euro 5-7 compared to Euro 7 in **Denmark** and around Euro 2.5 in **Italy**[159]. Costs will vary also according to local prices for printing, media, and labour.

If facing limited budget capacity, local authorities should determine what communication activities are essential and which are lower in priority. Further, local governments may consider reducing the frequency of their campaign from, for example, 5 times a week to 3 times a week. Smaller local governments can also consider partnering with other local governments to share costs and achieve economies of scale. External partnerships, such as with NGOS and industry organizations, can also reduce costs, as can the choice of media used to deliver communication content.

6.2.3 Local capacity for public engagement

Since waste management is typically a local public service, citizen engagement begins at the leadership level. However, within local waste management authorities, roles and responsibilities tend to be operational in nature and focus on service delivery; there is often only minimal emphasis on communication processes.

In order to deliver on their role of providing cost efficient public services to residents, it is important for government leaders to be familiar with the importance of citizen engagement and the strategic and tactical aspects of engagement initiatives – in addition to technical knowledge. Without strong capacity for communication at the leadership level, policies and plans may not be supported by the right levels of public engagement, campaigns may be short-term rather than long-term focused, funding may be insufficient, communications may not be initiated until problems already exist, and content may be poorly produced. As a result, sanitation and economic outcomes may be suboptimal.

Local officials should especially recognize that public communications are not only an outbound process as commonly imagined, but also an inbound process. Leaders are more empowered to deliver successful waste management projects when they communicate with the public early and regularly. Early feedback, and even informed debate, gives local authorities a chance to anticipate barriers and modify systems before they are designed, contracted, and implemented. Informing citizens of new initiatives provides them with time to learn about proposed changes and processes, express opinions, and accept new processes before they are implemented. A recent study in the **United Kingdom** found that many citizens felt that infrastructure projects happen 'to' them rather than 'for' them while at the same time expressed interest in being involved in the planning and delivery of services[160]. By promoting transparency, leaders have the opportunity to earn more trust and authorization.

Public leaders could also benefit from measuring public sentiment to assess the readiness for different environmental initiatives. For example, in **Ukraine**, pilot projects and surveys on source separation revealed that the majority of the population had a positive attitude toward waste separation, were motivated by environmental outcomes, and did not require strong financial incentives – signalling a readiness to move toward source separation programs[161].

More generally, feedback is important to the maintenance of waste management systems. In addition to acquiring public feedback for major projects, municipalities should seek resident feedback regularly. Through questionnaires, online feedback portals, and dedicated phone hotlines, governments can stay attuned to the opinions of residents, identify problems with waste infrastructure or services, and channel complaints to offices and operators who can address issues in a timely manner. Combined with regular surveys and standard service monitoring activities, inbound citizen communications provide critical nuance for future city planning efforts. Citizen feedback also allows local authorities to address issues surrounding, dumping, littering, or service shortfalls at a small, affordable scale before they escalate to a large, costly scale. For example, to accommodate citizen input, the City of Johannesburg in **South Africa** provides region-by-region phone numbers to report illegal dumping[162].

One way that local authorities can build internal capacity through public engagement is by designating a core group of employees responsible for public engagement. This group would undertake outbound communications campaigns and also serve as a permanent and active unit that manages citizen complaints and questions. This unit can ensure that communications are consistent across different arms of the government and amongst operators and

[158] Morton and Cross, Zero Waste Scotland Communications Guidance. Waste Resources and Action Program, 2012
[159] Costs for Municipal Waste Management in the EU Final Report to Directorate General Environment, Eunomia, Ecotec Research and Consulting, European Commission, 2001
[160] Independent Survey of Attitudes to Infrastructure in Great Britain, Copper Consultancy, 2015
[161] Stavchuk, I., Communication in Waste Management - Promotion of Waste Separation in Households. IIIEE, Lund University, 2005
[162] City of Johannesburg, City Services: Illegal Dumping, 2021

that communication is conducted strategically rather than in an ad hoc manner. This organization can also coordinate with external stakeholders and partners in the delivery of engagement campaigns. With their experience, these leaders would serve as repositories of institutional knowledge about the local communications context. This would be especially valuable in the process of involving representatives of marginalized and vulnerable groups to ensure that waste services are fair and meet the needs of all citizens, and in integrating the views of both champions and challengers of proposed programs. With their insight on customers, this group can also significantly benefit the planning and budgeting cycles of the waste management authority.

6.2.4 Waste communication plans

Communications should not be ad-hoc. Communications must be properly planned and carefully aligned with the policies they seek to support. A well-designed waste communication plan can help a city effectively design, coordinate and allocate funding. Just as waste management master plans allow local governments to take a comprehensive and long-term view of service provision and engage the right stakeholders, communications plans help governments reach end goals by investing in the right places, avoiding overlapping efforts, and achieving progress in productive steps.

Communication plans can vary by context, but should address the following factors:

Diagnostics. A communication plan for waste management should begin by understanding the status quo. The municipality should assess the context and define the need for public engagement. It requires reliable information to do so. The government may consult reputable partner organizations or directly conduct surveys and interviews. The agency may gauge public opinion on municipal services, assess recycling rates and shortfalls, and evaluate common behaviours. The government should also understand the levels of public knowledge on the waste system and environmental implications. Direct consultations with interest groups may provide more nuance on interest, awareness, pain points in the waste management system, and disconnections in messaging across different agencies.

Strategic Goals. With an understanding of strengths and shortfalls, the public agency can define its goals for communications. The government may set hard goals, such as increasing participation rates and knowledge of new policies and procedures, as well as soft goals, such as public perception and acceptance. All goals should be in alignment with the municipality's solid waste master plan. There should be clear definitions of success and timelines for achievement.

Audience. Communities vary greatly in their demographics, needs, and relationship with waste management services. Thus, communication methods and content will vary by audience. The public agency should identify different audience groups for communication based on their goals. Audiences may include aggregate user groups such as neighbourhoods, schools, condominiums, places of worship, restaurants and hotels[163]. Audiences may also be divided by personal characteristics such as age, lifestyle, culture, knowledge-level, digital literacy, and access to services.

Messaging and Design. With audience groups in mind, the communication planners can begin to consider messaging. Leaders should consider what messages the audience should retain based on the strategic goals. For instance, to educate residents on a new process, it may be effective to use simple and visual flow charts that are easy to read and understand. To announce a new regulation, public agencies may consider a single sentence summary of the modification. Schedules, cost schemes, and recycling rules should be supported by easily searchable databases or information tables. The communication campaign may also be focused on motivation and behaviour change. For these initiatives, simple and catchy phrases are often most effective. For an example from Lagos, **Nigeria** see **Box 17**.

Motivational campaigns may also focus on sharing reasons for engagement, such as keeping the city clean or reviving the tourism industry. Citizens are often uninformed about the waste value chain, such as what happens to waste and recyclables once they are collected[164]. In these cases, simple education on facts may naturally lead to more motivation.

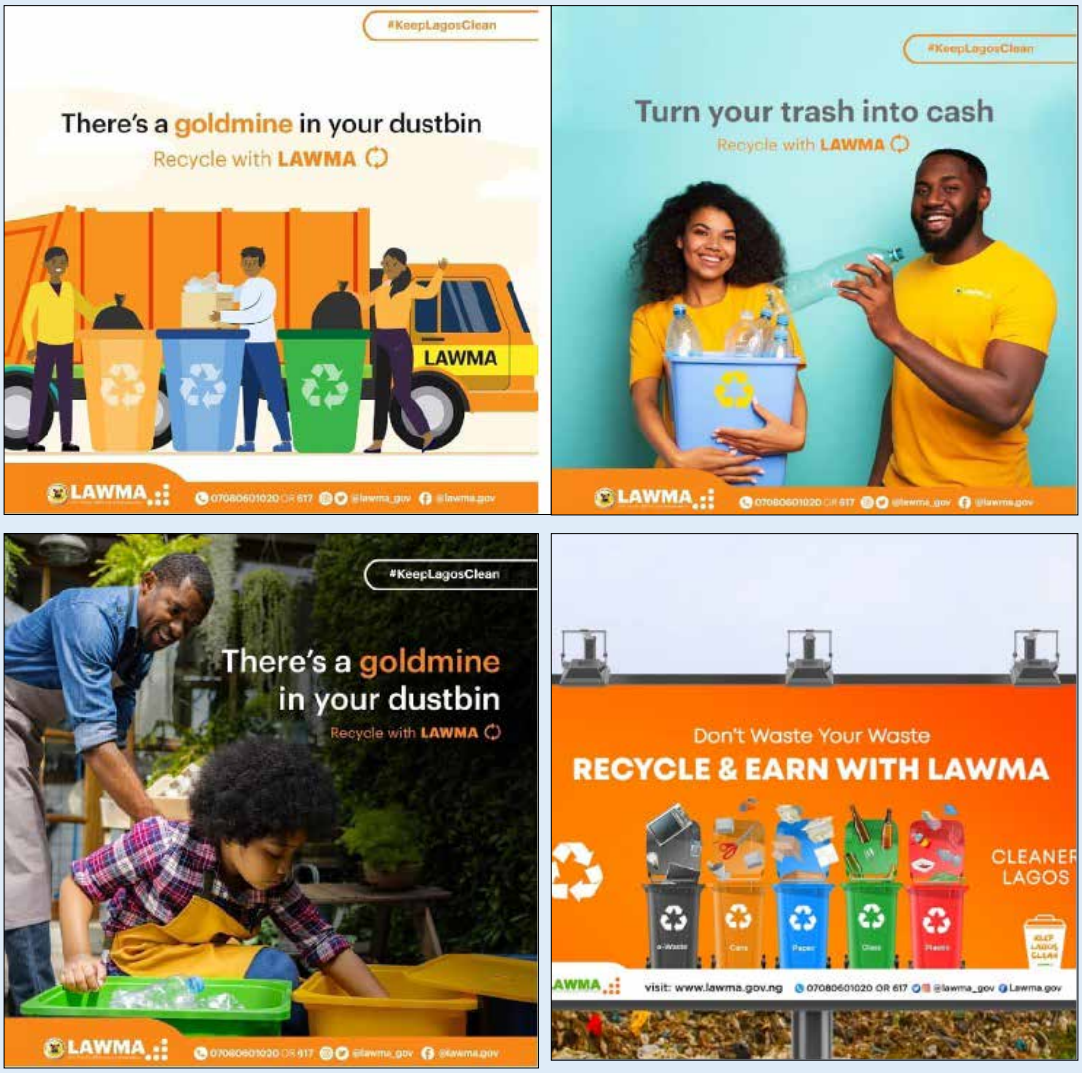
In this phase of content design, the municipality may consider conducting additional public consultations to brainstorm and test messages. It may also be useful to engage partner organizations and design specialists.

[163] Loureiro, Ana, et al. Environmental Communication Strategy. International Solid Waste Association and Climate and Clean Air Coalition, 2015
[164] 'The Role of Public Communication in Decision Making for Waste Management Infrastructure.' Journal of Environmental Management, 2017

Box 17 **Lagos Waste Management Authority recycling campaign**

At the turn of the new year in 2021, the Lagos Waste Management Authority in Nigeria launched a recycling campaign to encourage residents to properly dispose of waste. The campaign utilizes catchy slogans such as 'Turn your Cash into Trash' and 'There's a Goldmine in your Dustbin' to motivate city residents and reinforce financial incentives for recycling[165].

Posters Used in City of Lagos Recycling Campaign



Timeline and Delivery. The delivery of an engagement strategy involves several tactical components. The planning agency must first ensure that the right partnerships and responsibilities are defined. While public agencies may deliver the communications campaign themselves, they may also seek to partner with community organizations, NGOs, and industry members to deliver messages. Some stakeholders may require training on communication tactics.[165]

The timing of waste management initiatives can affect their success, and governments should set a timeline and anticipate contingencies. For new waste initiatives, public engagement should be slated to begin in the design stage. Citizen feedback should be used to influence the design of the program, reveal potential roadblocks, and ensure that influential stakeholders are informed and involved, preventing pushback at later stages. For example, introducing

[165] Turn Your Trash into Cash, Lagos Waste Management Authority, 2021

waste pickup in a hitherto unserved neighbourhood may benefit from the insight and support of existing community-based organizations that collect waste informally.

When it comes to behaviour change, many studies have shown that individuals are more receptive to modifications in habits at key points of transition in their life[166]. Therefore, local governments may plan to connect with citizens during key milestones in their lives, such as New Year's Day, moves to a new home and first days of employment. Similarly, while urban littering can be reduced through a strong anti-littering campaign, the same messages must be revived for major gatherings and holidays when waste generation is expected to rise. If a campaign is promoting the launch of a new recycling service, the messages should appear just before that service starts. Too soon, and citizens might be disengaged at launch. Too late, and citizens will have new containers that they do not utilize properly.

Ultimately, public communication is an ongoing exercise rather than a one-time initiative. Regular communication is required to motivate continued practices that achieve public sector goals. For example, while the implementation of a new door-to-door recycling scheme requires intense, targeted communications when the program is introduced, the encouragement to properly separate recyclables from mixed waste must be reinforced from time to time to prevent declines in participation.

The campaign may be most effective if implemented in phases, with the messaging or audience modified or scaled up in each phase. Governments may consider introducing a pilot scheme first and collect data on its efficacy before finalising the communications strategy.

When planning the implementation of the campaign, public agencies should coordinate with operational stakeholders to ensure that the programs the communications messages are meant to support are in place at the right time. For example, trash bins should be installed and emptied regularly if an anti-littering campaign is to take place. To ensure a smooth delivery, implementation agencies should also consider lead times for procuring media content as well as to gain approvals. Finally, funding must be committed in advance in the public budget and uncertainties in funding must be managed.

Monitoring and Evaluation. In order to measure success and improve future initiatives, the public agency should set targets related to communications and behaviour change and monitor these metrics over time. Impact metrics may include public satisfaction levels, awareness levels, recycling rates, and volume of engagement with public services. These metrics may also be supported by measurements of impression such as number of exposures or number of phone calls in order to assess efficiency.

If a campaign is promoting the launch of a new recycling service, the messages should appear just before that service starts. Too soon, and citizens might be disengaged at launch. Too late, and citizens will have new containers that they do not utilize properly.

If the impact of the campaign is poor, planners will want to consider the reasons for this. For example, the Covid-19 pandemic in 2020 caused many people to change their daily habits. Significant problems may have occurred, such as broken bins, substandard collections or seasonal effects such as poor weather. Metrics can be used to report on a campaign's performance once it has been completed. The effect of a campaign in terms of its reach as well as of its impact on operations and strategic goals is useful in designing future campaigns and in justifying further investment in communications.

6.2.5 Partners in citizen engagement and communications

Despite their responsibility for local service provision, it is not necessary that local authorities and waste management companies should implement communications campaigns directly or alone. Well-connected and internally-resourced external stakeholders with strong credibility in the local community – such as community organizations, NGOs, and corporations – are often well placed to assist in this area. Local authorities may also delegate this function to PROs and cities may partner with local and international organizations to communicate efficiently and cost-effectively.

For example, the City of Sao Paulo, **Brazil**, partnered with the International Solid Waste Management Association and the Climate and Clean Air Coalition to develop an Environmental Communication Strategy for Municipal Solid Waste Management[167]. In **Austria**, a national Producer Responsibility Organization responsible for

[166] Thøgersen, J., The Importance of Timing for Breaking Commuters' Car Driving Habits, Collegium, 2012
[167] Loureiro, A., et al. Environmental Communication Strategy, International Solid Waste Association and Climate and Clean Air Coalition, 2015

collecting packaging waste, EKO-KOM, funds communications and education campaigns that have helped the country increase its recycling rate[168]. In **Portugal**, an independent citizen volunteer-led organization called Re-Food has connected with over 900 institutional food waste generators, such as hotels and restaurants, to divert their food waste through donations at no cost to the government. Governments may also consider partnering with employers, celebrities, and reputable research organizations to deliver and scale-up communications campaigns.

Schools and universities are another vital partner. As institutions for learning and for youth, engagement campaigns within schools can have a strong impact on long term community behaviours and outcomes. Young people often serve as conduits of information to their families, which can amplify the impact of education efforts. For example, following the passage of a Zero Waste Law, the city of Buenos Aires, **Argentina**, designed waste education programs in schools and universities as a core method for educating citizens and promoting behavioural change[169]. Universities also provide opportunities for building curriculums in environmental education that train future professionals working in sectors that relate to sustainability and municipal services.

Cities with active informal sectors or community-based organizations may also consider connecting with these local cooperatives to implement waste campaigns, given the strong connection that exists between community-based collectors and households and their capacity to assess the quality of separated waste (see **Box 18** with an example from **Indonesia**).

Public agencies may also look to engage with the public through influential local institutions, of which the local media can be a specifically important partner. Local government can issue press releases on important system changes and allow media portals to disseminate news in outlets and languages that connect with their readership, typically at no cost to government.

[168] OECD Environmental Performance Reviews: Czech Republic 2018. OECD iLibrary, 2018
[169] Alvarez, M., Filling the Gaps in Buenos Aires' Waste Reduction, University of Pittsburg, 2019

Box 18 **Bali's Rumah Kompos Padangtegal (RKP)**[170]

Rumah Kompos Padangtegal (RKP) is a community-led waste collection program working to build a robust waste collection system in a high plastic-leakage context in Indonesia. RKP waste management workers hail from Indonesia's lowest class caste. Normally marginalized, these workers have gained dignity and respect through their work engaging community members in proper source separation and in minimizing pollution in the town of Ubud, Bali – earning them the title of 'Clean Warriors.'

RKP has been central to achieving a 100 percent source separation rate in Ubud using a combination of systems design, public pressure, and religious inspiration. Initially, RKP supplied every household with three bins -- one for organic waste, one for non-organic waste, and one for compost. During waste pick-up, the RKP collectors would shout the household name, followed by either 'good', 'bad', or 'terrible', depending on how well the waste was separated by the household. Another collector recorded the results in written form. Since residents could hear the classification given to their neighbours and reciprocally knew that their own performance would be heard by the community, many households complied with the system. The households that continued to sort waste poorly were sent a text message using language such as 'You're one of only five families which does not separate its waste. We can't get to 100 percent separation because of you. Please separate your waste.' RKP members also confronted households in-person and reported noncompliant households to the local religious authority, which holds significant power in the community.

This system led to a source separation compliance rate of two-thirds. To influence the behaviour of the final third, RKP appealed to the religious authority, gaining permission to only collect properly sorted household waste, leaving all mixed waste behind. Despite initial public outrage, the support of the religious leader and the modification of service rules led to a 100 percent source separation rate.

RKP demonstrated that the power of a community-based waste collection organisation can be a powerful force in communicating with and influencing residents' behaviour through their deep understanding of community values.

[170] Danielson, J., et al., Elevating Waste Management to Spiritual Levels in Bali, Alliance to End Plastic Waste, 2020

Importantly, communications should be a collaborative endeavour between different levels of the government and other organizations responsible for waste management outcomes. Though different stakeholders have different objectives in waste management, they all benefit from improved citizen engagement with public services. For example, national governments can more easily meet national targets and be more internationally competitive when sanitation standards improve. PROs, charged with capturing waste material from industry activities, increase revenue when citizens bring back materials for recycling. Public agencies at varying levels of government will have different forms of influence on communications. For example, national governments can set broad targets to align regional and local governments, while local governments are equipped to influence local dynamics that trigger behaviour change (see **Table 10**). Cooperation between stakeholders at different levels of government can lead to powerful outcomes, as was the case in the **United Kingdom** through the Waste Resources Action Programme (see **Box 19**).

Trash People by German artist HA Schult, Tel-Aviv, Israel. © Maratr | Dreamstime.com

Table 10 **Opportunities for public engagement at multiple entity levels**[171]

Entity	Objective	Contribution to Public Engagement
National government	▮ Meet national targets ▮ Meet international commitments ▮ Fulfil obligations set by donor organisations ▮ Promote economic and social prosperity	▮ Set strategic targets and local mandates ▮ Raise awareness at a national level ▮ Provide broad-stroke messaging ▮ Create and aggregate resources for local governments ▮ Facilitate knowledge sharing across local agencies ▮ Develop partnerships with NGOs, media, and public-interest groups that support local initiatives
Local authorities	▮ Meet local waste management commitments ▮ Maximize cost-efficiency of waste services ▮ Build public acceptance for new infrastructure facilities ▮ Increase citizen satisfaction ▮ Improve local environmental conditions ▮ Boost the economy and local employment	▮ Design locally-effective strategies and tactics ▮ Conduct high-touch educational sessions in communities ▮ Request and process public feedback ▮ Partner with local implementation organizations ▮ Customize messaging to culturally and economically diverse audiences ▮ Monitor local performance and fine-tune initiatives
Producer Responsibility Organisations	▮ Maximize material capture and minimize contamination ▮ Earn a profit ▮ Fulfil nationally mandated activities	▮ Communicate directly with businesses and industry ▮ Encourage consumer participation in take-back programs ▮ Provide expertise on specific products ▮ Fund communication campaigns using earnings ▮ Tie messaging to operational programs

[171] Adapted from: Improving Recycling through Effective Communications, Waste Resources Action Programme (WRAP), 2009

Box 19 Waste Resources Action Programme in the United Kingdom[172]

In the late 1990s, the United Kingdom government adopted the European Union Landfill Directive which set a number of improved waste management practices into motion. Over the following 10 years, recycling capacity was significantly increased and over 600 local authorities introduced door-to-door recycling services. To support this transition, the government funded the creation of a non-governmental organization, the Waste Resources Action Programme (WRAP). The mission of WRAP was to stimulate demand for recyclable materials by coordinating with businesses, individuals, and communities.

To achieve its mission, WRAP led several communications campaigns including a national Recycling Campaign called 'Recycle Now'[173]. The campaign empowered communications at both the national and local levels. At the national level, WRAP built a recycling brand identity including a logo, color palette, typographical styles and common messages. The brand included a set of icons denoting individual waste streams that could be recycled. WRAP led numerous campaigns on TV, in movie theatres, national newspapers, and magazines. At the local level, WRAP created a central repository that provides free research and graphic templates that are downloadable and adaptable. The centralized content provides a consistent and recognizable approach to waste management communications across the United Kingdom. The campaign is active on social media and offers a searchable database that households can use to determine the right process to recycle common goods.

The campaign has served as the national recycling campaign for England and has been adopted by over 90 percent of local authorities.

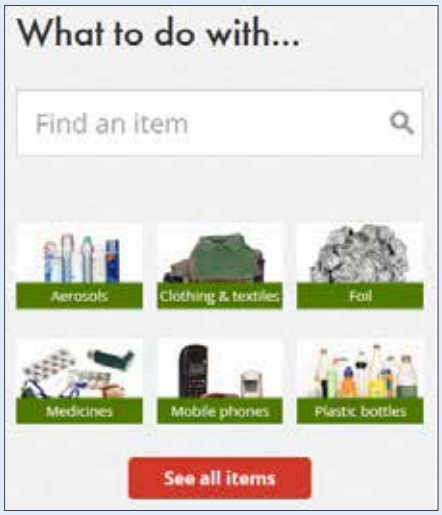
[172] WRAP - Circular Economy & Resource Efficiency Experts. The Waste and Resources Action Programme, WRAP, 2021
[173] RecycleNow, Recycle Now | Where and How to Recycle, The Waste and Resources Action Programme, WRAP, 2021

The national brand identity for recycling applied to all communications regardless of location.

Standardised material icons applied in all communication contexts relating to the separation of materials (for example at recycling centres).

Examples of how regional authorities adapt the national identity for application to local communications.

Examples of communication materials produced for local services consistent with the national design.



WRAP provides a searchable database for recyclable goods.

Box 19 Cont.

The United Kingdom's approach with WRAP was effective in several ways:

- **Both national and local campaigns were visually integrated, improving recognition and awareness**
- **Local campaigns were consistent with the national communication strategy and those of their peers**
- **Local communications grew from the heightened awareness achieved by the national campaign**
- **Local authorities avoided the need to invest large budgets to develop campaigns from the ground up**

The fact that WRAP operated under the auspices of a government mandate was a vital factor in the success of the Recycle Now program. With government-endorsed ownership of communications responsibility, local governments avoided an ebb and flow of initiatives across different entities and the disjointed campaigns that can result from strategic misalignment.

6.2.6 Communications and engagement tools

The choice of media is critical to any communications endeavour. For the waste management sector in particular, communications campaigns tend to require a broad reach, speedy implementation and low cost. It is important to explore different media options in the local context to maximize on impact while minimizing on expenses.

Local authorities have several tools available for communications, each with different costs and benefits. Non-digital options include door-to-door advertising, mail, local newspapers, informational leaflets and calendars, posters, and large signage. Local governments can directly communicate with community members at city hall meetings and local events, such as a recycling information day in a park.

Digital communications tools are now much more commonly used for public communications. At a basic level, TV, radio, and mobile phones are simple and commonly used platforms that can be used to reach a wide audience. For more digitally literate audiences, email, social media and webpages are effective for two-way communications with residents.

Different forms of media are appropriate for different audiences. For example, brochures and radio campaigns may be effective in reaching an older audience while failing to reach a younger one. Posters, signs, and billboards placed in prominent public spaces – such as markets, parks, and community centers – may be useful for reaching the general public and for sharing generic messages.

Communication tools also differ in terms of the scale of the audiences they reach and the types of messages they are effective in sending. For example, TV and radio advertising is effective in sending all members of a region the same message[174]. On the other hand, door-to-door canvassing and mobile phone text messaging may be more suitable for delivering customized information to households and individuals.

Communications tools also differ in their cost structures. Non-digital forms of advertising, such as fliers, mail and newspaper, incur design and printing costs and require lead time for design and production. On the other hand, communications using websites, social media and automatic text messaging may incur little to no costs. Similarly, communicating with newspapers and other press agencies can be a rapid and affordable way to deliver messages to a large audience network.

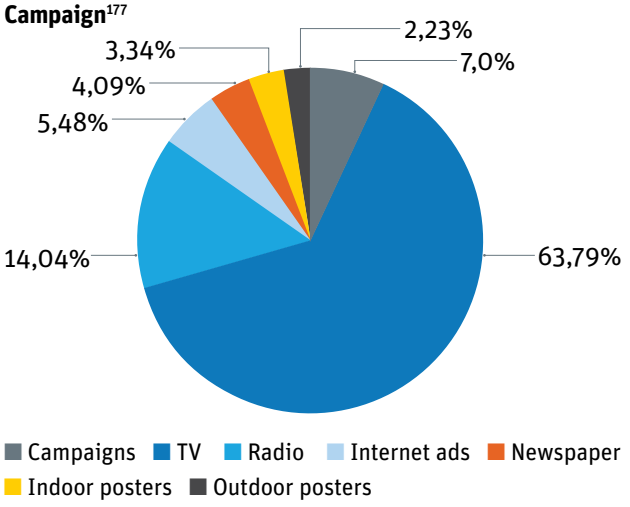
As cities consider media, it is crucial to take accessibility into account. As cities contain diverse communities of different identities, abilities, and cultures, it is important to ensure that communications are made accessible to different audiences. For example, webpages should be translated into all major local languages, as should print media and brochures. Further, utilizing alt-text on images or providing subtitles in videos can enhance access to the blind and the deaf. Communications campaigns should also be sensitive to different literacy rates and utilize audio methods to reach communities that may struggle to interpret information in print. Waste management is ultimately a service that affects all citizens, and that depends on the

[174] Morton, Gareth, and Lucy Cross, Improving Recycling through Effective Communications, Waste Resources and Action Program, 2013

participation of all citizens to maximize its effectiveness – communications should therefore be accessible to all.

For example, the city of São Paulo, **Brazil**, recently launched a public cleanliness campaign. The campaign utilized a playful slogan, 'Eu jogo limpo com São Paulo,' that connected playfulness and fun with a clean city[175]. The city partnered with municipal cleaning companies and designers to use a range of media to reach the public, including TV, radio, internet ads, newspapers, and indoor and outdoor posters (see **Figure 6**). The city of Kitakyushu, **Japan**, on the other hand, offers in-person workshops in neighbourhoods to educate residents on food waste composting processes[176].

Figure 6 **Media mix for City of São Paulo Clean City Campaign[177]**



As digitization has grown across the world, digital media has become an especially useful option for public communications. A major advantage of digital media is its low-cost relative to print and advertising methods of communication. A basic mechanism is for governments to connect with the public through a website. The local agency may set up an official web page that provides information on its services, instructions on recycling, and contact information for government helplines. The website may offer users the ability to provide direct feedback.

Some municipalities have turned to mobile phones as a method of communicating with residents. Mobile phones

Artist Eduardo Kobra staff painting a mural about recycling in São Paulo Brazil. Photo: © Marphotography | Dreamstime.com

are being used for requesting services, providing information to residents and offering reminders on waste collection times and changes. For more digitized communities, mobile apps provide a variety of functionality from searchable databases to videos and information pages. For less technologically advanced communities, SMS text messages offer basic connectivity. Monitoria Participative Maputo (MOPA) is a digital platform implemented in Maputo, **Mozambique**, that connects citizens with solid waste management services operating as the primary communication portal between residents and the local authority[178] (see **Box 20**). Similarly, residents of the Kaduwela municipality of **Sri Lanka** have access to the app 'Clean Up'[179]. Using this App, residents can track the live movements of local garbage trucks, receive notifications for service interruptions, and input their location to look up the days on which different types of garbage are collected (e.g. plastics, paper, food). Users can also rate the service provided and give feedback (see **Figure 7**).

[175] Nova/sb. Eu Jogo Limpo com São Paulo, 2014
[176] Communications from World Bank Study Tour in Kitakyushu, Japan, 2017
[177] Nova/sb. Eu Jogo Limpo Com São Paulo, 2014
[178] MOPA - Participative Monitoring Maputo.' Mopa.Co.Mz, MOPA, 2021
[179] Trancite24. 'Clean Up - KMC - Apps on Google Play.' Google Play, 2021

Box 20 MOPA in Mozambique

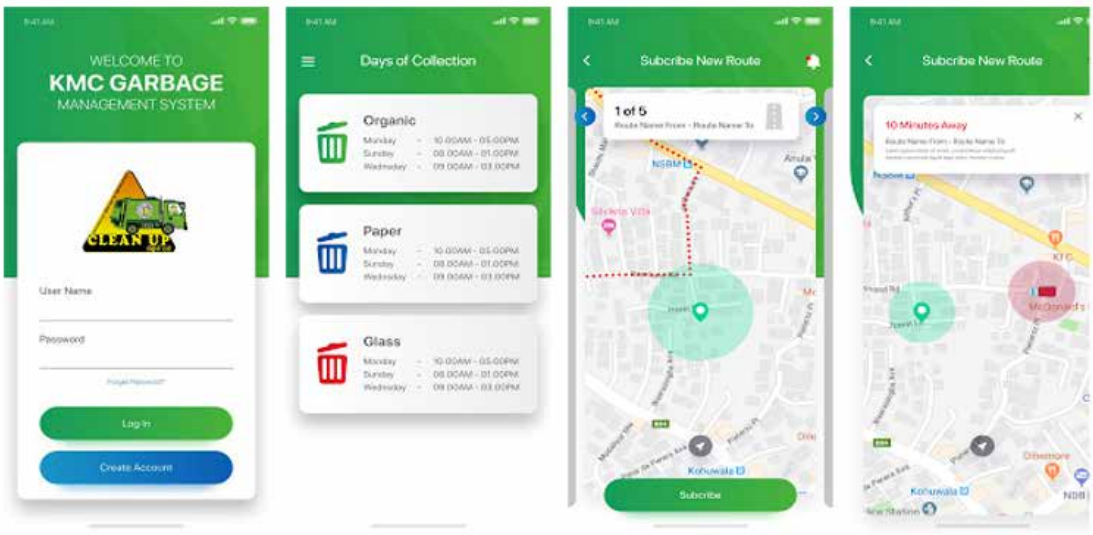
In Maputo, Mozambique, 54 percent of the population of 1.1 million live below the poverty line and 70 percent live in informal settlements[180]. Public services, already limited by funding and capacity, are particularly poor in low income neighbourhoods. As a result, trash often went uncollected in containers, wild dumpsites and ditches and sometimes containers were set on fire. Problems often remained undetected by the municipality and citizens had to write long letters to reach the responsible official in the city government.

Through a World Bank-supported project, the Municipality of Maputo developed Monitoria Participative Maputo (MOPA), a digital platform that connected citizens with municipal waste management services[181]. Citizens use the platform to report sanitation problems to city officials using either SMS or USSD messaging, a mobile app, or by dialling *311#[182]. The platform allows users to track progress with resolving the problems and to receive updates on when the issue is resolved. The platform handles 20 reports per day on average, has led to the removal of over 300 dumpsites across the city and has received over 9,600 submissions to date. Services are available in both Portuguese and English.

Since MOPA targets users in lower income areas, the app has connected marginalized voices directly to the municipality and allowed public services to better serve their needs.

[180] Making All Voices Count. MOPA: How an App Generates Data That Help Clean-up Maputo, 2017
[181] Improving Service Delivery in Maputo's Poor Neighborhoods, World Bank, 2018
[182] MOPA - Participative Monitoring Maputo.' Mopa.Co.Mz, MOPA, 2021

Figure 7 Example screens in clean up app for Kaduwela Municipality[183]



[183] Ibid

Figure 8 Social media post during Christmas holidays in Singapore[186]

Social media is an increasingly powerful mechanism for connecting with local communities. Social media can serve as a large platform for sharing initiatives, especially with an audience that has opted in as members. Social media also serves as a powerful way for waste and recycling agencies to help people understand messages and services through storytelling, especially by using images and short phrases[184]. For example, the National Environment Agency of Singapore maintains an official Instagram account that is used to share photo-based posts on environmental issues, including proper disposal, recycling, and waste reduction[185]. The platform directly reaches an audience of over 16,000 (see **Figure 8**).

6.2.7 Other citizen engagement mechanisms

In addition to traditional communications campaigns, local governments may consider a variety of specific methods to engage with the public on an ongoing basis. These engagement activities differ substantively by type and mechanism and range from consultations to participatory methods of decision-making. While these 'high-touch' strategies may require a high level of preparation and program design by public authorities, they can help governments maintain accountability and trust with the people whom they serve, foster public ownership in the service system and ensure that the waste management system benefits all stakeholders.

There are several methods that local authorities can use to involve residents in the planning and delivery of waste management services. For example, participatory budgeting is a form of public engagement that involves citizens in decisions around the use of public funds. This method was famously used by the government of Porto Alegre, **Brazil**, to shape the usage of the city budget, which was allocated to vastly improve urban waste collection[187]. Participatory budgeting may go hand in hand with participatory planning, which convenes a broad base of stakeholders to diagnose and develop solutions to jointly identified problems. Another simple participatory method of planning is focus group discussion, which involves a small group of citizens to discuss specific goals, procedures, and time frames in order to gauge users' perspectives, values, and concerns. Further, local authorities can practice community contracting and directly contract local organizations, such as community-based organizations or informal waste collectives, to provide waste services.

Local authorities can formalize feedback mechanisms from citizens. For example, a citizen report card is an

[184] Cole, K., Communications: Social Media and the Waste Management Sector: Eight Strategies to Use Social Media More Effectively, Waste Advantage Magazine, 2016

[185] National Environment Agency of Singapore, Official Instagram Account, 2020

[186] Ibid

[187] Bortoleto, Ana Paula, and Keisuke Hanaki, Report: Citizen Participation as a Part of Integrated Solid Waste Management: Porto Alegre Case, 2017; Calisto Friant, Martin, Deliberating for Sustainability: Lessons from the Porto Alegre Experiment with Participatory Budgeting, International Journal of Urban Sustainable Development, 2019

assessment of public services by the users through client feedback surveys, often aimed at building public accountability through media coverage and civil society advocacy. For example, in **Morocco**, a citizen report card was used to evaluate the quality of waste management services provided by private collection companies[188]. Results influenced the renewal of private contracts. Governments may also implement citizen satisfaction surveys periodically to acquire a quantitative assessment of government performance and service delivery, such as regarding the accessibility of waste containers, cleanliness of streets, clarity of instructions, and general satisfaction with waste services. Citizen surveys can be taken at the individual or at the community group level. Public authorities can also conduct public hearings, which are formal community-level meetings where local officials and citizens have the opportunity to exchange information and opinions, to discuss waste management services.

Finally, local authorities can build public accountability structures into waste management systems. One structure of building community oversight into a project is by openly sharing information on waste projects and allowing community members to conduct investigative work and publicly discuss and share results through a social audit. Another option is procurement monitoring, which allows citizens, communities, or civil society organizations to independently monitor procurement activities, such as of private collection companies or infrastructure construction, to ensure funds are used according to rules and contracts. Local authorities can also publicly display information about waste management projects and services in areas such as billboards, offices, schools, project sites, and other points of community interaction with the government.

By communicating with citizens and involving them in the planning, iteration and accountability of waste management systems, local authorities can deliver services that are appealing to users, widely adopted and paid for and sustainable in the long term.

6.3 The informal sector

The informal sector plays a key role in delivering waste management services and achieving resource sustainability in low- and medium-income countries. The informal sector consists of workers that are not formally charged with waste management activities[189]. They are typically unregistered, work in unregulated spaces and do not pay taxes. Informal waste workers are often known as 'waste pickers' who sort recyclables from mixed waste in streets or on dumpsites[190]. These workers may also be itinerant, traveling door-to-door to collect waste from households, often using pushcarts, donkeys, and motorized vehicles. They may additionally provide services such as street cleaning and sweeping. Downstream in the value chain, the informal sector includes aggregators of recyclables who sell to the recycling industry. Informal sector workers mainly profit from revenues from selling recyclables collected, though they sometimes earn income from households for waste removal services[191].

The informal sector employs a significant number of workers around the world. It is estimated that around 15 million people work in informal waste management worldwide, with estimates as high as 56 million[192]. In developing countries, 15-20 percent of waste generated is managed by the informal sector[193]. The informal sector most often exists when formal systems are insufficient to meet urban sanitation needs, especially in rapidly urbanizing contexts[194].

6.3.1 Benefits of the informal sector

Cost Savings

Since the informal sector collects a significant amount of local waste, they typically generate major cost savings for local governments. Informal sector costs are 'privatized' and thus typically do not utilize the municipal budget[195]. Informal workers significantly reduce municipal waste collection and transportation costs[196]. Waste picking activities also divert a significant percentage of waste

[188] US$130 Million to Support Recycling and Improved Solid Waste Management in Morocco, World Bank, 2015; Kaza, S., et al. Five Ways to Increase Citizen Participation in Local Waste Services, World Bank Blogs, 2016
[189] Scheinberg, A, M. Simpson, et al. Economic Aspects of the Informal Sector in Solid Waste Management. GTZ and CWG, 2010
[190] Medina, Martin, Informal Recycling Sector in Developing Countries, GRIDLINES, World Bank, 2008
[191] Wilson, David C., Adebisi O. Araba, et al., Building Recycling Rates through the Informal Sector, Waste Management, 2009
[192] Medina, Martin, Informal Recycling Sector in Developing Countries, GRIDLINES, World Bank, 2008; Linzner, Roland, and Ulrike Lange, Role and Size of Informal Sector in Waste Management – a Review Proceedings of the Institution of Civil Engineers - Waste and Resource, 2013
[193] Gupta, Sanjay, Integrating the Informal Sector for Improved Waste Management, Private Sector and Development, 2012
[194] Farajalla, Nadim, et al., The Role of Informal Systems in Urban Sustainability and Resilience, Issam Fares Institute for Public Policy and International Affair (American University of Beirut), 2017; Medina, Martin, Informal Recycling Sector in Developing Countries, GRIDLINES, World Bank, 2008
[195] Wilson, David C., Adebisi O. Araba, et al., Building Recycling Rates through the Informal Sector. Waste Management, 2009
[196] Scheinberg, A, M. Simpson, et al., Economic Aspects of the Informal Sector in Solid Waste Management, GTZ and CWG, 2010.; Informal workers are estimated to save 571 euros per worker.

from landfills, thereby reducing landfill operational costs and extending the lifespan of landfills. The informal sector is estimated to prevent around 15 percent of waste from going to landfill in Delhi and Bangalore, **India**, and Jakarta, **Indonesia**[197]. While municipalities may incur expenses in certain areas, such as cleaning up dispersed waste from waste picker sorting activities or operational delays at dumpsites, typically the savings exceed costs.

In many jurisdictions, avoided costs associated with informal waste workers reach millions of dollars per year. In Lima, **Peru**, the informal sector is estimated to save the municipality 14 million Euros per year, in Cairo, **Egypt** estimated savings are 12 million Euros, and in Quezon City, **Philippines** savings are 3.4 million Euros annually[198].

Environment

The informal sector is highly efficient in the recovery of recyclables, especially in localities where household and public source separation is not mandated. In low- and middle-income countries where public support for source separation is limited, formal sector-led recycling can lead to low recovery rates and poor quality of collected materials[199]. Recycling rates tend to be higher through the informal sector, which typically reach 20-50 percent[200]. The highest recycling rates are for bottles and glass, followed by plastics. In Beirut, **Lebanon**, informal sector recyclers are estimated to process 500 tonnes of recyclables per day, which exceed recycling rates by the formal sector[201].

A comparison of recycling rates by informal sector and formal sector are summarized in **Table 11**.

The informal sector's high recycling rates provide significant environmental advantages to cities. The informal sector's activities directly assist governments in achieving recycling targets and landfill diversion rates[202]. By increasing the recovery of high-value materials, informal recyclers also help cities reduce the extraction of raw materials, which indirectly leads to energy savings from production and supply chains. Since the informal sector often uses manual collection methods and takes a local focus, informal activities typically reduce the fossil fuel usage that would otherwise occur to collect similar amounts of waste formally. When the informal sector collects organic waste, it also reduces the carbon footprint of waste decomposition at landfills and dumpsites[203].

Table 11 Recycling rate by sector

	Percent of Total Recyclables Collected	
City	**Formal Sector**	**Informal Sector**
Cairo, Egypt	31	69
Cluj, Romania	38	62
Lima, Peru	2	98
Lusaka, Zambia	69	31
Pune, India	0	100
Quezon City, Philippines	10	90

Source: 'Recovering Resources, Creating Opportunities' by Gunsilius et al., 2011

Jobs and employment

The informal waste management sector is a significant employer in developing contexts. It is estimated that the informal waste sector provides livelihoods for 15 million people and around 0.5 percent of urban populations, often offering 10-49x more jobs than formalized waste management systems[204]. Informal workers are estimated to earn between US$1-15 a day, which is sometimes more than the local minimum wage. Though costs are not factored into these wages, the informal sector is typically cost-minimal as it is motivated by profits and often operates manually. Informal waste management labour sustains communities with income since informal sector workers often originate from the same families and neighbourhoods. The sector also provides opportunities to those who may have limited

[197] Sharholy, Mufeed, et al. 'Municipal Solid Waste Management in Indian Cities – A Review.' Waste Management, 2008; Van Woerden, Frank. Personal Communication. February 2021.
[198] Scheinberg, A, DC Wilson, et al. Solid Waste Management in the World's Cities. Earthscan for UN-Habitat, 2010.
[199] Gunsilius, Ellen, Bharati Chaturvedi, et al., The Economics of the Informal Sector in Solid Waste Management, CWG and GIZ, 2011
[200] Wilson, David C., Adebisi O. Araba, et al., Building Recycling Rates through the Informal Sector, Waste Management, 2009
[201] Farajalla, Nadim, et al., The Role of Informal Systems in Urban Sustainability and Resilience, Issam Fares Institute for Public Policy and International Affair (American University of Beirut), 2017
[202] Gupta, Sanjay, Integrating the Informal Sector for Improved Waste Management, Private Sector and Development, 2012
[203] Farajalla, Nadim, et al., The Role of Informal Systems in Urban Sustainability and Resilience, Issam Fares Institute for Public Policy and International Affair (American University of Beiruit), 2017
[204] Medina, Martin, Informal Recycling Sector in Developing Countries, GRIDLINES, World Bank, 2008; Scheinberg, A, DC Wilson, et al. Solid Waste Management in the World's Cities. Earthscan for UN-Habitat, 2010; Linzner, Roland, and Ulrike Lange, Role and Size of Informal Sector in Waste Management – a Review Proceedings of the Institution of Civil Engineers - Waste and Resource, 2013

When waste systems are capacity-constrained or relatively immature, the informal sector can deliver high recycling rates and comprehensive waste services to local communities.

access to more formal forms of employment. Due to its entrepreneurial nature, the informal waste sector tends to be resilient and provide labour to meet cities' needs when political and economic shocks occur[205].

6.3.2 Challenges

Despite the significant benefits of the informal sector, informal waste workers generate several challenges and points of tension for local governments. When waste systems are capacity-constrained or relatively immature, the informal sector can deliver high recycling rates and comprehensive waste services to local communities. However, for contexts in which waste systems are formalized or in the process of being so, the informal sector can collide with both the public and private sectors.

Since formal waste systems partially generate value in part from the sales of recyclable material, informal workers can significantly reduce the volume of materials available for the formal sector to collect, thereby depriving formal collection services of some revenue. Informal workers often work at odd hours, accessing recyclables at formal collection points before formal collection services arrive[206]. For instance, in Madrid, **Spain**, the informal sector removed cardboard from municipal containers and process them outside of the public waste stream[207]. The revenue from cardboard is reported to be significant and has promoted the Madrid municipality to seek assistance from local police. In Ningbo, **China**[208], the municipality rolled out separate collection containers which were emptied by the informal sector prompting the municipality to replace the open-top containers with smart deposit-type containers. Similar experiences have been observed in **Bulgaria** and **Belarus**[209]. As a result, relationships between the informal and formal sectors are often characterized by mistrust and competition[210].

The informal sector can also pose a challenge for local governments that have partnered with private sector companies to deliver waste services. Especially in cases when private sector companies are compensated by the quantity of waste collected or disposed of, or, when they are given ownership over recyclable revenues, informal workers are in direct competition with the formal sector[211]. For example, in the European Union, new EPR laws that shift accountability for material wastes from the consumer to the producer create tensions between manufactures, which are accountable for collecting and reporting a certain quantity of waste, and informal workers, who gather recyclables from waste generators[212]. Private companies perceive waste pickers as 'stealing the waste,' especially when high-value wastes, such as e-wastes, are at stake. Even when collaborative opportunities exist, private recycling companies sometimes hesitate to collaborate with the informal sector over concerns of perceived illegality[213]. Therefore, the design of private sector incentives is a critical piece in shaping the relationship between the public and private sectors and the successful transition to privatization of waste services.

Both public and private entities may perceive street pickers as a nuisance in public spaces[214]. Waste pickers may scatter undesirable content on streets while sorting and extracting valuable materials from mixed waste, and thereby generate additional clean-up costs for local governments, such as was initially the case with Borla Taxis in **Ghana** (see **Box 21)**. Waste pickers' carts and activities

[205] Farajalla, Nadim, et al., The Role of Informal Systems in Urban Sustainability and Resilience, Issam Fares Institute for Public Policy and International Affair (American University of Beirut), 2017
[206] Medina, Martin, Informal Recycling Sector in Developing Countries, GRIDLINES, World Bank, 2008
[207] Harper, Jo, and Will Smale, The Millions Being Made from Cardboard Theft - BBC News, BBC News, 2020
[208] Ningbo Municipal Solid Waste Minimization and Recycling Project, Implementation Completion and Results Report, ICR00005320, World Bank, 2020
[209] Integrated Solid Waste Management Project, Implementation Completion and Results Report, ICR00002756, World Bank, 2018
[210] Scheinberg, Anne, Jelena Nesi-, Rachel Savain, et al., From Collision to Collaboration – Integrating Informal Recyclers and Re-Use Operators in Europe: A Review, Waste Management & Research, 2016
[211] Aparcana, Sandra, Approaches to Formalization of the Informal Waste Sector into Municipal Solid Waste Management Systems in Low- and Middle-Income Countries: Review of Barriers and Success Factors, Waste Management, 2017
[212] Scheinberg, Anne, Jelena Nesi-, Rachel Savain, et al., From Collision to Collaboration – Integrating Informal Recyclers and Re-Use Operators in Europe: A Review, Waste Management & Research, 2016
[213] Aparcana, Sandra, Approaches to Formalization of the Informal Waste Sector into Municipal Solid Waste Management Systems in Low- and Middle-Income Countries: Review of Barriers and Success Factors, Waste Management, 2017
[214] Medina, Martin, Informal Recycling Sector in Developing Countries, GRIDLINES, World Bank, 2008

Box 21 Borla taxis in Ghana

There are many examples of micro-enterprises in the informal sector providing or supplementing formal service delivery, especially in emerging economies. These are termed 'Borla Taxis' in Ghana. Their numbers have grown over the last 20 years, evolving from manual cart-pushers to motorised tricycle operators. Borla Taxis offer households reliable and affordable mixed household waste collections compared to their formal counterparts.

Borla Taxi operators are often seen on the streets of major cities and provide important niche waste management services, particularly in low-income neighbourhoods in urban centres in Ghana. Most of the operators are local residents and therefore have an in-depth understanding of the waste management needs of the communities they serve.

However, their unregulated operations also posed some difficulties. They have been criticised for disposing of the collected waste in heaps at the city's outskirts, rather than paying to discharge it at formal disposal sites. They have also been reported to collect fees directly from users without paying tax on this income.

Consequently, in 2016, some assemblies (AMA) in pursuit of the 'Clean Accra Project' began the formal registration of Borla Taxis which operate within the Metropolis with the aim of identifying, coordinating, monitoring and controlling their activities. The registration was compulsory for all those operating a tricycle or Borla Taxi within Accra. Once registered, the operator is required to display an official sticker on their vehicle, provided free-of-charge. Refusal to register can lead to prosecution, including seizure of the tricycle.

By 2018, the daily contribution of these informal service providers to MSW collection increased from 385 tonnes to 720 tonnes, and their overall contribution to MSW collection improved from 28 percent in 2016 to 47 percent in 2018. At the same time, the contribution of formal service providers dropped in percentage points from 55 percent in 2016 to 48 percent in 2018[215].

[215] Oduro-Appiah, Kwaku, et al., Working with the Informal Service Chain as a Locally Appropriate Strategy for Sustainable Modernization of Municipal Solid Waste Management Systems in Lower-Middle Income Cities: Lessons from Accra, Ghana, Resources, 2019

may also directly interfere with formal collection vehicles, public traffic, or daily landfill operations, such as compacting. These consequences of unorganized waste picking can lead to a negative perception of the entire sector, as is the case in certain municipalities in **Nigeria**[216].

6.3.3 Opportunities for informal sector integration

Given the efficiency of the informal sector in waste management and the social and employment benefits that they generate, both local and national governments have good reason to integrate the informal sector into waste management. Governments can reduce the cost of their waste management sector, accelerate the achievement of their environmental goals, and boost overall human development indicators by strategically mobilizing informal waste workers. Local governments that have minimal source separation can focus on empowering waste pickers to maximize their value while minimizing undesired side effects. Similarly, governments in the process of modernizing their waste management sectors, such as through mandatory source separation, can focus on integrating the informal sector at key points of the value chain as part of the transition. While effective strategies will vary by context, there are several mechanisms that both local and national governments can employ to facilitate a successful integration process.

Policy and planning

Governments with an active informal sector under their purview should take a comprehensive approach to planning and integrate the informal sector in early stages of ambition-setting for the waste management sector. If the activities of the informal sector are not taken into consideration, unintended side effects such as loss of recyclables from publicly-accessible source separation sites and the formation of a parallel recycling system may occur even though the formal waste sector may have grown[217]. Additionally, governments may experience a loss of jobs, social stability, and economic security for many of its residents.

[216] Imam, A., et al., Solid Waste Management in Abuja, Nigeria, Waste Management, 2008
[217] Medina, Martin, Informal Recycling Sector in Developing Countries, GRIDLINES, World Bank, 2008

Recycling bottle caps for charity in Wroclaw, Poland› Photo: Denys Prokofyev | Dreamstime.com

Governments should begin with a cohesive and enforced national waste management strategy or local waste management plan that recognizes the informal sector. The plan should clearly delineate roles and responsibilities between different entities to prevent clashes, facilitate collaboration and align incentives[218]. This plan should forecast waste volumes, carefully plan out collection sites, map the flow of waste through the sectoral chain, and identify the stakeholders involved at each step. The plan should pinpoint existing metrics, such as tonnes of waste generated or collected, and demographic information on the informal sector in order to track the progress of revised policies.

Planning agencies should also contextualize informal sector activities in their local and national legislative frameworks and environmental and social targets. It is critical for new processes to be formalized through policies and regulations to ensure longevity. In the **EU**, **Hungary**, **Slovakia**, and **Poland** formed a trade association so that materials collected by informal recyclers could be purchased and sold across boundaries legally[219]. This was a highly successful partnership that promoted economic activity and enabled governments to track the flow of materials while empowering the informal sector. However, the initiative was not anchored in new laws and collapsed in 2012 when a newly elected political leader withdrew his support – there were no formal policies or regulations to uphold the market structure.

Examples of successful integration of the informal sector in national and local strategies include **Costa Rica**'s National Solid Waste Management Strategy, which prioritizes the integration of the informal sector[220]. Through the National Strategy for the Separation, Collection and Recovery of Waste, the country highlights recycling and reduction of waste through the informal sector as a key tool on its path to carbon neutrality. The strategy has provided guidance for municipal master plans, which include the preparation of buy-back, sorting, and recycling centers in localities. Similarly, **Peru**'s Law N29419 supports the authorization of informal recyclers and tasks local governments in supporting the creation of waste picker associations and including them in municipal collection and recycling programs[221].

Centralized transparency from formal legal processes can also empower stakeholders to collaborate with the informal sector rather than compete. For example, in Pune, **India**, the municipality worked with a local waste pickers union to develop a recycling program to meet national source separation guidelines[222]. The program has employed 3,500 workers, recycles 70,000 tonnes of waste per year, and has led to new national legislation requiring all cities to register and integrate waste pickers into planning processes (see **Box 22**).

Public sector planning should occur through a participatory process and consultations with key stakeholders, including informal waste workers. Conversations with waste workers can reveal their priorities and constraints. For example, whereas some waste pickers embrace formalization or integration for better work conditions, others prioritize individual entrepreneurialism and protecting profitability[223]. Promoting dialogue between private sector and waste pickers also allows key actors to explore collaboration and leverage mutual strengths. Local governments should strive to maintain a regularized, stable and legal relationship and open channels of communication with informal workers as with private operators.

[218] Aparcana, Sandra, Approaches to Formalization of the Informal Waste Sector into Municipal Solid Waste Management Systems in Low- and Middle-Income Countries: Review of Barriers and Success Factors, Waste Management, 2017

[219] Scheinberg, Anne, Jelena Nesi-, Rachel Savain, et al., From Collision to Collaboration – Integrating Informal Recyclers and Re-Use Operators in Europe: A Review, Waste Management & Research, 2016; Keep.eu., Project - Formalisation of Informal Sector Activities in Collection and Transboundary Shipment of Wastes in and to CEE, 2021

[220] Gunsilius, Ellen, Sandra Spies, et al. Recovering Resources, Creating Opportunities. GIZ, 2011; The Economist Intelligence Unit. Progress and Challenges for Inclusive Recycling: An Assessment of 12 Latin American and Caribbean Cities. The Economist Intelligence Unit, 2017

[221] Summary of the Regulatory Framework Pertinent to Waste Pickers (Law No. 29419). WIEGO, 2014

[222] Parsons, Sarah, et al., Urban Transformations: In Pune, India, Waste Pickers Go from Trash to Treasure | World Resources Institute, World Resources Institute, 2019

[223] Dias, Sonia, Waste Pickers and Cities, Environment and Urbanization, no. 2, SAGE Publications, July 2016; Scheinberg, Anne, Jelena Nesi-, Rachel Savain, et al., From Collision to Collaboration – Integrating Informal Recyclers and Re-Use Operators in Europe: A Review, Waste Management & Research, 2016

Box 22 SWACH an informal workers cooperative in Pune, India[224]

SWACH is a worker's co-operative that provides waste collection and recycling services in Pune, India. In a sense its genesis was in 1993 when waste pickers and waste buyers came together to form the Kagad Kach Patra Kashtakari Panchayat (KKPKP), a membership-based trade union.

KKPKP worked to improve the working conditions of the informal sector workers in the sector, many of whom are marginalised members of society (e.g. 80 percent are women from lower castes in India). The movement provided membership identity cards and worked hard to establish member's rights to provide services and be recognised for the key service they provide to the city.

When the Indian government introduced the formal requirement for segregated door-to-door waste collection in 2000, the KKPKP and Pune Municipality piloted SWACH, a wholly owned workers co-operative that worked with the city government to provide waste and recycling services as part of the city's waste management service.

SWACH has helped protect the rights and improve the working conditions of many waste pickers in the city of Pune. It is understood that the KKPKP has over 9,000 members and that SWACH has allowed 3,500 waste pickers to become service providers for door-to-door collection. The organisation has continued to grow its activities over recent years and has also diversified into providing collection services for a range of new material streams, including sanitary waste, electrical and electronic equipment, clothing and composting. SWACH has also established an education programme with schools.

Funding and in-kind support was provided by the Pune Municipal Corporation. Some small philanthropists supported specific activities and provided equipment and covered training costs. However, funding is generated mostly through operational costs. Householders pay a monthly fee of between Rs. 50 to Rs. 70 each month. The workers supplement this fee income with revenues from recyclable sales. SWACH receives support from PMC to provide back-office staff for day to day field coordination, data monitoring and customer service, and the payment of health insurance for workers. This financial model provides a stable income for workers, substantially above typical income of autonomous waste pickers.

SWACH illustrates an effective model for bridging the gap between the informal sector and municipal waste management service needs. The organisation has had considerable success in helping waste pickers in the city transition from scavenging to service provision, improving their working conditions, legitimising their work and securing access to the materials which they depend upon to earn a living.

[224] About SWaCH, SWaCH, 2020

Organization and cooperation

Organization is the key for drawing on the strengths of the informal sector to strengthen the entire waste management sector. Collectives empower individual workers to gain scale, share information, and increase market access. Business and public sector partners that may be hesitant to work with an individual may be willing to collaborate with an association that has credibility. Through collaborative organizations, market linkages can be strengthened between public, private, and informal actors.

One form of association is a community-based organization ('CBO'), which often form organically without public sector involvement in areas where basic municipal services are nascent. CBOs generate income by directly charging users and selling recyclables[225]. Where CBOs do not exist, the public sector may look to supporting the formation of small businesses or cooperatives. Local agencies may then directly partner with these semi-formal associations for waste management services.

Municipalities can maximize the productivity of semi-formal associations by providing contracts, offering access to credit and resources, and supporting growth and training. To begin, local governments can carve out service roles and niches in collection and recycling for waste cooperatives to add value. From there, they can offer waste picker associations contracts for performing desired services while still working in an entrepreneurial capacity. These contracts shift waste picker economics by reducing financial uncertainty and expanding access to markets.

[225] Aparcana, Sandra, Approaches to Formalization of the Informal Waste Sector into Municipal Solid Waste Management Systems in Low- and Middle-Income Countries: Review of Barriers and Success Factors, Waste Management, 2017

In many cities in **Brazil**, such as Diadema, waste picker associations are assigned a coverage area to collect waste. They are paid a fixed fee for collection and a recycling bonus based on amount of waste diverted from landfills (see **Box 23**)[226]. In the **Philippines**, informal waste workers at a materials recovery facility are not paid a salary, but rather receive payment for the value of materials recovered through sorting[227]. Many successful cases are ones in which municipalities have integrated former dumpsite or street waste pickers into higher levels of the waste value chain. This is the case in **Azerbaijan**[228] where pickers at the Baku main dumpsite were offered employment at the newly constructed material recycling facility when the dumpsite was rehabilitated and converted into a sanitary landfill. Many accepted and benefitted from improved health and environmental conditions.

Municipalities can improve the efficiency of semi-formal organizations with equipment and credit. Working as members of an association rather than as individuals, informal workers may offer improved creditworthiness and can collectively utilize capital and equipment to achieve scale. Municipal governments can support waste cooperatives by providing micro-credit opportunities directly or by partnering with local financial institutions. For example, in **Serbia**, the Fair Waste Practices program integrates waste pickers into the service chain and provides micro-credit loans for recyclers through the bank MicroFinS for both individuals and collectives[229]. Municipal governments can also directly provide access to equipment and facilities for sorting, aggregation and storage at transfer stations and landfills. In **Morocco**, the National Solid Waste Management Plan targeted informal waste worker inclusion. Through the Attawfouk Cooperative of waste workers, former landfill waste pickers transitioned to work at a new sorting facility that provided more efficient recycling equipment and safer conditions. Access to transportation equipment such as carts and vehicles can also help cooperatives scale volume and improve the quality of their services.

Training is another powerful mechanism for empowering informal waste worker associations. Governments can strengthen business capacities by providing training on the technical aspects of improving the quality and efficiency of sorting, crushing, and pelleting, the management components of achieving long-term financial sustainability, and essential skills in marketing, health and safety, and legal compliance[230]. They can also provide information on local recycling markets and prices to forecast demand. Local governments may consider partnering with an NGO to provide capacity building.

Governments can also simply provide waste associations formal rights to waste at the source, which provides a guaranteed access to waste. For example, in Bogota, **Colombia**, the Appellate Court removed exclusive right over waste from municipal contractors, which permitted the informal sector to gain access to resources[231]. Similarly, in 2006, the Pune Municipality in **India** granted waste pickers the right to collect waste and a service fee from households.

Waste entrepreneurs can be extraordinarily successful. By simply supporting entrepreneurs, governments can achieve high levels of efficiency and organization. For example, EazyWaste in **Ghana** is a start-up that has developed 7 recycling centers and a mechanism for recyclers to communicate with operators and locate recycling centers via a mobile app[232]. The local government has partnered with the small business to conduct community education campaigns. Similarly, Khaalisisi Management in **Nepal** is a digital platform that allows households to request waste pickup from waste collectors[233]. The platform has helped over 13,000 individuals transition from scavenging to a dignified livelihood. In **Bangladesh**, Waste Concern is an NGO that trains waste pickers in organizing waste recycling to produce compost, which is then sold to large fertilizer companies.

Local governments can put local expertise to good use toward modernizing the waste management sector by simply facilitating market development and entrepreneurship. By viewing informal workers as partners and innovators rather than victims and disadvantaged, informal integration programs have a much higher likelihood of success[234].

[226] Yates, Julian S., and Jutta Gutberlet, Enhancing Livelihoods and the Urban Environment: The Local Political Framework for Integrated Organic Waste Management in Diadema, Brazil, Journal of Development Studies, 2011
[227] Scheinberg, A, M. Simpson, et al. Economic Aspects of the Informal Sector in Solid Waste Management, GTZ and CWG, 2010
[228] ARP II- Integrated Solid Waste Management Project, Implementation Completion and Results Report, ICR00004491, World Bank 2019
[229] Inclusion of Informal Collectors into the Evolving Waste Management System in Serbia, GIZ, 2018
[230] Gunsilius, Ellen, Sandra Spies, et al., Recovering Resources, Creating Opportunities, GIZ, 2011
[231] Gupta, Sanjay, Integrating the Informal Sector for Improved Waste Management, Private Sector and Development, 2012
[232] EazyWaste website, 2020; 2020 World Bank Youth Innovation Contest Submission
[233] Khaalisisi website, 2020; 2020 World Bank Youth Innovation Contest Submission
[234] Scheinberg, Anne, and Justine Anschtz, Slim Pickin's: Supporting Waste Pickers in the Ecological Modernization of Urban Waste Management Systems, International Journal of Technology Management & Sustainable Development, 2006

Box 23 The evolution of Brazil's informal sector

Brazil's waste picker cooperatives are perhaps one of the best illustrations of the importance of the informal sector in municipal services. Waste pickers in Brazil began organising in associations and cooperatives from the late 1990s, receiving help from catholic groups known as Street Pastoral. The rising development of the waste picker movement prompted the need to create a multi-stakeholder forum to discuss strategies for integration of new waste pickers' organisations. In 1997, UNICEF convened several Brazilian institutions to constitute the National Waste and Citizenship Forum (FL&C, in Portuguese). The Forum rapidly gained traction in several states and municipalities with waste picker participation and the National Waste Pickers Movement (MNCR in Portuguese) was created in 1999 [235]. The first FL&C national negotiation with the Brazilian Government was to eradicate child labour from dumpsites and encourage them to attend schooling instead. In the next presidential election the MNCR received the support of most candidates who agreed to the institutionalisation of an inclusive and community-oriented recycling policy. In response to this, the Inter-ministerial Committee for Socio and Economical Inclusion of Waste Pickers (CIISC in Portuguese) was created in 2005.

Several programs were developed and funded by the CIISC to consolidate and organise waste picker cooperatives and to enable them to work in decent conditions[236]. The further recognition and integration of waste pickers has gradually continued through public policies that seek their inclusion. For example, the National Sanitation Policy formally recognised waste pickers as agents of the sanitation system in 2007. In 2010, the National Solid Waste Policy further detailed their role, and allowed municipalities to contract waste picker cooperatives to collect and sort recyclable residential waste without a competitive bidding process, making it easier to contract waste picker cooperatives[237]. In 2012, the Observatory for Inclusive and Solidarity Recycling (ORIS) was formed, based on the need for a dedicated space for reflection and discussion on actions to include waste pickers in formal solid waste management systems[238]. ORIS also provides support to the informal sector in the form of internal and external seminars and technical guidance. As the informal sector co-operatives often lack the technical capacity to meet the demands placed upon them by municipalities and state bodies, ORIS plays a key role in supporting them.

Individual Brazilian states also can set up their own policies to incentivise the creation of waste picker cooperatives. For example, in Minas Gerais, the 'Bolsa Reciclagem' (recycling bonus) was approved in 2011, which established a monetary incentive to be paid by the state government to waste pickers who are members of a cooperative or workers' association. The payment is due at the end of a three- month period of work. It is the first law approved in the country that authorizes the use of public money for ongoing payments for environmental work done by waste pickers. While payment for the service collection/provision comes from municipal budgets, the recycling bonus is a separate revenue stream for cooperatives and comes from the state of Minas Gerais budget as a compensation for protecting the environment. In order to receive the bonus, the cooperative or association must demonstrate that it is in good legal and administrative standing.

The bottom-up pressure from ORIS, the MNCR and the FL&C over the years, coupled with a national government sympathetic to the cause, has allowed significant advances for waste picker cooperatives throughout Brazil and they now form a major, recognised part of waste management activities in the country.

[235] Lima, Nathalia Silva de Souza, and Sandro Donnini Mancini, Integration of Informal Recycling Sector in Brazil and the Case of Sorocaba City, Waste Management & Research, 2017
[236] Rutkowski, Jacqueline E., and Emília W. Rutkowski, Expanding Worldwide Urban Solid Waste Recycling: The Brazilian Social Technology in Waste Pickers Inclusion, Waste Management & Research, 2015
[237] Ibid
[238] Rutkowski, Emilia, et al., Brazilian Observatory for Inclusive and Solidary Recycling, Conference: 5th International Conference on Sustainable Solid Waste Management, 2017

Recognition and social protection

Despite the significant benefits of the informal sector, informal waste workers themselves experience many challenges. From a social perspective, waste pickers are often socially marginalized. Waste pickers are commonly migrants, new residents of cities from rural areas or people groups of low status. For example, in **India**, waste pickers often hail from the lowest caste[239]. In **Europe**, waste pickers are commonly from the Roma ethnic minority[240]. Waste pickers also tend to include vulnerable populations such as women, children, and the elderly – populations that most local governments aim to protect. The welfare of workers in the informal economy can influence the reputation of a city as a whole.

[239] India – Global Alliance of Waste Pickers, Global Alliance of Waste Pickers, WIEGO, 2020
[240] Gunsilius, Ellen, Sandra Spies, et al., Recovering Resources, Creating Opportunities, GIZ, 2011

When it comes to infrastructure and social services, informal waste workers commonly experience a lack of proper housing, water, and sanitation, especially for waste picker families that live close to dumpsites[241]. Educational opportunities tend to be scarce amongst workers and their children. Their employment position can be insecure with unsteady wages and fluctuations in markets and policies. Waste pickers also tend to have minimal access to financial capital and equipment.

Waste pickers suffer severe health risks in their work. Their occupational safety risks include exposure to toxic fumes and bacteria, interactions with sharp objects such as needles and broken glass, and injury from collisions with trucks and even garbage landslides at dumpsites[242]. As a result, waste pickers suffer high rates of musculoskeletal ailments, ophthalmological and respiratory infections, and gastroenterological and skin problems and waste picker lifespans are significantly shorter than those of the greater population[243]. Informal waste workers are rarely covered by formal healthcare systems.

Waste picking work is also socially stigmatized due to its association with waste. As a result, citizens, government workers and private sector agents are often hostile to informal waste workers[244]. A study in **Algeria** and **Jordan** found that waste pickers are often arrested or fined[245]. Waste pickers, especially those at lower levels of the value chain, often suffer from low self-esteem due to social rejection and discrimination. Given their low status, waste pickers generally have a weak bargaining position with politicians and with middlemen in the recyclable materials trade, especially if they work alone[246].

Improving the welfare of informal waste workers can be complex, as local governments are typically resource-limited and it is not unusual for waste pickers to be unregistered residents. However, it would be difficult for local governments to accomplish the social, economic, and environmental goals set forth in their master plans without addressing the conditions of those who work in the informal waste sector.

Local governments can begin by exploring basic social protection schemes and safety nets for informal workers. Social recognition begins with legal identification. The 'Linis Ganda' program in the **Philippines**, for example, aimed to empower waste pickers in several ways, including providing workers with uniforms, carts, and identification cards. Formal identification allowed workers to access more customers and enter private properties to collect waste.

Going beyond personal identification, local governments can legally recognize informal recycling as an official occupation. Occupational recognition can play a role in shifting perceptions, driving more favourable policies and improving the productivity of the sector. In Lusaka, **Zambia**, shifting terminology for waste pickers from 'illegal collectors' to 'unregistered informal collectors' played a significant role in stimulating recognition[247]. In **Brazil**, by introducing informal recyclers as a category in the Brazilian Classification of Occupations, statistics on waste pickers were made available and updated over time[248].

By introducing measures that reduce the social stigma attached to waste pickers and promote their public acceptance, local governments can not only improve their welfare but also improve household engagement in waste management overall. Governments can conduct educational campaigns with citizens on the waste management system, specifically acknowledging the benefits of waste pickers, and build awareness of the importance of

[241] Scheinberg, A, M. Simpson, et al., Economic Aspects of the Informal Sector in Solid Waste Management, GTZ and CWG, 2010; Aparcana, Sandra, Approaches to Formalization of the Informal Waste Sector into Municipal Solid Waste Management Systems in Low- and Middle-Income Countries: Review of Barriers and Success Factors, Waste Management, 2017; Scheinberg, Anne, Jelena Nesi-, Rachel Savain, et al., From Collision to Collaboration – Integrating Informal Recyclers and Re-Use Operators in Europe: A Review, Waste Management & Research, 2016

[242] Aparcana, Sandra, Approaches to Formalization of the Informal Waste Sector into Municipal Solid Waste Management Systems in Low- and Middle-Income Countries: Review of Barriers and Success Factors, Waste Management, 2017; Kaza, Silpa, and Lisa Yao, Landslides, Dumpsites, and Waste Pickers, World Bank Blogs, 2018

[243] Gupta, Sanjay, Integrating the Informal Sector for Improved Waste Management, Private Sector and Development, 2012; Cointreau, Sandra, Occupational and Environmental Health Issues of Solid Waste Management: Special Emphasis on Middle- and Lower-Income Countries, Urban Papers 2, World Bank, 2006; Bernstein, Susan. Toolkit: Assessment and Public Participation in Municipal Solid Waste Management. World Bank, 2004

[244] Scheinberg, A, M. Simpson, et al., Economic Aspects of the Informal Sector in Solid Waste Management, GTZ and CWG, 2010; Aparcana, Sandra, Approaches to Formalization of the Informal Waste Sector into Municipal Solid Waste Management Systems in Low- and Middle-Income Countries: Review of Barriers and Success Factors, Waste Management, 2017

[245] Scheinberg, Anne, Rachel Savain, and Aziz Alaoui, Valuing Informal Integration, Inclusive Recycling in North Africa and the Middle East, GIZ, 2015

[246] Scheinberg, Anne, Jelena Nesi-, Rachel Savain, et al., From Collision to Collaboration – Integrating Informal Recyclers and Re-Use Operators in Europe: A Review, Waste Management & Research, no. 9, SAGE Publications, July 2016

[247] Scheinberg, A, M. Simpson, et al., Economic Aspects of the Informal Sector in Solid Waste Management, GTZ and CWG, 2010

[248] Dias, Sonia, Construindo a Cidadania: Avanços e Limites Do Projeto de Coleta Seletiva de Belo Horizonte Em Parceria Com a Asmare. (Master Thesis), Federal University of Minas Gerais, 2002

recycling and source separation[249]. Public entities can also offer health services, legal protection and alternative employment training. To address the problem of local child labor, education programs and childcare can help waste picker families access more economically productive livelihoods across generations.

Beyond direct interventions, local governments may also look towards the private sector. Social protection can emerge organically through local entrepreneurship, which generates new jobs and tax revenue whilst improving informal workers' welfare. An example of a successful innovation in informality and social protection is Soso Care, a start-up in **Nigeria** that provides health insurance and food stamps to informal recyclers[250]. By depositing their recyclables at a Soso Care recycling site, the recycler's account is credited with grocery credits or health insurance credits for services at a health management organization. Similarly, WasteCoin is a start-up in Indonesia that allows citizens to exchange recyclables for financial credits in a digital wallet[251]. For many waste pickers, WasteCoin is their first bank account. Finally, in **Indonesia**, Banda Aceh Plastic Recycling employs former waste pickers at a recycling plant, providing free elementary school education and vacation time in addition to a steady salary[252].

As societies mature and formalize waste management services, strategic integration of the informal waste economy is critical for a smooth human and environmental transition. By empowering the informal sector and finding 'win-win' outcomes, municipal governments can provide trustworthy and efficient waste management services, nurture the local economy and create jobs, and do their part in making progress toward the international Sustainable Development Goals.

6.4 Gender in Waste Management

6.4.1 Gender impacts in waste management

While waste management is a universal service that effects all citizens, there are distinctions in how men and women experience the waste management sector. Social structures have led men and women to play different roles in the management of waste in the household. Employment opportunities also vary significantly by gender, with women commonly holding lower status roles with lower pay. In the informal sector, men often occupy a position of advantage. By understanding gender differences in the waste management sector, local governments can not only improve public education and the efficacy of services, but also strengthen the livelihoods of vulnerable groups and advance gender equality.

Social connections to the waste sector

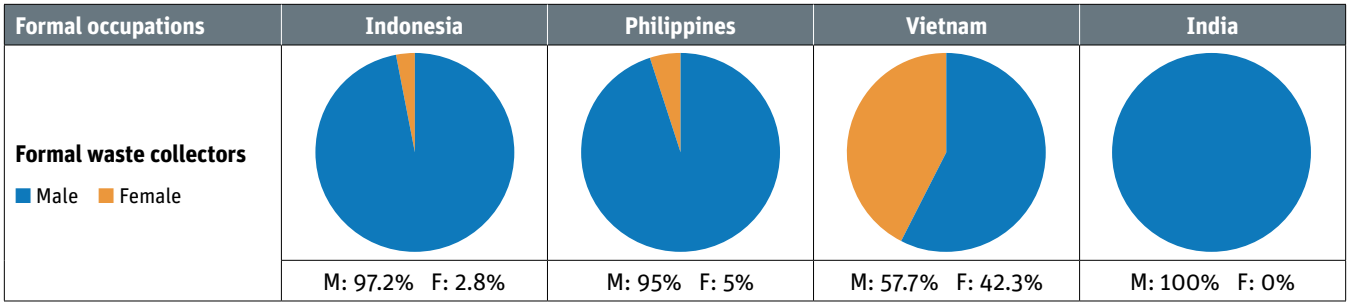
Around the world, it is common for women to manage household waste. Women often assume the role of cleaning, cooking, and domestic maintenance, and are thus often responsible for separating and disposing of waste. A recent study found that women were the sole manager of household waste in 95 percent of households in Bangalore, **India** and 75 percent in cities in **Indonesia**[253].

Based on their differing social roles and responsibilities in society, men and women often have different priorities related to the waste system. For example, a woman may prefer to convert organic waste to sellable compost, while a man may prefer to utilize organic waste to feed a pig farm[254]. Similarly, men and women may be affected differently by the design of municipal waste services. Women may prefer door-to-door waste collection based on their limited mobility and frequent usage, while men may prefer centralized drop-offs with lower costs. In **Ecuador**, men and women were found to have different preferences for how frequently waste should be disposed of, distance to travel, and time spent managing waste, and women considered waste disposal to be more time consuming than did men[255].

In **Europe** too, gendered attitudes and behaviours towards waste avoidance were found, with women more inclined toward taking environmental considerations into account when making consumption and disposal decisions[256]. At the same time, the study found that men and women have different perspectives on approaches to waste management, finding that women cited priorities linked to behavioural change and men citing priorities linked to improved operations. Based on these insights, gendered differences can have strong implications on the optimal

[249] Zurbrügg, Christian, et al., Determinants of Sustainability in Solid Waste Management – The Gianyar Waste Recovery Project in Indonesia, Waste Management, 2012
[250] Soso Care Website, 2020; 2020 World Bank Youth Innovation Contest
[251] 2020 World Bank Youth Innovation Contest
[252] Röchling Stiftung GmbH, The Waste of Others. Röchling Stiftung GmbH and Wider Sense GmbH, 2020
[253] The Role of Gender in Waste Management: Gender Perspectives on Waste in India, Indonesia, the Philippines and Vietnam, Ocean Conservancy, 2019
[254] Scheinberg, A, et al. Gender and Waste, University of Washington, 1999
[255] Grieser, Mona, and Barbara Rawlins, Issues in Urban and Rural Environments: GreenCOM Gender Report, USAID, 1996
[256] Buckingham , Susan, and Michelle Perello, Gender Mainstreaming in Waste Planning, European Union and Urban Waste, 2019

Figure 9 The role of gender in waste management



Source: 'The Role of Gender in Waste Management' by The Ocean Conservancy, 2019

design and targeting of local waste services. By implementing gender-balanced consultations, local governments can better achieve desired outcomes through waste education and interventions that recognize unique needs and preferences.

Gender in formal waste management employment

Gender differences in waste management also extend to formal employment. It is often seen that existing inequalities in social and economic structures shape women's experiences in employment in waste management. Formal waste collection tends to be a male profession, and women are less likely to be found in supervisory or material roles in private waste firms[257],[258]. In the formal waste system, men and women are often found performing different tasks. Men are most commonly found employed in tasks that involve carrying heavier loads and operation of machinery, such as loading and unloading of trucks. Women are more often tasked with conversion of recyclables to products or feedstock and in time-consuming tasks that require fine motor skills and repetition, such as cleaning and sorting. Women are also often tasked with administrative duties and have limited participation at the leadership level.

As a result, studies have found that men find it easier to seek formal employment in waste management. In several countries, almost all formal waste collectors were men (see **Figure 9**), and a survey of waste employers in the Philippines revealed that employers would prefer to employ men over women[259]. Similar trends exist when it comes to ownership. In several countries, businesses at the end of the recycling value chain, including scrap dealers, aggregators, and pre-processors, have registered male owners in almost all cases. It is often harder for women to form a business due to difficulty in accessing capital and equipment, and as a result, women are virtually absent as operators of landfills or owners of material processing companies.

Gender in informal waste management

Gender inequalities are particularly pronounced in the informal sector. Many studies have found that women have majority representation in informal roles. In some Indian cities, for example, around 80 percent of waste pickers are women and amongst a sample of waste picker collectives in **Brazil**, 56 percent were women[260]. Women may be highly represented in waste picking since informality gives them the flexibility to balance income-generation with their non-paid domestic responsibilities. For the same reason, however, women recyclers often work fewer hours than their male counterparts, receive lower pay and have weaker bargaining power[261].

As with the formal sector, men often have positions of advantage in the informal waste sector, having more control over high-value waste material for recycling and taking on more lucrative and safer roles than women[262]. Women often sort through and dispose of residual waste. In **Mexico**, a hierarchy was observed in which a male leader and those close to him accessed high quality materials while women received less valuable waste

[257] Abarca, Lilliana, and Chrisje Van Schoot, No Capacity to Waste: Training Module Gender and Waste. Gender and Water Alliance, 2010
[258] Gender and Waste Nexus: Experiences from Bhutan, Mongolia and Nepal, UNEP-IETC and GRID-Arendal, United Nations Environment Programme (UNEP), 2019
[259] The Role of Gender in Waste Management: Gender Perspectives on Waste in India, Indonesia, the Philippines and Vietnam, Ocean Conservancy, 2019
[260] Dias, Sonia, and Lucia Fernandez, Powerful Synergies: Gender Equality, Economic Development and Environmental Sustainability, United Nations Development Programme, 2012
[261] Kusakabe, Ken, and Veena N. Gender Equality in Urban Environmental Management: A Casebook. Asian Institute of Technology
[262] Gender and Waste Management, International Environmental Technology Centre (IETC), 2016

and sorted through waste from poor neighbourhoods and hospitals.[263] In the **Philippines**, women were found to sort and hand over small batches of recyclables to men to aggregate. Given their proximity to mixed and residual wastes, women waste pickers are often disproportionately exposed to toxic chemicals, infectious organisms and associated health risks.

Female leadership is also uncommon on rubbish dumps. Waste picker women are not only subject to gender biases and power asymmetries[264] but often have less access to skill-building experiences. They are often excluded from decision-making process and do not have the capacity to negotiate materials trade deals with local authorities[265]. Several studies have found that capital is another factor in explaining unequal access to scale. Vehicles and equipment are disproportionately owned by men; women tend to use baskets and sacks for collection while men have more access to carts and tricycles[266]. As waste systems formalize and become legitimized, the new jobs are overwhelmingly taken by men, even ones previously performed by women on an unpaid basis, such as street cleaning[267]. Biases, skills gaps, and access to equipment all must be addressed to increase women's access to job security and advancement in waste management work.

6.4.2 Actions toward gender-inclusive waste management

At a national level, the governments should set standards for gender inclusion nationwide, such as through a gender strategy. These national standards can then inform local plans and tactics to achieve gender goals, and lead to coordinated efforts in disparate localities. The national government may also encourage local authorities themselves adopt gender-sensitive practices, ensuring that the entities tackling gender-sensitive issues in waste management are themselves exemplifying inclusivity[268]. As socially dependent concepts, gender policies and practices can be highly influenced by the people lead their design, each of whom holds unique views on gender based on their own identities. In this way, diversity in planning can beget diversity in outputs.

At a local level, governments and planners can promote gender-inclusive waste management practices in six key areas, described below.

Consultation

Local waste initiatives should integrate both genders' priorities and views into waste planning. By involving both men and women in waste management decision-making, authorities can improve division of responsibilities, ensure fair access to resources, create empowering employment opportunities, and increase social inclusivity in the waste sector. Gender balanced consultations can lead to a broad mix of policies and designs that cater to diverse preferences and needs, thereby effectively achieving environmental and sanitation goals and strong public relations. Consultations in program development can also strengthen ownership and cohesion in the implementation process[269]. For example, a recycling initiative in **Vietnam** that engaged the Women's Union led to a strong uptake in source separation in addition to building visibility for women's leadership (see **Box 24**).

Local authorities can begin by understanding the context of gender relations and social norms, since no two localities are alike and since norms change over time[270]. This information can provide officials with an understanding of sources of vulnerabilities as well as mentalities to navigate. Given that women are often the marginalized gender in the waste sector, officials should specifically consult women (and other marginalized groups) to ensure that their needs and status are deliberately protected[271].

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[263] Gender and Recycling: Tools for Project Design and Implementation, Regional Initiative for Inclusive Recycling, Inter-American Development Bank, 2013

[264] Dias, Sonia, and Lucia Fernandez, Powerful Synergies: Gender Equality, Economic Development and Environmental Sustainability, United Nations Development Programme, 2012

[265] Gender and Recycling: Tools for Project Design and Implementation, Regional Initiative for Inclusive Recycling, Inter-American Development Bank, 2013

[266] The Role of Gender in Waste Management: Gender Perspectives on Waste in India, Indonesia, the Philippines and Vietnam, Ocean Conservancy, 2019; Gender and Recycling: Tools for Project Design and Implementation, Regional Initiative for Inclusive Recycling, Inter-American Development Bank, 2013.
Abarca, Lilliana, and Chrisje Van Schoot, No Capacity to Waste: Training Module Gender and Waste, Gender and Water Alliance, 2010

[267] Gender and Waste Nexus: Experiences from Bhutan, Mongolia and Nepal, UNEP-IETC and GRID-Arendal, United Nations Environment Programme (UNEP), 2019; Kusakabe, Ken, and Veena N., Gender Equality in Urban Environmental Management: A Casebook, Asian Institute of Technology

[268] Buckingham , Susan, and Michelle Perello. Gender Mainstreaming in Waste Planning. European Union and Urban Waste, 2019.

[269] Muchangos, Letícia Dos, and Philip Vaughter, Gender Mainstreaming in Waste Education Programs: A Conceptual Framework, Urban Science, 2019

[270] Recognizing Gender Issues in the Management of Urban Waste; Water, Engineering and Development Centre (WEDC) and Department for International Development (DFID), 1998

[271] Gender and Waste Nexus: Experiences from Bhutan, Mongolia and Nepal, UNEP-IETC and GRID-Arendal. United Nations Environment Programme (UNEP), 2019; Kusakabe, Ken, and Veena N., Gender Equality in Urban Environmental Management: A Casebook, Asian Institute of Technology

Box 24 **Women-led community recycling in Da Nang, Vietnam**[272,273]

Da Nang is Vietnam's 5th largest city with 1.1 million people, located on the coast with a vibrant tourism economy. The city's solid waste management strategy highlights the commitment by the government and local residents to improved waste management and recycling.

Despite its aspirations toward becoming a 'Green City,' Da Nang faces several constraints, including it having a landfill which is operating at full capacity, a 5-7 percent recycling rate and low public awareness of waste management issues. Additionally, the city's tourism economy requires clean cities and beaches.

In 2017, government officials partnered with USAID to implement a community-based recycling project to make progress toward the city's recycling and waste management targets. The project was implemented in two districts, Son Tra and Thanh Khe, and specifically engaged women at the center of the project through a participatory process.

The recycling initiative targeted women based on a recognition that women heavily inform practices on recycling due to local social norms, were open to mobilizing toward action, and held pro-environmental attitudes. Across Vietnam, women play a key role in waste management, accounting for 35-50 percent of formal waste collectors and 65 percent of the informal sector. Additionally, the Women's Union – a national political organization that advocates for women's interests – has a track record of advocacy for environmental causes.

The project engaged the Women's Union to inform the design of the program, including household targeting and incentives design, communications strategy development, and operational planning for the waste separation and recycling model. The Women's Union was later tasked with the implementation of the project including educating households on the environmental impacts of plastic pollution, acquiring household commitments to separate waste, collecting and sorting waste, and finally monitoring and reporting on impact.

Over 20,000 households, in addition to fishing boats, markets, schools, and hotels have been engaged in source separation and recycling. To this day, the system continues to provide income to waste collectors and dealers. City leaders have begun to expand this women-led community engagement model to other parts of the city and other local governments have begun to replicate the pilot as well.

By empowering women to lead in improving critical urban services, the Da Nang project extended the traditional role of women in household waste management to broader positions in the recycling value chain, for the betterment of the community and of the environment.

[272] McTarnaghan, Sara, and James Williams, Behavior Change in Local Systems to Mitigate Ocean Plastic Pollution, USAID, 2020
[273] Building a Green City Through Women-Led Plastic Recycling, USAID, 2020

Employment

Local governments can also seek gender parity in employment in waste management. Both formal and informal employment arrangements account for a significant portion of gender disparity in waste management, providing an opportunity for local action. At a municipal level, governments can start by setting incentives in gender parity in employment areas. For example, an EBRD project in **Georgia** recommended that the landfill management company adopt an equal opportunity policy for men and women[274].

Governments can also use training to strengthen access to jobs. Training programs can help women build the necessary technical and managerial skills to access resources, negotiate with stakeholders, and make informed decisions[275]. Leadership training can also build capacity so that women can take on higher status roles and compensate for the fact that women may not naturally be as exposed to markets and opportunities[276]. Governments can also structure the location of infrastructure and jobs to cater to constraints faced by women. For example, in **Vietnam**, a proposal to relocate waste aggregation sites and junk shops outside of city boundaries is being challenged as it will limit women waste pickers and sellers' who are less mobile[277].

Finally, local governments can empower marginalized gender groups through formalization or semi-formalization in

[274] Mainstreaming Gender in Waste Management Projects, European Bank for Reconstruction and Development, 2011
[275] Gender and Recycling: Tools for Project Design and Implementation, Inter-American Development Bank, Regional Initiative for Inclusive Recycling, 2013
[276] The Role of Gender in Waste Management: Gender Perspectives on Waste in India, Indonesia, the Philippines and Vietnam, Ocean Conservancy, 2019
[277] Ibid

order to improve bargaining power and wages. Workers can benefit both from cooperatives as well as formal agreements for work. Members of Solid Waste Collection and Handling (SWACH), a waste picker collective in **India**, earned 2-3 times more through the cooperative than before the cooperative began[278].

Capital and economic access

Empowerment security goes hand in hand with access to resources. To begin, governments can support gender parity in access to physical resources such as carts, bicycles, and motorized vehicles that are used to process heavy loads and scale up waste management businesses. As women are traditionally less represented in waste business ownership, equality would also be advanced through financial institutions that ensure that men and women have equal access to financial resources. For example, **Peru**'s La Caja Nuestra Gente provides loans to men and women equally[279]. Institutions should also ensure that women have fair access to information, such as recyclable prices and locations of trade, as well as safe work environments that include protective gear and sorting machinery to reduce barriers of access to certain jobs.

However, local institutions must ensure that the introduction of machinery and technology do not reinforce women's socio-economic disadvantages. While access to tools reduces the focus on physical strength in waste management roles, they may also create structures in waste jobs that preferentially advantage men. Especially if automation leads to reduction in jobs, governments must ensure that women have access to new employment opportunities. Automation and downsizing of the labour force can affect women more than men, since men often get preferential access to formal jobs in waste[280].

An example of a government-led initiative that significantly strengthened women's roles in waste management through employment opportunities, capital and elevated status is the waste bank program in **Indonesia** (see **Box 25**).

[278] Allen, Cecilia, et al., On the Road to Zero Waste: Success and Lessons from Around the World. Global Alliance for Incinerator Alternatives, 2012
[279] Gender and Recycling: Tools for Project Design and Implementation, Regional Initiative for Inclusive Recycling, Inter-American Development Bank, 2013
[280] Recognizing Gender Issues in the Management of Urban Waste; Water, Engineering and Development Centre (WEDC) and Department for International Development (DFID), UK Department for International Development, 1998

Box 25 **Waste Banks: An accelerator for women waste entrepreneurs in Indonesia**

In Indonesia, women play a central role in the management of household waste. However, their employment opportunities in the formal waste sector are limited. Due to a perception that they lack the strength and stamina to perform collection tasks, women are rarely employed in the formal sector. Women are active in the informal sector, although they are often left to collect lower-value recyclables than men and often receive less favourable prices from buyers[281].

Waste Banks are a solution in Indonesia that has empowered women in the waste management industry. First introduced by the Ministry of Environment and Forestry in 2008[282], waste banks allow individuals to exchange waste for a financial credit in an account, a mechanism that is similar to a regular bank deposit. Residents can bring organic waste, which is composted, or dry recyclables, which are sorted, aggregated, and ultimately sold to the city government for a standard price[283]. An individual's balance in a waste bank can be exchanged for cash, and sometimes goods and services such as healthcare and phone cards. It is estimated that there are 2,800 waste banks serving 175,000 account holders across Indonesia[284]. It is the role of each city in Indonesia to determine its plan and action to divert waste from landfills, such as through the support of waste banks.

In Indonesia, waste banks are disproportionately owned and used by women. It is estimated that 50 percent of the owners of waste banks are women, and that 75 percent of the customers are women[285]. Some banks, such as the 'Sakinah' Waste Bank in Tugu Village, directly aim to empower women as their central goal[286]. These waste banks provide women with dignified employment and income opportunities. Women commonly use

[281] The Role of Gender in Waste Management: Gender Perspectives on Waste in India, Indonesia, the Philippines and Vietnam, Ocean Conservancy, 2019
[282] Gender-Specific Consumption Patterns, Behavioural Insights, and Circular Economy. 2020 Global Forum on Environment, OECD, 2020
[283] Salim, Randy, Waste Not, Want Not: 'Waste Banks' in Indonesia, World Bank Blogs, 2013; Rosengren, Cole, Trash Banking Takes off around the World, Waste Dive, 2016
[284] Negi, Ashish, This Asian Bank Lets You Borrow Cash and Pay in Trash, BloombergQuint, 2016
[285] The Role of Gender in Waste Management: Gender Perspectives on Waste in India, Indonesia, the Philippines and Vietnam, Ocean Conservancy, 2019
[286] Suparmini, Purnawan, The Role of Waste Bank Partnership in Efforts to Decrease Waste Volume in Urban: A Case Study at a Waste Bank in Kalibaru, Cilodong, Depok City, Earth and Environmental Science, 2018

Box 25 Cont.

revenue from waste banks to acquire basic resources to support their families as well as capital to start small businesses. Waste banks have also allowed many formerly socially marginalized waste pickers to find solidarity and resilience from a previously socially marginalized status[287]. Women's engagement in waste banks also provides a role model effect that normalizes women's income-generation from waste entrepreneurship.

National and local government support of economic structures such as Waste Banks is critical to support the livelihoods of women in the waste sector. Countries across the world – such as Ghana, Colombia, and India – have developed similar systems. One of the core components of a current World Bank project in Indonesia strives to scale up waste banks in addition to other employment opportunities for women in waste management as way to support the government in reaching its national target of 30 percent waste reduction and recycling by 2025[288].

[287] Ni'mah, Nuzuli, and Lena Keller-Bischoff, Java's Waste Banks, Inside Indonesia, 2020

[288] Project Appraisal Document: Improvement of Solid Waste Management to Support Regional and Metropolitan Cities in Indonesia (P157245), World Bank, 2019

Social protection and healthcare

Local institutions should also evaluate whether waste management programs protect women's health and wellbeing. Measures that empower women in societies in which women assume domestic responsibilities may include childcare during work or training hours, education for children, and health care for the family. By strengthening women's ability to fulfil domestic duties, their capacity is expanded to participate in financially compensated work. Health safety nets would particularly benefit women who are disproportionately close to the dirtiest work in informal sectors and thus assume highest health hazards. Further, vocational training provides women with security and optionality outside of the waste sector. Other programs have helped women waste workers become aware of their access to rights and options for legal recourse against violations and have provided a safe means to exercise their rights[289].

Communication

The method of communication that local governments use in the waste industry can either reinforce or challenge gender stereotypes. For examples, governments can use words and visuals to dispel the notion that decisionmakers are men and that women are responsible for domestic waste disposal. Communications can also be used to increase social acceptance of women in waste management leadership and reduce stigma for atypical gender roles, such as by celebrating local female waste collectors in media. Given the role of women in socializing children in environmental education, waste communication programs sometimes target women to increase the impact of such initiatives. However, such targeted measures must guard against increasing the responsibilities of women and adding to their domestic burden[290].

Monitoring and evaluation

Finally, all local and national government policies and programs should be evaluated for their impact on both men and women so that neither group is discriminated against. Indicators should be developed in the program design phase based on local goals. These indicators should highlight accomplishments or shortfalls in access to economic resources, representation, and economic parity. One example of an indicator-driven waste initiative is a German-funded waste management project in Serbia that created an action plan and gender indicators to ensure that municipal waste management practices did not disadvantage women[291].

Waste decisions rarely lack a gender impact, and the waste sector presents a wide opportunity for local governments to build a just society. By taking a gender-sensitive approach to waste management, local institutions can improve working conditions for all, and especially for women, promote equal opportunity and status in industry, and ultimately strengthen the value chain for recyclables while advancing environmental health. Empowerment of all genders in waste management can ultimately serve as a sustainability multiplier for local governments, allowing them to tackle goals on social equality, while making progress toward responsible consumption and building sustainable cities.

[289] The Role of Gender in Waste Management: Gender Perspectives on Waste in India, Indonesia, the Philippines and Vietnam, Ocean Conservancy, 2019

[290] Recognizing Gender Issues in the Management of Urban Waste; Water, Engineering and Development Centre (WEDC) and Department for International Development (DFID), UK Department for International Development, 1998

[291] Buckingham , Susan, and Michelle Perello, Gender Mainstreaming in Waste Planning, European Union and Urban Waste, 2019

Single-use plastic is a major contributor of pollution in the ocean. It is often found in the stomach of whales, sea turtles, and other marine species.Photo: © Jao Cuyos

7

Policy instruments

7.1 Instruments to advance the policy agenda

A careful mix of policy measures and an enabling legislative environment are required to ensure effective action at all levels of government to move waste management practice towards national objectives in a cohesive and coordinated way.

The policy instruments applied need to be appropriate to the context. Experience illustrates that only once the basic foundations of a waste management system are in place is it feasible to fully implement progressive policies to move up the 'waste hierarchy' and towards sustainable resource management. To make this possible, it is important that the market failures associated with poor waste management are corrected. For example, the environmental cost of dumping and burning waste is high but the financial cost to the individual is very low. If uncontrolled dumping and burning of waste is not monitored and enforced with penalties or legal action, there is little incentive for waste generators to dispose of waste in controlled facilities. As such, a well-functioning system of waste collection and controlled disposal needs to be in place as the foundation to allow other policies such as landfill tax, extended producer responsibility, and product bans and levies to be implemented successfully.

Solid waste management contracting and operations can also provide a useful 'first mover' catalyst for improved waste management practices. These actions may include shifting waste collection vehicles to low-carbon engines powered by electricity or hydrogen, using digital technologies like robotics in waste sorting, increasing efficiency with sensor supported containers and collection logistic software, and piloting artificial intelligence solutions, drone based data collection, mobile applications and others.

While the previous chapters considered the main legal, policy, institutional, organizational and financial aspects of municipal waste management, the purpose of the present chapter is to provide international examples of policy instruments for sustainable resource management. The development of waste management systems is a long process and the immediate priorities differ considerably between countries. The policy instruments outlined below are not exhaustive and should be considered as sample tools and be interpreted within the specific context of waste management in the respective country. A different mix of policy instruments will be required in different contexts and at different stages in the development of the waste management system.

For the purposes of this document, the key policy mechanisms available for supporting the transition to sustainable resource management have been considered in terms of the 'waste hierarchy'. First, policy instruments related to waste disposal are presented, followed by measures to support the transition to sustainable resource management and moving towards a circular economy.

Extended Producer Responsibility, which can be viewed as a cross-cutting policy as it relates to several layers of the 'hierarchy' (i.e. waste prevention and minimisation, waste collection and recycling), is discussed separately in Section 7.4.

7.2 Landfill diversion and landfill compliance

Landfill sits at the base of the 'waste hierarchy'. However, measures to establish effective landfill management are an essential prerequisite for moving up the 'hierarchy'. The need to establish clear and effective standards for landfill was discussed above. The key policy mechanisms that can be used to support the transition to sustainable resource management are described below.

Landfill taxes

Landfill tax is used widely to encourage diversion of waste from landfill and enable waste management options further up the 'waste hierarchy' to become more financially viable. At its simplest level, landfill tax increases the cost of landfill disposal and encourages waste generators and carriers to manage waste through recovery or recycling options. It has been used widely in Europe, for example in Austria, Belgium, Denmark, Finland, Germany, Netherlands, Norway, Sweden and the United Kingdom. However, it can also be applied in a more nuanced way to promote landfill compliance. For example, the **Slovak Republic** managed to close its non-compliant landfills and dump sites by imposing a progressive landfill tax on them. As the gradually rising tax made non-compliant options progressively more expensive, investment in new compliant facilities became increasingly more cost effective; the compliant facilities were initially free from tax (see **Box 26**).

Box 26 Slovak landfill strategy development, administrative arrangements and economic instruments[292]

The aim of the strategy was to replace 5,000 uncontrolled dumpsites on the territory of Slovakia with 100 legally compliant regional landfills over a ten-year period. The goal was achieved through a programme of measures that included strategic planning, administrative decision making and the introduction of innovative economic instruments to support the strategic aims.

The Waste Act 1991. The responsibility of the waste generator for final disposal of waste was strictly defined and enforced. In the absence of international donor funding, private waste management companies were to be primarily responsible for the provision of waste disposal facilities, with government providing a supportive institutional and legislative framework. Municipal mayors were given legal responsibility for municipal waste management and authority to enact local waste management legislation and to set and collect waste fees.

The National Landfill Strategy 1993. The landfill development programme had three phases: the development of a national strategy and a legal basis for waste disposal; the closure of unnecessary disposal sites by administrative decision; and the introduction of economic instruments to support the development of legally compliant sanitary landfills. The landfill strategy defined controlled waste disposal as the main disposal practice, the number of landfills appropriate for Slovakia, how and where the landfills should be developed and how those goals should be achieved. It provided a decision-making process for reducing the number of dump sites; national mapping for decision making on dump site closure and sanitary landfill location; and defined the economic instruments.

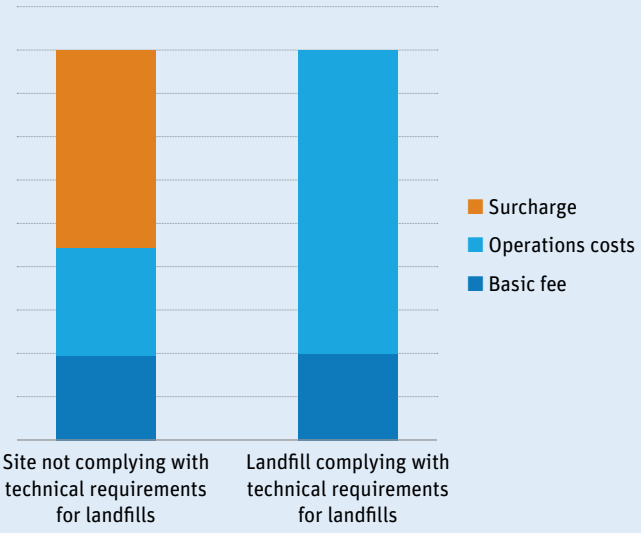
Administrative arrangements. Disposal of MSW in uncontrolled dumps was permitted for 5 years following adoption of the Waste Act. Sites were required to obtain a temporary permit from the regional environmental authority and prepare an upgrade plan, a step which enabled smaller dumps to be closed immediately. Larger dumps were required to upgrade to new landfill standards or face closure within 5 years (later extended to 7). From an initial 5,000 dumpsites, 4,500 were to be closed by administrative decision and 500 were granted temporary licences. Of these, 400 non-compliant landfills were to close by year 2000, leaving a total of 100 compliant regional landfills (including new sites) across the country.

Structure of the Economic Instruments. The aims of the economic instruments were to include an incentive component in waste disposal charges; to ensure that they complemented market development; to ensure that the relationships between all participants in the waste sector were clear; to promote diversion of waste from dump sites to new compliant sanitary landfills; and to generate funds to improve the quality of waste management infrastructure and services. The economic instruments allowed initial operation of all licensed landfills – both compliant and non-compliant – as immediate closure of non-compliant landfills was not feasible.

A-rate and B-rate disposal fees were introduced (in addition to a tariff to cover operational costs).

The basic fee (A-rate) was to encourage a municipality to host a regional sanitary landfill on its territory by guaranteeing a minimum level of revenue to its municipal budget. A fee per tonne of waste disposed of to a licensed landfill was collected by the landfill operator; the final beneficiary was the municipality in which the landfill was located.

The surcharge (B-rate) fee (or tax) was to discourage disposal at licensed landfills that did not meet the technical standards of a new landfill. It balanced the cost of disposal to dumps with the cost of disposal to a compliant sanitary landfill, effectively internalising the environmental impact of non-compliant landfills. A fee per tonne of waste was collected by the landfill operator. The final beneficiary was the State Environment Fund which used the funds to provide grants to



[292] Farkas, J., Transformation of the MSW Sector in Slovakia, (unpublished workshop paper), September 2009

Box 26 Cont.

the waste management sector; under certain conditions the operator could retain B-rate fees to upgrade to the standards of a compliant landfill.

Results. **The dumpsite closure and regional landfill development strategy achieved its objectives and a supportive environment for private sector investment was created, stimulating private sector contracts with municipalities for both collection and the development of EU-compliant landfills. It is an example of integrated planning at the national and local government levels, of establishing close linkages between administrative decision making and effective economic instruments, and of providing a stable and predictable framework for encouraging private sector participation.**

The revenues from the landfill tax usually go to the state budget or centralized environmental fund from where they are allocated to support other waste management projects or broader environmental activities. In some cases, part of the landfill tax is transferred to local authority budgets as an incentive for them to accept regional landfills and large treatment plants on their territory. For example, municipalities in **Bulgaria** are obliged to achieve minimum targets for recycling of municipal waste and for the diversion of bio-waste from landfilling. Municipalities that fail to achieve the targets are obliged to make landfill penalty deductions for each tonne of waste by which the minimum diversion target is missed. The deductions are deposited in a special municipal account and can be drawn upon only after approval by the Ministry of Environment for activities and waste treatment infrastructure that support landfill diversion. Municipalities that achieve the targets are free of the obligation to make deductions.

Landfill bans

Bans on sending certain materials to landfill are key to ensuring that specific materials chosen for their environmental impact or potential value are diverted for recovery. Materials targeted include biodegradable wastes (primarily due to the GHG emissions from landfilling), tyres, food waste and all recyclable materials[293]. The measure are implemented either as a total (absolute) ban or as a limitation or reduction target. For the bans to work, viable treatment options must exist for managing the banned materials. For example, if biowaste is banned from landfill or if the content of the biodegradable fraction is limited, sufficient, economically viable capacity must be available for treating the banned material. An effective enforcement system is also needed to prevent illegal dumping or disposal of banned materials. These measures are typically only feasible once the waste management system has shifted up the 'waste hierarchy' and there is well-established capacity for recycling and treating key materials such as biowaste, plastics, cardboard and paper.

Bans have been introduced in a variety of different ways in a number of countries of the **EU** (e.g. Austria, Belgium, Denmark, France, Germany, the Netherlands, Sweden, Norway), in some parts of the **USA** and in **Canadian** provinces. In contexts where levels of materials recovery are already high, bans tend to focus upon diverting residual waste from landfill. In countries where recycling levels are still developing, the ban has tended to focus on preventing sorted materials from being landfilled and allowing residual municipal waste to continue to be landfilled. For example, in **Germany** municipal waste that is recoverable is banned from landfill which, in effect, means that residual municipal waste must be treated before landfilling. The ban was introduced in 1993 with a total ban coming into effect in 2005. The quantity of waste landfilled dropped from 39 percent in 1997 to just 1 percent by 2005[294], supported by substantial investment in treatment infrastructure, particularly mechanical biological treatment to process residual waste.

Bans on landfilling biowaste have also been introduced in countries where waste composition is characterized by high volumes of organic waste. Many municipalities in the **Philippines** for example have introduced local ordinances which stipulate that biodegradable waste will not be serviced by the public sector. Households are expected to compost biowaste in-situ and only recyclables and residual waste is collected separately by the authorities. A similar approach has been introduced in states in **India**. While this approach reduces the volumes of waste handled by the public sector and eases the burden on the system, it

[293] The provided examples relate to materials where no technical limitations for depositing in landfills exist. The landfilling of certain waste categories like infectious healthcare waste, liquid waste, flammable waste, certain categories of hazardous waste should be completely prohibited.

[294] Landfill bans and restrictions Germany, United Kingdom Department of Food, Environment and Rural Affairs, 2009

may be difficult to implement in congested urban areas where households do not have space to handle their organics. Rural areas on the other hand may benefit significantly from such an approach.

Inventories of landfills and dump sites

Many countries in the initial phase of developing waste management systems are confronted by large numbers of uncontrolled landfills and dump sites. The usual approach for dealing with this problem is to prepare a detailed landfill inventory, followed by environmental risk assessments being undertaken for all identified sites. The inventories allow measures for dump site closure to be concentrated initially on those which pose the highest environmental risks and for subsequent closure and rehabilitation expenditures to be distributed realistically over time. Improving landfill standards is an investment heavy process which experience shows can take a decade or more to implement fully. Some countries have introduced transitional measures for phasing in compliance with national landfill standards over a statutory timeframe. These usually include acceptance of intermediate standards which allow certain non-compliant landfills to operate for a limited period under less strict requirements.

For instance, the State of Kerala in **India** initiated a process to create an inventory of legacy dumps. It started with identification of 37 medium to large sized dumpsites (ranging from 2 to 10 acres of land with height of the waste body between 2-8 meters). The total legacy waste accumulated at the dumpsites is estimated at close to 1 million m3 of waste as indicated by Kerala Pollution Control Board[295]. Eighteen of the identified dumpsites have an area greater than 10,000 sq.m. and have been prioritized for initial technical and safeguard screening assessments that would inform the potential for reclamation and/or utilization as part of future waste infrastructure. The initial technical and safeguard screening assessments included a comprehensive checklist of risks, including locational, environmental, flooding, connectivity, access, etc. Depending on the results of the technical investigations and field surveys, the dumpsites may be permanently closed or used for interim regional disposal facilities and other waste processing facilities to optimize the utilization of available land. The interim regional disposal facilities are seen as an important element of an incremental approach that would enable concurrent improvements in waste management while planning the identification and technical assessments necessary for developing long term regional waste disposal facilities.

When implementing programs and measures for cleaning up dump sites, collection services must be in place to prevent reoccurrence of new polluted areas and to monitor against pop-up of new dumpsites.

Reducing finance available for landfill

Investment finance can be used for landfill development as a policy instrument for reducing reliance on landfill. Countries with only limited engineered landfill capacity and where uncontrolled dumping is widespread require substantial sources of finance to support the development of additional landfill capacity. Often this finance is provided by central government, IFIs or specially developed finance vehicles. Once sufficient landfill capacity has been developed, however, these sources of finance can be constrained as a matter of official policy, by making the lending terms less attractive for example, in order to make it more difficult to develop landfill capacity. Provided that funding sources remain available for non-landfill investments, this can serve to make it more favourable to invest in treatment technologies that divert waste from landfill. For example, **Bosnia and Herzegovina** has been identified as a potential candidate for EU membership and receives financial assistance to increase its compliance with EU environmental (among others) requirements. The county was eligible to receive EU funding to develop landfill capacity in the past but future investments may be constrained in view of EU policies to minimize landfilling to 10 percent or less of municipal waste by 2030[296].

7.3 Recycling and recovery

Recycling and recovery targets

Implementing targets for improving recycling performance can serve as a key driver for promoting improvements in waste management. For this to be effective, penalties are needed for failure to meet the targets. The mere existence of a target does not of itself drive improvements in performance.

Targets for recycling have been used to good effect in Europe and are considered to have played a key role in helping governments raise their recycling rates. In the **EU**,

[295] Location of Dumpsites-Landfills in Kerala, Kerala Pollution Control Board, 2019, available at http://www.indiaenvironmentportal.org.in/files/file/dumpsites-Kerala-report-NGT.pdf

[296] Revised EU targets available at https://ec.europa.eu/environment/waste/target_review.htm

these targets were set by the Waste Framework Directive and applied to the national recycling performance of each EU member state. In this sense, the national targets provided an incentive for member states to increase their recycling performance; member states which failed to meet the targets were penalised - a process which began with a warning from the European Commission and later escalated into fines being imposed on the member state.

These national targets are often delegated to the state or local authority level, acting as incentives for local action on increasing the collection of recycled materials from municipal waste. For example, in 2010 the Welsh government in the **United Kingdom** set statutory recycling targets of 70 percent by 2025 for its 22 local authorities[297]. Ten years from the announcement of the target, Wales' national municipal waste recycling performance was 61 percent, amongst the highest in the world. Targets have played a key role in achieving high recycling rates, together with accompanying measures that include central government financial support of over £1 billion since 2000 for local authorities to invest in collection services for recyclable materials. The government also established a 'Collections Blueprint'[298], setting out the recommended method of waste and recycling collection to ensure the provision of consistent and high-quality services. This included introducing separate weekly food waste collections, reducing the frequency of residual waste collections, and expanding the range of materials collected (e.g. electronics and batteries). These efforts were supported by a national communications campaign.

Using targets in this way is a supply-side measure. It encourages the collection of materials for recycling but does not necessarily create the demand for those materials. Within the EU, the quantity of materials collected for recycling has increased considerably over the past decade. However, development of the capacity needed for reprocessing this material has emerged more slowly, with much of the collected material being exported from the EU to be recycled elsewhere.

Standards for recycled materials

Standards for recycled materials are important for creating confidence in the supply chain. Recycling has the greatest economic and environmental benefit when it focuses on high quality recycled materials. Mixed waste materials and contaminated materials (e.g. containing food waste and oils) are costly to separate and process into high quality recyclate. The options for recycling such materials are limited, and tend to be open-loop or downcycling, which typically results in the realisation of far lower net environmental benefits than when compared to closed-loop recycling (i.e. recycling waste products into products similar to the original). Closed loop recycling, however, entails high standards and strict quality control over material purity to meet manufacturers requirements.

By setting clear standards for the suppliers and manufacturers using recycled materials, voluntary or mandatory standards can help address these issues and help markets operate more effectively. Standards bring consistency, create confidence in supply and help develop markets for recycled materials. Standards are needed to support many of the policies discussed in this chapter.

Typically, standards for recycled materials are established by national technical centres, international standards bodies or trade associations with an interest in supporting a particular recycling sector. For instance, standards for processing biowaste are relatively well-established in a variety of countries. These standards help ensure that compost and fertilisers produced by plants treating biowaste, particularly from municipal sources, are safe to use and of a specified quality. These standards help to provide confidence in the product and create a market for the materials. For example, in **Germany** an industry association, the Bundesgütegemeinschaft Kompost e.V., has established standards for compost and digestate products produced by composting and anaerobic digestion plant (RAL-GZ 251, 245 and 246)[299]. These are recognised by the public authorities and provide confidence in biowaste-derived outputs produced by the composting and anaerobic digestion industries.

The development of standards for recycled materials is an on-going process, as technologies, materials and the associated environmental benefits and impacts from their use and recovery change. For example, the development of standards for plastics is growing rapidly in association with efforts to expand plastics recycling and tackle plastic pollution. Standards recently released on biodegradable plastics include the International Standards Organisation's ISO 22403:2020 related to the biodegradability of plastics[300].

[297] Towards Zero Waste, Welsh Assembly Government, 2010
[298] See https://collectionsblueprint.wales/
[299] See https://www.kompost.de/guetesicherung/guetesicherung-kompost
[300] Plastics — Assessment of the intrinsic biodegradability of materials exposed to marine inocula under mesophilic aerobic laboratory conditions — Test methods and requirements, available at https://www.iso.org/standard/73121.html

Standards also have a role to play further up the value chain, at the design and consumption stage of materials. For example, standards need to be set for manufacturers to provide a consistent basis for claims made in terms of the recyclability of consumer products. The **United Kingdom**'s On-Pack Recycling Label (OPRL) is an example of a simple and consistent United Kingdom-wide recycling label on retail and brand packaging that aims to help consumers make informed purchasing choices and recycle products correctly. By establishing a clear definition of the term 'recyclable' the scheme provides consistency and market confidence[301].

'Design for recycling' requirements

A key barrier to recycling is that products are rarely designed with consideration being given to their end-of-life destiny. Many products and materials are technically or financially difficult to recycle because they cannot be separated, are contaminated with non-recyclable materials or are comingled with materials that also cannot be easily recycled. Working with product designers, manufacturers and brands can help address these issues by encouraging designs that make products easier to recycle. For example, the change of a label on a plastic bottle from PVC (which is potentially harmful if heated and thus makes recycling challenging) to polypropylene (a material that can be easily separated and recycled) is a simple way in which product design can support recycling. The **European PET Bottle Platform**[302] is an example of an industry-led initiative that has played a key role in ensuring that bottles are designed with end-of-life management as an objective. The Platform provides guidance and resources to support product designers in designing products that satisfy this objective.

Taxes related to recycling content

Taxes and levies linked to minimum recycled content policies are a tool for supporting the development of recycling markets. For example, in the **United Kingdom** it is intended that any plastic packaging product containing less than 30 percent by mass of recycled content will be subject to a new plastics tax. Draft legislation is due to be presented for public consultation in early 2021. A similar legislative instrument is to be introduced across the **EU** as part of the Single Use Plastics Directive. These types of instrument provide incentives for the use of recycled content and for driving the demand for recycled plastic material. Under current proposals in the United Kingdom, the tax rate is expected to be set at £200 per tonne for any packaging materials with less than 30 percent recycled content.

7.4 Extended producer responsibility

The use of Extended Producer Responsibility (EPR) schemes to address the management of specific waste streams, such as packaging wastes, end-of-life vehicles, eWaste, batteries and used tires is now widespread and its application has also been considered recently across a broader scope of product categories, including textiles, diapers and tobacco products (see **Figure 10**). In essence, EPR places the responsibility for the management of a product once it becomes waste on to the producer. The OECD provides a definition of EPR[303]:

> *'Extended Producer Responsibility (EPR) is a policy approach under which producers are given a significant responsibility – financial and/or physical – for the treatment or disposal of post-consumer products. Assigning such responsibility could in principle provide incentives to prevent wastes at the source, promote product design for the environment and support the achievement of public recycling and materials management goals.'*

Figure 10 Extended Producer Responsibility as part of Circular Economy

Source: Circular Economy. Roles and Responsibilities for involved stakeholders. An initial proposal from the point of view of a Producer Responsibility Organization. European Recycling Platform

According to the OECD, and as presented below, four broad categories of EPR instruments are at the disposal of policy makers. These typically address specific aspects of waste management, and can be implemented concurrently:

[301] On Pack Recycling Label, available at https://www.oprl.org.uk/
[302] See https://www.epbp.org/
[303] Extended Producer Responsibility: Updated Guidance for Efficient Waste Management, OECD Publishing, 2016

- *Product take-back requirements*. Take-back policies require the producer or retailer to collect the product at the post-consumer stage. This objective can be achieved through recycling and collection targets set for the product or materials and through incentives which encourage consumers to bring used products back to the selling point.[304] In a takeback scheme, consumers return their end-of-life products to their manufacturer, supplier or retailer. The takeback organisation is then responsible for waste management. This connects the value chain to the end-of-life costs associated with the product and, in theory, creates incentives for participants in the value chain to minimise these costs by making changes to business model and product design. The takeback service is usually offered at no charge to the consumer at the point of return, although the cost is typically covered in the product price and is thus paid indirectly in advance. Reducing the costs of waste management can therefore provide a competitive advantage to the manufacturer. As the consumer has access to 'free' waste management it removes the incentive to stockpile or illegally dump the waste to avoid having to pay for waste management.

- *Economic and market-based instruments*. These include measures such as deposit-refund schemes, Advanced Disposal Fees (ADF), material taxes, and upstream combination tax/subsidy (UCTS) schemes that give the producer incentives to comply with EPR[305].

  ADF is paid by the consumer at the point of sale. The disposal fee is usually passed directly to a third party, typically the competent government agency or an authorised body responsible for administering the EPR system and ensuring that there are sufficient funds to cover the costs of managing the end-of-life waste product. The consumer is given access to 'free' waste management, having paid for it in advance. The mechanism is used to overcome economic barriers to waste collection, recycling and reuse, especially where these activities are deemed to be too expensive to be left to market forces.

  The fees paid by the producers for waste management and end-of-life impacts can be modulated in ways that provide incentives for achieving specific outcomes. For example, producers may pay a far lower fee when products are recycled than when disposed of to landfill or by incineration. The fee can, in theory, create incentives for changes across the value chain, including changes to business models and product designs. The fee can also be calculated to cover the costs of the economic damage associated with the waste product, including the clean-up costs of marine litter or estimated damage costs to the environment.

  In the DRS a deposit is paid on purchase of a product and is repaid on return of the end-of-life waste product to an authorised collection point. The deposit is an incentive for the consumer to return the waste product. The system is used to increase recycling rates and to tackle products that are often found littered or illegally dumped. The deposit needs to be transparent and of sufficient value to motivate the consumer to return the item and not treat it as a sunk cost.

Regulations and performance standards such as minimum recycled content. Standards can be mandatory or applied by industries themselves through voluntary programmes.[306]

- *Accompanying information-based instruments*. These policies aim to indirectly support EPR programmes by raising public awareness. Measures can include imposing information requirements on producers such as reporting requirements, labelling of products and components, communicating with consumers about producer responsibility and waste separation, and informing recyclers about the materials used in products.[307]

The mix of policy instruments applied varies between the different countries and product categories. The EPR instruments can also be combined or applied in parallel with other policy tools, such as pay-as-you-throw charging schemes for municipal waste services, landfill taxes, etc.

EPR can contribute to the achievement of a of range waste management objectives: as an incentive for producers to minimise waste and to design products which are simple to dismantle, re-use and recycle; to maximise the collection of specific waste categories; to increase the amount of waste that is re-used and recycled; to support the development of recycling markets, and/or to fund waste management. The EPR also supports the promotion of more sustainable consumption models through education initiatives and awareness raising programmes in support of waste prevention and separation at source. Last but not least, EPR is a tool for shifting responsibility away from

[304] Ibid
[305] Ibid
[306] Ibid
[307] Ibid

local authorities to the producers and consumers of products and in this way to reduce public spending on waste management (see **Box 27** with an example from **Chile**).

In addition, EPR is believed to generate a range of broader economic benefits, including expanded technological and organisational innovation, the diversification of material supply sources contributing to heightened resource security, and improvements in the organisation of supply chains resulting from the emergence of more international operators in the recycling sector[308].

Box 27 **EPR system in Chile**

The Law of Waste Management, Extended Producer Responsibility and Recycling Incentives (Ley N°20.920/2016, Ministry of Environment)[309], generally called 'EPR law', sets the framework for EPR schemes for six priority product categories. Almost a decade after studies were first carried out in 2007, the EPR law began to be implemented as the specific details, associated obligations and goals (collection and recovery rates) were defined and published in ordinances for each priority product:

- **Tires: Ordinance (DS N°8/2019, Ministry of Environment, re-entry 12/2020[310]) in final phase of inspection at Comptroller General of the Republic.**
- **Packaging: Ordinance (DS N°12/2020, Ministry of Environment, 06/2020[311]) in final phase of inspection at Comptroller General of the Republic.**
- **Lubricant oils: The draft ordinance in public consultation until 1/19/2021.[312,313]**
- **Portable batteries: The development process of the regulation will start soon.**
- **Automotive batteries: Process still pending.**
- **Electrical and electronic equipment waste (WEEE): Process still pending.**

According to the EPR law, the producers are responsible for the organisation and financing of waste management of priority products that they market in the country. The obligations established within the EPR framework must be fulfilled through an individual or collective producer responsibility organization (PRO), which will be responsible to the authority. The collective PROs cannot distribute profits among their associates.

***Packaging*[314]. In the case of packaging, there are different goals and obligations for household and industrial packaging waste. On average, the goals announced will allow Chile to move from 5 percent of household packaging recycling to 60 percent in twelve years. The decree establishes specific goals for each material in twelve years: beverage cartons (60 percent), metal (55 percent), paper and cardboard (70 percent), plastics (45 percent) and glass (65 percent). While for industrial waste, the obligations will be metal (70 percent), paper and cardboard (85 percent) and plastics (55 percent).**

The collection goals are identical to the recovery goals and should be met over the same time frame. But kerbside collection must also be expanded from 10 percent to 85 percent of inhabitants covered.

The collective PROs must conduct open tenders to contract waste management services separately for collection, pre-treatment (such as classification) and treatment (such as recycling). Municipalities and informal waste pickers have certain preferences.

Two packaging PROs are currently in the process of being founded: One, initiated by the Food and Beverage Association 'AB Chile', covers both domestic and industrial / commercial packaging waste. The other, focussing solely on industrial / commercial waste, is being constituted by a non-profit union federation of companies and unions from the Chilean industrial sector (SOFOFA), together with Rigk Chile (German PRO) and Valipac (Belgian PRO).

The collective PROs for packaging must lodge monetary guarantees to ensure compliance with the goals and associated obligations which will become effective in the event of non-compliance. The amount of the charge will be equivalent to the cost of managing waste that was not collected or

[308] Ibid
[309] See https://www.leychile.cl/Navegar?idNorma=1090894
[310] See https://rechile.mma.gob.cl/wp-content/uploads/2020/12/DS-08-Reingreso-2020-12-14.pdf
[311] See https://rechile.mma.gob.cl/wp-content/uploads/2020/07/DS-12_08_06_2020-Propuesta-DS-REP-envases.pdf
[312] See https://consultasciudadanas.mma.gob.cl/storage/consultation/Dvn3t4HsAFIDevlC5NWBzAvvTGafFpYtEfAA7Uvn.pdf
[313] See https://rechile.mma.gob.cl/wp-content/uploads/2020/12/28-Resolucion-aprueba-anteproyecto.pdf
[314] See https://rechile.mma.gob.cl/wp-content/uploads/2020/07/DS-12_08_06_2020-Propuesta-DS-REP-envases.pdf

recycled during the year. The amount of the guarantee could however be lowered by a 'default risk factor'.

Packaging waste is used below as an example to demonstrate the main elements of the EPR system.

The major role of the EPR system is to provide an additional financial stream in support of packaging waste recycling and recovery. It can also bring valuable knowledge on how recyclable material collection and sorting can be organized and provide guarantees that the materials collected will be recycled. As EPR schemes are organized by the private sector they are typically more flexible and efficient than state institutions are in organizing waste management services.

The provisions for EPR must be established in the relevant national waste management legislation defining the scope of requirements concerning the different products categories and the waste fractions arising from their consumption; specific separate collection, preparation for re-use, recycling and recovery objectives and targets to be achieved; responsibilities of various stakeholders; reporting requirements; and mechanisms for monitoring and control.

Taking EPR for packaging waste as an example, every producer or importer whose products are sold in packaging on a respective national market is required to contribute to or provide for the achievement of recycling and recovery targets as defined in national legislation. An example of recycling targets for packaging waste in EU countries is provided in **Table 12**.

The producers or the importers of the packaged goods usually have the option of fulfilling their packaging obligations in one of two ways: i) individually, through the establishment of take back or deposit systems for used packaging in the place of sale of the respective products or ii) collectively, by transferring their obligation for achieving the recycling and recovery targets to a collective compliance organization approved by authorities.

Producer Responsibility Organization

The Producer Responsibility Organisation (PRO) is the main entity through which the EPR system is implemented. The PRO is a collective compliance scheme established on behalf of an industry, responsible for organizing separate collection and achieving recycling and recovery targets on behalf of the producers and importers of packed goods on national market.

A PRO can assist in managing obligations, administration and fees for producers. This reduces the burden on individual producers which also benefit from the economies of scale realised by the PRO in working for many producers in a single scheme.

Table 12 Evolution of EU recycling targets for packaging waste

Material	2001[315]	2008[316]	2025[317]	2030[318]
Recycling (all packaging)	25% (max 45%)	55% (max 80%)	65%	70%
Paper and cardboard	15%	60%	75%	85%
Glass	15%	60%	70%	75%
Plastic	15%	22.5%	50%	55%
PET bottles	–	–	77%[319]	90%[320]
Ferrous metals	15%	50%	70%	80%
Aluminum			50%	60%
Wood		15%	25%	30%

[315] Directive 94/62/EC of the European Parliament and of the Council of 20 December 1994 on packaging and packaging waste
[316] Directive 2004/12/EC of the European Parliament and of the Council of 11 February 2004 amending Directive 94/62/EC on packaging and packaging waste
[317] Directive (EU) 2018/852 of the European Parliament and of the Council of 30 May 2018 amending Directive 94/62/EC on packaging and packaging waste
[318] Ibid
[319] Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment. The target refers to separate collection for recycling of the amount of waste single-use plastic products.
[320] Ibid. The target applies as from 2029.

Generally, PROs exercise the following functions[321]:

- Organise, often in combination with the local authorities, the take back of post-consumer products
- Ensure compliance with recovery and recycling targets
- Assist companies in (packaging) waste prevention, eco-design, promotion and communication towards the waste holder, together with the local authorities
- Verify the data and reporting requirements of the participating companies
- Report to the national/entity authorities

In the implementation of these duties the PRO interacts with various stakeholders, such as producers and importers of packed goods, state and local authorities, waste management companies, recycling plants and citizens using the separate waste collection services. The key relations of PRO with the different stakeholders are presented on the following **Figure 11**.

Figure 11 **Producer Responsibility Organization interaction with other stakeholders**

Financial vs organizational responsibility of PRO

The municipal administrations are formally responsible for organizing the separate collection of recyclable waste from the households on their territory.

The decision on the allocation of responsibilities between the PRO and the local authorities for organizing the separate collection and sorting of packaging waste from households is fundamental to the functioning of the entire system. The PRO role can be limited to a solely financial responsibility or, alternatively, the obligated industry can take full responsibility for financing, organizing and implementing the separate collection and sorting services itself.

In case that PRO has the full financial and organizational responsibility the usual practice is the separate waste collection and sorting to be implemented based on contracts with specialized waste management companies. The legislation in many countries requires such service contracts to be concluded based on tender procedure. The PRO should also provide for initial investments in separate collection containers (when relevant) The separate collection containers, if required could be financed and owned by the PRO or by the collection services provider. In limited number of cases the PRO could also invest in the specialized collection and sorting equipment and then rent it to the service operators. In case of full organizational and

[321] Extended Producer Responsibility at a glance, EXPRA, 2016

financial responsibility of the PRO, there are no financial transfers to local authorities and to a large extend the separate waste collection and sorting of packaging waste is functioning like parallel system to waste management services organized by the municipalities.

In covering the full cost the PRO must take the following into account:

- Other non-packaging materials put into the separate collection containers which separate collection and sorting systems organized by the PRO also deal with (mainly printing paper and newspapers).
- A significant quantity of impurities placed in the separate collection containers that cannot be recycled (residual waste).

This leads to additional collection and sorting costs for the PROs.

These additional costs incurred by the PRO are usually balanced by municipalities through not charging fees for the sorting residues delivered on behalf of PRO at the municipal waste landfills or treatment plants, providing support in the enforcement of requirements for separate collection and actively participating in public awareness campaigns implemented on their territory.

In case the PRO has only financial responsibilities the separate collection and sorting are organized directly by the municipalities in a similar way like other waste management services and in this way, responsibilities are shared between the obliged industry and local authorities. In case of shared responsibility model, the PRO is covering partly of fully the costs of municipalities related to management of packaging waste on their territory. The practice is the costs of municipalities to be reimbursed in the form of payments per tonne for the different separately collected and sorted/recycled packaging waste materials. Under shared responsibility model, the municipalities are responsible to cover the costs of non-packaging recyclable materials collected through the separate waste collection system.

Note also that the PRO will apply standard and unified requirements for all municipalities as implementing specific conditions in individual municipalities is difficult. In practice this means that all municipalities will receive from the PRO the same payment per tonne of packaging waste collected, sorted and delivered for recycling. A fairer solution would be to allocate municipalities to groups according to specific characteristics, such as population size and density and type of separate collection system established, and offer uniform cost sharing and payment conditions to all municipalities within a specific group.

Another issue that arises when applying the shared responsibility model is that the costs of implementing a separate collection system, the revenues from the sale of recyclable materials, and the treatment and disposal costs related to specific recyclable commodities change over time. Appropriate price adjustment mechanisms must be agreed between the PRO and the municipalities in order to guarantee the long-term financial and operational viability of the system.

Household vs commercial packaging collection

The scope of collection systems in some countries is limited to household packaging whereas in others it covers all packaging materials. Where collection systems are established for both household and commercial packaging the legislation can require a separation of the cost structures between the two components (e.g., Austria). In Belgium, household and commercial separate collection packaging services are provided by two separate PROs.

Setting specific objectives that are in addition to existing recycling and recovery targets can provide clear indicators of the results expected from the EPR system. As an example, such objectives can include:

- Minimum number of residents provided with separate collection services as a percentage of total number of residents.
- Container type and minimum container volume provided per capita served or maximum number of residents served by one set of separate collection containers
- Collection frequency (or volume collected per capita)
- Obligatory door-to-door separate collection systems implemented in all areas where individual bins are used for collection of residual waste
- All separately collected waste to be delivered to a specialized sorting facility

The objectives should be based on clear technical requirements for the separate collection and sorting systems.

Territorial coverage

An important consideration is whether separate collection should be organized throughout the entire national territory or focused only on those areas where an efficient

collection process can be organized. In countries where the collection of municipal waste generally remains poorly developed, especially in rural areas, it is may be unrealistic (or even counter-productive) to introduce separate collection schemes until basic collection and disposal schemes are fully operational.

The following possibilities should be considered:

- Organizing separate collection systems across the entire national territory
- Setting objectives for the minimum number of residents served as a percentage of total number of residents
- Setting a threshold number of residents living in individual settlements above which separate waste collection services are obligatory

Competitive or monopoly market

Most countries have not granted exclusive or special rights to companies operating collective systems. Their laws do not prohibit the creation of alternative systems.

For example, in some EU countries one cross-material system predominates (e.g., ARA in Austria, Eco Emballages in France, Fost Plus in Belgium, EKOKOM in Czech Republic). In other countries alternative cross-sectoral and cross-material systems exist.

EPR systems that allow more than one PRO depend on a framework of clear rules and procedures that ensure a fair allocation of tasks between market participants. The achievement of recycling and recovery targets cannot be the only criteria on which to base the formation of a PRO.

Two main approaches are possible:

- To set up a special entity (clearing house) charged with allocating and verifying the implementation of tasks allocated to individual operators, including the allocation of financial responsibilities
- To define precisely in the relevant legislation the procedures for allocating responsibilities between PROs. This approach is typically based on dividing the service territory proportionally to the market share of PROs.

Ownership of the PRO

The PRO is usually owned by the obligated companies.

Waste management companies and private entrepreneurs are likely to be interested in setting up PRO schemes, drawing on their market experience, and protecting and extending their range of services.

Given the significant amounts of commercial packaging generated and collected in the retail sector, retail chains may also be interested in setting up their own compliance schemes.

A non-for-profit requirement is another factor that can limit the potential shareholders in a PRO.

In some countries the national legislation prescribes limitations on the possible shareholders, ownership of PRO and the principles of its operations. These could include:

- Obligatory ownership of a PRO by obligated industries
- Physical persons are barred from becoming shareholders
- A single company or group of companies may not own more than a specified percentage of shares in a PRO (usually between 10 percent and 30 percent)
- Requirement for the organisation to be operated on a not-for-profit basis

Equal treatment of clients

The principle for the equal treatment of clients applies as a rule for the operation of a PRO.

Nevertheless, some PROs operating in competitive markets offer special conditions as an inducement to attract new clients or to protect existing ones. Such preferential conditions can be lower prices, discounts on official prices or additional free-of-charge services. The special conditions are usually offered to large companies which make significant financial contributions to the system.

In order to avoid market distortions the enabling legislation must ensure equal treatment of all clients.

Financing of EPR system

The major sources of finance for EPR schemes are licensing fees charged by the PRO to the producers and importers of packed goods and the revenues from the sale of recyclable materials. Revenues generated in this way are used to cover the end-of-life management costs of the respective products or packaging. These relate to separate collection and sorting and, in some cases, treatment and recycling, public awareness raising and administration. The range of costs covered and the fees charged differ considerably between the various systems.

The majority of PROs that deal with packaging waste

charge users fees based on the quantity of material collected. Different systems use different fee structures. For example, they may charge a uniform fee per unit of any category of plastic or they may charge differentiated fees for PET bottles, other plastic containers or foils. Some set different fees for household (sales) packaging and for commercial/industrial (group, transport) packaging. In a similar way, differentiated fees can be applied depending on packaging size or volume. There is some practice also of PROs charge additional or minimum fees per unit of packaging.

Technical aspects

Two main types of system for the separate collection of recyclables and packaging waste can be identified and implemented through various types of collection equipment: door-to-door collection systems and bring systems. The different types of system are associated with the different quality of the recyclable materials collected and with different costs. For example, the types and sizes of the separate waste collection containers used affect the quantity, composition (quality), volume, weight and unit size of waste collected. Although the decision whether to implement drop-off or kerb-side collection schemes depends mainly on the collection rates to be achieved, it is also linked with how the residual waste collection service is organised, the tariff system in place, people's behaviour, scavengers and many other factors.

Establishing minimum technical standards to be met by separate collection and sorting systems for packaging waste allows for better planning of implementation costs by PROs and municipalities. Such technical standards must be agreed between the PROs, municipalities and the competent national authorities. The requirements can be established in the respective packaging waste regulations, introduced as a separate guidance document or included into the plans submitted by PROs with the permit application.

It is wise to conduct a set of pilot projects before launching full scale operations to evaluate different collection methods. The existence of informal sector activities means that the effectiveness of collection systems based on separate collection containers or plastic bags must be initially tested prior to their eventual implementation at national level. The technical solution selected for implementing the separate collection and sorting system has direct influence on the amounts and quality of the materials collected and their related costs.

To the extent possible, the EPR system should build on the existing recyclables collection/sorting activities, including and involving the informal/semi-formal sector.

Permitting, reporting and control

The national legislation should provide for transparency of the EPR system.

PRO operations are usually subject to obtaining a permit or license issued by the competent national authorities based on a plan or programme of operations. The obligated companies and PROs are also obliged to report on the quantities of packaging placed on the market and on the collection, re-use, recycling and recovery of packaging waste. These reports can be subject to independent audit.

EPR systems established for packaging waste have proved their effectiveness in many countries. Nevertheless, there is no 'best' solution that can be directly transferred to other countries. The various EPR systems that are used internationally differ significantly from each other and have gradually evolved and adapted to meet the needs of the individual countries. The design of the EPR system is likely to be unique to the specific conditions of the place where it is to be implemented: the geography, the level of economic development and household incomes, the legal system, the current scope of waste management services, people's attitudes and behaviour patterns, the existence and stage of recyclable material markets, and more.

EPR implemented on voluntary basis

Not all EPR schemes are mandated by legislation. There are several examples of EPR schemes being developed and implemented on a voluntary basis by producers (see **Box 28** with an example from **South Africa**). This is normally a response to public pressure to address waste and pollution issues associated with specific types of product, such as single use packaging. A key risk associated with voluntary schemes is the free-rider problem: producers who do not participate in the scheme but who can unfairly benefit from it by having their products collected for recycling without contributing towards its costs. As such, voluntary schemes tend to be successful only where a small number of major producers control a large share of the market, or where a proactive trade association coordinates its members in support of a scheme.

Box 28 Voluntary EPR in South Africa

South Africa is well known for its successful industry-led EPR schemes, with one of the earliest, Collect-a-Can, being established in 1993[322]. Several different EPR schemes exist for different waste streams, leading to an increase in separate collections and recycling rates for the materials covered. At the core of each scheme is the establishment of a PRO to coordinate the industry's EPR activities and ensure that responsibilities are met.

One example of a PRO is the PET Recycling Company (PETCO). It is a non-profit, joint industry initiative which acts as the vehicle through which the PET industry self-regulates and coordinates its recycling activities. PETCO is funded by levies paid by PET converters (on resin purchased from PET resin manufacturers) and importers as well as bottlers (on bottles purchased from converters); resin producers and brand owners pay annual grants. PETCO is also involved in activities to increase demand for recycled PET, as well as in awareness-raising and educational activities for consumers. Through these efforts, PET recycling grew from 2 percent in 2000 to 62 percent in 2019[323].

Another PRO in South Africa, POLYCO, the Polyolefin Responsibility Organisation, collects voluntary EPR fees from 11 packaging converter members. These fees are used to fund support for collection and recycling companies through grants or interest-free loans. One such programme is Packa-Ching, a scheme for increasing recycling in informal settlements and low-income areas in South Africa.

[322] A Nahman, Extended producer responsibility for packaging waste in South Africa: Current approaches and lessons learned. Resources, Conservation and Recycling, 2010

[323] See https://recyclinginternational.com/business/high-hopes-for-pet-recycling-in-south-africa-despite-lost-capacity/31076/#:~:text=In%202019%2C%20no%20less%20than,non%2Dprofit%20producer%20responsibility%20organisation.

7.4.1 Public fund managed schemes for packaging waste

The EPR schemes for packaging waste are in principle organized by the obliged industries and involve packaging producers and companies that place packed goods on the market. In a limited number of cases, the management of packaging waste is organized by the state based on product taxes for packaging placed on the market that is paid to state budget, such as in **Hungary**[324], a state environmental fund, such as in **Croatia**[325], and specially designated enterprise, such as in **Belarus**.

The revenues from product taxes collected in the respective public fund or enterprise are used to develop the necessary separate collection and sorting infrastructure for packaging waste and finance the implementation costs.

Under the public fund managed scheme, local authorities are responsible for organizing the separate collection of waste from households and the related costs are fully or partly covered by the public fund.

The main arguments for implementing public fund managed scheme are to guarantee sufficient revenues for the system through product taxes imposed on packaging. Public funds also have less complicated institutional arrangements in comparison with other privately organized EPR models (e.g. no need for establishment and licensing of PRO and control of its activities) as well as direct state control over financing and implementation. The public fund managed scheme can help to guarantee the development of public separate collection and sorting infrastructure and speed up investments in the sector.

The mains issues associated with public fund management schemes are that the size of the product taxes for different packaging materials may not cover the actual costs for separate collection, sorting and treatment, governments may spend the collected revenues for purposes other than separate collection and sorting, or revenues may be utilized less efficiently than privately managed EPR schemes. The achievement of recycling and recovery targets is not guaranteed as the government or public fund cannot be held responsible.

[324] According to the legal requirements in Hungary all companies are obliged to pay an environmental tax to the National Tax and Customs Administration. The object of the charge is the packaging material instead of the packaging and therefore packers are directly not subject of the law for domestic products. In case of products produced abroad the importer company is responsible for the charge, i.e. the company who imports, and sells the product in Hungary at the first time, or uses it for their own purposes.

[325] Environmental Protection and Energy Efficiency Fund (EPEEF).

The public fund managed scheme assumes that the majority of the funds will be channelled through local authorities. Considering that local authorities often have difficulties in organizing collection, treatment and disposal of (residual) municipal waste, they may also encounter difficulties in separate waste collection, sorting of recyclables, and navigating the market for recycling waste.

7.5 Reuse and repair

Reuse and repair are options that sit near the top of the 'waste hierarchy' and form a fundamental component of circular economy approaches. Maintaining items in use for as long as possible by enabling their reuse (when discarded by one user) and/or repair to keep them in operation is typically associated with strong, net environment benefits. If items cannot be repaired there can typically be significant environmental benefits from dismantling products to recover useful parts and components.

The reuse and repair of items is well-established in many low and middle-income countries, where buying the products new is commonly not an option for much of the population. Reuse has also become more common in high-income contexts as well, thanks to digital platforms such as eBay and gumtree that help people buy and sell unwanted items.

However, major barriers still exist to increasing levels of reuse and repair. One key issue is that mass produced consumer products are available at relatively low cost and it is often cheaper and easier to buy new rather than to repair or reuse an old product. Fast changing consumer trends also act against reuse and repair, with consumers preferring to purchase modern fashionable items rather than reuse or repair older products, even if they are still functional.

The economic feasibility of repairing an item is also affected by the limited availability of spare parts, or by the conditions imposed by the manufacturer (e.g. warranties are often invalidated if an item is repaired or if an attempt is made to repair it). And in some cases, repair is just not possible. For example, many electronic devices now have an integrated battery that cannot be replaced, meaning that the device must be discarded if the battery fails.

There is a range of measures that can help promote these options as discussed below.

At a central level, government can legislate to promote repair as a viable option and to support the right of consumers to repair their products. For example, as part of the EU's Circular Economy Action Plan, the European Commission announced in March 2020 that manufacturers of phones, tablets and laptops will face legal obligations to make their products easier to repair and reuse, under a new recycling plan for the **EU**. Termed as 'the right to repair', the European commission will extend an eco-design law, which previously set energy efficiency standards, to also cover technical standards so that these goods will be made using changeable and repairable parts. The right to repair goes against the linear growth model of 'take, make, use, discard', embedding repair and reuse at an institutional level to support the transition to a circular economy.

Repair can also be supported by using tax incentives for business models that focus on reuse and repair. In **Sweden**, for example, families can access tax relief of some 25,000 Kr per year (US$3,000) to cover labour charges paid to repair companies for repairs to appliances[326]. VAT reductions on minor repair services are also made including, for example, repairs and alterations to bicycles, shoes and leather goods. In the **US** states of California and New York tax deductions are used for used goods, such as textiles, toys or furniture donated to charitable non-profit organisations.

Local government can play a key role in supporting initiatives that promote reuse and repair by supporting local entrepreneurs and businesses to develop and implement business models focused on reuse and/or repair. This can be achieved by offering small grants, providing free office space or discounted facilities. The concept of resource parks is well-established, particularly in Europe, where local governments offer businesses incentives to establish operations in a dedicated industrial park, thereby encouraging groups of businesses with similar aims to develop in close proximity to one another.

Making reuse and repair a key element of private sector waste management contracts. A requirement to collect items for reuse and repair, either from household collections or via collection points, can be built into private sector waste management contracts. This approach works particularly well for larger items, such as furniture, but can also be applied to household electrical appliances.

Local authorities can also support community level initiatives. Many initiatives focused on repair start at the grass roots level, organised by small businesses or volunteers in communities themselves. For example, 'Repair Cafes' are spaces organised by community groups where visitors can bring in broken items to be repaired free-of-charge by expert

[326] See http://www.rreuse.org/wp-content/uploads/RREUSE-position-on-VAT-2017-Final-website_1.pdf

volunteers with skills in various fields. While the events are often focussed on electronics, some Repair Cafes will accept many other kinds of broken items, such as clothes, furniture, bicycles, appliances, etc. There are over 1,500 Repair Cafes worldwide which offer valuable practical knowledge, not only on how to repair items but also on the value of items, and which also instil a sense of community and confidence. Many have joined the Repair Café International Foundation, which 'aims to maintain and spread repair expertise, and to promote social cohesion by bringing together neighbours from all walks of life and sets of motivations in the form of inspiring and accessible meetings' [327]. Once a Repair Café has been set up by the community, groups rely on the support of local authorities to approve licensing, insurance and permissions needed to organise and operate it.

This type of approach also applies to the concept of material reuse, which is well-developed in several countries. One such centre in Seattle, **United States**, founded in 1997, has become the largest materials centre by volume in North America. Dedicated teams of 'deconstructionists' dismantle and collect materials from the city and its surrounds on a daily-basis, dismantling anything from 'a kitchen, to a full house, to a 100 year-old grain mill'[328] and take them to the 'Rebuilding Center'. Such initiatives offer more than simply affordable reclaimed home improvement materials. They also offer opportunities for reuse education and repair skills workshops, often have twinning arrangements with educational facilities and provide employment opportunities within the community.

Reuse and repair is well-established in low and middle-income countries and typically functions without central or local government support. Repair in low-income countries is often carried out without proper health and safety protocols, monitoring of operational practices or regulatory control. This can lead to significant pollution and health hazards to workers and the environment. For example, repair and recycling of e-waste in such conditions can result in soil and surface water pollution by heavy metals. Similarly, improper recycling of refrigerators can result in electrical cables being burnt and the production of toxic gases and release of GHG emissions.

For example, in **Ghana**, technical assistance was provided by GIZ (German development agency) in 2016 to improve the policy framework for managing e-waste.[329] It included capacity building for informal workers as well as public regulatory institutions, such as the Ghana Environmental Protection Agency. The objective was to set up a system of extended manufacturer's responsibility by creating a recycling fund through fees charged to manufacturers and importers to finance the sustainable recycling of old electrical appliances. The project promoted skill building in recycling and disposal processes. It provided training in recycling and disposal methods to improve environmental practices and occupational safety.

7.6 Waste prevention and minimisation

Waste prevention and minimisation sits at the top of the 'waste hierarchy'. There are numerous instruments that can be used to promote this objective including awareness-rising campaigns; charging for waste collection by weight; green procurement; eco-design standards; voluntary initiatives; environmental accreditation standards; product taxes; national product bans; localized product bans. These are marked briefly below. Each of these policies could be explored in much more depth and detail, which remains outside the scope of this paper.

EPR schemes discussed earlier in this Chapter can also promote waste minimisation if applied progressively. Pay-as-you-throw schemes were discussed in Chapter 4 and awareness-building campaigns are discussed in Chapter 6.

Green public procurement

Green public procurement can drive demand for recycled materials and support the development of a resource recovery industry. The public sector is a substantial purchaser of products and services. This purchasing power can be used to good effect by preferentially procuring products and services that support resource recovery. For example, by purchasing recycled paper or reusable items rather than single use products, such as coffee cups. 'Green procurement' can be undertaken unilaterally by a local authority but has far more weight if done as part of a state or national level 'green procurement' policy.

When it is to be introduced locally, guidance documents and support can be used to encourage green procurement approaches. Individual local authorities may not have the capacity to research this issue and identify specific actions to take. Central and intermediary level government has a role to play here in providing guidance and support to help local authorities and other institutions make purchasing choices that support the principles of sustainable resource management.

[327] See https://repaircafe.org/en/foundation/
[328] See https://www.rebuildingcenter.org/what-we-do
[329] See https://www.giz.de/en/worldwide/63039.html

For example, **Italy**'s National Action Plan on Green Public Procurement (GPP) sets out the rules, requirements and goals for the country's public procurement. 'The objective of the GPP is to integrate environmental considerations into the procurement process of Public Authorities and to guide their choices of goods, services and works that have the lowest environmental impact'[330]. Each public procurement exercise must satisfy a set of 'minimum environmental criteria' defined by the Ministry of the Environment, in coordination with the GPP National Action Plan Management Committee. The criteria consist of both general and specific considerations for various phases of the tendering process (e.g. the scope of the contract, technical specifications, the award criteria) and include metrics such as CO2 savings per Euro spent.

It is possible to go further than this by setting green procurement targets and obligations on local authorities and public institutions. For example, the **United Kingdom** government banned the purchase of all disposal plastic drinking cups in all central government institutions in 2019.

Product eco-design

Eco-design standards can be used to encourage or mandate the manufacture of products that limit waste. Eco-design represents the systematic integration of environmental aspects into product design with the aim of improving the environmental performance of the product throughout its entire life cycle. These instruments are typically developed at the national level but can also be developed by producers in tandem with approaches based on product stewardship.

Eco-design measures relate closely to those for 'design for recycling' described below. However, eco-design is a broader concept in that it seeks to minimise the environmental impacts associated with a product's manufacture, consumption and disposal. As such, eco-design principles promote the minimisation of materials and support approaches that reduce the overall impact of a product throughout its lifecycle. For example, in the **EU** eco-design is seen as part of Europe's sustainable product policy which aims to both lower resource consumption and reduce the impact on the environment. The scope of EU's Eco-design Directive[331] is to be expanded to cover a wide range of products, beyond those related to energy. Priority product groups are likely to include electronics, information and communication technologies, textiles, furniture and high impact intermediary products such as steel, cement and chemicals.

Voluntary initiatives

Voluntary initiatives by the private sector can serve as an effective means of reducing waste and promoting recycling. Although achieving this type of involvement typically depends on dialogue and collaboration between the private sector and national government, it can also play a key role in supporting local government efforts to promote recycling. It is far easier for local authority to encourage behaviour change if major brands, retailers and manufacturers are promoting the same message and providing consumers with purchasing opportunities to reduce their waste and recycle more. Establishing a dialogue between national government and industry is an essential component of this approach.

Most notably, the New Plastics Economy Global Commitment[332], led by the Ellen MacArthur Foundation in collaboration with UN Environment, unites businesses, governments, and other organisations behind a common vision and overarching targets to address plastic waste and pollution at its source. Two hundred and fifty organizations, responsible for 20 percent of plastic packaging produced around the world, have committed to reducing waste and pollution as part of the commitment. Signatories must commit to a set of ambitious targets, many of which are focused on the current manufacture of the businesses' products. For example, for packaging producers, retailers, and food service companies, these businesses must:

- Take action to eliminate problematic or unnecessary plastic packaging by 2025
- Take action to move from single-use towards reuse models where relevant by 2025
- 100 percent of plastic packaging to be reusable, recyclable, or compostable by 2025
- Set an ambitious 2025 recycled content target across all plastic packaging used

To demonstrate progress toward these targets, signatories must disclose yearly action plans based on a common commitment framework using common definitions, as well as provide an update on their progress in a yearly report.

Several governments have also endorsed the Global Commitment's common vision and have committed to introduce ambitious policies and (where relevant) measurable targets by 2025. Some countries (France, United Kingdom, Chile, Netherlands, South Africa and Portugal)

[330] See https://www.minambiente.it/sites/default/files/archivio/allegati/GPP/all.to_21_PAN_GPP_definitivo_EN.pdf
[331] See https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0125
[332] See https://www.ellenmacarthurfoundation.org/our-work/activities/new-plastics-economy/global-commitment

have established national 'Plastics Pacts' that bring together key stakeholders at the national level to implement solutions towards a circular economy for plastics.

Environmental accreditation standards

Environmental accreditation standards encourage industries to minimise waste both in their production processes and in the services and products they provide. Key environmental management systems include the Eco-Management and Audit Scheme (EMAS) and ISO 14001 (International Organization for Standardization).

Product taxes

Product taxes create incentives to reduce waste. For example, product taxes levied by many countries on single-use plastic carrier bags have considerably reduced their consumption. These instruments tend to be targeted at products that are commonly mismanaged. They are typically introduced at the national or state level as they depend on national legislation. The level of the tax must be determined carefully as it needs to be set at a level that encourages customers to change their behaviour patterns without unfairly penalising the producers.

For example, the annual average consumption of plastic bags in **Colombia** was estimated to about 288 per person, many of which are littered and end up on Colombian coastlines and waters, damaging the livelihoods of fishers and the tourism sectors, as well as marine wildlife. To mitigate this, the Colombian government introduced a tax on single-use plastic bags in July 2017 to encourage consumers to use reusable bags. Within 18 months, consumption of single-use plastic bags had fallen by more than 50 percent. This success has encouraged the government to consider other initiatives to promote the use of alternatives to single-use plastics, including the introduction of legislation that would prohibit the manufacture, import, sale and distribution of single-use plastics by 2021.[333]

National product bans

An increasing number of problematic wastes, particularly single use products such as disposable carrier bags, are being banned outright (see **Box 29**). Although policy on product bans is usually defined and implemented at the national or state level, it is typically enforced at the local level.

When considering whether to introduce a product ban it is important to use an evidence-based approach to determine whether it would have the desired effect and if it would have any unintended consequences. In particular, it should be established whether other products, services or materials are readily available at affordable prices to replace the functions provided by the product that it is proposed to ban. For example, banning disposable plastic carrier bags is a measure that several countries have taken. Where plastic bags have been banned, alternative products, such as reusable plastic or paper bags, have usually been readily available. However, it is important to establish that replacement options for disposable plastic bags will be available to consumers and that the ban will not have serious adverse economic consequences for the manufacturing sector.

It is important also to assess whether the use of replacement products or materials is likely to result in other unintended environmental impacts. For example, whilst replacing plastic milk bottles with glass bottles can contribute to efforts to reduce plastic pollution, the greater weight of glass bottles can result in higher levels of transport-induced of air pollution. It is important that full life-cycle analysis is used when considering the overall impacts of different products and materials.

In 2002, **Bangladesh** became the first country to ban single use plastic bags. More than 60 countries have since introduced similar bans or levies[334]. In 2008, **Rwanda** banned the manufacturing, use, sale and importation of all plastic bags. Paper and reusable cotton replaced plastic ones. Rwanda has been particularly successful in eliminating plastic bag use, using a combination of measures to strictly enforce the ban and to support industry in manufacturing alternatives.[335]

Local product bans

Applying a localised product ban is a variant of the national ban approach applied by local authority to ban problematic products in specific contexts. For example, banning single use drinks containers at major entertainment events where they would have been consumed in large numbers and would commonly have led to littering. The approach has been shown to be effective and one that local authorities can apply using local ordinances without necessarily being authorised by national legislation.

[333] Colombia's plastic bag tax: A concrete step towards fighting marine litter in the Caribbean, UNEP, 2017, available at: https://www.unenvironment.org/news-and-stories/story/colombias-plastic-bag-tax-concrete-step-towards-fighting-marine-litter#:~:text=This percent20is percent20why percent20as percent20of,tax percent20by percent2050 percent20per percent20cent

[334] Single use plastics – a roadmap for sustainability, UNEP, 2018

[335] Ibid

Box 29 Box: EU Single-use Plastics Directive

The EU's Single-Use Plastics (SUP) Directive[336], adopted by the European Parliament in June 2019, identifies a series of measures to tackle the most common single use products found in marine litter.

The Directive bans plastic cottons buds, disposable cutlery and plates, plastic straws, drink stirrers and balloon sticks, where alternatives are readily available and affordable.

The Directive also sets reduction targets for member states to reduce their consumption of plastic food containers and drinks cups.

Through the extension of the Extended Producer Responsibility obligations, producers of certain single use plastics will be expected to cover the waste management and clean-up costs of food and drink containers, sweet and crisp packets and wrappers, cigarette buts, wet wipes, balloons and lightweight plastic bags.

The Directive also introduces an Extended Producer Responsibility scheme for fishing gear containing plastics, the aim being to encourage the responsible management of these materials and to prevent its abandonment at sea.

[336] Directive (EU) 2019/904 of the European Parliament and the Council on the reduction of the impact of certain plastic products on the environment

Bans on bottled water have been imposed in municipalities throughout the world over concerns about resource efficiency and plastic pollution. For example, the **US** states of California and Massachusetts, and some municipalities in **Canada** and **India**, have specifically banned the use of plastic mineral water bottles in all government offices and events, and the use of public funds for the procurement of plastic bottles for individual consumption.

7.7 The circular economy as a longer-term objective

The circular economy concept is only briefly mentioned here. It is an evolving concept that spans across vast segments of the economy and will influence how industries and business processes and organized. The depth and extent of it remain outside of this publication.

7.7.1 About circular economy

With growing concern over increased waste generation and the impact of human activities on climate, new production and consumption models are needed to reduce and eliminate as far as possible these negative environmental impacts whilst at the same time providing conditions for economic growth and social development. The circular economy concept is nowadays considered to offer a solution for decoupling economic growth from the consumption of finite resources and for building up economic, natural and social capital for the benefit of the environment, business and society (see **Figure 12**).

According to the Ellen MacArthur Foundation[337,338]:

'The present linear model of resource consumption mainly follows a 'take-make-dispose' pattern where companies harvest and extract materials, use them to manufacture a product, and sell the product to a consumer—who then discards it when it no longer serves its purpose.

A circular economy is a system level approach that is restorative or regenerative by intention and design. It replaces the 'end-of-life' concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste

[337] Towards the circular economy, Ellen MacArthur Foundation, 2013

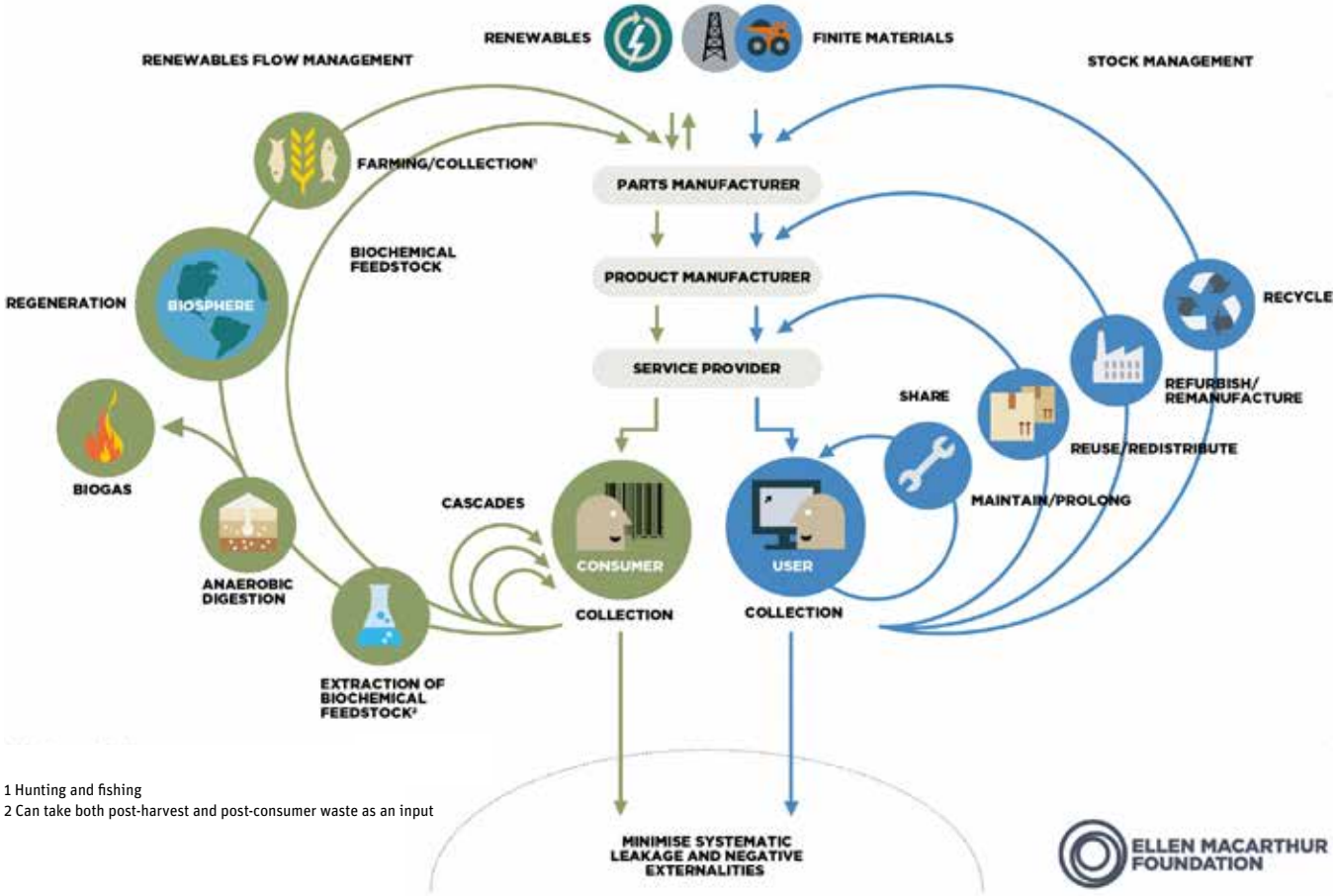
[338] The definition provided by Ellen MacArthur Foundation is the most prominent definition of CE as stated by Geissdoerfer et al. (2017, p.759) as well as Schut et al. (2015, p.15) according to J. Kirchherr et al. (2020).
Nevertheless, so far there is no common internationally recognized definition of CE. For example, the first EU circular economy Action Plan (2015), a circular economy is explained as an economy 'where the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimized', the Dutch Ministry of Infrastructure and the Environment describes a circular economy as 'an economic system based on the reusability of products and product components, recycling of materials, and on conservation of natural resources while pursuing the creation of added value in every link of the system'. In the publication of J. Kirchherr et al. (2020) considering CE publications in the period after 2010, 95 different definitions are used in a sample of 114 publications. The authors of same publication propose the following definition of CE: 'A circular economy describes an economic system that is based on business models which replace the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes, thus operating at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations.'

through the superior design of materials, products, systems, and, within this, business models. The circular economy is built on three principles: designing out waste and pollution; keeping products and materials in use; and regenerating the natural systems.

At the first place, in circular economy the waste does not exist, and products need to be designed and optimised for a cycle of disassembly and reuse. Such concept is aiming to completely eliminate waste disposal and even setting product cycles apart from waste recovery and even recycling where large amounts of embedded energy and labour are lost.

Secondly, circularity introduces a strict differentiation between consumable and durable components of a product. Unlike today, consumables in the circular economy are largely made of biological ingredients that are non-toxic and can be safely returned to the biosphere—directly or in a cascade of consecutive uses. Durable components such as engines or computers, on the other hand, are made of technical ingredients unsuitable for the biosphere, like metals and most plastics. These are designed from the start for reuse. Thirdly, the energy required to fuel this cycle should be renewable by nature, again to decrease resource dependence and increase system resilience (e.g., to oil shocks).

Figure 12 **The circular economy – an industrial system that is restorative by design**



1 Hunting and fishing
2 Can take both post-harvest and post-consumer waste as an input

Source: Ellen MacArthur Foundation
Circular economy systems diagram (February 2019)
www.ellenmacarthurfoundation.org
Drawing based on Braungart & McDonough, Craddle to Cradle (C2C)

Maldives, South-Male-Atoll, plastic waste disposal with digger. Photo: Martin Moxter

For technical ingredients, the circular economy largely replaces the concept of a consumer with that of a user. This calls for a new contract between businesses and their customers based on product performance. Unlike in today's 'buy-and-consume' economy, durable products are leased, rented, or shared wherever possible. If they are sold, there are incentives or agreements in place to ensure the return and thereafter the reuse of the product or its components and materials at the end of its period of primary use.

In other words, the circular economy model distinguishes between technical and biological cycles. In biological cycles, food and biologically based materials (e.g. cotton or wood) feed back into the system through processes such as composting and anaerobic digestion. These cycles regenerate living systems (e.g. soil), which provide renewable resources for the economy. Technical cycles recover and restore products, components, and materials through strategies including reuse, repair, remanufacture, or (in the last resort) recycling. Digital technology has the power to support the transition to a circular economy by radically increasing virtualisation, dematerialisation, transparency, and feedback driven intelligence.'

Applying circular strategies focused on waste prevention, re-use and recycling also has the capacity to bring about substantial reductions in GHG emissions. It has been argued that if applied to the four key industrial materials of cement, steel, plastic and aluminium, circular economy strategies could help reduce emissions by 40 percent by 2050; applied to the food system a reduction of 49 percent could be achieved.[339]

The following measures for transforming the way products are designed and used can also cut GHG emissions[340]:

'Designing for circularity. *This approach will require products to be designed for disassembly, modularity, repairability, flexibility or biodegradability, and to enable reuse,*

[339] Completing the Picture: How the Circular Economy Tackles Climate Change, Ellen MacArthur Foundation, 2019
[340] Ibid

remanufacturing, refurbishment or regeneration. For example, if 'refill' bottle designs and models were to be applied to all bottles in beauty and personal care as well as home cleaning, packaging and transport savings would represent an 80–85 percent reduction in GHG emissions compared to today's traditional single-use bottles.[341]

Eliminating waste. *Design can play an important role in eliminating waste. By designing for material efficiency, material input can be reduced, while designing for optimised supply chains can reduce waste generation; both offer effective ways of lowering the amount of energy and materials used per unit of GDP. For example, half the aluminium produced each year does not reach the final product but becomes scrap, while some 15 percent of building materials are wasted in construction. When it comes to food waste today, one out of every four food calories intended for people is not ultimately consumed by theme. In other words, 24 percent of food calories produced for human consumption are lost or wasted across the value chain.*[342]

Substituting materials. *Material substitution refers to the use of renewable, low carbon, or secondary materials as alternative inputs to new production. These provide the same function but contribute to lower emissions. For example, some bio-based plastics have been shown to have a negative emissions potential with -2.2 kg CO2e per kg of bio-based polyethylene (PE) produced, compared to 1.8 kg CO2e per kg of fossil-based PE produced.*[343]

Reusing products and components. *Reuse measures have one purpose and that is to conserve the embodied energy and other valuable resources used to manufacture products, components, and materials. The more a product is utilised, the larger the savings should be in terms of resources that are already embodied into the product such as material, labour, energy, and capital. Moreover, by keeping products and materials in use, GHG emissions associated with new material production and end-of-life treatment are avoided.*

Recirculating materials. *Recirculation refers to the recycling of materials in the technical and biological cycle. GHG emissions are reduced from avoiding new virgin material production and end-of-life treatment, such as incineration and landfill. For plastics, recycling 1 tonne could reduce emissions by 1.1–3.0 tonnes of CO2e compared to producing the same tonne of plastics from virgin fossil feedstock.*[344]*'*

The first three measures serve to design out waste and pollution leading to reduced GHG emissions across the value chain. The final two measures - reuse and recirculation – support keeping products and materials in use to retain their embodied energy. The circular economy favours activities that preserve value in the form of energy, labour, and materials.

The circular economy also favours the use of renewable resources and aims to enhance natural systems by returning valuable nutrients to the soil which offers opportunities for carbon sequestration.

7.7.2 The circular economy and waste management

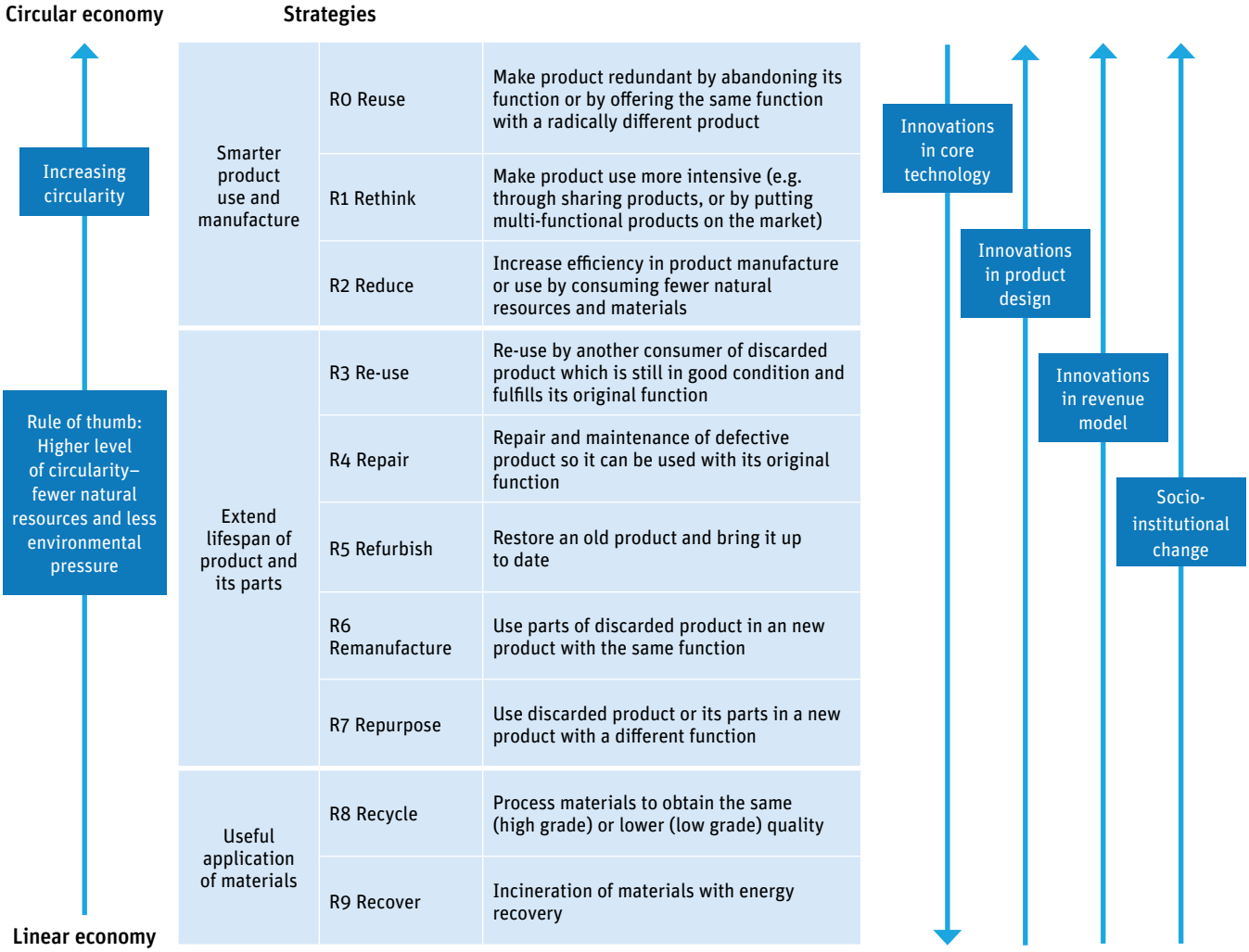
Waste management is a core element of the circular economy.

Linkages between the circular economy and waste management can best be seen by exploring circularity strategies (see **Figure 13**). The strategies – which aim to reduce the amounts of resources used and to minimise the amount of waste produced – can be related to product chains in order of their priority. For example, smarter product use and manufacturing typically ranks higher than extending the lifetime of a product as it enables the product to be used repeatedly whilst fulfilling the same function or for more users to be served by the one product (strategy with high circularity). Lifetime extension is the next preferred option, followed by recycling through materials recovery. Incineration with energy recovery is ranked lowest in the circular economy as the materials have a one-time use and cannot be recirculated (low-circularity strategy). Higher levels of circularity tend to be associated with higher levels of environmental benefit.[345]

'The circular economy is focused on the entire product chain. A product chain tracks products from the extraction of natural resources to waste treatment after they have been discarded. Recovering materials from a discarded product often requires large amounts of energy, and pollution and mixing of materials reduces their quality which means that very often recycled (secondary) materials cannot be applied again for the same type of product. Frequently, these materials do find an application in other products with lower

[341] The new plastics economy: catalysing action, Ellen MacArthur Foundation, 2017
[342] Creating a sustainable food future: reducing food loss and waste, World Resource Institute (WRI), June 2013
[343] The new plastic economy: rethinking the future of plastics, Ellen MacArthur Foundation, 2014
[344] The new plastics economy: rethinking the future of plastics, Ellen MacArthur Foundation, 2016
[345] Potting, J., Hekkert, M., Worrell E. and Hanemaaijer, A., Policy Report Circular Economy: Measuring innovation in the product chain, 2017

Figure 13 **Circularity strategies within the production chain, in order of priority**



Source: Potting et al. (2017, p5)

quality requirements. Therefore, a material chain may be longer than a single product chain.

In a circular economy, the materials recycled from a discarded product ideally retain their original quality so that they can be applied again in a similar product. As a result, no additional natural resources are needed to produce materials, and discarded products no longer become waste. This ultimate circularity, in which a product chain is closed because the materials can be applied over and over again is probably not feasible in practice. It is, however, the ideal situation which CE transitions aspire to bring about.[346]'

It is accepted that the priority given to the circularity strategies builds upon the widely adopted 'waste hierarchy' by giving priority to waste prevention as the preferred environmental option, followed by re-use, recycling and recovery.

It is also accepted that transitioning up the 9Rs strategies, as with the 'waste hierarchy', increases the environmental benefit but requires enhanced governance and regulatory complexity and comes with increased financial cost. As part of the more sophisticated governance structure and enabling environment, economic incentives and compliance are expected to be required and expanded beyond consumers to manufacturers and producers.

[346] Ibid

Beans bundled in plastic and banana leaf in Bali, Indonesia. Photo: Marlon Trottmann

7.7.3 Way forward

Current production and consumption patterns have a long way to go to internalize the circular model. Similarly, utilization of 'waste' materials and products through the implementation of circular strategies is at the beginning of an intended transition period.

Transition to the circular economy is likely to advance at different speeds in the high-, medium- and low-income countries and will depend on their baseline conditions, economic development, national income and financial capacities. There is a concern that the 'waste management gap' between countries, including in waste prevention and waste material utilization, will widen further before it begins to converge. This is due largely to dramatically different conditions, with most high-income countries implementing advanced waste management technologies and moving towards circular economy policies whilst low- and many middle-income countries continue to struggle with implementing and sustaining the most basic of waste management services.

In a business-as-usual scenario, and given projected waste generation growth forecasts and the ways in which municipal waste management services are currently organized and financed, a progressive worsening of the imbalances between higher and lower income countries seems almost inevitable.

In the meantime, pollution of the air, soil and oceans is becoming a major environmental emergency which demands immediate attention.

A business-as-usual scenario is not sustainable and must change. Extending municipal waste collection services and providing for the safe disposal of wastes must be the immediate priority for countries that contribute to pollution loads, along with concerted efforts to enhance the environmental awareness of constituencies and inspire behaviour change.

These 'downstream' solutions (postconsumer, such as recycling and disposal), though regarded as transitional, are foundational and a prerequisite for a transition upwards on the 'hierarchy' and the 9Rs strategic objectives.

Both 'upstream' solutions (pre-consumer, such as material redesign, plastic reduction, and substitution) and 'downstream' solutions must be applied in parallel.[347] Expanding waste collection services in low- and middle-income countries, providing support to the informal sector and building facilities as a transitional measure to dispose of waste materials that cannot be recycled economically, must be applied together with circular strategies focused on waste prevention and reduction.[348]

Concerted effort will be required. Active collaboration between governments, businesses, the manufacturing industry, entrepreneurs and the R&D community, philanthropic and citizens' organizations will be needed. Above all, an environmentally aware and inspired world population must drive the change towards sustained environmental practices – demanding action from administrations and individually practicing sustained consumption and utilization behaviour.

[347] Breaking the Plastic Wave: A Comprehensive Assessment of Pathways towards Stopping Ocean Plastic Pollution, The Pew Charitable Trusts and SYSTEMIQ in partnership with Oxford University, University of Leeds, Ellen MacArthur Foundation and Common Seas

[348] Ibid

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