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Economic instruments in solid waste management

Applying economic instruments for sustainable solid waste management in low-
and middle-income countries

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Abbreviations

BMZ	Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (German Ministry for Economic Cooperation and Development)
EPR	Extended producer responsibility
FCA	Full cost accounting
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
JNNURM	Jawaharlal Nehru National Urban Renewal Mission (Indian government programme for financing urban infrastructure)
OECD	Organisation of Economic Co-operation and Development
O&M	Operation and maintenance
PAYT	Pay-as-you-throw
SWM	Solid waste management

1 Introduction

This guidance paper is addressed to politicians and senior managers in national, state and local governments who want to improve cost recovery in solid waste management (SWM) or analyse options for economic incentives to improve SWM.

The financial sustainability of solid waste management systems is one of the greatest challenges in low- and middle-income countries. Fees to cover solid waste management costs do not always exist and, where they do, they often cannot be raised effectively by the authorities in charge, which means that total SWM costs (capital as well as operating costs) are rarely covered. Fees can be used not only to cover costs, but also to create incentives for waste reduction, recycling or particular treatment and disposal options; not forgetting the other economic instruments that are also available for incentivising the reduction or recycling of waste (e.g. product fees, deposit-refund systems, taxes or tax reductions for certain products, etc.). This broader range of economic instruments for solid waste management has so far been rarely used in low- and middle-income countries.

The aim of this guidance paper is to provide information about different options for cost recovery and other economic instruments in the waste sector. It describes different steps to be taken by local governments to successfully establish user charges or other mechanisms to cover SWM costs and thus improve service delivery. The design of user charging regimes receives particular attention in this paper, as these are often the most important instrument for local governments to achieve local cost recovery.

This paper also serves as a guide for national and state governments in their work supporting local governments to establish viable cost recovery mechanisms, and it helps national and regional/state decision-makers to navigate options involving the use of additional economic instruments to incentivise waste minimisation or waste recovery and valorisation.

This document gathers together the experiences and recommendations arising from several projects and case studies conducted by the GIZ advisory project Concepts for Sustainable Waste Management, financed by the German Federal Ministry for Economic Cooperation and Development (BMZ). As such, experiences from a broad range of countries (Bulgaria, Costa Rica, India, Mozambique and the Philippines) are incorporated. These cover different forms of user charging regimes and other cost recovery instruments, but also other economic instruments, such as extended producer responsibility (EPR) schemes and advanced recycling fees as well as the deposit-refund schemes linked to these. In addition, some information and examples are given on landfill taxes, subsidies and tax rebates as instruments to favour resource-efficient waste management practices.



2 Key messages for financially sustainable and resource-efficient waste management

- 1 Assessing and continuously *tracking the full service costs* makes cost reduction potentials visible and is thus essential for improving the efficiency of waste management.
- 2 Assessments of all SWM costs, *including upfront and back-end costs* (e.g. landfill closure and aftercare) as well as environmental or social costs resulting from unsustainable waste management or opportunity costs of foregone material value or work productivity show that the technological options with the lowest capital and operating costs may have higher total costs than upgraded technological options.
- 3 Operating costs often constitute 60–85% of total waste management costs. *Mechanisms to cover operating costs* are therefore highly important for ensuring that solid waste management services are sustainable.
- 4 A *socially acceptable tariff structure and an effective billing mechanism* are of the utmost importance when designing user-charging regimes. Integrated billing with utility bills has substantially improved cost recovery in numerous cases.
- 5 Local authorities cannot successfully implement economic instruments for cost recovery without legal backing, guidance/training and complementary measures by national and state governments. Close *coordination between government levels* on financing issues is key.
- 6 Covering the full service costs through user charges alone may in many contexts result in user charges that are not affordable for the majority of the population. Therefore, the *full range of economic instruments* should be considered, including property, tourist or other taxes, user charges, landfill fees or taxes, product taxes and deposit-refund systems, as well as economic incentives for improved solid waste management like subsidies, tax exemptions or feed-in tariffs for energy from waste.
- 7 Many of these instruments, especially product taxes, public funds that subsidise certain waste management technologies or feed-in tariffs can only be established at the national or regional level, not at the local level. Therefore, local decision-makers *need to put this issue on the national agenda*.
- 8 There is a need for much *wider dissemination of experiences* regarding the use of EPR, advanced recycling fees and other incentive mechanisms. This should include exchanges on how to ensure sufficient data quality, monitoring and control systems and how to integrate informal collection and recycling activities into EPR systems in low- and middle-income countries, which is necessary for the successful operation of these instruments.

3 Why are economic instruments important for SWM?

Economic instruments in SWM have two major objectives:

- 7 to cover costs and thus improve service delivery;
- 7 to influence behaviour by means of the pricing mechanism in order to minimise waste, avoid negative impacts (e.g. from landfill) or to strengthen resource recovery and recycling.

Some instruments only serve one of these objectives; some serve both objectives at the same time. Economic instruments do not substitute but complement and strengthen regulatory ('command-and-control') and informational approaches. As such, they are an important component of the policy mix and not 'stand-alone' policy instruments. Economic instruments can have various characteristics:

- 7 Instruments to create revenue for public authorities: typical revenue-creating instruments are user charges or taxes that serve to cover the costs of public environmental services; other fees or taxes also create revenues, but at the same time serve to create incentives for changing behaviour (for example, to produce less waste).
- 7 Instruments to provide revenues to, for example, private companies: examples are subsidies or tax exemptions for companies providing environmental services or products.
- 7 Instruments that use market mechanisms but do not generate or provide revenue: examples are permit-trading schemes for waste or emissions, or deposit-refund systems.

The following points show why economic instruments should be part of a sustainable waste management approach:

- 7 The costs of SWM services are often not well known by local authority managers because they are allocated under different budget categories that are often not attributed to SWM services. *Assessing and continuously tracking full service costs makes cost reduction potentials visible and is therefore essential to improve waste management efficiency.*
- 7 SWM costs are rarely covered by local authorities in low- and middle-income countries. Investment costs tend to overshadow operation and maintenance (O&M) costs in such a way that they ultimately seem insignificant. It is relatively simple to find donors or investors for infrastructure, yet it is virtually impossible to find donors willing to participate in meeting O&M costs – and failure to meet these O&M costs on a daily basis risks the

deterioration of the service and equipment due to neglect. This often results in a 'fire-fighting' situation where only the worst SWM problems are tackled, which then impedes the systematic provision of SWM services. *Regular revenue from economic instruments set up to cover O&M costs means that a strategic approach can be adopted and the financial sustainability of waste management services achieved.*

- 7 The need to upgrade SW collection, treatment and disposal infrastructure is widespread, but this will generate additional (capital and O&M) costs that will need to be met. *Any such future revenue requirements should be factored into the design of the economic instruments.*
- 7 Local authorities are often required to manage (and pay for) all kinds of waste that are found in the municipal waste stream. *Economic instruments for specific waste fractions (e.g. extended producer responsibility, deposit-refund systems, etc.; and special arrangements for industrial waste) can reduce this burden on local authorities.*
- 7 Cost recovery is insufficient to really tackle the waste hierarchy, so the means for incentivising waste avoidance and waste recovery need to be found. Compared to other policy options, such as command-and-control measures or communication tools for behavioural change, *economic incentives are usually the most efficient means for strengthening waste avoidance and recycling. Economic instruments can also serve to influence the materials used in the production of products by, for example, reducing the use of hazardous materials or influencing the degree to which products can be recycled at their end of life (eco-design).*
- 7 In order to set up a resource-efficient SWM, simply seeking to influence the behaviour of waste producers is not enough. Waste management companies and local authorities operating waste management systems may need incentives in order to adopt more resource-efficient and environmentally friendly practices and technologies, or to engage in recycling- and recovery-related business. *Tax exemptions or reductions, subsidies and other economic instruments can provide incentives to set up new recycling or SWM businesses, to use recycled materials or to invest in higher-grade infrastructure and equipment that reduces negative environmental impacts. Fixed or subsidised feed-in tariffs for electricity from waste can assure the financial viability of suitable biogas, refuse-derived fuel (RDF) or incineration plants.*

4 Which conditions enable the introduction of SWM economic instruments?

Different examples of economic instruments for SWM set up by national or local governments show that there are a number of conditions favouring their establishment:

- 7 ***A strategic planning process*** (national SWM strategy, local authority SWM master plan or similar) is the perfect opportunity to also look at the cost-recovery and economic instruments that can help with meeting the other SWM objectives mentioned above. The financing of the proposed system is a natural and necessary component of a sustainable strategy, and this kind of planning process is steered by the political decision-makers who are also in charge of making financial decisions. For example, in Mozambique the development of the Maputo SWM Master Plan served as the starting point for a comprehensive reorganisation of the financing system for SWM, including residential user charges linked to electricity consumption, landfill charges for private users of landfill space, and charges for commercial waste producers, plus an obligation for users to contract certified waste management services and pay them according to the quantity output.
- 7 ***Political will to implement transparency in financial management*** related to SWM services and the ***commitment to tackle the often unpopular topic*** of additional or higher taxes or fees is essential. Given that citizens often lack sufficient knowledge about the environmental, social and economic costs of 'cheap' but inappropriate SWM practices, there is often opposition to new fees. When citizens are provided with the opportunity to participate and with comprehensive information on the fairness of the proposed economic instruments and on how fees will tangibly improve services, public support can normally be secured.
- 7 ***A national programme for subsidising/financing SWM infrastructure*** can be a powerful way to incentivise local authorities to tackle cost recovery issues if the degree of cost recovery is a criterion for financial support. This approach has been adopted in India through the installation in 2009 of its benchmarking system (service level benchmarking), which includes among its criteria the percentage of cost recovery and the collection efficiency of SWM user charges. Under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) programme, which provides finance for local authority infrastructure this benchmarking system helps with the identification of local authority interventions worthy of financial support. Even though the system has yet to be applied successfully in all Indian local authorities, the criteria it contains may still serve as a powerful incentive for considering cost recovery instruments in the future.
- 7 ***When considering initiatives to involve the private sector in service provision***, the question commonly arises as to how the private contractor's services will be paid for. Managed properly, the private sector can achieve improved service efficiency, thereby reducing unit costs. Private sector participation can be valuable in mobilising investment and bringing in the operational experience needed to provide efficient services. A necessary condition for involving the private sector is to guarantee that private companies can recover all legitimate costs (including profit) incurred in financing, setting up and operating services. Contracting with the private sector therefore depends on having a reliable understanding of the full costs of privately delivered services and the capacity to cover these costs from recurrent revenue funds.
- 7 ***The autonomy to apply systematic, service-specific accounting methods as a basis for determining the cost recovery rate*** is important. This is easiest to ensure when most of the waste management services are delegated to a separate public or public-private enterprise that takes charge of monitoring costs. Where services and substantial administrative functions for waste management are directly provided by the local authority, it is helpful to have local authority accounting regulations and procedures in place (often instituted by national or regional governments) that enable service-specific cost tracking. In India, for example, the state government of Andhra Pradesh has begun a process to map and implement functional codes that will make it possible to extract detailed cost data on SWM directly from the local authority accrual accounts.
- 7 ***Collaboration between national, regional and local government levels and national regulations granting financial powers to local governments*** strongly influence which economic instruments will be used by authorities in charge of waste management. Most local authorities will first consider the institution of local user charges or fees to cover their SWM costs. Their applicability often depends on national or state legislation on fiscal transfers between different levels of government, and on local authorities' powers to raise local taxes and

levy charges. For example, the local authority acts of a number of Indian states do not explicitly empower urban local authorities to levy charges on users of waste management services. It might be necessary to amend state legislation to enable local authorities to establish user charges, as well as to earmark certain revenues for solid waste management expenditures.

7 *A national law requiring cost recovery or setting other targets like recycling quota* for waste can also be a strong incentive for economic instruments. For example, in the Philippines, the target of 25% waste diversion from landfill laid down in waste management legislation has led several local authorities to institute user charges that vary according to the quantity of waste produced (pay-as-you-throw). In the city of Bayawan, this has resulted in a 20% reduction of waste sent to landfill – it would now seem that households directly give or sell their recyclables to waste collectors.

7 *Regional integration and its resulting policy harmonisation initiatives* (in the manner of the European Union, for example) are often a starting point for establishing economic instruments. Bulgaria, for example, instituted an extended producer responsibility (EPR) system for packaging waste in the course of EU accession. In Chile, EPR became a topic because the country joined the OECD. In countries that are not involved in similar integration processes, policy harmonisation is nevertheless sometimes pushed by big international companies that pursue global corporate objectives or anticipate changes in the regulatory framework and take actions to develop voluntary frameworks with governments.

Different economic instruments need to be introduced and managed at specific levels of government (local, regional or national) and involve specific responsibilities at each level. In the following chapters, we will look at economic instruments available for use at the local level as well as at those that should be implemented at the national level.

5 Focus on local cost-recovery instruments – guidance for local authority decision-makers

Once the legal conditions for establishing waste management fees are clarified, local authorities should consider the following steps in order to establish financial sustainability in solid waste management:

1. Determine the current and future costs of the local SWM system
2. Determine the cost recovery policy and objectives
3. Design the user-charging regime
4. Inform and consult with the public
5. Establish a legal base for implementing the new cost recovery mechanisms
6. Implement and monitor the new cost recovery systems

These steps are discussed in more detail in the following chapters. Iterations between the different steps are important for ensuring the selection of affordable SWM solutions, the appropriate mix of different instruments and an equitable and effective design of these instruments.

5.1 Determine the current and future costs of the local SWM system (step 1)

The first problem that local governments need to tackle when seeking to improve SWM cost recovery is to find out the real costs of SWM. To do this, the administration first needs to describe its solid waste management system and identify the different costs linked to this system. A first step in describing the solid waste management system is to identify the SWM service users in different zones in the local authority and describe the services they currently receive. The number of residential, commercial and institutional entities in the different zones should be identified on the basis of existing cadastres and commercial registers. This is a precondition for determining the actual current service coverage and quality, as well as the possible information base for charging users. This description should detail all elements of the SWM system (e.g. primary collection, transfer, transport, sorting, composting, disposal, etc.).

Analysis of current costs

For each of these elements, the current investment and O&M costs should be determined. This information is often not available in local authority accounting systems, as they are often structured according to line-items (such as wages, rent, fuel and office expenses). While recording expenditure according to line-items gives a high level of control over total cash expenditures, it fails to provide information according to service (such as waste

management) or to service components (such as waste collection). This kind of information is crucial for managing and planning services effectively. In order to establish cost information on SWM in this case, the existing accounts have to be cross-checked with data from the SWM department on equipment (e.g. vehicles), personnel, fuel consumption, etc.

It is important to use a tool or template that incorporates all types of costs (or at least monetary costs) linked to the delivery of SWM services, including direct investment and operating costs as well as indirect costs. Operating costs often constitute 60–85% of total waste management costs in low- and middle-income countries. Indirect costs can, for example, include a percentage of personnel and office costs for administrative bodies involved in waste management, but not directly in service provision. Full cost accounting (FCA) and programme budgeting techniques help to identify all relevant costs and attribute them to the different services provided by the local authority (US EPA 1997). The rules and formats for local authority accounting systems might need to be adapted by state governments to make it possible to effectively track SWM costs.

Examples of cost calculation methods/tools from Costa Rica, India and the Philippines

Microsoft Excel spreadsheet models tailor-made for specific local authorities have proved to be the best way to capture all the costs related to different SWM elements, as each organisation can differ markedly between or within different locations (with some using primary and secondary collection, others one-step collection, etc.). In Costa Rica, individual spreadsheet tools have been developed for each of the elements of the SWM system (collection, sorting station, composting and disposal) to calculate capital costs, annual operating costs and a total 20-year cost projection. Examples of the types of cost calculation tables used in Costa Rica are presented in Annex 1. In some countries, local authorities found it difficult to apply the full-cost-accounting approach: Bayawan in the Philippines, for example, having used the FCA method to perform the initial assessment of costs, did not go on to use it when developing its new waste user charge. When more sophisticated accounting tools are not taken up by local administrations, simple templates for tracking expenditures and revenues should be used instead, as they provide more service-specific detail than general local authority accounts. The simple templates used in Tirupati, India, to capture and process O&M costs and capital costs are presented in Annex 2.

When the overall costs of SWM have been identified, unit costs (per tonne of waste) can be calculated. In a first exercise to determine current and future SWM costs, many elements often need to be estimated. As such, it is also important to verify the evolution of costs after the introduction of cost recovery instruments in order to adapt cost recovery mechanisms to real costs, if necessary.

Expenditure on capital assets (items with an expected economic life of more than one year) should be recorded in the accounts as balance sheet items whose costs are recovered over their expected lifetime through depreciation provisions. Operational expenditures are expensed in the year in which they are incurred. The two expenditure types must therefore be reported separately for accounting, budgeting and cost analysis purposes.

If waste management functions are widely dispersed across a range of entities, operational and financial information from each of them must be consolidated before the operational and financial performance of the overall waste management service can be established. Internal management information systems can be set up to capture this information within local authorities.

Analysis of future costs

A detailed assessment also needs to be performed of future costs in order to ensure the long-term financial sustainability of SWM. As a first step, a strategic planning exercise for the waste management system should be conducted to identify the logistics and infrastructure required for managing future amounts of waste and for closing existing service gaps (for example, extending door-to-door collection to a greater share of the population or ensuring the better disposal or treatment of waste). It should:

- 7 be based on a thorough analysis of waste characteristics (quantities, composition, availability) and market analyses, also taking into account the activities of informal waste collectors and recyclers, etc.;
- 7 take account of realistic projections of changing socio-economic conditions;
- 7 identify simple, appropriate and affordable solutions that can be implemented progressively over time;
- 7 consider options that enable economies of scale to be realised – for example, planning, organising and financing a common waste management system in association with neighbouring local authorities can lead to significantly lower costs than if each local authority were to implement its own individual facilities;
- 7 put priority requirements first;

- 7 consider the relative costs of alternative technologies and their inherent risks:
 - » implementing pilot programmes where significant uncertainty exists regarding outcomes,
 - » not adopting contentious or unproven technologies, or overly ambitious service standards, that jeopardise the service and other essential local services;
- 7 consider the potential social, environmental or economic costs that could result from certain treatment or disposal options (e.g. the costs of negative impacts on health, aftercare of landfill sites, costs of foregone revenues from recyclable materials, etc.) and, in so doing, identify cases where seemingly cheap options will end up costing significantly more;
- 7 allow the community to contribute to the strategic planning process (e.g. hold discussions on the levels of service).

The cost analysis of future operations and investments can be performed in parallel with the strategic planning exercise. Planners should prepare realistic projections of all expenditure (cash outlays) by functional area that are needed going forward to develop and sustain the services. These projections make it possible to determine the minimum revenue needed each year to cover annual O&M costs, plan and budget for future capital expenditure (including asset replacement and service expansion), and determine the minimum revenue needed to achieve financial sustainability.

Unit cost analysis is a powerful tool for gaining a clear insight into the relative costs of the functional components of the proposed waste system over its projected operational life. For example, alternative scenarios for collecting waste and transporting it to landfill sites with and without transfer facilities can be analysed by directly comparing the unit cost per tonne of total waste managed over the operational period for each scenario.

The costs of regional and local strategy alternatives can be compared, revealing the relative costs of each. This can help to establish, for example, the most cost-effective alternative, the cost implications for each participating local authority and the policy responses needed to make the regional strategy beneficial to all parties.

In addition to the cost per tonne of waste, calculations should also include the cost per inhabitant or per household, in order to facilitate the determination of appropriate user charges.

5.2 Determine the cost recovery policy and objectives (step 2)

When designing a cost recovery policy, it is important to address two questions:

- 7 Which costs are to be recovered?
- 7 Which funding sources will be used to cover the annual revenue requirement?

Sources to cover investment costs (e.g. for vehicles, transfer stations, composting or sorting stations, landfill sites, etc.) include government grants, accumulated reserves (own sources), loans (commercial and non-commercial), and private equity. Given that much has already been written about investment funding, these will not receive greater attention here; furthermore, it is assumed that even where investments are funded by grants, depreciation should be included in the calculation of the annual revenue requirement in order to make the replacement of equipment or infrastructure at the end of its life-cycle possible.

Which costs are to be recovered?

- 7 Generally, the cost recovery policy should aim to cover at least the O&M costs. If regular revenues are to be expected from instruments established by the national government (for example, one of the instruments presented in Chapter 5), it is also justifiable to set a cost recovery objective of less than 100% of O&M costs. These interactions of different possible instruments mean that communication between different government levels is important at each stage in the process to design a sustainable SWM financing system.
- 7 In the longer term, full cost recovery is desirable to ensure a sustainable financing system. Full cost recovery refers to covering total system costs – i.e. O&M costs (including indirect administrative costs) plus capital costs as well as closure or aftercare costs if applicable. Annual capital costs consist of the depreciation on capital assets (recovery of investment) and profit (return on investment).
- 7 Between these two extremes lies a range of possible cost recovery objectives, depending on how it is proposed to fund capital expenditures. For example, if capital expenditures are to be part-funded by grants and part-funded by loans, a cost recovery objective might be to cover O&M costs plus debt service obligations on the loans.

- 7 Setting the cost recovery objective should take into account how both initial and future investments are expected to be funded. For example, if an asset (e.g. a haulage vehicle) is initially funded by a grant but its replacement (in 10 years' time) is expected to be via a loan, then the cost recovery policy might be to progressively increase user charges so that the revenue available when the asset comes to be replaced is sufficient to cover the higher annual costs of servicing the loan.

Which funding sources will be used to cover the annual revenue requirement?

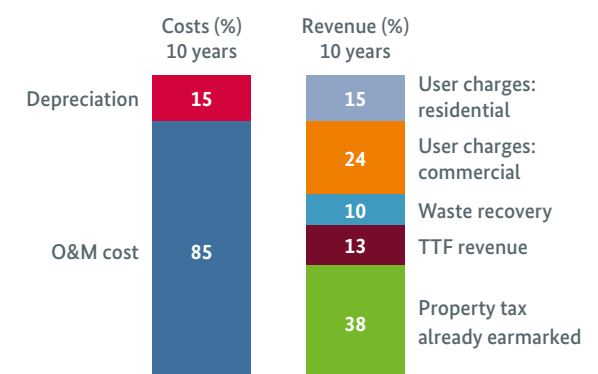
Waste management services are often funded from general local authority revenue. Typically, a share of property tax revenue is earmarked for funding waste services. Property tax and other charge collection rates are frequently low. As such, the following actions will be necessary:

- 7 Evaluate existing local authority sources (primarily the property tax or other local authority transfers) and determine their capacity to contribute to waste management costs in the future. It is important to make realistic projections of the revenue expected to be available from each of the local authority (non-user charge) sources for each year of the planning period. Next, assess the potential for raising property tax rates and/or for improving its collection efficiency. Both measures have the capacity to improve local authority revenue collections significantly and may be preferable to introducing new, specific financing mechanisms.
- 7 Analyse the potential for generating revenue from the sale of products derived from the waste stream (compost, recyclable materials, and energy) on the basis of detailed analyses of the waste streams, treatment techniques, and markets for recycled products or compost. It is useful to draw up different scenarios for possible revenues from waste valorisation and to conduct a sensitivity analysis, as prices for secondary raw materials are prone to major fluctuations and markets for secondary raw materials and compost depend on the awareness and attitudes of possible clients as well as on legal incentives for using these products.
- 7 Seek to identify additional realistic funding sources that can be developed and used to fund waste services:
 - » For example, *tourist taxes* might be introduced to cover the costs of services provided to itinerant populations that cannot be recovered through the commercial user charges applied to hotels.

These could be levied by hotels, at beaches or by the managements of main tourist sites in a local authority (if applicable) and transferred to the local government.

- » Another option is the institution of a fee *for the disposal of waste on a local authority landfill site* that must be paid by large-scale private waste generators or neighbouring local authorities using the site. When such a mechanism is established, fly-tipping controls must be put in place.
- 7 The analysis of the pros and cons of different instruments should include an analysis of the legal framework in which the local government operates, as this might already exclude certain instruments or might require coordination with higher government levels when seeking to change certain legal provisions.
- 7 In the case that no other funds are available and foreseen to cover SWM costs, the revenue gap (if any) constitutes the revenue required from user charges. It is recommended to check – by conducting studies on different service users’ willingness/ability to pay – if the revenue gap can indeed be covered by affordable user charges. If not, it needs to be ascertained whether central government transfers or other funds can be mobilised over a certain period to cover costs, or if any of the above-mentioned revenue sources can be raised.

The chart below is from a GIZ study on a sustainable SWM financing system for Tirupati Municipal Corporation, India. It illustrates that, of the total estimated costs over the next 10 years: 38% is proposed to come from the share of property taxes already earmarked for that purpose; 13% from a proposed pilgrim tax levied by the management authority of an important religious site (TTFD); 10% from the sale of products recovered from waste; and the remaining 39% from commercial and residential user charges.



A comprehensive approach to ensuring the financial sustainability of SWM that incorporates a wide range of financing instruments has been established in Maputo, Mozambique.

- A waste user charge for residential service users linked to the electricity bill was introduced in 2007.
- Non-household waste producers were also included in the same scheme, but were charged higher fees. The municipality started in 2006 with the introduction of a licensing and registration system designed for non-household waste producers who generate too much waste to be allowed to use the public waste collection service (more than 25 kg per day). These waste producers must register with a licensed service provider and provide a ‘proof of service’ to the authorities.
- The municipality also offers service provision for ‘proof of service’ clients, which generates additional revenues.
- A disposal fee in place at the official disposal site in Maputo is charged to private operators.
- A set of fees and fines for additional services or illegal waste disposal has been introduced and generates revenues on a small scale.

The combined revenues of all economic instruments covered about 69% of the total costs in 2012, the rest being covered for a fixed period by a World Bank support programme. An assumed ability to pay for SWM services to the order of 1.5% of household income was used in the strategic planning exercise (based on similar estimations by the World Bank). Willingness-to-pay studies have been conducted, but have not been of much influence in the political decision-making process relating to the financing system. To achieve total cost recovery, further tariff adjustments are planned.

5.3 Designing the user-charging regime (step 3)

User charging

There is no 'best' approach to user charging; the decision depends on existing legal and institutional arrangements and, to a degree, on accepted practice. A basic principle is to adopt approaches that are already within the sphere of control of local governments, and the availability of an appropriate user database/register is crucial. When analysing the different user-charging options presented below, the first task is to ascertain which registers of SWM service users already exist and how these could be used or must be modified to respond to the requirements of the preferred user-charging option.

Desirable characteristics for a charging system are, for example, that it is:

- 7 fair and reasonable;
- 7 low-cost and simple to administer;
- 7 efficient (a high ratio of fees collected to fees billed);
- 7 able to differentiate between and within user groups to enable the social scaling of tariffs;
- 7 readily understandable to users;
- 7 convenient for users with a clear, simple and efficient payment mechanism;
- 7 legally enforceable;
- 7 in line with the 'polluter pays principle' (users producing more or more hazardous/non-recyclable waste have to pay more).

User charges relating to the latter criterion are being increasingly implemented in European and other industrialised countries and are known as 'pay-as-you-throw' (PAYT) user charges. This type of user charge aims to serve not only as a cost recovery instrument, but also as an incentive to reduce waste production. Different types of user charges are applied for different reasons. The political acceptability, administrative costs, social effects and acceptability to the population, revenue potentials, and environmental effects of each model need to be analysed, preferably through a participatory process. Table 1 below shows the most frequent types of user charges and some of their advantages and disadvantages.

A flat-rate tariff is the most frequently used option in many low- and middle-income countries, probably because it is easiest to calculate.

In low- and middle-income countries, pay-as-you-throw user charges have, to date, been rarely implemented

because the systems for constantly measuring household waste production (through standard containers or weighing systems) are not widely established and are considered to be too costly. First applications tend instead to focus on pre-paid systems where standard waste bags or stickers must be purchased in advance in order to control the volume of waste collected from service users.

A tariff varying according to residential area is also relatively common, but it should be taken into account that this approach can only be considered to be 'fair' in cases where residential areas have a very homogenous income distribution. If this is not the case, variable tariffs set according to utility charges might be more appropriate, as different user-charge levels can be established according to, for example, electricity consumption, which is often strongly linked to income (influencing the ability to pay) and consumption (influencing waste production). When variable tariffs are the preferred option, the common approach is to determine a basic tariff for the user category paying least, and then to determine the factors for multiplying this basic tariff, such as property size, assumed ability to pay, assumed waste production or similar.

In order to determine the possible user charges to be paid by different user categories, it might also be necessary to conduct a study on willingness and ability to pay. This will also serve the objective of citizen involvement and can legitimise political decisions on user-charge categories.

An example for differentiated user-charge tariffs as applied in Maputo, Mozambique, is shown in Table 2.

Determination of user charges for commercial, industrial or institutional entities

Different charging mechanisms are likely to apply to residential and commercial users. Small commercial entities could be treated in the same way as households, while larger companies could be charged according to the quantity of waste produced. As waste production in bigger commercial, industrial or institutional entities can be considerably higher than in households, different strategies need to be chosen to account for this:

1. Commercial entities can be charged a fee similar to a flat-rate household user charge, but with higher rates. This measure is simple to administer, but does not allow differentiation between, for example, small- and large-scale commercial waste producers or between businesses with a differing ability to pay.

Variable tariffs set according to assumed waste production or ability to pay: If the user charge is to reflect the actual waste production of commercial enterprises, it

Table 1: Advantages and disadvantages of different user charge types

User charge type	Description	Advantages	Disadvantages
Flat-rate tariff	The same tariff is applied to all users (all households/all commercial users)	It is simple to calculate Stable revenues	It ignores individuals' ability to pay (affordability) It ignores the 'polluter pays principle' and fails to create incentives for waste reduction
Variable tariff differentiated by waste quantity produced (pay as you throw)	Users are charged according to waste container volume, per emptying of their waste containers, or per waste bag purchased in advance (pre-paid)	It creates an incentive to reduce waste production It can be useful for larger commercial and industrial users Pre-paid bag systems are relatively easy to establish and to enforce (no collection without payment)	Revenues are less stable Equipment and logistics are needed for measuring waste produced (standardised containers/bags or others) It can be expensive and complex to administer if the correct use of bags/recipients is to be controlled effectively May encourage illegal dumping – need for enforcement
Variable tariff differentiated according to proxy for income	Different tariff categories or proportionately rising tariffs linked to property tax bands or water/electricity consumption. Alternatively, tariffs can vary according to the size of the lot or residential area.	Provides the possibility to account for ability to pay and incorporate cross-subsidisation Efficient administration, as registers/collection mechanisms already exist; easy to enforce if integrated billing is used (see below) Can incorporate proxy for waste production	Provides no incentives for waste reduction Information and collaboration by utility company/property tax registry required, which could result in extra costs Variation by residential area requires income homogeneity for it to be fair
Two-part tariff (flat-rate and variable part)	Combination of options 1 and 2 or 1 and 3	More stable revenues than variable tariffs Accounts for certain fixed system costs	More complicated to calculate, flat-rate part is difficult to include in pre-paid PAYT systems Less transparent to users

Table 2: Household waste fee in Maputo (as of 2010)

Energy consumption class	Energy consumption per month	Waste fee per month
Social tariff	0–100 kWh	10 MZN/0.23 EUR
Low consumption	0–200 kWh	35 MZN/0.79 EUR
Average consumption	201–500 kWh	55 MZN/1.24 EUR
High consumption	>500 kWh	80 MZN/1.80 EUR

Source: GIZ

will be necessary to put in place one of the following: regular measurements of waste volume or weight produced by the different users, standardised collection containers that are paid per emptying, or pre-paid systems. If this is not feasible, average waste production or the average ability to pay must be estimated for different types of commercial and institutional user categories. This option is adopted by many local authorities, which set up user-charge tariffs according to the type of establishment. The use of this type of categories has the disadvantage that it does not provide incentives for reducing waste production and is not directly linked to ability to pay; however, it seems to be an option that local authorities find easier to implement in many cases. An example from Shimla, India, is given below:

Table 3: SWM tariffs in Shimla

Category	Monthly charge	
Shops including paan shops and tea shops	- 50 INR	0.60 EUR
Vegetable and fruit shops	- 100 INR	1.20 EUR
Sweet shops	- 200 INR	2.40 EUR
Dhaba (roadside cooked-food outlets)	- 300 INR	3.60 EUR
Restaurants (without bar)	- 750 INR	9.00 EUR
Restaurants (with bar)	- 1,000 INR	12.00 EUR
Hotels/guesthouses (up to 10 Rooms)	- 500 INR	6.00 EUR
Hotels/guesthouses (11–20 Rooms)	- 600 INR	7.30 EUR
Hotels/guesthouses (21–30 Rooms)	- 800 INR	9.70 EUR
Hotels/guesthouses (above 30 Rooms)	- 1,000 INR	12.00 EUR
Offices (small)	- 250 INR	3.00 EUR
Offices (big)	- 600 INR	7.30 EUR
Factories and workshops	- 500 INR	6.00 EUR
Bakeries, food outlets and baked-goods outlets	- 500 INR	6.00 EUR
Schools (up to and including 8th standard)	- 200 INR	2.40 EUR
Schools (above 8th standard)	- 350 INR	4.20 EUR
Colleges	- 800 INR	9.70 EUR
Other establishments	- 350 INR	4.20 EUR

Source: GIZ/IMACs

If this option is chosen, the following aspects must be considered:

- » the categories and tariffs should be reviewed regularly in order to ensure the fairness and appropriateness of the user charge;
 - » an effective billing mechanism must be developed, because it is difficult to use business types as tariff categories in integrated billing systems (see below).
2. Commercial and industrial users can be obliged to contract private waste collection companies with which they negotiate tariffs according to the quantity of waste they produce. In this way, the municipal waste management services do not have to handle these users' waste; instead, they need only verify the existence of a service contract with a certified waste management company. This option has been chosen by, for example, the municipality of Maputo in Mozambique, where commercial enterprises with higher levels of waste production must provide a 'proof of service' from a certified waste management company. The waste management company has to pay a tipping fee for waste delivered to the municipal waste disposal site, which ensures that waste collection and disposal is financed by commercial waste producers. This system has been operational since 2008, but its financial contribution is still falling below expected levels. Resistance from the commercial sector and organisational challenges are the main reasons for this.

User-charge billing

Collection, or 'billing', mechanisms for user charges can be performed using direct billing or indirect ('integrated') billing.

Direct billing

Direct billing consists of a waste management bill issued directly to users by waste management services or by the local authority revenue collection service. In many countries, user charges or SWM fees exist, but the competent authorities have serious difficulties in effectively collecting these charges. Official registers on service users may not exist or the authorities may not be able to reach the users featuring in these registers, and legal action against non-payers is very lengthy and unpopular.

Some local authorities resolve this problem by commissioning private waste-collection companies to collect the user charges. This is a useful option in cases where the

public tax and charge collection system is not operational. Users may also be more willing to pay a private company than the public authorities, because they have a greater fear that their waste collections will be stopped. Waste collection companies are, however, often confronted with problems similar to those faced by local authorities when seeking to enforce payment by service users, because stopping the service for some users might end up creating a nuisance for others and/or because they do not have legal powers to enforce payments.

In addition, leaving fee collection to private companies creates the risk that they incorrectly report the amounts of user charges collected to the authorities. Therefore, if user charges are to be collected by private service operators, clear and simple procedures must be laid down in the contract terms describing:

- 7 how user-charge collections are recorded (such as a register of charges billed and raised);
- 7 the amount/share of user charges to be transferred to the local authority – the best approach is probably to transfer the full amount to an escrow account;
- 7 bonuses and penalties for collecting more or less than a predetermined share of projected revenues, serving as an incentive to increase fee collection efficiency;
- 7 the responsibilities of the local authority to support the fee collector in achieving high fee collection efficiencies – for example, through raising public awareness and through support for enforcing payments in the case of serious delays;
- 7 the right to impose enforcement measures, such as the interruption of services or penalty payments.

These terms need to be controlled by the local authority administration.

Pre-paid pay-as-you-throw (PAYT) systems are a variant of direct billing that, by charging for the service in advance, avoids the risk of non-payment by service users. These systems require the adoption of suitable provider structures for the pre-paid equipment (for example, waste bags or stickers that have to be attached to each waste bag), as well as the mechanism through which these providers pass on the user charge to public authorities.

In Bayawan in the Philippines, a pre-paid PAYT system has been established that requires citizens to purchase one sticker per bin bag (up to 25 litres) for the collection of residual and special waste only (households or commercial establishments in the city centre that do not have space for composting can also include bio-waste). The stickers



Workers document waste quantities © NSWMP/David Degner

must be bought at the city hall (City Treasury Office) or at authorised sales points in the public markets or barangay (district) halls and cost two pesos (around four euro cents) per sticker. The authorised sales points do not receive a commission for selling the stickers since they are already otherwise supported by the local authority. The sticker itself is composed of two sections, with each section displaying a matching identification number. The collection crew checks if a sticker is connected correctly to the garbage bag placed for collection and takes off the smaller unit that will be forwarded to the City Treasury Office for documentation. The system has been effective in reducing the amount of waste collected for disposal, but the control mechanisms were not able to verify if this reduction was due to reduced waste production, a higher share of recyclable materials given to recyclers, or the illegal disposal of waste. The system has only been able to achieve a small increase in cost recovery levels.

Indirect (integrated) billing mechanisms

In these billing systems, user charges are linked to an existing utility bill or tax instrument, such as the local property tax or water/energy bills.

Indirect billing mechanisms have the following advantages:

- 7 Linking the charging mechanism to the register and billing system of a utility with high charge collection ratios (e.g. water supply) can be more cost-effective than setting up a separate direct charging system for waste services. This approach was adopted in Maputo, Mozambique, where the electricity provider collected the waste user charge in return for a commission. This commission was perceived to be very high (initially

25%) and was subsequently negotiated down to 15% by the local government. Despite the commission, this approach still seemed to cost less than setting up a separate collection mechanism for waste management user charges. The collection rate of the waste user charge rose to almost 100%.

- 7 They can open up more opportunities for recognising and responding to vulnerable groups.
- 7 If the user charge is linked to a utility bill, the proxy service can be shut off as a sanction for non-payment of the waste charge. This type of sanction is more easily accepted for electricity services than for other utilities like water.

Linking the waste-management user charge to a local tax makes sense only if this local tax has a high collection rate, especially as the above-mentioned disconnection sanction is not possible in this case. Another aspect that needs to be considered is that property taxes are often collected annually, whereas SWM user charges are normally collected monthly. If the SWM user charge were linked to an annual property tax, the tariff would need to be relatively high to cover SWM costs. To pay such a high user-charge in one go might not be acceptable and feasible for many citizens, especially the poorer sections of the community. The advantage of linking to a local tax is that the local authority would not need to pay a commission to the service provider.

If integrated billing is envisaged, the local authority needs to check for legal and political constraints to cooperation with private or public utility providers or other public revenue collection entities (in case of integrated billing with other taxes) and consciously prepare negotiations with the respective entity on conditions for implementation.



Formal waste collection in Egypt © GIZ

5.4 Inform and consult with the public (step 4)

As the collection efficiency of both taxes and user charges is usually low in many cities, it is important to involve the public when setting up a new system in order to strengthen payment behaviour. For the public to accept the charging regime, it is absolutely essential that the user charges, basis for tariff calculations and collection mechanisms are presented clearly and discussed with representatives of the different user categories.

The importance of public information and consultation is highlighted by the case of Maputo, where a mechanism to add waste user charges to electricity bills was instituted without a wide-reaching public information campaign, which led to a widespread refusal to pay and the subsequent retreat of the electricity provider from the scheme. It took the revision of the user charge and an intensive awareness-raising campaign (including the distribution of leaflets, public meetings, community theatre, etc.) to improve acceptance of the system and convert the charge's collection efficiency rate to almost 100%.

As a basis for information and consultation, a short and easily understandable document for public information should be prepared that presents the plans for service improvements, current and future SWM costs, options to achieve financial sustainability, and the selected option including the tariff structure and collection mechanism developed. This should be distributed to selected civil society and private sector representatives in the city.

In a second step, consultation meetings with private sector and civil society representatives should be organised to discuss the proposed provision for financing SWM and any possible adjustments proposed by the representatives.

Before introducing the new system, a larger information campaign is needed to reach a greater number of households and commercial/administrative entities. The instruments used depend on the social and cultural context and could include IEC (information, education and communication) material, newspaper announcements, television and radio spots, street theatre and events in schools. Information should be provided on:

- 7 why it is important to pay user charges in order to ensure an effective service;
- 7 the current costs and projected future costs and the financing gap in the current system (transparent cost and user-charge calculations can help in making the case to the public);

- 7 the amount that different users will have to pay for solid waste management and the principles for defining the user categories;
- 7 the way in which user charges will be collected.

Although this larger-scale information campaign can be rolled out after the legal establishment of the new system, the consultative elements need to be performed prior to the system's legal adoption in order to ensure the public will accept it.



'Let's stop the waste by paying the waste tax', awareness-raising event in Mozambique © GIZ

5.5 Establish a legal base for implementing the new cost recovery mechanisms (step 5)

In order to become effective, the proposed financing system needs to be adopted officially. This might involve, according to the legal provisions in place in the respective country, a modification of the local waste management by-law or regulation, the local authority tax and fee regulation, or a similar official document. This system is usually adopted by the local authority and, in many cases, is approved by regional oversight bodies. Regional or national governments might also need to modify in advance existing legislation that restricts certain local cost-recovery options. As such, constant coordination between different government levels is important during the process to modify SWM financing systems. Regional and national government can also support the establishment of the legal base for new cost recovery mechanisms by drawing up guidance documents, delivering training or producing model by-laws for the financing mechanisms.

A key provision will be the need to earmark the revenue from user charges so that they are solely used for the provision of municipal waste services. The relevant amounts should be recorded in the waste management service budget and transferred to an appropriate reserve/escrow account.

5.6 Implement and monitor the new system (step 6)

After introducing the new system, the administrative procedures required to effectively implement the rules must be put in place. For example, accounting and waste management departments will need to take charge of regular cost tracking and the billing of the SWM charges.

The financial management procedures of the relevant waste management department may need to be strengthened and the duties of officers defined, especially for those with statutory responsibilities or involved in managing funds. The following functions should be represented:

- 7 accounting;
- 7 cost analysis;
- 7 asset management and register;
- 7 Tariff setting and review;
- 7 Bill collection;
- 7 Budget preparation;
- 7 Performance monitoring

The expenditures and the revenues for SWM need to be regularly reported with the aid of the introduced accounting tools or at least simple cost templates (see annex), and modifications should be initiated to the planned expenditures or user charge system if it becomes clear that the cost recovery objectives cannot be achieved.

6 Focus on economic incentives to be established by national / regional governments

Economic instruments other than waste charges and fees, and how they can be implemented, are not sufficiently known in most low- and middle-income countries. It is often assumed that it is too complicated or too costly to apply them in these countries, and therefore, fees or voluntary agreements with the private sector are preferred.

The instruments presented in the following chapter are usually initiated by national or regional government authorities and can complement local cost recovery mechanisms. Even if they can contribute to cost recovery or reduce costs for municipal governments (for example by relieving municipal government from the (financial) responsibility for the management of certain waste fractions), their main purpose is to create incentives for the application of environmentally friendly waste management options and / or the avoidance of waste generation. This is done either through taxes and levies that discourage waste production or less desirable waste management technologies, or through subsidies and tax exemptions/ rebates that encourage waste reduction or valorisation. For the establishment of these instruments, a close co-ordination between ministries, especially between Environment and Finance ministries, and for example with customs authorities, and between different government levels is necessary. The following instruments are regarded as the most relevant and explained below:

- 7 Landfill taxes
- 7 Advanced recycling fees, product taxes and other instruments supporting Extended Producer Responsibility
- 7 Funds and subsidies
- 7 Tax exemptions
- 7 Feed-in tariffs for energy from waste

6.1 Landfill taxes

Landfilling is normally a cheaper way to manage mixed municipal waste than sophisticated waste sorting and treatment options as like composting, anaerobic digestion, recycling or incineration. However, the environmental and social costs of landfilling (for example, greenhouse gas [GHG] and air emissions, and leachate creating water and soil pollution) are borne by the general public and the communities neighbouring landfills, and these costs are often not considered by local authorities, waste management services and industrial waste producers when comparing the relative costs of different waste management options. A landfill tax – a levy on the disposal of waste in landfills – is a means to incorporate these external effects in the price for waste disposal. Alternative solutions for waste treatment (reuse, recycling or incineration) and waste avoidance thus become cheaper in comparison to disposal. This serves as an incentive to divert waste from landfills and channel it towards treatment and recycling, provided that the tax is sufficiently high to make the other options an economically viable alternative. In some countries incineration is also taxed.

Differing from the landfill fee concept mentioned in 4.2 where one local authority charges other local authorities or commercial waste producers for the opportunity to dispose of their waste in its municipal landfill, landfill taxes are considered herein to be taxes charged by national governments to landfill operators (be they private or public, e.g. local authorities). Landfill operators are normally only responsible for transferring the tax to the government and they recover the tax from local authorities or large-scale industrial/commercial waste producers delivering waste to the landfill. In some countries, the tax is also charged to the landowner of illegal dumpsites. Frequently, varying rates are applied to different waste fractions (e.g. inert waste may be exempt or subject to a lower tax rate, while untreated organic waste may be subject to a higher rate) and waste that is directed to sorting and recycling within the landfill site may not be subject to the tax. The funds raised are either entered into the general budget or paid directly into a special fund that serves to mitigate the negative effects of landfills or to finance other environmentally friendly waste management technologies (see chapter 5.3). Experiences with the implementation of landfill taxes have shown that the tax rates need to be relatively high in order to create an incentive sufficient for reducing waste disposal. Landfill taxes also only make sense where monitoring and control systems are functioning well enough to prevent fly-tipping by those seeking to avoid paying the landfill tax. Also, in low-income countries in particular, realistic opportunities for investing in and operating alternative waste treatment facilities must be present (which might require government grants or subsidies).



Truck being weighed at the landfill entrance; Lebanon
© NSWMP/David Degner

Waste arrives at the landfill; Egypt © GIZ/SWEEP-Net



6.2 Advanced recycling fees, product taxes and other instruments supporting extended producer responsibility

As cost-covering user charges might go beyond the ability to pay of many citizens in low- and middle-income countries, a complementary strategy to reduce costs for local authorities and/or create revenues for SWM is to involve the producers and importers of certain products (e.g. electronic equipment, lubricant oils, batteries, end-of-life vehicles) or packaging in the responsibility for managing the waste resulting from these products.

OECD defines extended producer responsibility (EPR) as 'an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle'. EPR is in essence a command-and-control approach, because the state imposes take-back obligations or minimum recycling quotas on the private sector. In many countries, companies fulfil these obligations individually or establish producer responsibility organisations (PRO) that organise collection and recycling for groups of companies and are financed through company contributions. Even though this kind of system uses market mechanisms, it is not based on an economic instrument and is therefore not treated here.

Alternatively, some countries levy a charge on producers (or consumers) in order to provide funding for the implementation of (publicly managed) collection and recycling. This mechanism of 'advanced recycling fees' or product taxes, sometimes also called a 'financial EPR scheme', is explained below.

Many countries also use economic instruments that support take-back obligations and recycling quotas by creating incentives for the consumers to return the product at the end of its life (deposit-refund systems, also presented below).

6.2.1 Advanced recycling fees and product levies

The objective of advanced recycling fees is to internalise the costs of the recycling of discarded products in the product price. In order to qualify as an economic instrument, the rate of advanced fees must be determined and the revenue collected by a public authority or a publicly mandated body.

Some countries have established advanced recycling fees as one option for producers to fulfil their legal obligations of extended producer responsibility. In Bulgaria, for example, the EPR system for packaging waste contains three options: producers and importers of packaging must (1) take back their packaging waste themselves, (2) adhere to a collective take-back scheme, or (3) pay a packaging tax. While most producers have opted to establish collective take-back systems, many smaller importers of packaged products have chosen to pay the packaging tax, mainly because the other options would require relatively high internal administrative efforts.

In Tunisia, producers have chosen to adhere to the public take-back system for plastic packaging (Eco-Lef) and pay a levy on imports of plastic goods or resins (for importers) or on quantities placed on the market (for local producers).

When setting up such a financing system, the following aspects need to be considered:

- An effective mechanism to track and control the quantities of products/packaging that producers or importers place on the market is key to avoid 'free-riding'. Otherwise, some producers might declare fewer products than they actually issue (or none at all) and thus evade financial contributions while benefiting from the public recovery system.

- 7 The materials subject to either import or local-production levies must be the same so that local producers do not end up at a disadvantage in relation to importers (and vice versa).

Product taxes can also be applied independently of take-back and recycling systems, where their primary aim is not to finance take-back and recycling, but rather to provide incentives for reduced use, the alternative design of certain products or to raise funds for supporting the waste management system in general. One example is plastic bag taxes that aim to reduce consumer use of plastic bags.



Plastic bottles are sorted out; Tunisia © GIZ/SWEEP-Net

6.2.2 Deposit-refund systems

Deposit-refund systems seek to ensure that valuable or potentially hazardous materials (e.g. car batteries) are not disposed of, but rather recovered and recycled or treated appropriately. In addition, an oft-cited aim of deposits for one-way beverage containers is to avoid littering and promote the use of recyclable packaging materials. Deposit-refund systems do not create revenues for the state, but neither do they involve major administrative efforts other than sporadic controls. In general, they have been very effective in increasing the collection and recycling rates of the product in question, securing higher rates than other

producer-led collection systems for, for example, packaging materials. However, in Germany for instance, the deposit-refund system for one-way beverage containers has not led to increases in the share of recyclable beverage containers compared to one-way containers and has thus failed to achieve one of its environmental objectives. The social effects of such schemes are generally not negative, as they do not involve noticeable additional costs for consumers and, in some cases, they can support income opportunities for informal workers collecting discarded products to recover the deposit.

Deposit-refund systems can be introduced voluntarily by producers or as an obligation by national authorities. Producers are obliged to charge a deposit to retail companies, which are then obliged to pass the deposit on to the consumer. Retailers pay the refund to consumers when they bring back the product or the packaging waste, and they reclaim the refund from the producers (or another coordinating body). Authorities either leave the coordination to the industry (which can set up a collective body for coordination) or attribute the coordination role to an independent, authorised (public or private) organisation that serves as a clearing house for ensuring that refunds are returned to all retailers according to what they have paid out to consumers. Supervision of this body and of the other stakeholders in the system (producers, retailers) should be performed by environmental control institutions.

It is also possible to combine advanced recycling fees and deposit-refund schemes. In this case, a mechanism is needed that refunds only part of the paid deposit, and uses the other part to cover collection, recycling or disposal costs. In Kiribati, for example, only 80% of the deposit on beverage containers is refunded, with the rest used to cover system costs. In several countries, the institution of deposit-refund schemes for mobile phones has been discussed with the aim of raising the collection rates for end-of-life mobile phones under existing extended producer responsibility systems.



Deposit-refund bottle container © NSWMP/David Degner

6.3 Funds and subsidies

Special funds established for SWM or general budget finances can be made available as grants, subsidies or special interest loans to private or public institutions to favour higher-grade, resource-efficient waste management practices.

Access to funds can be on a non-competitive or competitive basis. For the latter, the establishment of waste valorisation infrastructure or activities that favour waste reduction or sorting are included among the criteria of the bidding process for grants from the national government.

An example is the UK's waste performance and efficiency grant that is provided to local authorities (and adjusted according to population size) for new ways to realise waste reduction and increase recycling or diversion from landfill – for example, to improve separate waste collection services, promote home composting, promote investment in central composting or material recycling facilities, implement public awareness-raising campaigns, provide incentives for householders to reduce and recycle their waste, and improve cooperation between local authorities.

Funds can also be used to support research and technology development for resource-efficient waste management technologies adapted to the local context.

Subsidies for private waste management enterprises are also sometimes used to support mostly small-scale sorting, recycling or composting activities through, for example, the provision of public spaces or infrastructure for private waste management activities or the covering of certain operating costs of private enterprises or cooperatives. Some successful examples for this kind of public support for small-scale sorting and recycling initiatives exist in, for example, Brazil (IADB 2003).

6.4 Tax exemptions or rebates

Tax exemptions can be applied to incentivise the creation of small recovery, sorting or recycling enterprises or cooperatives, which can be exempted from taxes in their first years of operation or required to pay a reduced amount of taxes. These exemptions or rebates have the same effect as subsidies, the only difference being that they do not provide direct revenue to the private entity but, instead, reduce its outgoings.

Exemptions can also apply to customs duties for the import of waste management equipment, with the aim of facilitating private investment in specific waste management infrastructure and equipment by reducing investment risks.



Worker looking over the plastic bag sorting, shredding, and compacting facility at the waste management operation at the Egyptian Company for Solid Waste Recycling © NSWMP/David Degner

Tax rebates delivered through, for example, reduced tax or customs rates can also be provided to those private enterprises outside the waste management sector that opt for recycled input materials over virgin materials. When applying these kinds of subsidies or tax rebates, national and international regulatory requirements on competition will, of course, need to be analysed in detail.

6.5 Feed-in tariffs for energy from waste

Investment in infrastructure for producing energy from waste, be it through biogas production and conversion, through combustion of municipal solid waste or refuse-derived fuels or through other technologies, can be significantly facilitated by regulations on feed-in tariffs for this type of energy. This approach gives investors a level of security regarding the financial viability of their investment, which can be particularly important for small investors. Viability is often very much dependent on the level of the feed-in tariff and the time period for which certain feed-in tariffs are guaranteed. Introducing feed-in tariffs for energy from waste is often a complicated and drawn-out process because it is usually developed under the Ministry of Energy and is often related to broader reforms of the energy sector and instruments to promote renewable energies. Nevertheless, it can serve as a powerful and sustainable instrument to favour the energetic use of waste.

7 Conclusions

Economic instruments for solid waste management ensure the financial sustainability of SWM services and, thus, good service delivery for citizens. In addition, economic incentives facilitate waste avoidance, recycling and other forms of higher-level waste treatment that are an essential part of resource-efficient SWM systems.

Strategic and financial issues are often discussed and decided on at higher government levels, but local authority officers need to be able to implement appropriate service costing and revenue collection. As such, local authority officers and decision-makers need to receive continuous training and guidance on financial management and cost recovery options. Local authority training institutes (whether state-run or private) and associations of local authorities need to tackle this issue more systematically. As such, cases where such economic instruments have been successfully applied should be shared among authorities.

For many local authorities, the first steps to take are:

- 7 to systematically track solid waste management costs and analyse cost minimisation potentials in SWM planning;
- 7 to determine realistic cost recovery objectives and mechanisms, be it through improved local tax recovery, revenue creation from waste recycling or the establishment/reorganisation of user charges, or through other instruments like tourist waste fees or landfill fees;
- 7 to consult with national or regional government to ensure that the local cost-recovery options planned are in line with national regulations and national economic instrument plans, and to receive support and guidance from higher-level government bodies.

The design of these instruments can vary significantly, depending on the priorities and implementation capacities of the local government in question and on how acceptable they are to the local population.

- 7 Adapting existing tax or fee systems to cover SWM costs is often the easiest approach; however, when taking forward this approach, authorities should look closely at how an appropriate share can be effectively earmarked for SWM services.
- 7 Pay-as-you-throw user charges might work more effectively if they are applied using a pre-paid system. This can still, however, be difficult to control.
- 7 The benefit of variable user charges linked to property tax bands or to electricity consumption is that they can

be set according to users' ability to pay and can be easily billed together with these other taxes or charges.

- 7 For individual waste user charging, it is important to carefully design an effective billing system, as the local authorities or private service providers tasked with direct fee collection often struggle to achieve high fee-collection rates.

Given that local economic instruments like user charges are often not able to cover the whole cost of SWM and, at the same time, remain affordable for citizens, local authority decision-makers should request and promote the establishment of additional economic instruments at the state or national government levels. These complementary instruments offer great opportunities for ensuring resource-efficient waste management by diverting waste from landfills and, at the same time, improving cost recovery. Some promising instruments for improving waste recovery and valorisation are:

- 7 advanced recycling fees and deposit-refund systems that support the principle of extended producer responsibility;
- 7 grants, subsidies and tax rebates for resource-efficient waste management technologies;
- 7 feed-in tariffs for energy from waste;
- 7 landfill taxes, insofar as they are delivered in tandem with instruments that facilitate the establishment of alternative treatment infrastructure.

It is desirable for national, regional and local governments to closely coordinate their plans and exploit any synergies between different local and national economic instruments.

No single policy measure can achieve improved waste management practices on its own. An integrated waste management strategy requires a combination of measures, and there is no right or wrong approach. As such, combinations of related measures must be developed and adapted as necessary to meet local circumstances. A balanced set of policy measures should contain both legislative and economic instruments. Whatever policies are adopted, they should be based on a detailed assessment of the problems they are intended to address and an analysis of their costs and benefits.

Annexes

7.1 Annex 1: Example of a spreadsheet model for calculating collection costs in Costa Rica

TABLA 2

ESTIMACION DE COSTOS DE INVERSION - ACTIVOS PROPIEDAD DE LA MUNICIPALIDAD

SERVICIO DE RECOLECCION

Valores en Colones sin impuesto de venta

Descripcion	Unidad	Cantidad	Valor unitario ₡	Inversión total ₡	
1	CAMIONES Y VEHICULOS				
1,1	Camión recolector	Nº	7	60.000.000	420.000.000
1,2	Camión, otro tipo	Nº	0	0	0
1,3	Vehiculos livianos	Nº	1	15.000.000	15.000.000
SUBTOTAL 1		Nº	8		435.000.000
2	INFRAESTRUCTURA (PLANTEL)				
2,1	Terreno	m ²	2.000	85.000	170.000.000
2,2	Oficina de administración	m ²	50	100.000	5.000.000
2,3	Taller de mantenimiento	m ²	50	80.000	4.000.000
2,4	Zona de lavado	m ²	30	70.000	2.100.000
2,5	Otras inversiones (sectores/caminos pavimentados, empalme eléctrico, etc.)	global	1	100.000	100.000
2,6	Porcentaje de uso correspondiente a recolección (en caso de ser compartido el plantel)	%	40%	181.200.000	72.480.000
SUBTOTAL 2					72.480.000
3	EQUIPAMIENTO Y ACCESORIOS				
3,1	Equipamiento del plantel (hidrolavadora, herramientas, muebles, PCs, etc.)	global	1	2.500.000	2.500.000
3,2	Contenedores (p.ej. para campañas de reciclaje)	Nº	80	75.000	6.000.000
3,3	Otros	global	1	25.000.000	25.000.000
SUBTOTAL 3					33.500.000
COSTO TOTAL DE INVERSION (1 a 3)					540.980.000

TABLA 3

ESTIMACION DE COSTOS DE OPERACIÓN

SERVICIO DE RECOLECCION

Valores en Colones sin impuesto de venta

Descripcion	hom- bres / turno	turnos / día	total hombres / día	Sueldo bruto / mes ₡	Costo total / mes ₡	Costo total / año ₡	
1	GASTOS EN PERSONAL						
1,1	Gerente (generalmente compartido con otros servicios)	1	0,5	0,50	800.000	400.000	4.800.000
1,2	Jefe de Operaciones	1	1	1,00	500.000	500.000	6.000.000
1,3	Gestor ambiental (sólo si también se dedica al tema de recolección)	1	0	0,00	600.000	0	0
1,4	Secretaria	1	0,5	0,50	300.000	150.000	1.800.000
1,5	Chofer (1 por camión, más eventualmente para vehículo liviano)	8	1	8,00	250.000	2.000.000	24.000.000
1,6	Peón (generalmente 3 por camión, a veces 4)	21	1	21,00	200.000	4.200.000	50.400.000
1,7	Guarda (para plantel, considerar turnos)	1	1,2	1,20	200.000	240.000	2.880.000
1,8	Personal de mantenimiento (plantel, taller, lavado, etc.)	0	0	0,00	250.000	0	0
1,9	Otro personal (especificar)	0	1	0,00	0	0	0
1,10	Horas extras	-	-	2,22	213.793	474.621	5.695.448
1,11	Mano de obra temporal	-	-	4,20	200.000	840.000	10.080.000
SUBTOTAL 1		-	-	38,62	-	8.804.621	105.655.448

Descripción		Unidad	Cantidad	Valor unitario ₡	Costo total / mes ₡	Costo total / año ₡
2	SERVICIOS					
2,1	Alquileres					
a)	Alquiler de edificios, locales y terrenos (plantel)	Nº/mes	1	0	0	0
b)	Alquiler de maquinaria, camiones y vehículos	Nº/mes	1	88.000	88.000	1.056.000
c)	Otros alquileres (equipamiento y accesorios, contenedores)	Nº/mes	1	0	0	0
2,2	Servicios básicos (agua, agua de lavado, energía, correo, telecomunicaciones, internet)	Nº/mes	1	0	0	0
2,3	Servicios comerciales y financieros	global/mes	1	0	0	0
2,4	Servicios de gestión y apoyo					
	a) Asesorías, ingenierías, auditorías, laboratorio, contratación de estudios, etc.	global/mes	1	50.000	50.000	600.000
	b) Vigilancia, limpieza	global/mes	1	250.000	250.000	3.000.000
2,5	Gastos de viaje y transporte	global/mes	1	0	0	0
2,6	Seguros, reaseguros y otras obligaciones	% interés/año	5%	435.000.000	1.812.500	21.750.000
2,7	Capacitación y protocolo	global/mes	1	0	0	0
2,8	Mantenimiento y reparación					
a)	Mantenimiento de maquinaria, camiones y vehículos	% del valor/año	13%	435.000.000	4.712.500	56.550.000
b)	Mantenimiento de edificios e infraestructura (plantel, sin valor del terreno)	% del valor/año	5%	4.480.000	18.667	224.000
c)	Mantenimiento de equipamiento y accesorios	% del valor/año	10%	33.500.000	279.167	3.350.000
2,9	Otros servicios	global/mes	1	0	0	0
SUBTOTAL 2					7.210.833	86.530.000

Descripción	Unidad	Cantidad	Valor unitario ₡	Costo total / mes ₡	Costo total / año ₡	
3	MATERIALES Y SUMINISTROS					
3,1	Combustibles y lubricantes	l/mes	7.510	526	3.950.155	47.401.863
3,2	Herramientas, repuestos y accesorios	global/mes	1	50.000	50.000	600.000
3,2	Otros útiles, materiales y suministros	global/mes	1	100.000	100.000	1.200.000
SUBTOTAL 3				4.100.155	49.201.863	

4	CONSUMO DE ACTIVO FIJO Y BIENES INTANGIBLES / DEPRECIACIONES	Las depreciaciones están consideradas mediante las re-inversiones en la tabla 4.				
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5	OTROS GASTOS					
5,1	Intereses, comisiones y gastos sobre endeudamiento público (préstamos)	% interés/año	11%	435.000.000	3.987.500	47.850.000
5,2	Otros gastos	global/mes	1	0	0	0
SUBTOTAL 5				3.987.500	47.850.000	

TOTAL 1 a 5				24.103.109	289.237.312
IMPREVISTOS	%	10%		2.410.311	28.923.731
GASTOS ADMINISTRATIVOS	%	10%		2.651.342	31.816.104
UTILIDAD PARA EL DESARROLLO DEL SERVICIO	%	10%		2.916.476	34.997.715
COSTO TOTAL DE OPERACIÓN (sin costo de tratamiento ni disposición final)				32.081.238	384.974.862

7.2 Annex 2: Simplified templates for assessing SWM operating and capital costs used in Tirupati, India

SIMPLIFIED TEMPLATE FOR CAPTURING OPERATING AND MAINTENANCE COSTS	
Budget item	Costs in year X
SALARIES AND WAGES	
Managerial and supervisory staff	
Local authority health officer	
Sanitary inspectors	
Sanitary officers, etc.	
Door-to-door collection	
Permanent staff	
Temporary and contract staff	
Drain cleaning and street sweeping	
Permanent staff	
Temporary and contract staff	
Transportation	
Permanent staff	
Temporary and contract staff	
Processing plant, transfer station, treatment plant, landfill	
Permanent staff	
Temporary and contract staff	
Drivers	
Cleaners, etc.	
Others	
VEHICLE AND EQUIPMENT MAINTENANCE	
Repairs and maintenance	
Insurance	
CONSUMABLES, ACCESSORIES AND FUEL	
Fuel expenditure	
Uniforms	
Gloves and protective equipment	
Other accessories	
Other consumables	

POWER COSTS	
Treatment plant	
Landfill site	
Transfer station	
Other facilities and locations used in the local authority SWM	

SIMPLIFIED TEMPLATE FOR CAPTURING CAPITAL COSTS	
Budget item	Costs in year X
FACILITIES' INSTALLATION AND IMPROVEMENT	
Landfill	
Treatment plant	
Transfer station(s)	
Collection points	
VEHICLES AND EQUIPMENT	
AT FACILITIES – landfill site, treatment plant, collection point	
Loader/material handling equipment, etc.	
Secondary transportation	
Dumper placers/tippers/trucks, etc.	
Primary collection	
Rickshaws	
Push carts	
Light commercial vehicles: four-wheelers/three-wheelers	
Bins of different sizes	
Other safety equipment (for firefighting, etc.)	

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