Incentives for Municipalities to Divert Waste from Landfill in South Africa

Final Report

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Incentives for Municipalities to Divert Waste from Landfill in South Africa: Final Report

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EXECUTIVE SUMMARY

INTRODUCTION

The National Environmental Management: Waste Act, 2008 (No. 59 of 2008) (Republic of South Africa, 2008) and National Waste Management Strategy (NWMS) (Department of Environmental Affairs, 2011) call for increased diversion of waste away from landfill towards reuse, recycling and recovery. This is in line with the waste management hierarchy, according to which waste should first be avoided, reduced, reused, recycled or recovered (in order of preference); with disposal as a last resort. It is also in line with the concept of a circular economy, which is central to the updated NWMS (Department of Environment, Forestry and Fisheries, 2021).

However, the majority of waste generated in South Africa is still disposed of (either to landfill or a communal/own dumpsite, or illegally dumped) (Department of Environmental Affairs, 2018a).

The aim of this study was to understand the root causes for the dominance of landfilling as a waste management option in South Africa, and to identify relevant solutions for addressing the issues and for increasing the diversion of waste from landfill toward alternative waste management options.

The focus was on identifying economic instruments that can be implemented by national government to create incentives for the diversion of waste from landfill. In this respect, a guideline was developed for national government, providing guidance for the selection, design and implementation of such instruments.

In addition, the project also looked more broadly at the range of actions required by all relevant role-players in order to move up the waste hierarchy in South Africa.

METHODOLOGY

The project consisted of four phases, as follows:

1. **Scoping**: Literature reviews and workshops with stakeholders and experts to unpack the root causes for the predominance of landfilling as a waste management option in SA.
2. **Review**: Literature review and discussions with stakeholders and experts to identify relevant economic, regulatory and other instruments that can potentially address the root causes and increase the diversion of waste away from landfill toward alternative waste management options. Lessons learned from the implementation of these instruments in other countries were documented, as were considerations for their potential implementation in South Africa.
3. **Assessment**: Evaluation of the identified instruments in terms of their suitability for addressing the root causes and incentivising the diversion of waste from landfill toward alternative waste management options.
4. **Reporting**: Development of a guideline for national government to inform the implementation of economic instruments to incentivise the diversion of waste away from landfill; as well as related project deliverables.

ROOT CAUSES: WHY ARE WE NOT MOVING UP THE WASTE MANAGEMENT HIERARCHY?

A wide range of root causes for the dominance of landfilling as a waste management option in South Africa were identified. These can be categorized as follows:

1. Legislative barriers
2. Low cost of landfilling
3. High cost of alternative waste management options
4. Lack of funding and other resources
5. (Perceived) lack of benefits from alternative waste management options
6. Behavioural and institutional issues

ADDRESSING THE ROOT CAUSES: LEVERS FOR CHANGE

A broad range of potential solutions were identified for addressing the various issues and increasing the diversion of waste from landfill in South Africa toward alternative waste management options. Given the complex nature of the problem, and the broad range of issues to be addressed, no single type of intervention on its own is likely to be effective; nor will actions by any one role-player be effective in isolation. Instead, implementing the waste hierarchy and transitioning to a circular economy will require a coherent set of mutually reinforcing regulatory, economic and other interventions; with actions required by all relevant role-players.

THE ROLE OF ECONOMIC INSTRUMENTS: GUIDELINES FOR NATIONAL GOVERNMENT

During the project, a guideline was developed for national government that focuses specifically on addressing the economic/financial issues identified above, particularly through the implementation of economic instruments and incentives. Specifically, the focus is on economic instruments that can be implemented by national government to create incentives for waste to be diverted from landfill toward alternative waste management options, such as recycling and recovery. The guideline aims to provide practical guidance for the selection, design and implementation of such instruments.

It should be noted that the guideline focuses specifically on ‘downstream’ economic instruments for diverting waste away from landfill; and not on the upstream measures required to reduce waste generation. Specifically, the guideline focuses on the following categories of economic instruments:

- Conditional grant funding for waste infrastructure (through a dedicated fund for waste infrastructure, with conditions attached to funding)
- Landfill tax
- Subsidies/tax concessions (e.g. tax credits for investing in infrastructure for alternative waste treatment, subsidies per unit or per kg of material processed through alternative treatment, tax credits/rebates for using recycled materials, income guarantees/price support to recyclers, ‘top up’ incentives for collectors)
- Virgin material taxes (and elimination of perverse subsidies).

However, in line with the waste hierarchy, it is clear that there is also a need to look at the upstream measures required to achieve waste avoidance and reduction in the first place, rather than solely relying on 'end-of-pipe' solutions to deal with waste once it has already been generated.

KEY FINDINGS

An important finding of the study is that environmental taxes and other economic instruments are only justified where there is a specific market failure (e.g. an environmental externality) to be addressed. Markets and related institutions that are otherwise well-functioning, as well as the requisite institutional capacity and political will, are important prerequisites.

Landfill taxes, for example, are not appropriate when there are underlying structural issues; e.g. pervasive under-pricing of waste services due to landfill sites being unlicensed or non-compliant, lack of full-cost accounting, tariffs being set below the levels required for cost-recovery, etc. These issues need to be corrected before considering a landfill tax, which could create further distortions. Landfill taxes are only designed to address environmental externalities, and not the various other root causes behind the low cost of landfilling and under-pricing of waste services. Specific prerequisites that need to be addressed before landfill taxes can be considered in SA are as follows:

- Licensing of landfill sites, and compliance with permit conditions and with the Norms and Standards for Disposal of Waste to Landfill (Department of Environmental Affairs, 2013)
- Viable alternatives to landfill disposal (e.g. options for recycling) to enable a change in behaviour without stimulating an increase in illegal dumping
- Effective access control, functioning weighbridges and adequate reporting systems, to enable accurate monitoring and reporting of waste quantities
- Capacity to monitor and control illegal dumping
- Full cost accounting, and cost reflective gate fees and waste tariffs, to enable cost recovery
- Municipalities must be in a sufficiently sound financial position for payment of the tax.

Importantly, putting in place some of these prerequisites will in and of itself increase the cost of landfilling (and thereby result in a diversion of waste from landfill); even without the imposition of a landfill tax. Therefore, once these fundamentals have been addressed, it could potentially be found that there is no longer a need for such a tax. In this way, the potential negative impacts of a landfill tax (e.g. stimulating an increase in illegal dumping, negative impacts on municipal finances, etc.) can be avoided.

In conclusion, while this study focuses on 'downstream' economic instruments that can be implemented by national government to incentivise increased diversion of waste from landfill; there is clearly a need for a much broader suite of interventions to be implemented, with action required by role-players at all levels. In particular, there is a need to focus on waste avoidance and reduction, in line with the waste hierarchy; and in particular to focus on improved product design (e.g. Design for Recycling, or Design for Environment more broadly); in line with the circular economy. In addition, with a number of other waste streams currently being addressed through EPR; there is a need for actions to address organic and C&D waste; which make up the bulk of the waste going to landfill, and for which significant untapped opportunities exist.

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1 Introduction

1.1 Problem statement

The National Environmental Management: Waste Act, 2008 (No. 59 of 2008) (Republic of South Africa, 2008) calls for increased diversion of waste away from landfill towards re-use, recycling and recovery. Similarly, the National Waste Management Strategy (Department of Environmental Affairs, 2011; Department of Environment, Forestry and Fisheries, 2021) calls for waste to be managed according to the waste management hierarchy (see Figure 1). This means that waste should in the first instance be avoided, reduced, reused, recycled or recovered (in descending order of preference); with final disposal (e.g. to landfill) as a last resort. Moving up the waste hierarchy is in line with the concept of a circular economy, which is central to the updated NWMS (Department of Environment, Forestry and Fisheries, 2021).

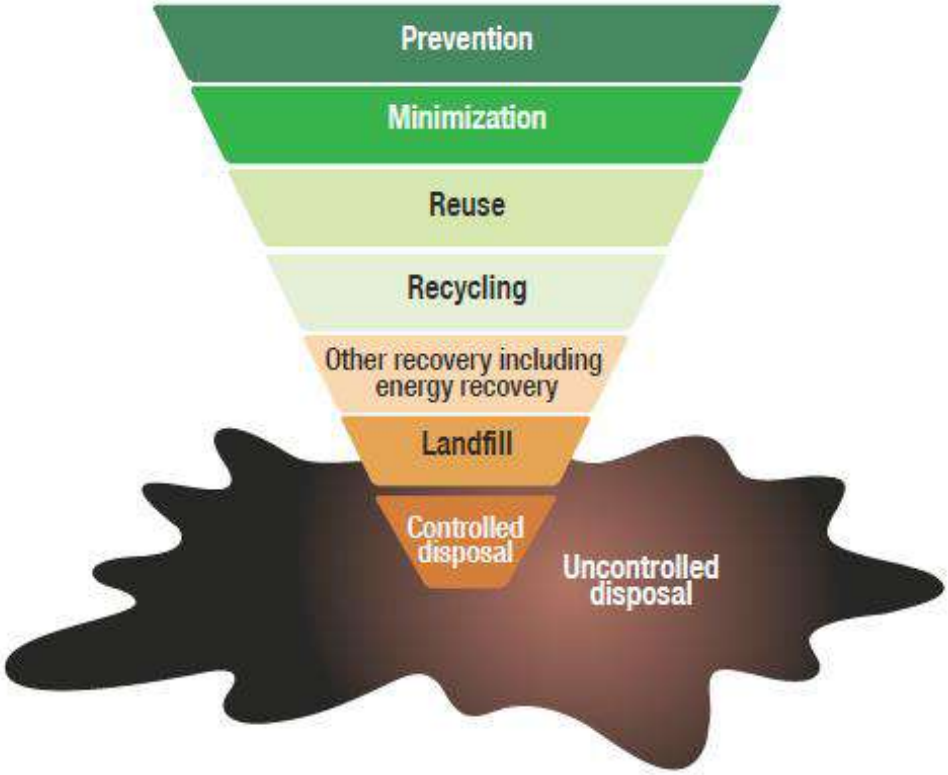

Figure 1: The Waste Management Hierarchy (UNEP, 2015). This depiction of the hierarchy emphasises that disposal to well managed landfills is still preferable to 'uncontrolled disposal' (i.e. open dumping).

However, the majority of waste generated in South Africa is still disposed of (either to landfill or a communal/own dumpsite, or illegally dumped) (Department of Environmental Affairs, 2018a). For example, according to the final draft State of Waste report (Department of Environmental Affairs, 2018a), 34.5% of general waste generated in 2017 was recycled or recovered, while 65.2% was disposed to landfill. This represents a significant loss of valuable resources that could potentially be recovered and recycled for further processing (Department of Science and Technology, 2014). Disposal of waste also gives rise to negative social and environmental impacts (Nahman, 2011); while many municipalities are rapidly running out of landfill airspace.

The dominance of landfilling as a waste management option in South Africa, in preference to alternatives such as recycling, tends to be explained by the relatively low cost of landfilling in South Africa, relative to alternative options, which means that there is no incentive for municipalities to divert waste away from landfill towards alternatives. As such, there is much emphasis on economic instruments[1] (see Section 4) as a means of 'getting the prices right' and creating incentives for moving up the waste management hierarchy in South Africa; that is, for diverting waste from landfill towards alternatives such as recycling. For example, DEA recently commissioned a study to investigate the role of landfill taxes as a means of raising the costs of landfilling in South Africa, and thereby to create incentives for alternative waste management options (DEA, 2018b).

However, the implementation of economic instruments imposes high administrative demands (Pearce and Turner, 1994; Inter-American Development Bank, 2003), and requires the fulfilment of a number of pre-conditions. These include well-functioning markets (Inter-American Development Bank, 2003); adequate institutional capacity to monitor compliance and ensure adequate enforcement (United Nations Environment Program, 2005), and to ensure that perverse incentives (such as illegal dumping) are avoided; and political will, particularly given the likelihood that many economic instruments (particularly taxes and charges, which may impact negatively on business competitiveness and social equity) will be politically unpopular. In a developing country context, many of these pre-conditions are unlikely to be fulfilled.

In addition, while economic instruments have significant theoretical advantages over other types of policy instruments, such as regulatory instruments; in practice, if they not evaluated carefully prior to implementation, they can end up doing more than harm than good. For example, in the case of waste management, economic instruments can lead to a host of perverse incentives and unintended consequences (such as illegal dumping). In addition, landfill taxes levied on municipalities will either be passed on to waste generators in the form of higher tariffs; or, if they cannot be passed on through higher tariffs, they will negatively impact on municipal finances. As such, issues around affordability and resulting distributional impacts (e.g. potential negative impacts on poor households and small businesses) also need to be taken into account.

As such, according to the National Pricing Strategy for Waste Management (Department of Environmental Affairs, 2016), before a decision can be made to implement a particular type of economic instrument, it is crucial to evaluate the range of instruments available, in order to select the right type of instrument for the issue at hand, and to avoid potential negative unintended consequences. In others words, there is a clear need to understand the root causes of the problem, and to consider the full range of potential interventions for addressing these root causes (in addition

[1] Economic instruments, in contrast to regulatory or 'command and control' policy instruments, are a type of environmental policy instrument that seek to change behaviour indirectly; by changing the relative prices (and hence incentives) that individuals and businesses face. Specifically, they are aimed at addressing market failures, such as externalities, i.e. the positive or negative side effects (external benefits or costs) of a particular economic activity or process, which are not incurred by those undertaking the activity, but are instead borne by other parties, broader society, and/or future generations. Examples include pollution arising from the production of a particular product; the costs of which are not typically incorporated within the costs of production, or within market prices for the product in question; and are therefore not taken into account by producers or consumers of that product. Economic instruments aim to 'internalise' these external costs within private costs and benefits (market prices), such that they are taken into account in decision making.

to economic instruments), in order to ensure that the most appropriate instrument or instruments for addressing the problem can be identified.

1.2 Aims of the study

Originally, the objectives of the study were as follows:

1. To understand the root causes of the current price differential between landfilling and alternative waste management options in South Africa
2. To identify potential instruments that can be used by national and provincial government to incentivise municipalities to increase diversion of waste away from landfill
3. To document lessons learned from the implementation of these instruments in other countries
4. To evaluate these instruments based on a broad range of relevant criteria, in order to identify the most appropriate instruments in the South African context
5. To develop a Decision Support Tool that can be used for example by provincial government to inform instruments that can be implemented in their specific context.

During the course of the research, however, it became necessary to refine the objectives to a certain extent, for a number of reasons. Specifically:

- Objective 1: At an early stage during the research, it was found that there are a number of root causes for the dominance of landfilling as a waste management option, aside from simply the issue of the low cost of landfilling relative to alternatives. It was seen as being important to understand the 'bigger picture' in terms of all possible reasons as to why the majority of waste in SA is still being landfilled; in addition to simply the difference in cost between landfilling and alternatives; in order to be able to recommend an appropriate solution or solutions. Objective 1 was therefore broadened to include other potential root causes for the dominance of landfilling as a waste management options, in addition to the issue of cost.
- Objective 2: Similarly to the case of Objective 1, the need was identified to broaden Objective 2 beyond identifying only those instruments that can be implemented by national and provincial government, and only those targeted at municipalities. Instead, there was a need to start by identifying the broader range of instruments that could be implemented to address the issues identified under Objective 1, and to increase the diversion of waste from landfill; irrespective of who the instrument would be implemented by, and who the target of such instruments would be. Thereafter, under Objectives 4 and 5, the broad range of instruments identified would be refined to focus on those that are most relevant to the South African context and to addressing the root causes identified in Objective 1; and specifically to focus on economic instruments that can be implemented by national government to incentivise the increased diversion of waste form landfill.
- Objective 4: After the broad range of potential instruments for increasing diversion of waste from landfill was identified (Objective 2), it became evident that evaluation of these instruments using the Multi-Criteria Decision Analysis (MCDA) approach, as originally intended, would not be appropriate. MCDA and related methodologies are designed to compare and rank among a set of options (e.g. alternative policy instruments), in order to

identify a preferred option. However, in the case of the broad range of instruments identified under Objective 2, the instruments in question should not be seen as alternative, mutually exclusive instruments that can be compared on a one-to-one basis. Instead, they are a range of instruments aimed at addressing different aspects of a very complex problem. As such, there is a need to consider a suitable combination of instruments that should be put in place to address the various issues (i.e., to address the complex range of root causes identified in Objective 1). As such, instead of assessing the instruments based on an MCDA type of approach, the instruments were rather assessed in terms of their suitability for addressing the various issues identified in Objective 1, specifically within the South African context.

- Objective 5: At the time that the study was conceived, it was initially thought that a decision support tool would be developed for use by, for example, provincial government, to inform the selection of instruments that can be implemented within their specific context. However, during the course of the research, it became evident that
    - most economic instruments would typically need to be implemented at a national government level; and that
    - there was a need to provide practical guidance to national government in terms of the implementation of economic instruments.

As such, the study ultimately ending up having the following objectives:

1. To understand the root causes for the dominance of landfilling as a waste management option in South Africa
2. To identify potential instruments that can be implemented to increase the diversion of waste away from landfill
3. To document lessons learned from the implementation of these instruments in other countries
4. To evaluate these instruments based on their suitability to address the root causes identified in Objective 1, in the South African context.
5. To develop a guideline for national government to inform the implementation of economic instruments to incentivise the diversion of waste away from landfill.

In this way, the study aimed to provide evidence-based information to support national government decision making regarding the selection, design and implementation of economic instruments for incentivising the diversion of waste away from landfill towards alternative waste management options.

In addition, the project also looked more broadly at the range of actions required by all relevant role-players in order to move up the waste hierarchy in South Africa. Given the complex nature of the problem, and the broad range of issues to be addressed, no single type of intervention on its own is likely to be effective; nor will actions by any one role-player be effective in isolation. Instead, a suite of coherent and complementary interventions will be required, with action required by all relevant role-players.

1.3 Structure of this report

This report is structured as follows. Section 2 describes the approach to the study. Section 3 summarises the root causes for the dominance of landfilling as a waste management option in South Africa (Objective 1 of the study as outlined above). Section 4 identifies the range of economic, regulatory and other policy instruments that could potentially be applied to increase the diversion of waste from landfill (Objective 2), and reviews lessons learned from their implementation in South Africa and other countries (Objective 3), based on local and international literature. Section 5 overlays the root causes identified in Section 3 with the potential instruments identified in Section 4, in order to identify those instruments that are most suited to addressing the root causes in the South African context, and which can therefore be used as 'Levers for Change' to increase the diversion of waste from landfill in South Africa (Objective 4). In Section 6, we focus in specifically on the economic instruments that could play a role, with a specific focus on those that could be implemented by national government; and provide some guidance regarding their potential implementation in the South Africa context (Objective 5). The information in this section is also provided in a dedicated guideline intended for national government, which aims to provide practical guidance regarding the selection, design and implementation of economic instruments for incentivizing the diversion of waste from landfill toward alternative waste management options.

2 Research Design and Methodology

The project consisted of four main phases; namely scoping, review, assessment, and reporting. Note that the focus of some of these phases changed slightly as compared to what was originally envisaged, in line with the refinement of the objectives of the project as described in Section 1.2. Ultimately, the four phases focused on the following:

1. **Scoping**: Identification of key stakeholders to engage; and determination of the root causes for the predominance of landfilling as a waste management option in South Africa, i.e. for the failure to divert waste towards alternative waste management options; based on a review of relevant local literature and reports; and consultation with relevant experts and stakeholders.
2. **Review**: Identification of relevant economic, regulatory and other instruments that can potentially be used to address the root causes identified in Phase 1, and to increase the diversion of waste away from landfill toward alternative waste management options; and a review of lessons learned from the implementation of these instruments in South Africa and other countries. This consisted of literature reviews, as well as discussions with key stakeholders and experts.
3. **Assessment**: Evaluation of the identified instruments in terms of their applicability to the South African context; and specifically to address the root causes identified in Phase 1, and to incentivise the diversion of waste from landfill toward alternatives; in order to prioritise instruments that are most suited to addressing the issues (with a focus on those that can be implemented by national government).
4. **Reporting:** Development of a guideline for national government to inform the implementation of economic instruments to incentivise the diversion of waste away from

landfill; as well as related project deliverables (including this report, a journal article, a briefing note, and a powerpoint presentation).

3 Root causes for the dominance of landfilling as a waste management option in South Africa

Phase 1 (Scoping) focused on Objective 1 of the study; that is, on understanding the root causes as to why the majority of waste in SA is still being landfilled rather than diverted to alternative waste management options (that is, to identify the obstacles to implementing the waste hierarchy in SA).

Phase 1 was conducted by means of both a review of relevant local literature and reports; as well as two dedicated expert consultation workshops (see Figures 2 and 3), conducted on 28 March 2019 in Gauteng (Pretoria), and 3 April 2019 in the Western Cape (Stellenbosch). In addition, further insights were obtained from a range of additional one-on-one meetings with experts and stakeholders.

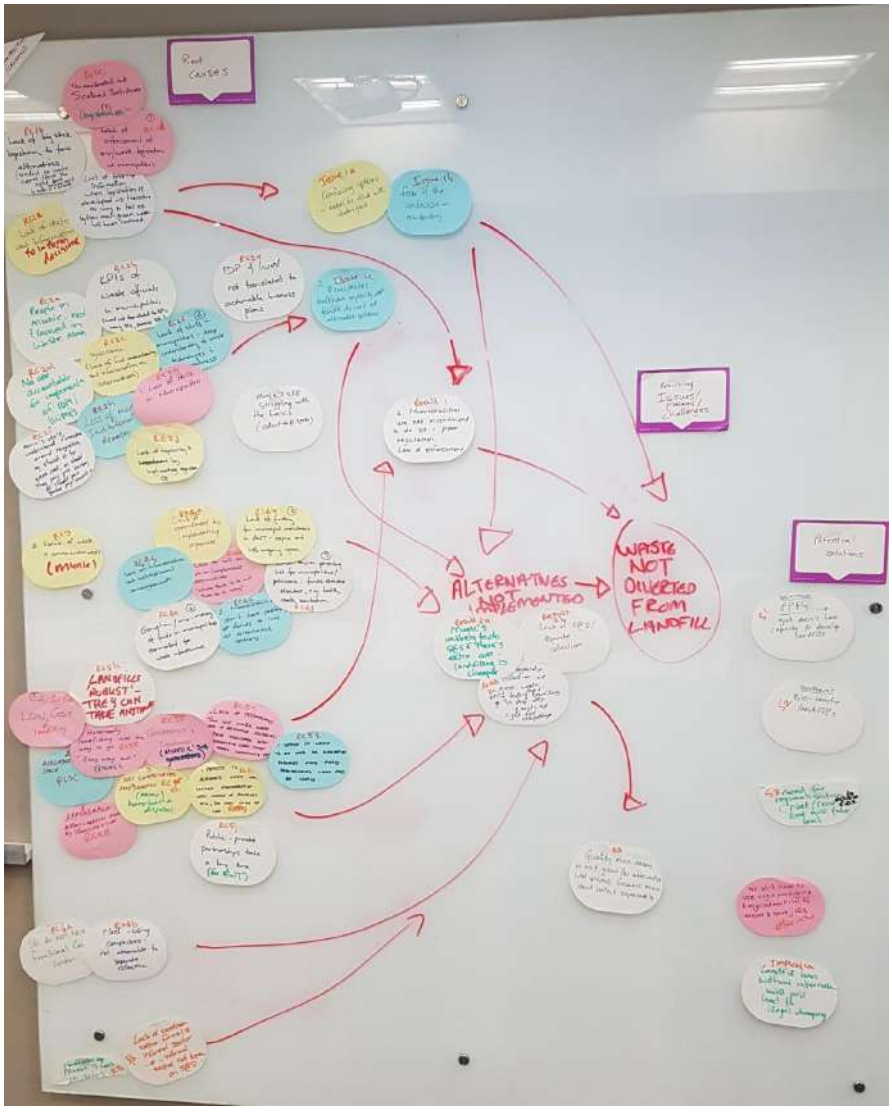

Figure 2: Some of the issues identified during the Pretoria workshop

Figure 3: Some of the issues identified during the Stellenbosch workshop

A wide range of root causes for the dominance of landfilling were identified during Phase 1. These can be grouped into six broad categories of issues, as follows:

1. Legislative barriers
2. Low cost of landfilling
3. High cost of alternative waste management options
4. Lack of funding and other resources
5. (Perceived) lack of benefits from alternative waste management options
6. Behavioural and institutional issues

The following sub-sections unpack these issues in more detail.

3.1 Legislative barriers

3.1.1 Municipalities are mandated to collect and dispose

The mandate of municipalities, as enshrined in the Constitution, is the collection and disposal of waste. Implementing alternative waste treatment technologies, such as recycling, is not seen by municipalities as being their responsibility.

In line with this mandate, Key Performance Indicators (KPIs) for municipal solid waste managers are focused on disposal of waste to landfill, and there is therefore no incentive to divert waste away from landfill.

3.1.2 The NWMS does not allocate and delineate responsibilities

Section 6(3)(b) of the Waste Act states that the National Waste Management Strategy (NWMS) may allocate and delineate responsibilities in line with Section 3; which specifies that it is the duty of the state to put in place measures to ensure that waste generation is reduced; and that waste is reused, recycled and recovered in an environmentally sound manner, before it is safely treated and disposed of.

The 2011 NWMS (DEA, 2011) put in place targets for waste diversion from landfill, but failed to put measures in place to ensure waste reduction, reuse, recycling, and recovery. The updated 2020 NWMS (DEFF, 2021) is similarly not clear on roles and responsibilities. Section 9 does not clearly distinguish who should do what to enable diversion of waste from landfill.

The end result is that no action is taken. Municipalities wait for industry to take action, while industry wait for government to create an enabling environment to support waste reduction, reuse, recycling, and recovery.

3.1.3 Legislation makes it difficult for the private sector to get involved

Certain legislation disincentivises or inhibits private sector participation or investment in waste diversion or beneficiation activities; or makes it a long and complex process to get projects off the ground. These obstacles include:

- The classification of materials as falling under the definition of waste makes beneficiation of such waste streams difficult, as such activities are then classified as waste management activities, for which a Waste Management License (WML) is required, environmental impact assessments (EIAs) must be conducted, etc.; in accordance with the Waste Act. These can be cumbersome and costly processes to undertake.
- Municipal by-laws assign ownership of waste to municipalities. Waste is considered to be a municipal asset and therefore private sector involvement requires processes under the Municipal Finances Management Act (MFMA) (Act no. 56 of 2003). A municipality cannot simply give away municipal assets. It is therefore difficult for the private sector to access such waste streams for beneficiation.
- Some stakeholders mentioned that procurement rules under the Municipal Finances Management Act (MFMA) favour a three year limits on contracts. This period is too short for private sector operators to recoup investment in capital infrastructure, which typically has a longer pay-back period; and as such disincentivises such investment. However, other stakeholders noted that the MFMA does make provision for contracts beyond three years, through an application to National Treasury, although there seems to be a lack of awareness around this or of how such exemption can be obtained.

- Procurement, compliance and regulatory obstacles and red tape make it a difficult and lengthy process to establish public-private partnerships (PPPs).

3.2 Low cost of landfilling

One of the main reasons for the predominance of disposal as a waste management option in South Africa relates to the low cost of disposal, in comparison with alternative waste management options. There is a common understanding that landfilling is 'under-priced' – that is, that the cost of landfilling is artificially low, which creates a perverse incentive for the continued preference of disposal as waste management option. It is generally understood that getting the 'prices right', i.e. increasing the cost of landfilling to reflect the true cost of this management option, would create incentives for waste to be diverted away from landfill towards alternatives.

However, in order to get the prices right, it is first critical to understand the factors at play behind the current low cost (and low price)[2] of landfilling. The review of relevant literature and engagement with stakeholders revealed that there are a number of reasons as to why landfilling is currently too 'cheap' in South Africa:

3.2.1 Many landfill sites in South Africa are unregulated, unlicensed and/or non-compliant, and therefore the cost of landfilling is artificially low.

According to DEA (2018b), based on information reported to the South African Waste Information System (SAWIS), there are 826 landfills in South Africa (both operating and decommissioned), of which 667 (81%) are licensed in terms of the National Environmental Management: Waste Act, 2008 (No. 59 of 2008).

However, there are indications that there are also a large number of unregulated dump sites in South Africa, which are neither licensed nor reported on SAWIS. For example, according to GroundWork (2014), there are a total of 1347 waste disposal sites in South Africa, of which 639 general waste sites and 58 highly hazardous sites are unlicensed. Data from the General Household Survey suggests that "28% of households dispose of waste in an 'own refuse dump'" (DEA, 2018b:ii); particularly in rural areas. This suggests that the number of unregulated sites is high.

DEA has spent R32 million on a campaign to get 258 unlicensed municipal landfills licensed between 2013 and 2016 (DEA, 2018b). This programme is reported as being successful (DEFF, 2021).

However, DEA (2018a and 2018b) highlights that even among facilities with Waste Management Licenses (WMLs), there are a number of facilities that are contravening the conditions of these licenses. In particular, compliance among public waste management facilities is generally low (DEA,

[2] It is important to distinguish between the 'cost' and 'price' of landfilling. In the case of municipal landfill sites, the cost refers to what it costs the municipality to dispose of waste to landfill, per tonne. The 'price' refers to landfill gate fees and/or waste tariffs. In theory, the cost of landfilling determines whether there is an incentive for municipalities to seek alternatives; while gate fees and waste tariffs (in theory) influence the behavior of private disposers and waste generators respectively. Generally speaking, both the costs and the price of landfilling are currently low in South Africa, so there is no incentive for municipalities, private disposers or waste generators to seek alternatives.

2018a). Indeed, DEA acknowledges that even following the successful licensing campaign, many of the licensed landfill sites still did not have the requisite infrastructure to ensure that they are operationally compliant (DEA, 2018b), and as such there are ongoing challenges associated with non-compliance with permit conditions (DEFF, 2021), and with monitoring and enforcement of legislation.

The net result of landfills being unregulated, unlicensed, or non-compliant with their license conditions is that many disposal sites in South Africa are not properly engineered sites, and are deficient in terms of infrastructure and/or operating standards; and as such the costs of landfilling are artificially low.

In particular, many landfill sites do not comply with the Norms and Standards for Disposal of Waste to Landfill (DEA, 2013); which "increased the specifications, and hence the capital costs, of landfills" (DEA, 2018b). Specifically, the Norms and Standards specify minimum engineering requirements for containment barrier design to prevent leachate and other negative environmental impacts; which implies a significant increase (nearly double when compared to the Minimum Requirements) in the cost of developing new landfill sites and cells that meet these requirements. The significant increase in cost "has been felt by those municipalities who needed to construct new cells or new landfills" (DEA, 2018b) in compliance with the new standards. To the extent that these requirements are not met, however, the cost of landfill disposal will be too low. Many municipalities, particularly in cases where landfills were constructed prior to 2013, do not yet comply with the standards, "and thus the cost of landfilling is artificially low" (DEA, 2018b).

Specifically, the Norms and Standards specify minimum engineering requirements for containment barrier design to prevent leachate and other negative impacts; which implies a significant increase in the cost of developing new landfill sites and cells that meet these requirements. To the extent that these requirements are not met, however, the cost of landfill disposal will be artificially low.

3.2.2 Lack of full cost accounting and cost recovery for waste services

Even if waste disposal standards and permit conditions are being met, and the actual costs of disposal to landfill are in line with what municipalities "should" be spending; in many cases, solid waste tariffs (charged to waste generators for waste collection and disposal services) and landfill tipping fees (charged to waste generators for disposing of waste directly at municipal landfill sites) are set too low to reflect these costs. This means that municipalities are not obtaining sufficient revenues to properly maintain and improve landfill infrastructure. It also implies that there will be no incentive for waste generators to reduce the amount of waste that they generate, or to seek alternative waste management options, such as recycling (DEA, 2018b).

There are a number of reasons why solid waste tariffs and tipping fees among South African municipalities do not reflect the costs of providing waste services (see DEA, 2018b), including:

- The way in which municipalities source funds for capital infrastructure. In many cases, funding for solid waste infrastructure forms a relatively small component of a larger loan for the municipality's overall capital programme, which is repaid through general

revenues, rather than through ring-fenced solid waste revenues. In other cases, funding is obtained through capital grants; and since municipalities are not required to depreciate grant-funded assets, the associated capital expenditure is not reflected in operating costs, and is therefore not taken into account in the calculation of tariffs (DEA, 2018b).

- Lack of full cost accounting. Full cost accounting (FCA) is a systematic approach to identifying and quantifying the full cost of providing a service, including not only current and direct capital and operating costs; but also the indirect, past and future costs of providing the service; including overhead costs, maintenance costs, administration costs, replacement costs, and interest charges. Importantly in the context of waste disposal services, full cost accounting includes future costs that are directly related to current activities, such as the costs associated with landfill closure and post-closure (including rehabilitation) (DEA, 2012; DEA, 2018b). The Municipal Solid Waste Tariff Strategy (DEA, 2012) promotes the principle of full cost accounting for waste services, while the National Waste Management Strategy (DEA, 2011) set a target for all municipalities to conduct full cost accounting for waste services (and to set cost reflective tariffs) by 2016. However, according to DEA (2018b) and DEFF (2021), aside from the large metros, very few municipalities have achieved this.
- Tariffs must be approved by municipal councils, who are obliged to balance cost recovery objectives with affordability to ratepayers (DEA, 2018b); such that actual tariffs may be lower than those required to ensure cost recovery.
- Solid waste tariffs are generally set as a flat monthly fee, or flat fee per bin, rather than taking into account the actual quantity of waste generated (DEA, 2018b); and as such they do not reflect the costs per tonne of waste generated (nor do they create incentives for reduced waste generation).
- Municipalities are obliged to provide solid waste services to indigent households for free (DEA, 2018b); such that no tariffs or fees are applicable in this instance.
- Many municipalities charge very low landfill tipping fees, or do not charge for the first tonne disposed; or, in some cases, do not charge landfill tipping fees at all. Typically this is done to avoid stimulating illegal dumping, or because of a lack of weighbridges (DEA, 2018b).

3.2.3 Externalities are not internalized

Externalities refer to the positive or negative side effects (external benefits or costs) of a particular economic activity or process that are not incurred by those undertaking the activity (e.g. the producer of a particular product), but are instead borne by other groups in society and/or by future generations; or are dispersed throughout society as a whole (Nahman, 2011). Typical examples of externalities are environmental and social impacts, such as pollution. In the absence of some form of government intervention, externalities are not incorporated in the direct financial cost associated with the activity or process in question, and are therefore not internalised in prices associated with that activity or product. As such, in the case of negative externalities (such as pollution), prices will be too low, and as such there will be no incentive to reduce use or consumption of that particular activity or product.

Landfilling gives rise to negative environmental externalities in the form of leachate generation and emissions of methane (a component of landfill gas), which is a powerful greenhouse gas; as well as negative social externalities in the form of noise, odour, litter, vermin and dust (Nahman, 2011). This is therefore another reason as to why the costs of landfilling appear too low as compared to the 'true' cost, and as to why solid waste tariffs and landfill gate fees are too low, thereby not incentivising a reduction in waste generation.

It is important to note, however, that the external costs associated with landfilling can be mitigated to a certain extent through improved landfill infrastructure and management. For example, fully engineered landfill sites, constructed with liners to contain leachate, and landfill gas capture systems to prevent methane emissions, will have a lower environmental impact. In this case, the external costs of landfilling would have been internalised in 'private' costs (that is, the costs to the municipality of constructing and managing the landfill site). There therefore tends to be a trade-off between private costs and external costs. Engineered landfill sites, which are compliant with norms and standards, will have higher capital and operating costs, but lower environmental costs; whereas non-compliant landfill sites will have lower capital and operating costs, but higher environmental costs. It is therefore clear that addressing the artificially low costs of landfilling through compliance with the norms and standards (see Section 3.2.1 above) will not only raise the cost of landfilling, thereby creating incentives to divert waste toward alternatives, but will also reduce the environmental impact associated with landfilling.

3.3 High cost of alternative waste management options

Although alternative waste treatment technologies give rise to a number of benefits, such as cost savings associated with the extension of landfill lifespans (see Section 3.5); they can also be costly to implement. Costs are likely to be particularly high in the absence of the required economies of scale.

In particular, alternative treatment technologies tend to be waste stream-specific, and require a higher level of segregation of waste into different fractions, which increases the costs of waste management relative to the traditional model of collect and dispose. On the other hand; where waste has not been separated at source; additional pre-processing steps (such as sorting and washing) are required, which increases the capital and operating costs of the downstream processing industry.

As such, relative to landfilling, alternative waste management options generally have:

- high capital costs (e.g. additional vehicles required for separate collection; new infrastructure required for sorting, treatment and processing; etc.); and
- high operating costs (e.g. costs associated with separate collection of waste, energy costs associated with processing, etc.).

3.4 Lack of funding and other resources

The relatively high cost of alternative waste management options (as compared to landfilling) is generally seen as unaffordable to municipalities, who do not have funds either to invest in CAPEX, or for the ongoing OPEX. In addition, there is lack of other necessary resources, including the requisite skills and data. Some specific issues in this regard are as follows:

3.4.1 Lack of funding for capital infrastructure

The capital infrastructure required for alternatives is not suited to funding from municipal sources (such as tariffs); instead, municipalities rely on funding from national sources for such infrastructure. Currently, the Municipal Infrastructure Grant (MIG) is the only source of funding from national government that can be accessed by municipalities for waste-related infrastructure. However, waste projects have to compete with projects from other sectors (e.g. water, sanitation and electricity), which are typically prioritised (World Bank, 2019a).

As a result, and taking into account the high cost of such infrastructure (see Section 3.3), there is a lack of infrastructure and equipment for the collection, sorting and processing of waste; for example, a lack of vehicles (or unsuitable vehicles) for separate collection of recyclables, a lack of materials recovery facilities (MRFs), a lack of processing capacity, etc.

3.4.2 Difficult to raise tariffs

Covering the higher OPEX costs associated with alternatives would require that tariffs are raised, which is difficult from a political and affordability perspective. As a result, and taking into account the higher operating costs involved (see Section 3.3), there is a lack of separate collection, sorting and processing of waste. For example, most municipalities do not currently implement separation at source programmes. As such, the quality and quantity of waste recovered is not sufficient for alternative treatment or recycling.

3.4.3 Lack of skills

Municipalities generally lack skills and capacity for waste management (for example, municipal solid waste officials are often not trained in waste management); and many municipalities still struggle with the basics (collection and disposal). In particular, there is a lack of expertise and knowledge to understand and properly assess the wide range of alternative technology options and their appropriateness (and associated risks), leading to confusion and uninformed decisions, or inaction.

In particular, there is a lack of understanding regarding economic and financial aspects. For example, there is a lack of expertise to conduct full cost accounting; to quantify the value of waste; and to properly assess the costs and benefits of landfilling vs. alternatives; including externalities, indirect costs and benefits, and avoided costs.

3.4.4 Lack of data

Finally, there is a lack of data on the basis of which informed decisions can be made. For example, in many municipalities, there is a lack of baseline information on the volumes and types of waste generated, waste composition, and of whether the quality of the waste is suitable for specific alternative technology options.

3.5 (Perceived) lack of benefits from alternative waste management options

In many cases, the financial benefits associated with diversion of waste from landfill are seen to be too low to justify the relatively higher cost associated with alternative waste treatment. In some cases, the benefits are not fully understood or appreciated and are *perceived* to be too low (see Section 3.4.3), while in other cases, they are *actually* too low.

3.5.1 Where there is airspace available, there is no incentive to divert waste

In the case of municipalities who still have many years of available airspace, there is no apparent benefit associated with saving landfill airspace (except in the very long term). Municipalities have invested CAPEX in the establishment of landfills, so as long as there is still airspace remaining, municipalities need to continue landfilling so as to recover these 'sunk' costs. In addition, some OPEX costs (such as salaries) remain constant irrespective of the quantities of waste going to landfill, so if there is less waste going to landfill, the costs per tonne of waste are higher.

3.5.2 Failure to properly understand or account for the benefits

Financial cost-benefit analyses and short-term municipal budgeting processes do not currently incorporate externalities, indirect benefits, or avoided costs. Specifically, they do not account for the value of waste, the long term benefits of diverting waste from landfill (particularly when there are many years of landfill airspace still available, see above), or benefits in terms of the production of energy and other by-products from alternative waste treatment).

3.5.3 Market prices are too low

In many cases, market prices for recyclables are too low relative to the costs of collecting and recovering such materials; and as such there are no profits to be made from these activities, and therefore no incentives for collection and recovery.

3.5.4 Fluctuating market price of virgin materials

The fluctuating market price of virgin materials (linked to global commodity prices) relative to recycled materials means that there is no guaranteed market for recycled materials, which disincentivises investment in recycling infrastructure.

3.5.5 Lack of markets

In many cases there is a lack of markets for recyclables, or for the end-products produced from recycled materials.

For example, the global demand for recyclables has crashed as a result of the Chinese ban on waste imports; while the local market is limited in many cases. A specific issue identified is the lack of off-take agreements to guarantee a market.

3.5.6 Virgin materials tend to be cheaper

Some recycled materials (or the end products produced from such materials) are unable to compete in the market, because virgin alternatives tend to be cheaper. This is particularly the case when oil prices are low, which reduces the price of virgin plastics and other virgin materials, such that recycled materials are unable to compete.

3.6 Behavioural and institutional issues

The current take-make-dispose linear economy model is a deeply entrenched status quo, and therefore difficult to change. Transitioning toward a more circular economy model; and moving up the waste management hierarchy away from disposal toward waste reduction, reuse and recycling; requires commitment from all actors along the value chain – particularly producers, waste generators, and municipalities; as well as national government, in terms of creating an enabling environment. In addition, there is a need for improved collaboration and partnerships among the various actors.

3.6.1 Lack of an effective enabling environment created by national government

There is a perception that legislation, policy and other initiatives are fragmented and uncoordinated; and that decisions are made without a full understanding of the problem or without the required information; and in particular without taking into account the local context.

3.6.2 Producers don’t take responsibility for their products at end of life

In the absence of Extended Producer Responsibility (EPR) schemes, producers generally do not take responsibility for the waste generated as a result of the products that they put on the market; managing this waste then becomes the municipality’s problem.

3.6.3 It is difficult to change deeply entrenched behavioural patterns among waste generators

There are a number of reasons as to why promoting recycling behaviour among waste generators is difficult, including:

- Behavioural patterns are affected by, among other things, values, attitudes and culture (for example, South Africa is generally characterized by a ‘throwaway’

culture; while taking care of the environment is generally low on the priority list); and are therefore deeply entrenched and difficult to change. In particular, people do not tend to associate with waste, but see it as the municipality's responsibility; while the value of waste is not appreciated.

- It is easier to simply throw waste in the trash; separating waste for recycling takes additional time and effort.
- There is a lack of knowledge or awareness around recycling – e.g. around how, what and where to recycle.
- Generally speaking, there is a lack of convenient recycling facilities in many areas, and in particular a lack of separation at source with kerbside collection of recyclables.
- Even in cases where separation at source programmes are implemented, participation rates are generally low. There are various reasons for this, including a lack of awareness; poor service delivery, resulting in people losing faith in the system, etc.

3.6.4 Institutional issues within municipalities

- Since municipalities' mandate is to collect and dispose of waste (see Section 3.1.1):
    i. they do not see recycling as their responsibility.
    ii. KPIs for municipal solid waste managers are focused on disposal of waste to landfill, and there is therefore no incentive to divert waste away from landfill.
    iii. In line with this mandate; landfilling is, historically, what municipalities are accustomed to doing. It is therefore seen as 'easy' and 'convenient'. On the other hand, alternatives are unchartered territory; and there is a fear of the unknown, an unwillingness to take risks, and institutional resistance to change.
- There is a lack of accountability for the implementation of Integrated Development Plans (IDPs) and Integrated Waste Management Plans (IWMPs); and in particular, there is a lack of political will or commitment to implement alternatives to landfilling.
- Waste is low on the priority list for municipalities; funds tends to be directed to other priorities; such as health, roads and sanitation; while there is also corruption and mismanagement of funds.
- Municipalities tend to operate in silos; there is a lack of shared learning, participation, or learning from what has worked well previously.

3.6.5 Lack of collaboration and partnerships

Generally speaking, there is a lack of effective communication, collaboration and partnerships among the various actors in the value chain. In particular, stakeholders noted that improved collaboration and partnerships are required between producers, municipalities, and the South African Local Government Association (SALGA); between municipalities and private sector waste

companies (in particular, a need was identified for increased involvement of private sector waste management companies, e.g. through public-private partnerships (PPPs)); and between the formal sector (municipalities and private sector collectors) and informal waste reclaimers.

4 Literature review: Review of policy instruments for diverting waste from landfill

4.1 Introduction

Environmental problems, including those related to solid waste management, have traditionally been addressed using 'command-and-control' regulations, which regulate behaviour directly, by prescribing specific legislation and standards which must be achieved, and enforcing compliance through the use of penalties and fines (Perman et al., 2003). By contrast, economic instruments and incentives, such as environmental taxes and subsidies, seek to change behaviour indirectly; by changing the relative prices (and hence incentives) that individuals and businesses face. In the context of waste management, they can be used to provide incentives for waste generators (producers and consumers), municipalities and service providers to reduce waste generation and to seek alternatives to final disposal to landfill (such as re-use, recycling or recovery) (Inter-American Development Bank, 2003).

Under a regulatory (command and control) approach, "the regulatory authority sets an environmental standard (target) and the polluter is required to honour the standard, under the threat of some penalty system" (Pearce and Turner, 1993:64). Thus, all polluters must achieve the same standard, "regardless of individual differences in the ability to comply with the regulation" (Inter-American Development Bank, 2003:7). In developing countries, including South Africa, regulatory mechanisms still dominate environmental policy, including solid waste management, with governments relying on public provision of waste management services, and regulatory instruments to deal with the problems arising from waste generation and disposal (Pearce and Turner, 1994; National Treasury, 2006).

However, "the option of using various economic instruments has emerged as an alternative to this approach, in order to improve the efficiency and efficacy of waste management" (Inter-American Development Bank, 2003:29). Economic instruments work through the price mechanism, i.e., they seek to change behaviour *indirectly*; by changing the relative prices (and hence incentives) that individuals and businesses face.

In particular, economic instruments are aimed at addressing market failures, such as externalities, which distort market prices, thereby providing price signals for behaviour that is sub-optimal from an overall social perspective. Externalities refer to the positive or negative side effects (external benefits or costs) of a particular economic activity or process, which are not incurred by those undertaking the activity, but are instead borne by other parties, broader society, and/or future generations. Examples include pollution arising from the production of a particular product; the costs of which are not typically incorporated within the costs of production, or within market prices for the product in question; and are therefore not taken into account by producers or consumers of

that product. Externalities therefore drive a wedge between 'social' costs and benefits on the one hand (i.e., the overall costs and benefits to society of a particular activity, inclusive of both private costs and external costs); and 'private' costs and benefits on the other (i.e., market prices, which influence the behaviour of producers and consumers). Economic instruments aim to 'internalize' these external costs within private costs and benefits (market prices), such that they are taken into account in decision making.

Economic instruments have grown in importance in developed countries since the 1980s, where experience has shown that they can be highly effective in achieving environmental objectives, such as reducing waste generation or diverting waste from disposal to recycling, provided that adequate enforcement mechanisms are in place (Forum for Economics and the Environment, 2002; United Nations Environment Program, 2005). There has also been growing interest in the use of such instruments in developing countries, where they appear to have some important advantages over command-and-control (Pearce and Turner, 1994; Bell and Russell, 2002; Inter-American Development Bank, 2003). These include cost effectiveness, promotion of economic efficiency, incentives for innovation, the potential for self-regulation, and the potential for revenue generation. In turn, revenues can be used in various ways (depending on the extent to which such revenues can be ring-fended), such as to finance related environmental expenditures (such as improved waste management services in the case of solid waste management) or policies (such as subsidies), or to reduce distortionary taxes elsewhere in the economy, such as on labour, thereby generating a 'double dividend' (National Treasury, 2006).

In the context of waste management, economic instruments are "incentives or disincentives that influence waste generators – both consumers and producers – [as well as service providers, such as municipalities and recycling companies] to minimise, recycle or recover waste" (Inter-American Development Bank, 2003:8). In theory, economic instruments are able to 'internalise' the externalities associated with solid waste; that is, to close the gap between private and social costs; thereby ensuring that an optimal'[3] level of waste is generated, and that an optimal combination of recycling and landfilling occurs (Pearce and Turner, 1993).

Generally speaking, externalities can be internalised either by taxing environmentally damaging activities, such as landfilling; or by subsidising environmentally beneficial activities, such as recycling (Turner et al., 1996:29). For example, in the case of disposal of waste to landfill, there are 'negative' externalities in the form of environmental, social and health impacts; such as emissions of leachate and methane, odours, visual impacts, etc. (Nahman, 2011). Landfill taxes aim to internalise these externalities within market prices (landfill tipping fees and/or waste tariffs), by incorporating the external costs within the private costs of those undertaking the activity (e.g. the landfill owner/operator); such that they can then be incorporated within market prices; thereby creating incentives for a reduction in disposal to landfill.

[3] The concept of an 'optimal' level of waste generation refers to the fact that 'zero waste' is unlikely to be economically efficient (since the overall social costs of achieving zero waste, even if physically possible, are likely to outweigh the benefits). Instead, there is likely to be a non-zero level of waste generation, beyond which the costs of any further reduction in waste will outweigh the benefits.

On the other hand, relative to landfilling, recycling gives rise to 'positive' externalities, in the form of improved environmental and social outcomes (e.g. job creation). In this case, subsidies may be warranted. Subsidies essentially act in the opposite direction to taxes - they aim to support activities that give rise to positive environmental and social externalities.

Generally speaking, the most common examples of economic instruments within the field of solid waste management fall within one of the following categories:

1. Taxes and charges on activities generating negative externalities (e.g. waste generation or disposal to landfill), which increase the private costs associated with these activities, such that the external costs are 'internalised', i.e. such that the relevant actors take full social costs into account, and thus reduce their level of the activity to the socially optimal level. For example, such instruments have increasingly been used to change behaviour (i.e. reduce consumption or waste generation; or encourage waste minimisation, recycling, reuse or recovery) by making waste generators (producers or consumers) or service providers pay per unit of waste generated or disposed of; either through taxes on waste-generating inputs or products, or quantity-based (as opposed to flat) user charges for collection or disposal services (Inter-American Development Bank, 2003).

   Taxes and charges can act at various stages along the product-waste value chain (see Figure 4). For example, input or product taxes are upstream instruments, affecting the prices of waste-generating inputs or products, thus affecting the incentives of producers and/or consumers, so as to reduce the amount of waste generated (waste avoidance/minimisation). However, if applied specifically to non-recyclable or hazardous inputs or products, they can also have the effect of reducing the generation of non-recyclable forms of waste (and thereby indirectly reducing the quantity of waste disposed of to landfill, in favour of recycling); or the environmental impact of a given quantity of waste.

   Volumetric tariffs and disposal taxes, by contrast, are primarily downstream instruments, affecting the price of waste collection and/or disposal services, and thus affecting the incentives of waste generators and/or municipalities in terms of how a given quantity of waste will ultimately be managed (e.g. disposal to landfill, vs alternative waste treatment options such as recycling). In addition, however, by raising the costs of waste collection or disposal, they also indirectly raise the costs of waste generation, and may therefore ultimately reduce waste generation indirectly, by affecting the type or quantity of goods purchased (Choe and Fraser, 1998).

2. Subsidies on activities generating positive externalities (e.g. recycling), which increase the private benefits or reduce the private costs associated with such activities, such that the external benefits are internalised. The result is that recyclers would be able to realise the full social benefits of recycling, such that incentives are created to increase recycling to the socially optimal level. Recycling subsidies, for example, "appear to offer some advantages in the developing country context… [They] could involve fairly modest sums of finance but still increase recycling activities" (Pearce and Turner, 1994:13).

3. Deposit-refund schemes (or deposit-refund systems), which involve a combination of taxes and subsidies, and which also seem to be appropriate to the developing country context (Inter-American Development Bank, 2003).

Examples of economic instruments that can be applied at various stages along the waste value chain are provided in Figure 4 (DEA, 2016). Note that the different instruments can be implemented at various points along the chain (upstream or downstream), at different levels (e.g. by national government, municipalities or the private sector); and to target the behaviour of different actors within the chain (e.g. producers, waste generators, or municipalities). The appropriate instrument in any given case depends on whether the aim is primarily to reduce waste generation, to encourage recycling activities, to divert waste from landfill, etc.

Figure 4: Examples of economic instruments along the waste value chain (Source: DEA, 2016).

The focus of this project is primarily on instruments aimed at creating incentives for the diversion of waste from landfill, in favour of alternative waste treatment options, such as recycling. As such, the focus is primarily on 'downstream' instruments for diverting waste away from landfill (as per Figure 4); and not on the upstream measures required to reduce waste generation in the first place. However, in line with the waste management hierarchy (Figure 1), it is clear that there is also a need to focus on achieving waste avoidance and reduction, rather than solely relying on 'end-of-pipe' solutions to deal with the waste problem.

However, it is important to bear in mind that the implementation of economic instruments imposes high administrative demands (Pearce and Turner, 1994; Inter-American Development Bank, 2003), and requires the fulfilment of a number of pre-conditions. These include well-functioning markets (Inter-American Development Bank, 2003); adequate institutional capacity to monitor compliance and ensure adequate enforcement (United Nations Environment Program, 2005), and to ensure that perverse incentives (such as illegal dumping) are avoided; and political will, particularly given

the likelihood that many economic instruments (particularly taxes and charges, which may impact negatively on business competitiveness and social equity) will be politically unpopular. In a developing country context, many of these pre-conditions are unlikely to be fulfilled.

It is therefore important to consider that, in addition to economic instruments, other types of policy instruments can be used to change behaviour with respect to landfilling and alternative waste management options. Specifically, in addition to economic instruments (also referred to as market-based instruments), other categories of environmental policy instruments include regulatory instruments ('command-and-control'), and 'softer' types of instruments based on education/awareness/information provision, voluntary approaches, and behavioural 'nudges'. Examples of regulatory instruments would include bans on certain waste types to landfill; while an example of a 'softer' instrument is an information campaign to encourage recycling. In addition, it is crucial that any instrument designed to discourage landfilling is accompanied by the provision of alternatives; e.g. adequate recycling infrastructure and services; in order to reinforce the desired behaviour, while reducing the likelihood of an increase in illegal dumping.

While economic instruments have significant theoretical advantages over command-and-control instruments; in practice, they have often been shown to do more harm than good, and in many instances they are not appropriate, particularly in a developing country context. For example, in the case of waste management, economic instruments can lead to a host of perverse incentives and unintended consequences (such as illegal dumping). In addition, landfill taxes levied on municipalities will either be passed on to waste generators in the form of higher tariffs; or, if they cannot be passed on through higher tariffs, they will negatively impact on municipal finances. As such, issues around affordability and resulting distributional impacts (e.g. potential negative impacts on poor households and small businesses) also need to be taken into account.

As such, according to the National Pricing Strategy for Waste Management (Department of Environmental Affairs, 2016), before a decision can be made to implement a particular type of economic instrument, it is crucial to evaluate the full range of instruments (including economic, regulatory and other types of instruments) available, in order to select the right type of instrument for the issue at hand. If not evaluated carefully prior to implementation, economic instruments (such as landfill taxes) can end up doing more harm than good. It is therefore crucial that the right type of instrument is selected to address the problem, in order to avoid potential negative unintended consequences. Therefore, a wide range of possible instruments and incentives should be investigated, in order to ensure that the most appropriate instrument or instruments for the South African context can be identified.

DEA (2018b: iv) identifies three primary means to reduce the absolute volume of waste to landfill, namely: "mechanisms to reduce overall waste generation; mechanisms to make landfill more expensive; and mechanisms to make disposal alternatives more viable". However, these three categories exclude certain other type of instruments that could be included within a broader categorisation; such as landfill bans, permit conditions, etc. In addition, each of these categories can be sub-divided further as 'regulatory', 'economic', or 'other' types of instruments. As such, we would suggest the following categorisation:

1. Instruments aimed at reducing waste generation
    - Regulatory
    - Economic
    - Other
2. Instruments aimed at discouraging waste to landfill
    - Regulatory
    - Economic
    - Other
3. Instruments aimed at making alternatives more viable
    - Regulatory
    - Economic
    - Other

In Table 1, a wide range of potential instruments for reducing the volume of waste going to landfill are identified, based on a comprehensive review of both local and international literature. The instruments are grouped in terms of their primary purpose (i.e. to reduce waste generation, to discourage waste to landfill, or to make alternatives more viable); and then in turn they are broken down further by category (economic, regulatory, or 'other' types of instruments). Although not strictly part of the terms of reference for this study, 'upstream' instruments for reducing waste generation are also included within Table 1 for the sake of completeness, since waste avoidance and reduction still be prioritized as the 'pinnacle' of the waste hierarchy. Indeed, the most effective way to reduce waste to landfill is to reduce the quantity of waste generated in the first place, as opposed to relying purely on 'end-of-pipe' solutions.

However, for the remainder of this report, the focus is only on the latter two categories of 'downstream' instruments, namely those aimed specifically at discouraging waste to landfill (Section 4.2); and/or making alternatives more viable (Section 4.3); since the focus of the study is on instruments to incentivize diversion of waste from landfill to alternatives, and *not* on mechanisms for reducing waste generation.

In Sections 4.2 and 4.3, we provide more detail on each of the instruments under these two categories, and review lessons learned from their implementation both in other countries (and in South Africa, where applicable). Note however that some of the specific instruments identified in Table 1 are grouped together for the purpose of discussion in Sections 4.2 and 4.3, since they share similar features.

Table 1: Potential instruments for reducing the volume of waste going to landfill

Primary Purpose	Category	Type	Instrument
Reducing waste generation	Regulatory	Standards	Product standards limiting amount of material, input, or packaging
	Economic	Taxes	Input taxes
			Packaging material levy
			Product taxes
			Advance disposal fees
		Subsidies	Subsidies to manufactures to reduce use of inputs / packaging etc.
		User charges	Quantity-based (volumetric) waste collection tariffs (pay-as-you-throw)
	Other	Education / awareness	Awareness programmes and behavioural 'nudges'
Discouraging waste to landfill	Regulatory	Licensing / permits	Licensing of landfill sites
		Quotas	Non-tradable quotas
		Enforcement	Enforcement of license / permit conditions
		Penalties & fees	Non-compliance fees
		Bans	Landfill bans
	Economic	Trading schemes	Tradable landfill quotas
		User charges / elimination of perverse subsidies	Cost reflective gate fees
			Differentiated gate fees
		Taxes	Disposal tax (landfill tax)
		Funding	Waste Infrastructure Development Fund
	Other	Education / awareness	Capacity Building
			Awareness raising
Making alternatives more viable	Regulatory	Legislation	Legislative changes
		Standards	Product standards to increase reusability/ recyclability
			Product standards mandating use of recycled materials or specifying a minimum recycled content
			Recycled product labelling.
			Adapting building standards
			Quality standards
		Procurement policies	Procurement policies mandating the use of recycled products
			Preferential pricing
			"Set-asides"
			Off-take agreements
	Economic	Elimination of perverse subsidies	Elimination of subsidies on virgin materials
		Taxes	Virgin material taxes
			Advance recycling fee
		Tax-subsidy combination	Deposit-refund scheme

Primary Purpose	Category	Type	Instrument
		Subsidies	Subsidies to producers
			Subsidies to households
			Subsidies to collectors
			Subsidies to recyclers
		Tax concessions	Tax rebates / exemptions
		Trading schemes	Tradable recycling certificates
		Funding	Infrastructure Development Fund
			Grants
	Other	Partnerships	Multi-stakeholder decision making
			PPPs
			Integration of informal sector
		Education / awareness	Awareness raising
			Training and development
		EPR	Various instruments to facilitate EPR
		Separation at Source (S@S)	Various instruments to facilitate S@S

4.2 Instruments aimed at discouraging waste to landfill

4.2.1 Licensing, enforcement, penalties and fees

One of the key drivers identified in Phase 1 of the study for the current low cost of landfilling relative to alternatives, and therefore for landfilling being the preferred waste management option, is the high number of unlicensed landfill sites; and, among those that are licensed, the high number of sites that are non-compliant with their permit conditions (see Section 3.2.1). In this context, landfill sites will not be operating according to best practice, and as such the costs of landfilling will be artificially low.

For example, according to DEA (2018c), 56.4% of general waste landfill sites in South Africa are unlicensed (see Table 2).

Table 2: Licensing status of general waste landfill sites in South Africa (DEA, 2018c).

Total number of sites	Number of licensed sites	Number of unlicensed sites	% of unlicensed sites
990	432	558	56.4

Furthermore, of those sites that are licensed, levels of compliance vary widely. In particular, according to the final draft State of Waste Report (DEA, 2018a), “the level of compliance of the publicly owned facilities that were audited was relatively low, with 26 facilities attaining between 0 and 25% compliance. Nine of these facilities attained 0%. Twenty four facilities attained between 26 and 50% compliance, nine facilities between 51 and 75% compliance, and 14 facilities between 76 and 100% compliance.”

It therefore stands to reason that the crucial first steps, before considering any other type of instrument, are to

(1) ensure that all sites are licensed, which enables the setting of conditions (DEA, 2018b) to ensure that sites are managed in accordance with the National Norms and Standards for Disposal of Waste to Landfill (DEA, 2013); and
(2) enforce compliance with license conditions. Compliance of landfill sites with their license conditions, set in accordance with the norms and standards, would improve the state of landfill operations and thereby increase the cost of landfilling, and thereby potentially avoid the need for additional economic instruments, such as a landfill tax.

Permit conditions could also be used to allow or disallow the disposal of particular waste streams (DEA, 2018b); while landfill quotas, which specify a fixed quantity of waste which can be landfilled per year, could also be considered.

Enforcing compliance could include mechanisms such as non-compliance fees / penalties. However, it is also important to ensure that municipalities are provided with the financial support and capacity development (see Sections 4.2.7 and 4.2.8) required to ensure that they are able to comply with licensing conditions; e.g. through the provision of funding for infrastructure development to improve the state of landfill sites.

4.2.2 Landfill bans

4.2.2.1 Mechanism

The objective of a landfill ban is typically to prevent specific waste types (such as particularly voluminous or hazardous waste types) from being disposed at landfill, and thereby to reduce the volume of waste going to landfill, or the impacts thereof. In addition, such bans are typically implemented on waste types with a significant potential for material, nutrient or energy recovery, and where alternative options are in place, in order to stimulate recycling or recovery (DEA, 2018b).

Some municipalities in South Africa have ad-hoc municipal level landfill bans in place for certain waste types; particularly where other options exist; for example, “the banning of green waste to certain landfills where a composting facility is available as an alternative” (DEA, 2018b:56).

For example, in the Western Cape, the provincial government has put in place a target to reduce organic waste to landfill by 50% by 2022, and a complete ban by 2027 (Western Cape Department of Environmental Affairs and Development Planning, 2018).

4.2.2.2 International experience

Landfill bans have been implemented in a number of European countries, as well as in some states within the USA (DEA, 2018b). Importantly, however, such bans are typically not implemented in isolation, but instead in combination with other types of instruments, such as

- "differentiated taxes on landfilling and incineration, thus ensuring a viable business case for capital intensive waste treatment facilities
- development of standards for the use of recovered materials, thus supporting a market for recovered materials
- energy revenue incentives that either favours market access for heat/steam/electricity produced from waste and/or ensures a premium sales price compared to traditional/fossil energy sources)" (DEA, 2018b: 57).

Table 3 provides an indication of the percentage reduction in waste to landfill following the introduction of a landfill ban in various countries, and the time period over which such reductions were achieved. However, it should be noted that these reductions cannot necessarily be attributed to the implementation of the ban alone; since in call cases the ban was implemented in combination with other types of instruments (DEA, 2018).

Table 3: Reduction in waste to landfill following implementation of a landfill ban (source: DEA, 2018b)

Country / state	**% reduction in waste to landfill**	**Time period over which reduction was achieved (years)**
Austria	25	7
Belgium - Flanders	22	10
Germany	26	6
Netherlands	25	11
Sweden	19	6
USA (Massachusetts)	3	2

4.2.2.3 Lessons for South Africa

Landfill bans have been shown to be relatively effective (in combination with other instruments) in developed country contexts; although as mentioned above, the reductions in waste to landfill that have been achieved cannot necessarily be attributed to the bans alone. However, a number of pre-conditions need to be in place for landfill bans to be effective. These include:

- "Efficient waste management legislation that clearly defines waste types, roles and responsibilities, duty of care, ability to plan and direct waste, and… waste management fees that are reflective of the full costs
- Clear permitting conditions and standards for waste treatment and disposal facilities
- Reliable waste data based on weighing and report of waste according to a standard nomenclature and that payment of waste taxes are reliable and efficient
- Compliance and efficient enforcement that ensures that the powers to direct can be utilized and that undesirable and illegal activities can be detected and stopped efficiently
- Predictable financing and capacity planning conditions allowing for long-term investment in capital-intensive treatment facilities e.g. as concession agreements, PPP or traditional prudential borrowing by the municipalities or their utilities" (DEA, 2018b: 57-58).

In addition, as discussed above, landfill bans need to be implemented in combination with other, complementary instruments. In particular, it is necessary that viable alternatives are in place. In the absence of alternative treatment options for the waste types being banned from landfill, bans are likely to result in the affected waste types being illegally dumped.

4.2.3 Tradable quotas

Tradable landfill quotas are an innovative economic instrument that works along similar lines to analogous 'cap-and-trade' type schemes dealing with other environmental externalities, such as carbon trading schemes. In essence, municipalities are allocated a quota/allowance specifying the amount of waste that can be landfilled per year. The total number of allowances issued can be set in accordance with a target for the maximum total tonnages of waste to landfill (the 'cap'). These quotas can then be traded, thereby incentivising municipalities to reduce waste to landfill (as municipalities who reduce waste to landfill can gain revenue by selling their quotas; while municipalities who exceed their allocated quota will have to incur expenditure to purchase additional allowances). In addition, the expected benefit of such a scheme is that landfill diversion will be achieved at the lowest aggregate cost; since those municipalities who are able to divert waste at a lower cost will do so and sell allowances; while municipalities who are not able to divert waste at a low cost will rather purchase additional allowances. An overall diversion target can therefore be met in the most cost-effective way (Jones, 2011), as diversion will be done primarily by those municipalities who are able to do so at low cost.

An example of a tradable landfill quota system is the Landfill Allowance Trading Scheme (LATS) in the UK. The scheme was discontinued in England as of 2013, when it was replaced with a Landfill Tax; although it is still in place in Wales, Scotland and Northern Ireland, where it is known as the Landfill Allowance Scheme (Chartered Institution of Waste Management, 2019). The aim of this scheme was to achieve compliance (at least cost) with the EU Landfill Directive requiring member states to significantly reduce the quantity of biodegradable municipal waste (BMW) sent to landfill.

The European Environment Agency (2013:4) deemed the LATS to be "a major driver of rapid landfill diversion and recycling rates"; although Calaf-Forn et al (2014) describe the reductions in BMW as "satisfactory"; with an average reduction of 7% per year during the first seven years of the scheme (compared to a 4.2% annual reduction during the 4 years preceding implementation). After 2008, the landfill tax became a more significant driver of waste diversion (European Environment Agency, 2013; Calaf-Forn et al., 2014). However, it is argued that "the Landfill Allowance Trade Scheme (LATS) may have been an enabling factor in allowing [local authorities] in England as a whole to divert MSW from landfill more rapidly than the Landfill Tax would have done alone (European Environment Agency, 2013: 13).

4.2.4 Cost reflective gate fees

4.2.4.1 Mechanism

Another key driver identified in Phase 1 of the study for the current cost differential between landfilling and alternatives, and therefore for the dominance of landfilling as a waste management option, is that waste collection tariffs and landfill tipping fees are not reflective of the full costs of landfilling (see Section 3.2.2).

For example, according to a survey undertaken by DEA (2018b: 45), half of the municipalities sampled do not charge landfill gate fees, while those who do charge do so at below cost. In addition, many do not charge at all for the first tonne of waste landfilled.

To the extent that the full costs of landfilling are not reflected in waste collection tariffs and landfill gate fees, there is an implicit subsidy on landfilling; creating perverse incentives for landfilling as the preferred waste management option.

There is therefore a clear need to ensure that tariffs are reflective of full costs, which would incentivise waste generators to seek alternatives; before considering any potential economic instruments, such as landfill taxes, which are likely to distort prices further. For example, one suggestion put forward during the Phase 1 workshops was to provide training and development (see Section 4.2.8) in full cost accounting. In addition, it is necessary to improve the state of landfilling infrastructure and management itself in order to raise the actual costs of landfilling, through ensuring licensing and compliance (see Section 4.2.1), and the provision of funding for capital infrastructure (see Section 4.2.7).

4.2.4.2 International experience

According to DEA (2018b:47), across a sample of 16 countries, “landfill disposal charges, excluding landfill taxes, range widely, from zero to R 2 025 per tonne. When landfill taxes are added, the range of total landfill costs is from R423 to R2 380, with an average of R 1 442. This is approximately 7 times more than the average disposal fee (where fees are being charged) in South Africa, after converting for purchasing power parity.” Table 4 provides examples of landfill tipping fees in a number of countries, while also providing an indication of landfill taxes, in order to show the total cost per ton of waste disposed.

Table 4: Landfill tipping fees and taxes in a number of countries (Source: DEA, 2018b)

Country	Landfill tipping fee (R/t)	Landfill tax (R/t)	Total (R/t)
Austria	2 004	376	2 380
Belgium (Wallonia)	723	940	1 664
Cyprus	810	-	810
Czech Republic	231	289	521
Denmark	940	911	1 852
Estonia	579	174	752
Finland	868	434	1 302
France	883	231	1 114
Germany	2 025	-	2 025
Ireland	940	723	1 664
Italy	1 302	434	1 736
Netherlands	362	1 548	1 910
Sweden	1 519	709	2 228
UK (non-hazardous)	352	1 350	1 702
UK (hazardous) 12	282	1 350	1 632
USA	Varies	Varies	753
Australia	Varies	0-1250	473

4.2.4.3 Lessons for South Africa

Cost-reflective landfill tipping fees would incentivise waste generators to seek alternatives to landfilling. However, according to DEA (2018b: 47), "raising landfill fees will only affect the behaviour of private operators and households taking waste directly to landfill, but will have no direct impact on municipal-collected waste". As with landfill taxes (see Section 4.2.6), they would only incentivise reduced waste generation if they were passed on to waste generators in the form of quantity-based waste collection charges, which are very difficult to administer; rather than as a higher flat rate waste collection charge.

In addition, based on the survey undertaken by DEA (2018b); setting landfill tipping fees below cost among South African municipalities seems to be done mainly "out of a fear of promoting illegal dumping" (DEA, 2018: 47). As such, if landfill fees were increased, measures would need to be taken to avoid an increase in illegal dumping; including the provision of viable alternatives.

4.2.5 Differentiated gate fees

4.2.5.1 Mechanism

Differentiated gate fees can be applied to different waste types; on the basis of, for example, the different cost of treating specific waste types; or to create incentives / disincentives for specific waste types to be landfilled; or to direct particular waste streams to particular types of facilities.

In the survey undertaken by DEA (2018b), 13% of the municipalities in the sample published differentiated landfill fees for organic and Construction & Demolition (C&D) waste as compared to

general waste. However, the fees for organic and C&D were higher than for general waste in some cases, and lower in other cases; "depending on the available alternatives, and what the municipality is intending to incentivise. For example, Tshwane… does not charge for green waste and builders' rubble delivered to dedicated sites for composting or reuse. However, if these wastes are delivered to general waste sites, a punitive charge is levied" (DEA, 2018b:47).

4.2.5.2 International experience

Differentiated gate fees are applied in a number of countries. According to DEA (2018b), European countries typically apply one or a combination of the following instruments to regulate flows of waste to particular types of facilities:

- permit conditions allowing/disallowing flows of particular waste types (see Section 4.2.1)
- bans on specific waste types from being disposed at particular types of landfills (see Section 4.2.2)
- differentiated gate fees, based on the costs associated with treating different waste types
- differentiated disposal taxes, which should be designed to "reflect the aim of national policies and desire to direct particular waste streams to particular types of facilities" (DEA, 2018b: 48) (see Section 4.2.6).

Which of these instruments are applied, and in what combination, "typically depends on the enforcement and institutional capacity as well as the ability to make use of voluntary industry approaches to achieving overall policy objectives" (DEA, 2018b: 48).

4.2.5.3 Lessons for South Africa

Differentiated gate fees are relatively easy to establish, but like disposal taxes, they "depend on adequate systems of control and measurement at landfills, which are not currently in place in most landfills" (DEA, 2018b: 48) in South Africa. Differentiated gate fees are "easily applied to 'clean' (homogenous) loads, but cannot be applied to mixed waste. If the intention… is to discourage a particular waste stream, or to promote the separation of waste, then a punitive tariff must be set for mixed waste containing the discouraged waste stream. In order to prevent a differentiated landfill fee from promoting illegal dumping, it is important that viable alternatives are available within a reasonable distance of landfills (or closer than landfills)" (DEA, 2018b: 48). For example, if composting facilities are available nearby, higher gate fees can be set for organic waste at the landfill, which would incentivise diversion to the composting facility instead (DEA, 2018b).

4.2.6 Landfill taxes

4.2.6.1 Mechanism

Landfill taxes are generally levied by national government, per tonne of waste disposed at landfill sites. The aim is to increase the overall cost of landfilling, and thereby to discourage landfilling in favour of alternatives. Specifically, landfill taxes are aimed at internalising the externalities associated with disposal to landfill, such as landfill gas emissions (which contain methane, a greenhouse gas which contributes significantly to climate change); and leachate emissions to soil

and groundwater. In the absence of landfill taxes, these externalities would not typically be reflected in landfill costs.

4.2.6.2 International experience

Landfill taxes are applied in a number of countries across Europe, as well as in the USA and Australia. Table 5 provides examples of landfill taxes in a number of countries, while also providing an indication of landfill tipping fees, in order to show the total charge per ton of waste disposed (see also Section 4.2.4).

Table 5: Landfill tipping fees and taxes in a number of countries (Source: DEA, 2018b)

Country	Landfill tipping fee (R/t)	Landfill tax (R/t)	Total (R/t)
Austria	2 004	376	2 380
Belgium (Wallonia)	723	940	1 664
Cyprus	810	-	810
Czech Republic	231	289	521
Denmark	940	911	1 852
Estonia	579	174	752
Finland	868	434	1 302
France	883	231	1 114
Germany	2 025	-	2 025
Ireland	940	723	1 664
Italy	1 302	434	1 736
Netherlands	362	1 548	1 910
Sweden	1 519	709	2 228
UK (non-hazardous)	352	1 350	1 702
UK (hazardous) 12	282	1 350	1 632
USA	Varies	Varies	753
Australia	Varies	0-1250	473

For example, the UK levies a weight-based landfill tax on disposals made by landfill operators, on top of the normal tipping fee. Importantly, the aim of the tax is to internalise the external costs of disposing of waste to landfill. However, the effectiveness of the landfill tax in reducing waste to landfill is unclear. Waste to landfill fell by 70% between 2000 and 2016; while average household recycling rates rose from 18% to 44%. However, these impacts cannot all be attributed to the tax; since a number of other changes and instruments were implemented over the same time period (DEA, 2018b).

Likewise, in Norway, the landfill tax is aimed at internalising the externalities of waste disposal. Sites with lower environmental standards have a higher tax imposed on them, and vice versa. In the first three years after implementation, landfilling rates halved and recycling increased by 25%; while there was also increased investment in Waste-to-Energy (WtE) facilities, recycling initiatives, separate collection & recovery of biowastes, etc. (DEA, 2018b).

In Australia, tax rates vary by state; but in most states are far higher than the external costs (which in turn are lower than the private costs). Better managed sites have higher private costs and lower external costs; and vice versa. However, the overall impact of the tax is debated. There is some evidence that a relatively low tax is effective in Queensland; while an annually increasing landfill tax rate in New South Wales appears to have been effective. "Waste tourism" was initially counteracted by laws stating that waste must be disposed within 150km, but this was subsequently repealed due to an inability to enforce (DEA, 2018b).

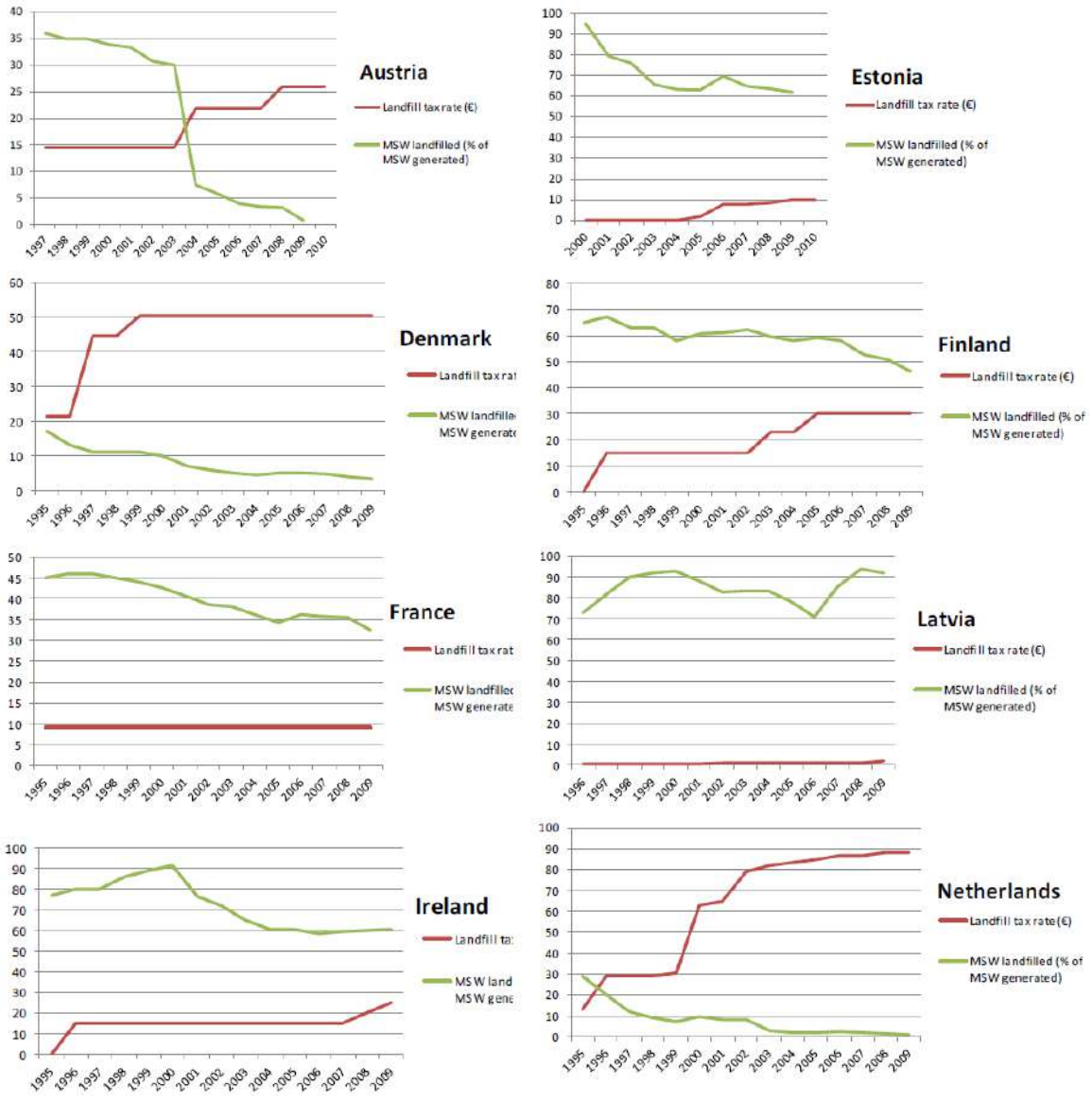

Figure 5: Landfill tax rates and % of municipal solid waste landfilled over time (Source: European Commission, 2012).

Figure 5 shows how landfill tax rates, as well as the % of municipal waste landfilled, has varied over time in a number of European countries. In most cases, there is evidence of a correlation between the landfill tax rate and increased diversion of municipal solid waste to landfill (DEA, 2018b). Again however, it is important to note that correlation does not necessarily imply causation, given the variety of different factors that affect the volumes of waste going to landfill.

However, landfill taxes may also result in illegal dumping, as in the UK case (Mizuno, 2001). It is therefore important that viable alternatives to landfill are in place; such as recycling infrastructure and end-use markets; to ensure that waste can be diverted toward an appropriate alternative, and that the potential for an increase in illegal dumping can be avoided.

4.2.6.3 Lessons for South Africa

International experience has shown that there are a number of pre-conditions that are required for the implementation of landfill taxes:

1. Viable alternatives to landfilling need to be in place, both in order for the tax to provide incentives for changing behaviour (DEA, 2018b), and to avoid illegal dumping:
    - Firstly, if the tax aims to change incentives away from landfilling towards alternatives, municipalities and private disposers "need to be able to shift to alternatives – be that increased recycling or alternative waste disposal" (DEA, 2018b: 52). Where these alternatives are absent, they need to be put in place (e.g. funded by national government) before a landfill tax can be considered. Similarly, "in order for households and businesses to respond to the price signal, they need options for alternative behaviours to minimise cost. This implies that other instruments… should accompany a landfill tax" (DEA, 2018b: 52).
    - Secondly, in the absence of such alternatives, landfill taxes are likely to lead to perverse incentives and tax avoidance in the form of illegal dumping and disposal at unregulated landfills. This would give rise to a "worse environmental outcome than before" (DEA, 2018b: 52).
2. Implementation of landfill taxes therefore requires that municipalities have sufficient capacity for "stringent control of illegal dumping sites" (Inter-American Development Bank, 2003:30).
3. Landfill taxes also require that municipalities or landfill operators are sufficiently financially sound so that they are "in a position for the payment of a tax of this type, either directly or indirectly" (Inter-American Development Bank, 2003:30).
4. They require effective landfill gate control and quantification of the amount and type of waste entering landfills.
5. The tax needs to be applied universally to all public and private landfills, so as to avoid 'waste tourism' (DEA, 2018b).
6. There should not be any distortions in current prices. This implies that landfills should be operated in accordance with best practice, so that the costs of landfilling act as appropriate signals; and that landfill tipping fees and waste collection tariffs should be reflective of full costs.

In developing countries, many of these conditions are lacking. As such, while landfill taxes have been shown to be relatively effective in developed countries, "there is no experience in the use of this type of tax" (Inter-American Development Bank, 2003:30) in developing countries.

In particular, municipalities in developing countries, including South Africa, tend to be financially constrained, and are therefore generally "not in a position for the payment of a tax of this type, either directly or indirectly" (Inter-American Development Bank, 2003:30). In South African municipalities, the additional cost of a landfill tax would need to be covered either through grant funding or through internal cross-subsidisation within the municipality (DEA, 2018b). As such, "municipal finances will be negatively impacted by a landfill tax as they will have to pay a new charge that may not be recoverable from customers, and will receive less tariff revenue if the objective of diversion of waste is achieved" (DEA, 2018b: 52).

In addition, since alternatives to landfill are generally lacking, a landfill tax is not likely to create the right incentives for diverting waste to alternatives, and is instead likely to lead to an increase in illegal dumping. As with cost-reflective landfill tipping fees (see Section 4.2.4), the impact of landfill taxes on household waste generation and disposal depends on the extent to which (and, importantly, the *way* in which) they are passed on from waste collectors, landfill operators or municipalities (on which they are levied) to households, in the form of higher waste collection charges. If they are passed as quantity-based waste collection charges ('pay-as-you-throw'), they would in theory incentivise reduced waste generation. However, quantity-based waste collection charges are particularly challenging to administer. On the other hand, if they are passed on in the form of a higher flat rate waste collection charge, there will be no incentive to reduce the amount of waste generated.

Furthermore, landfill sites in South Africa generally do not have adequate systems in place for measurement and reporting on waste quantities and types being received (DEA, 2018b). Municipalities also tend to have insufficient capacity for controlling the likely increase in illegal dumping. Indeed, many municipalities don't charge landfill tipping fees at all, due to a lack of resources, or fear of an increase in illegal dumping due to the lack of the necessary monitoring and enforcement capacity. Without proper landfill gate control and quantification of the amount and type of waste entering landfills, proper billing for disposal, and the capacity to address illegal dumping, landfill taxes are likely to do more harm than good.

Finally, a landfill tax should only be considered once all landfills are licensed and fully compliant with the norms and standards for landfilling, and once waste tariffs and landfill gates fees are cost reflective so as to enable full cost recovery. If these conditions are met, the costs of landfilling would naturally increase, which would in turn automatically create incentives for diverting waste from landfill. The possible need for a tax could then be reassessed based on the extent to which externalities are already being internalised through improved landfilling practices and higher costs. With improved landfilling practices, the direct/financial costs of landfilling tend to increase, while the external costs tend to fall (DEA, 2018b).

If it is then found that a landfill tax is still needed in order to further internalise external costs; such a tax must be designed and implemented in accordance with the principles set out in the National Pricing Strategy (DEA, 2016); and in such a way as to internalise externalities, rather than to raise revenues. For example, the rate of the tax should be set in accordance with the value of the externality, should be designed in a phased manner, and should be implemented together with

support for viable alternatives. Since, in the South African context, "the use of the revenue raised through a landfill tax is likely to be controversial" (DEA, 2018b:52); revenues should preferably be ring-fenced to support alternatives; e.g. through the provision of subsidies (see Section 4.3.8) or infrastructure development grant funding (Section 4.3.11).

Setting an appropriate tax rate requires detailed information regarding the external costs associated with landfilling, based on economic valuation studies. Estimates of household sensitivity to such charges are also required. Finally, political will is also important, as no form of tax is likely to be politically popular, particularly if it is poor households who are affected. However, as with product taxes, this can be mitigated to a certain extent through transfers of various types (e.g. by reducing the rates of other taxes faced by poor households) (Reschovsky and Stone, 1994:138).

4.2.7 Waste Infrastructure Development Fund

4.2.7.1 Mechanism

South Africa has adopted the principle of the waste hierarchy. However, in a context with significant uncontrolled disposal (illegal dumping, use of 'self-help' or communal disposal, and non-compliant and semi-compliant landfill sites), the first priority should arguably be to move from uncontrolled disposal towards controlled disposal in well-operated, sanitary landfill sites; which should be seen as the foundation of the waste hierarchy (see Figure 1, repeated here as Figure 6 for convenience) (World Bank, 2019b). In other words, it is necessary to get the basics right first, before considering implementation of a landfill tax for example, which would simply exacerbate illegal dumping. Improving the state of landfills in South Africa would also increase the costs of landfilling, which would in turn create incentives for moving towards alternatives higher up in the waste hierarchy, potentially precluding the need for a landfill tax.

It is acknowledged that improving landfill infrastructure will require significant capital investment. According to the World Bank (2019b: 8), "one common approach to developing waste infrastructure is to develop a national 'Waste Infrastructure Development Fund' to which municipalities can apply for capital support to improve infrastructure". Such a fund needs to be carefully designed "to ensure that its parameters and accessibility requirements are clearly defined. Administration of the fund will need to be established and municipalities are likely to require technical support to develop appropriate proposals for funding" (World Bank, 2019b: 8).

Figure 6: The waste hierarchy (Source: United Nations Environment Program, 2015).

4.2.7.2 International experience

Examples of countries with this type of funding mechanism include India (the Jawaharlal Nehru National Urban Renewal Mission, JNNURM) and the UK (Waste Infrastructure Fund).

Of particular relevance to the South African context, "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, for example, under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) programme. This programme provides finance for local authority infrastructure, based on criteria such as the percentage of cost recovery, and the collection efficiency of solid waste user charges. A benchmarking system is applied, which "helps with the identification of local authority interventions worthy of financial support" (GIZ, 2015).

4.2.7.3 Lessons for South Africa

Currently, the Municipal Infrastructure Grant (MIG) is the only source of funding from national government that can be accessed by municipalities for waste-related infrastructure. However, waste projects have to compete with projects from other sectors (e.g. water, sanitation and electricity), which are typically prioritised (World Bank, 2019a).

As such, the potential need for a dedicated fund for waste management infrastructure should be considered (World Bank, 2019a, 2019b). However, in the case of funding for upgrading landfill

infrastructure, such a fund should ideally have conditions attached, to ensure that municipalities implement the necessary waste management reforms in order to access such funding.

Conditional grants are grants that are provided by national government to provincial or local government on condition that certain criteria are met; as opposed to unconditional grants, which are provided with 'no strings attached.' In the case of conditional grants for solid waste infrastructure, in particular landfills, conditions which could be attached to grants include the following:

- Licensing of landfill sites
- Compliance with license conditions / Norms and Standards
- Application of full cost accounting principles
- Application of cost-reflective solid waste tariffs and landfill tipping fees
- Cost recovery for waste services
- Reporting to SAWIS

The intention of attaching such conditions to grants is to create incentives for municipalities to ensure that these fundamental issues are addressed, in order to improve the state of waste management; while also increasing the costs of landfilling to reflect best practice, ensuring that tariffs reflect the full costs of disposal to landfill. In turn, this would create incentives to divert waste away from landfilling, towards alternatives.

4.2.8 Education and awareness

In addition to funding (see Section 4.2.7), improving the state of landfill management in South Africa will also require "significant capacity building at municipal level to ensure that there is the necessary technical capacity to develop and operate landfill in accordance with National Norms and Standards" (World Bank, 2019b: 8). In addition, there is a need for capacity building around full cost accounting, in order to ensure that tariffs are set in such a way as to be reflective of the full costs associated with landfill disposal. This capacity building could entail a "program of workshops and training packages (ranging from short courses to tertiary education), which would be delivered in close partnership with academic, research and trade institutions working in this space" (World Bank, 2019b: 8).

In addition, it was identified during Phase 1 of the study that waste generators do not tend to associate with waste; or consider what happens to their waste once it has been collected (the "Not In My Back Yard' (NIMBY) problem). Instead, waste is simply seen as the municipality's responsibility. There is therefore a clear need for awareness raising among waste generators regarding the impacts of the waste that they generate, particularly when it is landfilled rather than re-used or recycled.

4.3 Instruments aimed at making alternatives more viable

4.3.1 Legislative changes

During the workshops conducted as part of Phase 1 of this study; a number of legislative obstacles were identified, which acted as barriers to the access, recovery and use of waste materials; and therefore to the diversion of waste from landfill and development of a secondary resources economy (see Section 3.1). To recap, some of the obstacles identified were as follows:

- The classification of materials as falling under the definition of waste makes beneficiation of such waste streams difficult, as such activities are then classified as waste management activities, for which a Waste Management License (WML) is required; which can be cumbersome and costly to obtain
- Municipal by-laws assign ownership of waste to municipalities; making it difficult for the private sector to access such waste streams for beneficiation
- Procurement rules under the MFMA make it difficult to set up contracts for a period longer than three years, which is too short for private sector operators to recoup investment in capital infrastructure
- Procurement, compliance and regulatory obstacles and red tape make it a difficult and lengthy process to establish public-private partnerships (PPPs).

It therefore stands to reason that legislative changes to remove these obstacles should be prioritised; before considering the implementation of new policy instruments, which may exacerbate the current fragmented and uncoordinated state of policy and legislation. Indeed, removing these legislative barriers may preclude the need for implementation of additional policy instruments to a certain extent.

4.3.2 Standards

Another set of factors behind the preference for landfilling over alternative options relates to the lack of markets for recycled materials (see Section 3.5). A number of different types of standards could be considered to facilitate the creation and/or development of these markets, such as:

- Product standards mandating the use of recycled materials, or specifying a minimum recycled content
- Standards regarding recycled content labelling. Requiring producers to indicate the recycled content of products would enable consumers to more easily identify and choose products with a higher recycled content, which would in turn incentivise producers to increase the recycled content of their products, thereby increasing demand for recycled materials.
- Adapting building standards to accommodate/encourage use of recycled material (e.g. C&D waste) in road building, construction, etc.
- Quality standards to ensure the quality of products made from recycled materials. Standards should be set “in such a way that secondary material can be integrated into a product (for example, concrete made from recycled aggregates, plastic made from recycled

> polymers), and that product would still meet the requirements that it would need to meet if virgin materials were used" (DEA, 2018b: 42-43).

While the standards referred to above primarily address the demand side (i.e., they aim to facilitate the development of markets for recycled materials); standards can also be put in place to address the supply side, in terms of increasing the re-usability and/or recyclability of products, which would make re-use or recycling more viable, and therefore increase the likelihood that they would be re-used or recycled rather than disposed at landfill. An example of such a standard is the plastic bag minimum thickness standard (DEA, 2018b). In addition, standards regarding product labelling, providing information on how and where products can be recycled, would also increase the likelihood that products would be recycled rather than landfilled.

4.3.3 Procurement policies

Another important way in which markets can be created or developed is through government's own procurement activities. It was suggested during the Phase 1 workshops that government could help to create markets for recycled materials by adapting their own procurement policies to favour products made from recycled materials over those made from virgin materials. Examples of such procurement policies, identified both during the workshops and in international literature, include the following:

- Procurement policies mandating the use of recycled products: Government can create markets for recycled materials; for example, by using C&D waste in building materials, low cost housing/furniture, school desks/benches, park equipment, etc.
- Preferential pricing - favouring products with more recycled content. For example, government can extend preferential price treatment in its procurement practices to suppliers using recycled content (Inter-American Development Bank, 2003).
- Set-asides - reserving a certain proportion of expenditure for recycled products (World Bank, 2016)
- Off-take agreements - provide a guaranteed market for recycled materials; or a guaranteed income from a recycling facility (United Nations Environment Program, 2005).

4.3.4 Elimination of perverse subsidies

Subsidies on virgin materials can be seen as an implicit 'tax' on recycled materials; since they create perverse incentives for the use of virgin materials rather than recycled materials. Eliminating subsidies on virgin materials would therefore contribute towards making recycled materials more competitive, and thereby grow the market for recycled materials.

For example, the National Recycling Coalition (1999) identified nine separate subsidies in the USA, costing between $3 to $5 billion per year, which artificially lower the price of virgin materials (as well as landfilling), and thereby negatively impact on recycling. It was recommended that these subsidies be eliminated. However, it was also noted that "while the elimination of these subsidies is an important first step, their elimination alone will not guarantee an improvement in the market demand and prices paid for recovered materials" National Recycling Coalition (1999:i). In other

words, elimination of subsidies on virgin materials should form part of a complementary package of instruments.

4.3.5 Virgin material taxes

Generally speaking, market prices for virgin materials tend to be lower than those for recycled materials (DEA, 2018b). This means that recycled materials are unable to compete with virgin materials, which inhibits the development of markets for recycled materials.

In principle, taxes on virgin materials would help recycled materials to compete, by increasing the prices of virgin materials relative to recycled materials; thereby encouraging the use of recycled materials, and the development of markets for such materials (DEA, 2018b).

A common example of virgin material taxes are those applied on construction aggregates, such as sand and gravel. A number of European countries have taxes on virgin aggregates, including the UK, Sweden and Denmark (Söderholm, 2011). The taxes on virgin aggregates in these three countries have been shown to reduce the use of virgin aggregates and encourage recycled materials to an extent, although the evidence is mixed (Söderholm, 2011). Since the cost of aggregate materials tends to be low relative to overall construction costs, the price elasticity of demand for aggregates (i.e. the change in demand in response to changes in price) tends to be low. As such, substitution from the use of virgin to recycled aggregates tends to be limited (Söderholm, 2011). Furthermore, "generators of recycled materials have few incentives to enhance their waste sorting activities in the presence of a tax on virgin materials, and unless additional policies to increase the supply of such materials are implemented, supply will not increase much even in the presence of a high demand" (Söderholm, 2011:911). In other words, it is argued that a complementary suite of policies is needed to stimulate both the demand and supply side of the market for recycled materials.

4.3.6 Advance recycling fee

Similarly to product taxes, advance recycling fees (ARFs) are fees levied on either the producer or consumer of a product; however, they have the specific objective of raising revenue to cover the cost of recycling (DEA, 2018). In other words, an ARF is essentially a tax assessed on product sales, revenues from which are used to cover recycling costs (Walls, 2006; Nnorom and Osibanjo, 2008). ARFs "may be visible to the consumer… as a separate line item on the bill, similar to sales tax – or they can be assessed upstream on producers and later incorporated into the product price" (Walls, 2006:3).

Internationally, ARFs are most commonly levied on electronic goods, which tend to be complex and expensive to separate into their component materials for recycling. ARFs serve to "adjust the recycling market to make recycling of a particular material or product more viable" (DEA, 2018b:53).

The incentives provided by an ARF depend largely on what is done with the revenues (Walls, 2006). As with many of the instruments discussed in this report, ARFs tend to be most effective as part of a package of complementary instruments (DEA, 2018b). For example, as with Extended Producer Responsibility (EPR) fees (see Section 4.3.14), revenues from ARFs can be used to fund financial

incentives (payments) to consumers, collectors or processors per unit or on a weight basis of material returned, collected or recycled, thus increasing the quantity supplied. This combined ARF/incentive system is essentially a type of deposit-refund scheme, where the ARF acts as a 'deposit' at the point of sale, while the payment acts as a refund that is paid upon return of the used product for recycling.

However, ARFs require that revenues can be ring-fenced to fund recycling activities. As such, in a context where environmental tax revenues are not ring-fenced, as in South Africa, ARFs would need to be implemented within an industry-managed EPR system, in which the Producer Responsibility Organisation (PRO) would be responsible for ensuring that revenues are allocated towards organisations undertaking recycling.

4.3.7 Deposit-refund schemes

4.3.7.1 Mechanism

Deposit-refund schemes (or deposit-refund systems) are essentially a combination of a product tax and a subsidy. An initial deposit is paid upon the purchase of a product; acting as a product tax. The deposit is refunded when the used product (or packaging) is returned, which acts like a subsidy, creating incentives to return the product or packaging for re-use or recycling, rather than having it collected for disposal.

The rationale behind deposit-refund schemes is that, in principle, they provide an optimal combination of instruments which is both self-funding (revenues raised through the deposit are used to fund the payment of refunds), and which creates appropriate incentives both for reducing waste generation and for recycling. The deposit that is paid on the product should ideally reflect the full social costs associated with its disposal, including environmental externalities. This would in theory reduce demand for the product, thereby reducing waste generation. At the same time, the refund element creates incentives for the product to be returned for recycling (Calcott and Walls, 2005, Pearce and Turner, 1993; Forum for Economics and the Environment, 2002).

Ideally, the value of the refund should equal that of the deposit, to ensure that consumers end up no worse off than before (Pearce and Turner, 1993); although in some systems only some fraction of the deposit is returned, with the remainder used to finance the system.

4.3.7.2 International experience

Deposit-refund schemes (DRSs) are most commonly applied to refillable/recyclable beverage containers (including glass and plastic bottles and aluminium cans), but their application has also been extended to tyres, cars, and batteries (particularly car batteries). They are common in both developed and developing countries, including South Africa, where voluntary DRSs have been applied successfully to glass bottles, car batteries and waste oils (DEA, 2018b).

Internationally, they have been used in Austria (for refillable plastic beverage containers), Germany (plastic beverage containers and other packaging), the Netherlands (products containing aluminium

and polyvinyl chlorides), Portugal (metal cans), Sweden (aluminium cans; cars), Norway (cars), and the USA (beverage containers); as well as in Bangladesh, Brazil, Chile, China, Colombia, Ecuador, Jamaica, Japan, Mexico, the Philippines, Taiwan, and Venezuela (Pearce and Turner, 1993; Forum for Economics and the Environment, 2002).

Importantly to note, most DRSs are voluntary, although "compulsory systems do exist for some special hazardous wastes" (Inter-American Development Bank, 2003:20); for example, car batteries in Mexico. Legislation enforcing a compulsory deposit-refund system tends to meet with industry resistance. For example, the German Einwegpfand system for single-use beverage containers met with resistance as a result of the high administrative burden placed on the impacted industries (DEA, 2018b). In addition, the system was found to have a negligible impact on the disposal patterns of consumers (DEA, 2018b).

DRSs on refillable or recyclable beverage containers are often implemented in combination with product taxes on non-refillable/non-recyclable beverage containers, to encourage use (and return) of the former, and discourage use of the latter. In other words, recyclable or reusable products are subject to a deposit-refund (and exempt from the product charge), in order to encourage use (and appropriate disposal) of these products over non-recyclable/non-reusable products, which are themselves subject to a product charge in order to discourage their use (Pearce and Turner, 1993:67).

For example, in addition to a deposit-refund on refillable beverage containers, "Belgium additionally created an exemption ruling that beverage producers that do not have refillable containers would have to pay an eco-tax" (Inter-American Development Bank, 2003:20-21). Canada, Denmark, Finland and Norway have all used product charges on non-refillable beverage containers in combination with a deposit-refund on refillable containers to discourage use of the former and encourage use and return of the latter (Pearce and Turner, 1993:67). Revenues obtained from the product charges are often used to finance such deposit-refund systems, e.g. in Finland and some states in the USA (United Nations Environment Program, 2005).

In general, deposit-refund systems seem to have been effective in increasing recycling and in reducing disposal and litter clean-up costs. For example, in the late 1980s, Denmark had a recycling rate for recyclable beverage containers of 97%, largely attributed to its deposit-refund system. By 2001, "reports showed that beverages in local refillable bottles made up 99% of the Danish market" (Inter-American Development Bank, 2003:21). Similarly, in the USA, where many states have a deposit-refund system for carbonated beverage containers (soft drinks and beer), 80% to 95% of containers affected by the system are returned for recycling. They have also been successful in Finland, where 90% of affected containers are returned (United Nations Environment Program, 2005).

Norway implemented a DRS for the hulks of cars and vans in 1978, with higher refunds paid for hulks returned to officially designated sites, stimulating a return rate of over 90% in the mid-1990s. Revenues are used to fund refunds as well as collection, transportation, and dismantling facilities. Similarly, some states in the USA (e.g. California) impose a mandatory deposit on the sale of car

batteries, which is “waived or returned if a used automotive battery is brought to the store” (United Nations Environment Program, 2005:445).

However, the effectiveness of deposit-refund systems in stimulating recycling has varied from case to case and has proven difficult to determine accurately. For example, “the recycling rates of aluminium beverage cans range from 40 per cent to 90 percent among developed countries. The level of the initial product tax or charge, the level of infrastructure for collection and recycling, and the general public ethic towards the environment are all factors which influence the success of the programme” (Forum for Economics and the Environment, 2002:239).

They have also imposed costs on society, for example, in the form of increased product prices and increased handling, storage and transport costs. Thus, evidence regarding their overall societal effect is mixed, with most cost-benefit studies unable to demonstrate unambiguous net benefits (Pearce and Turner, 1993). For example, according to Pearce and Turner (1993:78), “superficial evidence drawn from schemes that have actually been implemented (most for beverage containers) suggests that DRSs may impose net costs on society. Actual schemes have led to only relatively small reductions in the volume and cost of waste disposal, and litter reduction cost savings have usually been experienced, but their magnitude has varied quite widely, and such schemes have also been expensive to operate and have pushed up product prices.”

In fact, households have had “significant costs imposed on them in the form of lost consumer surplus as product prices have risen above the level of the deposit set” (Pearce and Turner, 1993:80). For example, in Michigan’s DRS for beer and soft-drink containers, “net reuse/recycling value of aluminium cans turned out to be less than the net reduction in social benefits. The prices of beverages in both cans and bottles also rose by up to 5c per filling and overall consumption fell (Pearce and Turner, 1993:83); resulting in an overall reduction in consumer surplus.

There is also “a lack of quantitative assessments in which the costs of deposit-refund systems are compared to the costs of alternatives that have an equally beneficial environmental impact. Nonetheless, it can be assumed that, in some cases, the costs of household waste collection, transport, and incineration or dumping exceed the costs of the deposit-refund system” (United Nations Environment Program, 2005:445).

Finally, there is also contrasting evidence regarding the sensitivity of return rates to the size of the deposit. For example, in Sweden, “doubling the deposit charged for aluminium beer cans increased the quantity of cans returned from 70% to more than 80%” (United Nations Environment Program, 2005:445). However, “a much more important factor in this context has been the number, knowledge and convenience of container return points” (Pearce and Turner, 1993:81). For example, in Michigan, “the critical issue in deciding whether the DRS was economically efficient was whether the benefits to individuals in the form of less litter were worth the return inconvenience costs imposed on consumers” (Pearce and Turner, 1993:82).

4.3.7.3 Lessons for South Africa

By providing a tangible financial reward for the return of recyclable products, deposit-refund systems have been shown to stimulate recycling (or at least safe disposal) and discourage littering (United Nations Environment Program, 2005); at least in the case of the fairly limited range of products to which they can be applied (Inter-American Development Bank, 2003). Compared to product taxes, which do not generally provide incentives to stimulate recycling, they are also fairer on households, who are able to offset the price increase associated with the deposit by returning the product and claiming a refund. They may also be less regressive, to the extent that poorer households are more likely to return used products (Pearce and Turner, 1993). Compared to quantity-based collection fees, they have similar effects on the incentives for waste reduction and recycling, but have the advantage that they don't create incentives for illegal disposal, and are more "efficient in terms of administration, in that monitoring or other involvement by authorities is usually not required" (United Nations Environment Program, 2005:445). Indeed, they could be left almost entirely to the market, with government merely monitoring the process. Finally, they have been shown to be more cost-effective than other policy instruments (Choe and Fraser, 1998).

However, as compared to product and input taxes, deposit-refund schemes are slightly more administratively demanding, implying higher transaction costs; thus the net effect on society may be negative (Pearce and Turner, 1993; Choe and Fraser, 1998). Finally, they are "only applicable to a limited class of wastes… [i.e.] to certain materials in the waste stream for which recycling and reuse possibilities are significant" (Choe and Fraser, 1998:284-5). In particular, they are only applicable to waste types that "maintain their integrity after use and are readily recyclable" (Inter-American Development Bank, 2003:20); such as beverage containers. They are not appropriate for materials that cannot be easily recycled or reused, or "that simply need to be disposed of and for which high transaction costs are incurred in implementation" (Choe and Fraser, 1998:286). The items in question should also be easy and convenient to clean and return, such as beverage containers. As such, there may be limited scope for DRSs to be expanded to other products in South Africa, since they are already applied to a number of products that meet the requirements for such a system (DEA, 2018b).

Thus, the merits of implementing a deposit-refund scheme must be considered on a case-by-case basis. For example, the UK is a notable example of a country that doesn't rely heavily on deposit-refund schemes. Studies there have found that "the most promising application for [deposit-refund schemes] might well be in the control and management of the more hazardous components of MSW [such as batteries and used motor oil], where an assured system of 'safe' disposal is a high priority objective" (Pearce and Turner, 1993:89; Pearce and Turner, 1994). Indeed, a DRS can provide assurance "that more material will be disposed of through an authorised outlet" (Pearce and Turner, 1993:88). However, deposit-refund schemes tend to be voluntary (so as to fit with the concept of consumer convenience); whereas for particularly hazardous waste products, compulsory return may be more appropriate, as is the case for car batteries in Mexico (Inter-American Development Bank, 2003:20).

Factors influencing the success of a DRS include "the level of the initial [deposit], the level of infrastructure for collection and recycling, and the general public ethic towards the environment"

(Forum for Economics and the Environment, 2002:239). The level of infrastructure affects the convenience of making returns. However, "inconvenience costs to consumers may well fall over time as individuals adjust to the returnable system. Government regulation/legislation could mandate the required number and type of returning points, which in turn could boost trippage (i.e. return) rates" (Pearce and Turner, 1993:81). However, the more return points, "the higher will be the overall system costs for handling, storage and transport of returns" (Pearce and Turner, 1993:81). In the South African case, however, deposit-refund schemes may provide a sufficient incentive to stimulate increased collection and recovery by the informal sector, even if the refunds are not high enough to encourage consumers themselves to return products (DEA, 2018b).

Finally, a DRS requires a viable recycling industry comprising "careful sorting, segregated collection, and development of a strong network of industries to reuse the materials" (Inter-American Development Bank, 2003:26). They will also be more economically viable and successful if there is "a significant market for the recycling of wastes, including their import and export. In those countries where such [markets] have not been well developed, a more detailed analysis is needed to identify the measures that would allow the stimulation of such markets" (Inter-American Development Bank, 2003:29).

4.3.8 Subsidies

Subsidies "can be used to advantage in most phases of solid waste management" (United Nations Environment Program, 2005:445). For example, subsidies can be paid to various actors along the chain in order to stimulate improved design for recycling and/or use of recycled inputs; to provide incentives for separation, collection, and/or recovery of waste; and/or to increase the viability of recycling and other alternative waste treatment options. Specifically, subsidies could be paid to:

- Producers, to provide incentives to design products for recycling / recyclability; or to use recycled materials/inputs
- Waste generators, e.g. households, to provide incentives to separate their waste, e.g. through separate collection of recyclables, drop-off centres, 'reverse vending machines', and subsidised composting bins (e.g. in the UK and Australia)
- Collectors (either waste collection authorities, as in the UK; private sector companies; or informal collectors), in order to provide incentives to collect recyclable materials
- Recyclers, in order to "provide financial or other support to increase the viability of waste treatment options with lower environmental impacts than the default option" (DEA, 2018b :9).

4.3.8.1 Mechanism

In terms of subsidies to waste generators, households could in principle receive a payment per item returned for recycling, related to the item's recycling value or (preferably) degree of environmental impact associated with disposal. This would have the effect of reducing the costs to the household of separating waste, thus providing an incentive to increase the separation of waste for recycling. However, in the absence of kerbside collection of recyclables, payments for recycling require that households return recyclable items to central drop-off centres; which involves transaction costs on

the part of the household (time, inconvenience and travel costs involved in making such returns[4]). These vary across households, and counteract the payments received, increasing the cost to the household. Thus, maintaining the assumption that households have two options for disposing of the waste they generate (collection for landfill disposal, and recycling at central drop-off points[5]), households can choose either to have their waste collected for disposal, which is convenient but does not provide payment (and may involve costs, if quantity-based collection fees are also implemented); or to return their waste for recycling at drop-off centres, for which payment is available, but which involves transaction costs (Calcott and Walls, 2005).

If these transaction costs exceed the payment received by households, or if there is a lack of awareness regarding the existence or location of drop-off points, such payments will not be effective in stimulating recycling. Since different items have different recycling values, and thus involve different payments to households, the extent to which returns to drop-off centres are viable for the household depends on the type of material. Return of high-value items may entitle the household to payments which outweigh any transaction costs, such that recycling of these items will increase. For items with a low recycling value, however, transaction costs may outweigh payment received, and households will have no incentive to recycle, and will instead opt to have their waste collected for disposal to landfill. Thus, incentives for waste generators should be implemented in combination with other instruments, such as quantity-based disposal fees or kerbside collection of recyclables, which provide an incentive for households to recycle even low-value items[6] (Calcott and Walls, 2005).

The level of recycling is affected not only by the incentives facing households, but those facing the individuals and businesses involved along the entire value chain; such as suppliers of products with recyclable content, collectors, recyclers, and users of recycled materials; who typically don't realise the full social benefits of their activities. As such, another type of subsidy is aimed at changing the incentives faced by these individuals or businesses, such that they are able to internalise the external benefits of their activities. These instruments are therefore aimed at increasing the level of recycling by making it more financially viable to produce products with recyclable content, to collect recyclables, to establish new recycling companies, to expand existing recycling activity, or to produce products using recycled materials.

[4] Transaction costs also depend on employment status and income, which determine the 'opportunity costs' of the time and effort involved. The poor and unemployed may have more time available and find that payments received are worth the effort; whereas for middle and upper-class households, the small payment received does not warrant the time involved. Environmental awareness therefore becomes important.

[5] Payments for returns don't create incentives for illegal dumping, so we can again ignore this here as a disposal option. Furthermore, in some countries, such as the USA and UK, kerbside collection of recyclables is also available as an option, often in combination with collection charges (as in the USA); which provides a dual incentive to increase recycling and decrease final disposal to landfill.

[6] The advantage of kerbside collection as an additional recycling option is that households still have an incentive to recycle (rather than have waste collected as trash) even for those items with low recycling value (low payment). However, kerbside collection of recyclables is rare in developing countries; and requires that collection routes are covered twice (once for municipal waste collection and once for collection of recyclables), implying additional financial and environmental costs associated with road transport.

For example, the UK introduced a recycling credit scheme in 1992, whereby savings in collection and disposal (landfill) costs as a result of increased recycling are passed on from disposal authorities to waste collection authorities or other organisations undertaking collection activities. The ultimate objective is "to move waste disposal up the waste hierarchy, thus supporting sustainable waste management" (Powell and Craighill, 1996:2).

In the South African context, where informal waste pickers play a significant role in the collection of recyclables, one potential mechanism that has been suggested is that of paying "top-up" incentives to informal waste pickers, funded by EPR schemes (analogous to payments made to private collectors for kerbside collection of recyclables in developed countries) (Godfrey, 2019). These could take the form of an additional amount paid per kg of material collected, over-and-above the market value of the materials. The aim of such payments would be to incentivise increased collection (across a wider range of materials, rather than only cherry-picking the highest-value materials), encourage pickers to sell recyclables directly to EPR-linked buy-back centres (Godfrey, 2019), and compensate them for their activities, particularly given their contribution towards the recycling industry in South Africa, as well as the cost savings that they generate for municipalities through airspace savings.

In this review, we were not able to find examples in other developing countries of top-up incentives being paid per kg of material brought by informal collectors to buy-back centres. Instead, financial support for waste pickers tends to take other forms, such as payments for waste pickers' labour, and/or compensation through subsidies; typically through formal integration in collection within source separation programmes (Dias and Samson, 2016). In some parts of Brazil, waste organisations receive a subsidy on the rental of warehouses (Perrupato-Stahl, 2016). Nevertheless, it is a concept that is certainly worth exploring further; while other types of incentives for informal collectors that have proved effective in other developing countries should also be investigated.

4.3.8.2 International experience

Internationally, a "wide range of subsidy-based instruments are used to incentivise movement up the waste hierarchy. Examples of such subsidies are the financial support of recycling activities, tax rebates for recycling, preferential loans for the recycling industry, preferential rates on electricity generated from waste, the incentivised use of secondary materials, or the support of research into recycling opportunities. This includes the subsidisation of products with lower levels of non-recyclable waste or a higher percentage of bio-degradable material" (DEA, 2018b :56).

In practice, subsidies to households for separation of waste for recycling are relatively uncommon, at least on their own. Instead, such payments are often combined with an initial tax on the product, in the form of a deposit-refund scheme, as discussed in Section 4.3.7.

However, subsidies to collectors and recyclers are somewhat more common. For example, the UK introduced a recycling credit scheme in 1992, prior to implementation of the landfill tax, whereby savings in collection and disposal costs as a result of increased recycling are passed on from disposal

authorities to any local authority or organisation undertaking collection and sorting of recyclables[7]. In other words, the savings in terms of avoided disposal costs are passed on to the collectors/recyclers who have diverted waste from landfill. The scheme aims to "incentivise recycling of household waste by local authorities and by third parties (e.g. community groups, businesses and other organisations carrying out recycling activity)" (Department for Environment Food and Rural Affairs, 2006b:1); by making available to recyclers "the savings in disposal and collection costs which result from recycling household waste" (Department for Environment Food and Rural Affairs, 2006b:1).

Within the scheme, "credits are calculated as a percentage of the collection and disposal avoidance costs and thus ensure some income for recycling businesses, even when the market demand for recyclables is low" (Inter-American Development Bank, 2003:16). Currently, the scheme operates in conjunction with other instruments, including the landfill tax. However, there has been evidence that "the design of the scheme could inhibit effective and sustainable waste management" (Department for Environment Food and Rural Affairs, 2006b:1). For example, as discussed above, "credit rates set are not equivalent to the social costs of waste disposal and therefore do not fulfil a strict economic efficiency criterion" (Turner et al., 1996:14). However, an advantage of the scheme is that it is "not a drain on the central government budget, as it is simply a transfer payment between different tiers of local government and third parties[8]" (Turner et al., 1996:28).

In terms of effectiveness, a 1994 review of the scheme was "unable to identify any statistically significant impact that recycling credits might have had on the amount of recycling taking place during the first two years of operation of the scheme" (Turner et al., 1996:29); although this survey took place before credits were increased from half to full long-run marginal costs. Sixty percent of waste collection and disposal authorities interviewed suggested that "recycling levels would have been lower without the recycling credits scheme and 71% thought the increase to full marginal costs would increase the amount of recycling" (Turner et al., 1996:29).

Note however that recycling credits are not true environmental subsidies, as the full value of the external benefits of recycling are not internalised. Instead, the credits "correct the market failure of the waste management system by reflecting the financial savings achieved by recycling" (Turner et al., 1996:29); in terms of reduced disposal costs.

In South Africa, there are currently no subsidies specifically aimed at reducing waste to landfill. However, "municipalities often provide implicit subsidisation to formal and informal recyclers and composting operations, through the provision of land and equipment and the supply of material free of charge. Government also assists with the funding of feasibility studies (even for landfills), funding the capital cost for Materials Recovery Facilities (MRFs), and providing soft loans, but this is done on an ad hoc basis" (DEA, 2018b: 56). However, it should be noted that subsidies provided by "national government to local government in the form of capital grants, if used for landfilling,

[7] Recycling credits will therefore not be effective in cases where disposal authorities are one and the same as those responsible for collection and sorting of recyclables, as is the case with many municipalities in SA.
[8] See previous note

could be argued as a perverse subsidy that encourages the continued use of landfills" (DEA, 2018b: 56).

4.3.8.3 Lessons for South Africa

It is clear from the above that subsidies could potentially be applied at a number of different points along the value chain. As such, when considering subsidies, it is important to identify where in the value chain they could be applied in order to have the "largest impact on diverting waste from landfill" (DEA, 2018b: 56). In addition, since subsidies "are likely to be provided to the private sector, the distributional effects and impacts on competitiveness need to be carefully assessed. Subsidies should only be provided where a market would otherwise not exist and where access to the subsidy is not privileged" (DEA, 2018b: 56).

Payments to households for return of recyclables requires that the necessary infrastructure (such as drop-off or buy-back centres) are in place. They also require awareness on the part of households as to the existence and location of drop-off centres, as well as environmental awareness, since payments alone will not be sufficient to encourage return by households with high transaction costs. These services are likely to require the involvement of private companies, in which case well-functioning recycling markets are required. Recycling credit schemes, on the other hand, require little additional infrastructure, but some degree of monitoring and enforcement of payments from waste disposal authorities to recycling companies.

In addition, a system of payments to households for recycling is likely to be costly, because it "requires recyclers to determine how valuable products are for recycling and pay a price based on that value. Consumers may also incur costs in making items available to recyclers" (Calcott and Walls, 2005:288-9). However, the problem of funding can be mitigated to a certain extent if subsidies are 'self-funding,' as is the case with the UK recycling credit scheme; or if they are implemented in conjunction with user charges or product taxes (as in a deposit-refund system).

Indeed, payments for recycling, implemented in isolation from other, complementary policies, are unlikely to be effective, particularly for low-value materials for which the payment received is insufficient to justify the transaction costs involved in recycling. For such materials, the inconvenience associated with making returns to appropriate drop-off centres is likely to outweigh any potential payment, such that households are likely to opt for the convenience of kerbside collection of trash for disposal. Thus, a complementary policy is required in conjunction with subsidies that provides an incentive to recycle even low-value materials. For example, subsidies to households could be implemented in conjunction with (Calcott and Walls, 2005):

1. kerbside collection of recyclables, which makes recycling as convenient as the normal collection of trash destined for landfill; but which requires additional resources and capacity in the solid waste sector, which is unavailable in many developing countries (indeed, this service is available in only a few developed countries)
2. quantity-based collection charges, which increase the costs associated with having waste collected as trash relative to recycling; but which may provide an incentive for illegal

disposal. However, if implemented in conjunction with recycling payments, the overall effect on incentives may be to encourage recycling rather than either legal or illegal disposal.

3. product taxes, which increase the costs associated with waste generation. This particular combination (deposit-refund system) is discussed in Section 4.3.7.

Furthermore, payments based on recycling value fail to fully internalise environmental externalities and therefore do not ensure optimal recycling of environmentally damaging materials. Instead, payments for different types of materials should be based on the associated environmental damages; although this requires the quantification of environmental damages in monetary terms.

A final problem with subsidies is that "once initiated, they tend to become institutionalised with the recipients claiming financial harm if the support is reduced or stopped" (Forum for Economics and the Environment, 2002:240). For example, the problem with subsidies to recycling companies is often that the companies involved are not financially viable after the subsidy is removed, and the policy therefore fails. Possible reasons include the lack of a stable market for recyclables, or significant price differentials between materials. The challenge is therefore to ensure that these companies remain sustainable, i.e., that recycling remains financially viable, even after the subsidy is removed. There is therefore a need to ensure that distortions in the recycling market are permanently removed, so that such a market can ensure an optimal level of recycling, without ongoing government support.

4.3.9 Tax concessions / rebates

An alternative to direct, explicit subsidies as discussed in the previous sub-section, is the provision of implicit subsidies in the form of various types of tax concessions, such as tax rebates or exemptions.

For example, tax reductions could be provided to "incentivise waste management behaviour/activities with lower environmental impact than the default option" (DEA, 2018b: 9). In other words, preferential tax treatment could be provided to businesses for improved waste management practices or initiatives, as is done in the USA and Poland (United Nations Environment Program, 2005).

Another option could be to provide rebates on waste collection/disposal charges for activities that divert waste from landfill, based on the avoided costs.

Finally, tax rebates or tax credits could be provided to industries for using recycled materials as an input in their products (United Nations Environment Program, 2005); in order to incentivise an increased demand for recycled materials.

4.3.10 Tradable recycling obligations

Similar to other 'cap-and-trade' type schemes, tradable recycling obligations are an approach to achieving an overall target for recycling, at the lowest overall cost. Specifically, a country's overall recycling target (in terms of tonnages to be recycled/recovered) can be allocated among businesses,

placing an obligation on each business to recycle or recover a certain quantity of materials; after which businesses can be allowed to trade obligations among each other, thereby ensuring that recycling is done primarily by organisations that can do so most cost-effectively.

This approach is followed in the United Kingdom as a way of achieving the country's recycling target set out in the EU Packaging Directive. Specifically, "the recovery and recycling targets to be met by the UK are cross-referenced at the start of the year with the market share (measured in the amount of packaging handled) of each UK business, giving each a quantity, in tonnes, that they must recycle or recover – and if every obligated company in the UK recycles their allocated "obligation", the overall UK target will be met" (James Ross Consulting, 2010: 1).

Businesses are then able to meet their recycling targets "through the purchase of Packaging Waste Recovery Notes (PRNs). These are tradable recycling certificates generated by government-accredited recycling companies" (James Ross Consulting, 2010: 1), which provide evidence that a certain quantity of packaging material has been recycled.

The purchase price of the PRNs "depend on the material it represents and the market. For example, if there is a shortage of plastic recycling to meet an increased recycling target then plastic PRNs will be in short supply. The plastic PRN price will therefore increase and, as a result, more money will be available to plastic reprocessors to invest in collection and recycling infrastructure" (James Ross Consulting, 2010: 1).

However, the effectiveness of the PRN system is contested. The scheme has allowed the UK to meet its recycling targets at minimal cost to producers, and is therefore favoured by the packaging industry in terms of cost-effectiveness (Harrabin, 2018; Peake, 2018). However, it has been criticised for passing the bulk of the financial responsibility for recycling onto local authorities (and, ultimately, taxpayers); for not creating incentives for improved design and innovation; and for not allowing current recycling targets to be exceeded (Peake, 2018; Easen, 2019). As such, there have been calls for the scheme to be replaced with a deposit-refund system, although industry remains in favour of the PRN system (Harrabin, 2018).

4.3.11 Infrastructure Development Funding / Grants

One of the key reasons identified in Phase 1 for the dominance of landfilling as a waste management option was the lack of infrastructure for recovery and recycling of waste.

As such, there is a clear need for national government to provide access to funding for municipalities for the development of infrastructure, for example in the form of an Infrastructure Development Fund (World Bank, 2019b). For example, such funding could be used to develop municipal infrastructure such as:

- Composting and/or anaerobic digestion (AD) facilities for the treatment of organic waste
- Materials recovery facilities (MRFs) for the sorting and recovery of recyclable waste
- Buy-back centres, particularly in formal neighbourhoods (or, mobile buy-back centres), for the collection of recyclable materials collected by communities and informal waste pickers.

Locating buy-back centres closer to where the waste is generated will enable informal collectors to work more efficiently and therefore recover more materials per day.

- Drop-off centres for the collection of recyclable waste and organic waste streams not typically collected by the municipality.

Grants could also be provided in order to create financial incentives for the improvement of various aspects of solid waste management. Grants could be provided not only to municipalities, but also for the establishment of recycling businesses, thereby contributing toward the development of small businesses.

Finally, "the market for recyclable materials can be stabilised through: price supports for the establishment of materials banks… [or the provision of] investment grants, accelerated depreciation, and soft loans designed to encourage private enterprises to implement resource recovery activities" (United Nations Environment Program, 2005:446).

4.3.12 Partnerships

Another key issue identified during Phase 1 of the study, and by the World Bank (2019b), is the lack of collaboration and partnerships among the various role players within the waste sector in South Africa. In particular, there is a lack of collaboration and coordination between government and industry, between municipalities and private sector waste management companies, and between the formal and informal sectors.

Some recommendations in this regard that have emerged in this study include the following:

- All stakeholders (both formal and informal, public and private sector roleplayers) should be involved in policy / decision making
- Public-private partnerships between municipalities and the private sector - municipalities don't necessarily have the funding to develop infrastructure, whereas the private sector relies on municipality to access waste; so partnerships are required. In addition, it was suggested that industry bodies should collaborate with SALGA as the representative of all municipalities
- Municipalities should seek to improve integration of the informal sector within the formal waste management system, in order to reduce the costs associated with collecting recyclables, while also maintaining the livelihoods of informal pickers.

4.3.13 Education and awareness

A further issue identified in Phase 1 was the lack of awareness among waste generators around how/what to recycle, etc. Previous studies have also indicated a low level of awareness of and participation in separation at source programmes by households. There is therefore a clear need for awareness raising and information campaigns for waste generators in terms of what types of material can be recycled, how their recyclables should be separated, where it can be delivered to, how to participate in separation at source programmes, etc. In addition, waste generators should

be educated around how organic waste can be composted, to develop community-led composting initiatives (World Bank, 2019b), etc.

In addition, a need was identified for awareness campaigns targeted at both producers and consumers, aimed at changing perceptions around the quality of recycled inputs (or of products with recycled content) relative to those from virgin sources.

Finally, the World Bank (2019b) identified a need for training and development of waste pickers; e.g. mentoring waste pickers to move up the value chain, encouraging them to organise themselves, etc.

4.3.14 Extended Producer Responsibility

4.3.14.1 Mechanism

Extended producer responsibility (EPR) is a policy approach, rather than a specific policy instrument, in which the responsibility for a product's end-of-life impacts is placed on producers. An EPR system could comprise of a combination of various types of instruments, including EPR fees (or PRO fees), advance recycling fees (ARFs), product take-back schemes/mandates, deposit-refund schemes, etc. (see Table 6).

The aim of an EPR scheme is to "provide incentives for producers to make design changes to products that would reduce waste management costs. Those changes should include improving product recyclability and reusability, reducing material usage and downsizing products, and engaging in a host of other so-called "design for environment" (DfE) activities." (OECD, 2006: 4).

Table 6: Policy instruments under the EPR umbrella (adapted from Widmer et al., 2005; Nnorom and Osibanjo, 2008)

Category	Examples
Regulatory instruments	Take-back programs (mandatory or voluntary), including the provision of infrastructure; reuse and recycling targets; minimum product standards; prohibitions of certain hazardous materials or products; disposal bans; mandated recovery/recycling obligations
Economic instruments	Product taxes, input/material levies, virgin material taxes, EPR fees, ARFs, collection fees, disposal fees, deposit-refund schemes, subsidies, tax/subsidy combinations
Information instruments	Environmental reports; environmental labelling; information provision to consumers, collectors, recyclers, etc. through education and awareness-raising campaigns

4.3.14.2 International experience

The concept of extended producer responsibility was originally conceived and applied to the management of packaging waste in countries such as Sweden, Taiwan and Germany (e.g. the 1991 German Packaging Ordinance) in the late 1980s and early 1990s (Wilson, 1996; Walls, 2006). It has

since been extended to the management of waste electrical and electronic equipment (WEEE) in the EU (through the 2002 EU WEEE directive), North America and East Asia; and to a range of other waste streams, inluding used oil in Western Canada and vehicles in Japan (Widmer et al., 2005; Walls, 2006; Nnorom and Osibanjo, 2008).

EPR systems are also applied in Korea, covering a range of products, including tyres, lubricants, various electronic products, fluorescent lightbulbs, metal cans, glass bottles and PET bottles. The government "sets mandatory take-back and recycling requirements, which the industries need to comply with. Most producers then join an organisation which coordinates the collection and recycling processes" (DEA, 2018b); i.e. a Producer Responsibility Organisation (PRO). In the case of electronic products, a significant increase (39%) in recycling rates occurred after implementation of EPR, as well as improved design in terms of reduced weight and volume of materials; although it is not clear how much of this can be attributed to the EPR system as compared to other factors (DEA, 2018b).

EPR is traditionally implemented through either mandatory or voluntary product take-back schemes. Mandatory take-back obligations require that manufacturers, importers, distributors and/or retailers take products back at the end of their useful life, usually in combination with a recovery or recycling target, as in Germany, Austria and Taiwan. Alternatively, EPR schemes can be implemented voluntarily by industry, often to meet targets agreed with government, as in the Netherlands, Victoria (Australia) and the UK (Wilson, 1996; Walls, 2006). In the latter case, government may set a framework within which industry must act, but producers are given the financial and physical responsibility to fulfil these obligations, and the freedom to find the most cost-effective way of doing so (Wilson, 1996). Voluntary approaches are often created by agreements arising out a memorandum of understanding between the industry and government, often stemming from a desire by the industry to avoid the imposition of potentially harmful regulations (Widmer et al., 2005).

In either case, PROs are often established as cooperative industry initiatives to collectively handle collection and arrange for recycling on behalf of the industry, so as to ensure that member companies are able to meet their EPR obligations (Widmer et al., 2005; Walls, 2006; Nnorom and Osibanjo, 2008).

PROs are usually financed through fees paid by member companies (producers and/or users of packaging), per ton or unit of the packaging material or product (Walls, 2006). The purpose of PRO fees (or EPR fees) is to provide funding for the provision of incentives, subsidies, infrastructure and/or information to consumers, collectors and/or processors; so as to increase supply of recyclables or recycled materials. Furthermore, the fees could encourage producers to reduce material use or packaging volumes, which would lead to a reduction in waste generation.

EPRs fees are often passed on to consumers in the form of higher product prices, which should lead to a decline in demand from consumers, also leading to a decline in waste generation. In other words, EPR fees "may have a similar effect as a product tax, resulting in higher prices for the taxed products, which may in turn reduce demand" (DEA, 2018b: 54). However, unlike product taxes, but similarly to ARFs, "the primary intent of EPR is to fund the collection, re-use and recycling of

materials to make these processes more viable. EPR fess should therefore be set at a rate at which this can be achieved" (DEA, 2018b: 54).

Both mandatory and voluntary take-back programs have been found to increase recycling, while PRO fees have been found to lower material use and packaging volumes (Walls, 2006). However, in general, mandatory schemes are often seen as overly prescriptive, and therefore inflexible and costly; whereas firms who engage in voluntary schemes have incentives to develop innovative strategies to ensure that costs are minimised (Walls, 2006).

Furthermore, other types of policies which fall under the EPR umbrella, but which provide different incentive effects, can yield similar outcomes as a mandatory take-back program, often at a lower cost (Walls, 2006). For example, according to Walls (2006), a combined ARF/incentive system may be more cost-effective as compared to a mandatory take-back program. For example, in British Columbia, one of the provinces involved in the Western Canada used oil program, a combined ARF/incentive programme was found to be far more effective than the previous mandatory take-back system, in which retailers were required to simply accept used oil from consumers at their own expense, leading to a lack of compliance by retailers (Walls, 2006).

4.3.14.3 Lessons for South Africa

In South Africa, a number of voluntary, industry-managed producer responsibility schemes have been implemented, for example in the glass, beverage can, PET and polyolefin industries, and have been relatively successful in increasing recovery rates of the materials for which they are responsible. For example, South Africa's plastics recycling rate (41.8%) is higher than the average for Europe (29.7%) (PlasticsSA, 2017). PETCO, the PRO for the PET industry, has been particularly successful, with the PET recycling rate as high as 55% (PlasticsSA, 2017).

In addition, "Section 18(1) and (2) of the Waste Act allows the Minister to specify the financial arrangements of a waste minimisation programme in support of Extended Producer Responsibility arrangements" (DEA, 2018b: 54). The Department of Environment, Forestry and Fisheries (DEFF) have recently published EPR regulations, requiring mandatory EPR in the paper and packaging, waste electrical and electronic equipment (WEEE) and lighting industries.

However, in comparing mandatory vs voluntary EPR systems, Nahman (2010) found that voluntary industry initiatives (as in the can, glass and PET industries) are far more effective than mandatory, government-imposed regulations (as in the plastic bag industry) in stimulating recovery. This was found to be due to the particular types of market failure affecting recycling markets: information failure, technical constraints, search costs, etc.; which act as barriers to the development of a viable recycling industry. Nahman (2010) therefore concluded that it is in the industry's own best interests to voluntarily implement EPR to overcome these market failures.

4.3.15 Separation at Source

Separation at source (S@S) refers to waste being separated into two or more fractions by waste generators, in order to facilitate recovery and recycling of pre-separated materials, which should increase both the quality (reduced contamination) and quantity of materials recovered.

DEFF has set targets for metropolitan municipalities, secondary cities and large towns to initiate S@S programmes, as part of its National Waste Management Strategy (NWMS) (Department of Environmental Affairs, 2011). More recently, one of the targets emanating from the Chemicals and Waste Economy Phakisa is for "a minimum of 50% of households separating at source by 2023" (DEA, 2019). Municipalities are also charged with providing an enabling environment for the collection of separated recyclables (DEA, 2018b).

Various types of separation at source systems are used internationally; varying in terms of:

- the number of separate fractions; ranging from a simple 2-bin (dry recyclables and residual waste) or 3-bin system (dry recyclables, organics and residuals); to more sophisticated systems with multiple separate fractions (such as separate containers for paper, glass, metal, plastics, organics and residual waste) (DEA, 2018b);
- The type of collection system; including the use of multiple vehicles, split-compartment vehicles, and integration of the informal sector (making use of low-tech equipment such as trolleys or bicycles); and
- The type of sorting and treatment facilities used to deal with the various separated fractions.

Furthermore, it is of interest to note that in a number of European countries, the focus of S@S systems is on organic waste, rather than on dry recyclables (European Bioplastics, 2016). The argument for such an approach is three-fold:

- Organic waste tends to make up a large proportion of total waste generation; diverting organic waste from landfill is therefore critical to achieving overall targets for diversion of waste from landfill.
- The bulk of the waste sector's contribution to climate change arises from the decomposition of organic waste at landfill, which generates methane, a powerful greenhouse gas.
- The waste (including recyclables) remaining after organic waste has been separated will be 'cleaner' and less contaminated, which will thereby facilitate recovery and recycling.

Separation of organic waste at source would therefore essentially enable a 'win-win-win' solution. In particular, if the aim is to divert waste from landfill, then this type of system is likely to be of relevance for South Africa, where organic waste (together with C&D waste) makes up the bulk of the waste going to landfill; as compared to the mainline recyclables, which make up a far smaller proportion. For example, according to the final draft State of Waste Report (DEA, 2018a), organic waste made up 34.6 % by weight of general waste generated in 2017.

However, any type of S@S system is likely to be costly for municipalities (unless the informal sector can be integrated within the collection system), and needs to be incentivised or subsidised.

According to the World Bank (2019b: 2); most municipalities in South Africa "do not have financial or technical resources to transition from existing waste separation at transfer stations to individual household-level separation of waste… Achieving DEFF's target of mandatory household source separation and of 50% of the households in metros separating at source by 2023 will require substantial technical and financial capacity building efforts at municipal level. Innovative financing mechanisms and partnership models will be needed to: upgrade existing waste collection fleets to accommodate separated waste; construct the necessary sorting infrastructure for recyclable materials; to build new landfill capacity; and to rehabilitate existing landfill".

As such, S@S would need to be implemented alongside other types of economic or regulatory instruments aimed at incentivising, subsidising or financing the system. According to DEA (2018b:55), "Given the financial impact of separation at source, municipalities require an incentive to do this. If the alternative to separation at source is increased landfilling, this will certainly be cheaper than the added costs of a second collection (at current landfill costs). Separation at source by municipalities can therefore be incentivised by a subsidy, by increased landfill costs (e.g. though a landfill tax), or through national regulations requiring them to do so. Such regulations would need to consider the impact of drastically increasing the costs of solid [waste] management" (DEA, 2018b:55).

Currently in South Africa, "the majority of separation at source… is done informally by door-to-door waste pickers. There is sufficient incentive for them to do this at current rates with no cost to the municipality" (2018b:55). As such, integration of the informal sector is critical in order to ensure both that informal pickers' livelihoods are maintained, and that S@S can be done in a cost-effective way (World Bank, 2019b).

Finally, waste generators themselves are currently not incentivised to separate their waste. "There is a flat fee charged for waste collection to households and businesses, which is not based on volume or type of waste generated and does not create incentives for source separation" (World Bank, 2019b:2). Both "households and informal waste pickers can be incentivised to increase the volume of recyclables separated at source through subsidies. This is most feasibly done through payment for recycled materials. However, to be financially feasible, this payment would need to be less than the cost of landfilling the equivalent volume of recyclable material. Households will also be incentivised to separate at source through the charging of volumetric tariffs" (DEA, 2018b:55-56).

As such, it is clear that targets relating to S@S need to be accompanied by instruments aimed at incentivising and/or subsidising various elements of the system.

4.4 Conclusions from the literature review

Much of the current discussion relating to policy instruments for waste management in South Africa pertains to economic instruments. In theory, properly designed economic instruments can contribute to improved environmental management, particularly in a developed country context (Forum for Economics and the Environment, 2002). However, experience has shown that text-book outcomes cannot be expected to occur in reality, particularly in a developing country context, where implementation of economic instruments is plagued by a variety of practical problems (Pearce and Turner, 1994; Inter-American Development Bank, 2003). Although economic instruments "can improve environmental management, they normally impose high administrative demands and do not represent a 'quick fix' to the problems associated with more traditional command and control approaches" (Huber et al., 1997; cited in Inter-American Development Bank, 2003:27-8).

These issues are particularly pertinent in developing countries, where the institutional capacity for effective design, implementation, monitoring and enforcement of economic instruments is likely to be lacking. Indeed, where economic instruments have been applied in developing countries, they have generally not been effective; because they have not been tailored to developing country circumstances, because they have been used primarily for raising revenue and have thus failed to achieve environmental objectives, because price incentives (e.g. tax rates) have been set at the wrong levels, or because of ineffective monitoring and enforcement (Bell and Russell, 2002; Russell and Vaughan, 2003).

As such, there is a clear need for further research regarding the suitability of economic instruments in developing countries, including South Africa; before implementation of such instruments can be considered. For example, there is a need for research regarding the "identification and establishment of monitoring and enforcement capabilities that would be appropriate in a developing country setting" (United Nations Environment Program, 2005:440-1). In particular, there is a need to understand the South African context with respect to economic instruments, and assess the likely impacts of their implementation.

Some further relevant findings from the literature review are discussed in each of the sub-sections below.

4.4.1 Pre-conditions for implementing economic instruments

A number of interrelated pre-conditions must be in place if economic instruments for solid waste management are to be effective and efficient. These include:

1. *Well-functioning markets and related institutions:* Economic instruments require "well-functioning markets with adequately defined property rights, the presence of private enterprise motivated to reduce costs, some degree of competition, competent judicial systems, and limited price distortions" (Inter-American Development Bank, 2003:26). Developing countries are generally characterised by poorly functioning markets and/or market failure, whereby these conditions fail to hold. Thus, for example, implementing economic instruments requires that existing price distortions in the economy (e.g. as a

result of inappropriate subsidies) be removed (Pearce and Turner, 1994:14). It is also "necessary to have a well-functioning and competent legal system" (Inter-American Development Bank, 2003:26).

2. *Institutional capacity:* Economic instruments tend to be administratively complex, and require sufficient institutional capacity in terms of acquiring relevant information, monitoring compliance and illegal activities, and enforcement. Thus, "the efficiency and environmental effectiveness of such instruments is conditioned by the baseline institutional context into which it is assumed instruments are introduced" (Pearce and Turner, 1994:12). For example, monitoring and enforcing the activities of numerous individual households and small enterprises is extremely difficult (Inter-American Development Bank, 2003:27). Furthermore, setting optimal tax and subsidy rates requires information on both household's private costs with respect to waste generation and disposal (e.g. the costs of preparing waste for collection and of returning recyclables), and the external costs associated with waste generation and disposal, both of which are likely to be difficult to acquire, and require sophisticated analysis (Reschovsky and Stone, 1994; Inter-American Development Bank, 2003). Finally, there can be costs associated with legal disputes and with policing "sabotage, corruption, illegal disposal, and various forms of revenue leakage and tax evasion" (Inter-American Development Bank, 2003:26).

   Thus, the implementation of economic instruments in developing countries "will be conditioned by the effectiveness (legislation, monitoring and enforcement activities) of the institutional system that is in place in any given developing country" (Pearce and Turner, 1994:17). Waste management authorities, for whom authority must be clearly delineated, must be "endowed with the expertise, human resources, equipment [technological capacity], and financial resources needed to carry out the policies" (United Nations Environment Program, 2005:440). Many developing countries lack the necessary institutional capacity (Bell and Russell, 2002; Russell and Vaughan, 2003). Thus, institutional capacity building is also an important precursor to the implementation of economic instruments (Pearce and Turner, 1994:14). Implementation of economic instruments may require "a substantial strengthening of human and financial resources and of organisational structure" (United Nations Environment Program, 2005:440).

3. *Political will:* Finally, there must be political will to address waste as a priority issue. In particular, given the likelihood that many economic instruments (particularly taxes and charges) will be politically unpopular, their implementation requires genuine political willingness. "The political will to implement these instruments is [also] likely to be affected by the impact of these instruments on other economic areas, such as international competitiveness" (Inter-American Development Bank, 2003:26-27). However, there are various ways of alleviating the negative impacts associated with taxes so as to ensure that the overall impact of the tax is neutral; such as tax shifting, revenue recycling and transfer payments.

Most developing countries are characterised by poorly functioning markets, lack of institutional capacity, and a lack of political will (Bell and Russell, 2002; Russell and Vaughan, 2003). For example, in South Africa, solid waste management services are generally provided by municipalities, rather than private enterprise, such that there is less incentive to reduce costs; and where private companies are involved, there is generally a lack of competition, with services provided by a single company. There is also a lack of property rights and insufficient collection of waste data; as well as insufficient capacity for effective waste management at all levels of government, including monitoring and billing of waste services by municipalities.

4.4.2 The need for a suite of complementary policy instruments

Experience from various countries has shown that "the most effective approach to environmental management lies with a combination of methods" (Forum for Economics and the Environment, 2002:230). Different types of policy instruments are necessary for dealing with different aspects of the waste management problem. In other words, "the best results are achieved when a combination of instruments is implemented (Choe and Fraser, 1998:285-6).

In particular, economic instruments are not generally effective in isolation; instead, they "operate best in combination with a legal framework and regulatory instruments" (Forum for Economics and the Environment, 2002:230). Although in certain circumstances purely regulatory or economic instruments may be necessary, often a package of complementary instruments will be more appropriate. Such a policy package could consist of elements of both regulatory and economic instruments, depending on the situation at hand (Organisation for Economic Cooperation and Development, 2001; National Treasury, 2006; Stern, 2006). Therefore, "a combination of an effective regulatory approach and highly selective economic instruments" (Forum for Economics and the Environment, 2002:241) will generally be needed.

Indeed, implementation of economic instruments requires and pre-supposes a foundation (existence and enforcement) of regulations and monitoring and enforcement capabilities (United Nations Environment Program, 2005:440). For economic instruments to be implemented successfully, "the regulatory standard needs to be clear and the program of monitoring compliance needs to be adequate, implying that the success of the economic instrument is dependent on successfully implementing regulatory controls" (Inter-American Development Bank, 2003:8). However, "even with the establishment of effective monitoring and enforcement capabilities, it is unlikely that economic instruments will replace traditional regulatory instruments" (United Nations Environment Program, 2005:440). Economic instruments should rather be seen as "useful supplementary and supporting instruments embedded within the regulatory system" (Pearce and Turner, 1994:17). Economic instruments can be used to "encourage compliance with the regulations, particularly in countries where enforcement and penalties associated with regulations do not provide adequate incentives" (Inter-American Development Bank, 2003:8).

For example, in some countries, regulations are used to "establish minimum performance standards" (Forum for Economics and the Environment, 2002:230), while economic instruments are used to "provide an incentive for environmental performance over and above the regulated levels" (Forum for Economics and the Environment, 2002:230). However, in developing countries,

"inspection and enforcement resources are limited, and political influences may lead to inequitable compliance requirements. In such cases, economic instruments may be designed for the achievement of more modest standards of performance rather than over-performance" (Inter-American Development Bank, 2003:8).

The optimal combination of economic and regulatory approaches depends on local conditions, and will thus differ between countries. In deciding upon an appropriate combination of instruments; social, political, economic and environmental factors must be taken into account. Configuring an optimal, complementary mix of regulatory and economic instruments requires that different instruments are considered simultaneously rather than in isolation (Choe and Fraser, 1998). In turn, this requires adoption of a general (as opposed to partial) equilibrium framework, in which incentives are seen as affected by relative tax/subsidy rates on all waste-related products and activities, rather than by any particular tax or subsidy rate alone. For example, when illegal disposal can be easily monitored and penalised, the optimal policy mix consists of a combination of quantity-based collection fees and taxes on illegal dumping (Fullerton and Kinnaman, 1995). However, in reality, a tax on illicit dumping is likely to be difficult or impossible to enforce. The same result can be achieved, however, through a different combination of taxes and subsidies; such as a subsidy (rather than a tax) on legal disposal (both landfilling and recycling), which provides an incentive to dispose of waste appropriately, and a tax on consumption (a product tax), which provides an incentive to reduce waste generation (since a subsidy for legal disposal effectively subsidises consumption, by lowering the cost of waste disposal) (Fullerton and Kinnaman, 1995:79-80). In other words,

> "if the downstream tax on illicit dumping cannot be enforced, the same [optimal outcome] can be achieved by using an upstream tax instead. Consumption should be taxed at a rate that reflects not the good's disposal cost, but its possible externality from illicit burning or dumping. The result is a deposit-refund system… but it applies to all consumption goods rather than just bottles or… batteries" (Fullerton and Kinnaman, 1995:80).

Thus, "waste management needs to be analysed in a comprehensive framework where various policy instruments targeting consumption, waste disposal services and illegal waste disposal can be considered simultaneously, along with the choice of waste disposal technologies" (Choe and Fraser, 1998:280).

The comprehensive waste management framework of which economic instruments should form a part will also include infrastructural components (e.g. kerbside collection of recyclables, or conveniently located drop-off centres); policy and legislative procedures; communication (including education and awareness) programmes; and consultation processes. For example, a deposit-refund scheme requires a viable recycling industry comprising "careful sorting, segregated collection, and development of a strong network of industries to reuse the materials" (Inter-American Development Bank, 2003:26). Similarly,

> "evaluating the potential for quantity-based solid waste disposal pricing systems cannot be conducted in isolation with other components of the recycling program… households are particularly sensitive to the marginal private costs of waste reduction and less sensitive to the

> costs of waste disposal… This implies that efforts to encourage widespread recycling by imposing high quantity-based fees or by stringently enforcing mandatory recycling without also providing a convenient means for households to recycle may be both unpopular and ineffective" (Reschovsky and Stone, 1994:137).

Furthermore, "the solid waste sector relies on the cooperation and motivation of various stakeholders, including consumers, producers and service providers" (Inter-American Development Bank, 2003:17). Therefore, every effort to stimulate private sector investment and participation is essential" (Inter-American Development Bank, 2003:17). Thus, information and voluntary instruments are also important and must be considered along with economic and regulatory instruments as part of an integrated waste management strategy: "Simple instruments like neighbourhood cleanliness competitions and clean-up campaigns have proven to motivate change in countries as diverse as Indonesia, Ghana, and Nigeria" (Inter-American Development Bank, 2003:17). Legal instruments that "strengthen liability for damage to the environment or public health could also be useful, assuming the legal system can make such instruments operative" (Inter-American Development Bank, 2003:30).

Furthermore, consultation, co-operation and consensus with other government departments and industry regarding the need for regulation, the choice of instrument, and the tax/subsidy level, is necessary to ensure that the proposed instrument will be acceptable to the affected industry and other stakeholders (O'Connor and Turnham, 1992; National Treasury, 2006). The environmental and fiscal objectives of any proposed instrument must be clearly stated (Organisation for Economic Cooperation and Development, 2001; National Treasury, 2006).

Furthermore, economic instruments are central to the concept of 'Design for Environment' (DfE), whereby "solid waste policy is shifting from waste disposal concerns back upstream to product and process design issues" (Calcott and Walls, 2005:288). This involves moving up the waste management hierarchy (Figure 1), and is thus related to the concept of integrated waste management:

> "Solid waste policy should provide correct incentives for both ''upstream'' and ''downstream'' decisions. Upstream, it should encourage product design to reflect environmental concerns, and downstream it should encourage recycling [and] diverting solid waste from landfills… Producers choose an amount of packaging for their products and a degree of recyclability, where recyclability is the fraction of the product that can be recycled… Efficient DfE [Design for Environment] requires incentives for producers to design products that are easily recycled. Such incentives would be generated by fully functioning markets for recyclables, whereby recyclers pay consumers a price for their used products that depends on the degree of recyclability. Alternatively, such incentives could be provided by a tax–subsidy combination (a deposit–refund scheme), if taxes and subsidies were customized to the recyclability of each specific product" (Calcott and Walls, 2005:287-8).

Thus, economic instruments "have a potentially very significant role to play in the waste management policy of the future. But the overall watchword for such a policy has to be integration" (Pearce and Turner, 1993:88).

4.4.3 Using tax revenues appropriately

In the case of taxes, charges, and fees; a decision must also be made as to whether the aim of the policy is to raise revenue (to cover the costs of existing waste management services; or finance improvements in waste management services, facilities, or infrastructure; or for some other purpose); or to achieve environmental aims (reduced waste generation, or increased recycling/reduced disposal to landfill). Generally, there will be a trade-off between these two purposes. Taxes that are effective in achieving environmental aims (e.g. reducing the targeted behavior, such as landfilling) will erode their own tax base to some extent (because there will be less waste going to landfill, for example), such that less revenue can be generated. By contrast, taxes that are effective in raising revenue imply little change in behaviour, such that environmental aims will not be achieved. Furthermore, "a balance will need to be struck in terms of the level of the charge that could be levied; so that a meaningful amount of finance is raised but at the same time not at a charge rate that stimulates extensive 'illegal' dumping, or corrupt practices" (Pearce and Turner, 1994:12-13).

In developing countries, economic instruments tend to be ineffective because they are typically used as sources of revenue for cash-strapped governments rather than as incentives for changing behaviour so as to achieve environmental aims (Bell and Russell, 2002; Russell and Vaughan, 2003). Issues such as earmarking of revenues for reuse within the field of waste management therefore arise (see below). In cases where tax revenues cannot be ring-fenced to fund improved waste management, the argument for economic instruments becomes weaker. In such a case, if they are to be used at all, economic instruments should be designed in such a way as to incentivise the desired behaviour, rather than as a tool for revenue-raising.

At the same time, even if a tax is aimed at motivating environmental improvement, it will also generate some amount of revenue. Thus, a decision needs to be made regarding how revenue collected from the tax should be used. Ideally, the revenues should be channelled back to the solid waste sector; for example, to finance improved waste management services, infrastructure, or facilities; or to finance complementary policies like subsidies or grants. Thus, for example, activities imposing negative externalities can be discouraged by means of a tax, while the revenue collected can be used to encourage activities creating positive externalities by means of subsidies (National Treasury, 2006). Revenues could also be used for "specific waste management investments, general improvement in waste management services, waste-related environmental remediation, or other applications" (Inter-American Development Bank, 2003:30).

In principle, there are three options as to how revenues can be channelled towards related environmental investments or recycled back to the industry; namely full earmarking, soft/partial earmarking, and allocations through the normal budget process. Full earmarking is generally seen as inappropriate in international literature and practice, as it reduces transparency and increases the scope for special interest groups to capture revenue. Earmarked taxes "tend to fragment and complicate the tax system and allow departments and agencies to escape the discipline of the budget process" (National Treasury, 2006:101). They also create rigidities and result in an inappropriate allocation of resources. International best practice asserts that government spending

decisions should be separated from revenue collection, via the fiscal budget process (National Treasury, 2006). Thus, South Africa's Department of Finance does not allow the earmarking of environmental tax revenue for related environmental projects. This has meant, for example, that revenue from South Africa's plastic bag levy has gone into general government funds rather than being used to finance recycling of plastic bags (Gosling, 2006).

However, in the absence of earmarking, there is no guarantee that any funds will be channelled back to the solid waste sector. A compromise may be to use 'soft' or 'partial' earmarking, whereby "revenues will flow via the fiscus with the provision that special consideration be given to fund certain activities, but with no fixed commitment to allocate all the revenues from a specific source to such activities" (National Treasury, 2006:105). Alternatively, allocations can be made through the normal budget process. However, even in this case, there is no guarantee of revenues being channeled back to the solid waste sector. In general, there are no clear guidelines to determine whether earmarking is appropriate; instead, the desirability of earmarking needs to be assessed case-by-case, and, where earmarking is granted, regularly re-evaluated to ensure its ongoing desirability (National Treasury, 2006).

Any remaining revenues (after allocations to the solid waste sector) can potentially be used to "provide room for discretionary reductions in other taxes to reduce distortions (efficiency losses) in labour or capital markets" (Organisation for Economic Cooperation and Development, 2001:5-6), thus generating a so-called 'double-dividend' of environmental improvement and economic efficiency gains. For example, in some European countries,

> "not all of the money generated through economic instruments is needed for purposes of environmental improvement. Eco-taxes are increasingly being set at high levels to discourage waste generation and pollution, and surplus revenues are being applied to reduce other taxes" (Inter-American Development Bank, 2003:13-14).

For example, some of the revenues generated by the UK Aggregates Levy are recycled back to the industry through a 0.1% reduction in pay-roll taxes (National Treasury, 2006), thereby creating another type of 'double-dividend' in terms of reducing distortions and promoting employment opportunities. Another portion of the revenue is used to finance projects that minimise demand for extraction of virgin aggregates and promote cleaner extraction and transport of aggregates, among other objectives (Department for Environment Food and Rural Affairs, 2006a).

However,

> "This "double dividend" of economic and environmental improvement through eco-taxes needs careful assessment in each country. While it may be important in European countries known for their very high income taxes, it possibly has little relevance in… most developing countries, where income taxes are more modest" (Inter-American Development Bank, 2003:13-14).

As such, in the South African context, where allocation of revenues from environmental taxation back to the solid waste sector (either through full or partial earmarking or the normal budget

process) is problematic; and where designing a tax in such a way as to achieve environmental gains is likely to be difficult; the case for environmental taxation becomes a rather weak one.

4.4.4 The need for gradualism

If economic instruments are to be considered, it is critical that they are phased in gradually, building on pre-existing institutional structures, legislative frameworks and government policies, and in accordance with a pre-announced timeline; in order to ensure sufficient time for consultation, certainty regarding what is required from industry, and acceptance; and to build confidence and institutional capacity (O'Connor and Turnham, 1992; Organisation for Economic Cooperation and Development, 2001; Bell and Russell, 2002).

In other words, components of economic instruments should be implemented as part of an integrated waste management framework in progressively more institutionally-demanding stages, with the focus on gradually developing institutional capacity (Pearce and Turner, 1994; Bell and Russell, 2002; Russell and Vaughan, 2003). For example, in the control of industrial pollution emissions, Russell and Vaughan (2003) recommend starting with a technology standard, which requires relatively little monitoring capacity, followed by a technology-based discharge standard as institutional capacity grows, and finally converting these non-marketable discharge permits into marketable permits as part of a full-blown permit-trading scheme.

What is needed in the field of solid waste management is a similarly stage-based approach to implementing economic instruments. In developing countries specifically, the priority should be on building and augmenting institutional capacity; with information building and sharing, gradualism and flexibility being key issues for successful implementation (Pearce and Turner, 1994; Huber et al., 1997). In addition, it is necessary to build on what already exists, and learn from past failures. For example, if there are already economic instruments in place, “they need to be reviewed for their effectiveness and improved to the extent possible” (Inter-American Development Bank, 2003:30), before considering implementation of any new economic instruments.

5 Addressing the root causes for the dominance of landfilling: Identifying "Levers for Change" for increasing the diversion of waste from landfill

In this section, we overlay the root causes for the dominance of landfilling as a waste management option in South Africa, discussed in Section 3; with the potential instruments for diverting waste from landfill identified in Section 4; in order to identify which specific types of instruments are best suited to addressing the identified root causes. Specifically, the focus is on identifying "Levers for Change", in terms of solutions for addressing the various root causes identified, and thereby increasing the diversion of waste from landfill in South Africa toward alternative waste management options.

The information in this Section is presented in the form of tables (see Tables 7 to 12, which correspond with the six categories of root causes discussed in Sections 3.1 to 3.6). Each table summarises the root causes identified in Section 3 (first two columns), as well as the mechanism by which each of the root causes results in waste not being diverted from landfill (third column). Finally, the fourth column of each table identifies potential "levers for change", in terms of potential solutions to each of the identified challenges.

Note that in this Section, the range of potential solutions identified is broad, and includes many of the economic, regulatory and other instruments identified in the literature review (Section 4); as well as a range of other potential solutions identified by experts and stakeholders during the research; including during the workshops conducted in March and April 2019 (see Section 3), as well as in other one-on-one discussions and consultations.

The various solutions identified can be implemented by role players at different levels; including the various tiers of government (national, provincial or local), industry, waste generators, etc. The intention is to highlight the fact that, given the complex nature of the problem and the broad range of issues that need to be addressed, no single type of intervention on its own is likely to be effective; nor will actions by any one role-player be effective in isolation. Instead, a suite of complementary interventions will be required, with action required by all stakeholders involved.

Thereafter, in Section 6, the focus is refined to hone in specifically on economic instruments and incentives that can be implemented specifically by national government, in accordance with the objectives of this study.

5.1 Legislative barriers

Table 7: Legislative barriers and potential solutions

Root causes		End result	Potential solutions / Levers for change
Type of barrier	**Specific issues / examples**		
Municipalities are mandated to collect and dispose	• The constitutional mandate of municipalities is the collection and disposal of waste.	• In line with this mandate, KPI's for municipal solid waste managers are focused on disposal of waste to landfill, so there is no incentive to divert waste from landfill. Implementing alternatives to landfill, such as recycling, is not seen by municipalities as being their responsibility.	• Adapt KPI's of municipal solid waste managers to include diversion of waste from landfill toward appropriate alternatives. • Training and capacity building on the circular economy and benefits for municipalities to buy into the diversion of waste from landfill.
The NWMS does not allocate and delineate responsibilities	• The 2011 NWMS (DEA, 2011) put targets in place for waste diversion from landfill, but failed to put measures in place to ensure waste reduction, reuse, recycling, and recovery. • The 2020 NWMS (DEFF, 2021) is also not clear on roles and responsibilities. Section 9 does not clearly distinguish who should do what to enable diversion of waste from landfill.	• No action is taken. Municipalities wait for industry to take action, while industry waits for government to create an enabling environment to support waste reduction, reuse, recycling, and recovery.	• Create a platform/roundtable discussion session for industry and municipalities to unpack the 2020 NWMS and the EPR regulations to determine linkages and how implementation should be supported. • Clearly outline what an enabling environment will look like and how it should be created.
Legislation makes it difficult for private sector to get involved	• Beneficiation of materials classified as waste requires that Waste Management Licenses (WMLs) be obtained, EIAs must be conducted; etc.; which are cumbersome and costly processes.	• Lack of incentives for private sector involvement in beneficiation of materials classified as waste.	• DEFF have started allowing for applications to be made for the exclusion of certain waste streams (or a portion thereof) for beneficial use from the definition of waste.

Type of barrier	Root causes Specific issues / examples	End result	Potential solutions / Levers for change
	• Municipal by-laws assign ownership of waste to municipalities.	• Waste is considered to be a municipal asset and therefore private sector involvement requires processes under the MFMA. A municipality cannot simply give away municipal assets. It is therefore difficult for the private sector to access such waste streams for beneficiation.	• The model by-law prepared by DEFF and available on SAWIC needs to be revised. Municipal by-laws must be updated removing ownership of waste.
	• MFMA procurement rules favour three year limits on contracts; while infrastructure and assets are typically amortised over a longer period.	• Investment in infrastructure cannot be recouped over a three-year period; there is therefore no incentive for private sector involvement in waste management and beneficiation activities.	• Longer term contacts are possible and should be encouraged through training and capacity building of municipal officials on how to enter into longer term contracts. • There is a need for templates and guidelines for municipalities on how to navigate the MFMA for longer term contracts.
	• Procurement, compliance and regulatory obstacles and red tape make it a difficult and lengthy process to establish public-private partnerships.	• Lack of PPPs, which would lower the cost of waste beneficiation activities.	• Development of guidelines for municipalities to enter into PPPs. • Sharing of experiences and learning between municipalities.

5.2 Low cost of landfilling

Table 8: Issues related to the low cost of landfilling, and potential solutions

Root causes		End result	Potential solutions / Levers for change
Type of barrier	**Specific issues/examples**		
Many landfill sites in South Africa are unregulated, unlicensed and/or non-compliant, and therefore the cost of landfilling is artificially low	• Unregulated and/or unlicensed landfill sites.	• The cost of landfilling is artificially low, creating incentives for continued landfilling.	• Licensing of landfill sites. • Provision of funding for landfill infrastructure should be conditional on landfills sites being licensed (conditional grants).
	• Non-compliance with license conditions / Norms and Standards.	• The cost of landfilling is artificially low, creating incentives for continued landfilling.	• Enforcing compliance through penalties/fines • Funding to upgrade waste management infrastructure (e.g. through a dedicated fund for waste infrastructure). • Provision of funding for landfill infrastructure should be conditional on the degree of compliance with license conditions/ Norms and Standards (conditional grants).
Lack of full cost accounting and cost recovery for waste services	• Municipalities typically source funding for waste infrastructure as part of a larger loan or through capital grants.	• Capital expenditure on waste infrastructure is not reflected in operating costs; so municipalities do not see the cost implications of the infrastructure. Tariffs are therefore set too low to recover these costs; and do not create incentives for reduced waste generation.	• Funding for waste infrastructure should be allocated on a cost sharing basis to incentivize the municipality taking ownership.
	• Lack of full cost accounting.	• Tariffs are set too low to recover full costs, and do not create incentives for reduced waste generation.	• Provide training and capacity development in full cost accounting. • Provision of funding for landfill infrastructure should be conditional on full cost accounting practices being followed (conditional grants).

Root causes		End result	Potential solutions / Levers for change
Type of barrier	**Specific issues/examples**		
	• Tariffs must be approved by municipal councils, who are obliged to balance cost recovery objectives with affordability to ratepayers.	• Actual tariffs may be lower than those required to ensure cost recovery, and do not create incentives for reduced waste generation.	• Cost-reflective waste tariffs • Provision of funding for landfill infrastructure should be conditional on the degree to which tariffs are cost reflective (conditional grants).
	• Solid waste tariffs are generally set as a flat monthly fee, or flat fee per bin, rather than taking into account the actual quantity of waste generated.	• Solid waste tariffs do not reflect the costs per tonne of waste generated and therefore do not create incentives for reduced waste generation.	• Quantity-based ('pay-as-you-throw') tariffs could be considered where technically feasible.
	• Municipalities are obliged to provide solid waste services to indigent households for free.	• No tariffs or fees are applicable in this instance, so there is no incentive for households to reduce waste generation.	• Non-monetary incentives should be introduced to reduce waste generation.
	• Many municipalities charge very low landfill tipping fees, or do not charge for the first tonne disposed; or, in some cases, do not charge landfill tipping fees at all.	• Landfill tipping fees are too low, thereby not creating incentives to divert waste from landfill.	• Cost reflective tipping fees • Provision of funding for landfill infrastructure should be conditional on cost reflective landfill tipping fees being applied (conditional grants).
Externalities are not internalized	• The cost of landfilling is too low relative to the 'true' (social) cost.	• Solid waste tariffs and landfill gate fees do not reflect the external costs of landfilling, and do not create incentives for reduced waste generation.	• In the long term, once all of the prerequisites have been addressed (licensing of landfill sites, compliance with norms and standards, establishment of requisite infrastructure e.g. functioning weighbridges, cost recovery, full cost accounting etc.); and if the cost of landfilling remains too low relative to alternatives; a landfill tax could be considered; following the guidelines, recommendations and timelines of the Landfill Tax Feasibility Study (once available) and the National Pricing Strategy (DEA, 2016).

5.3 High cost of alternative waste management options

Table 9: Issues related to the high cost of alternative waste management options, and potential solutions

Type of barrier	Root causes Specific issues/examples	End result	Potential solutions / Levers for change
Alternatives to landfilling are generally more expensive; particularly in the absence of the required economies of scale	• High capital costs (vehicles for separate collection, infrastructure for sorting and processing, etc.).	• Lack of infrastructure for separate collection, sorting and processing of waste; which reduces the viability of recycling.	• Funding for the infrastructure required for alternatives (e.g. through a dedicated fund for waste infrastructure). • Tax credits for investing in infrastructure for alternative treatment. • Regionalisation / joint ventures among municipalities to pool resources and reduce costs.
	• High operating costs (costs associated with separate collection and transport of waste, energy costs associated with processing, etc.).	• Lack of separate collection, sorting and processing of waste; which reduces the viability of recycling.	• Subsidies paid per unit or per kg of material processed through alternative waste treatment. • Private sector involvement. • Integration of waste pickers in collection in order to reduce costs. • Create local markets whereby waste is processed and used close to source, to reduce transport costs.

5.4 Lack of funding and other resources

Table 10: Issues related to the lack of funding and other resources, and potential solutions

Type of barrier	Root causes Specific issues/examples	End result	Potential solutions / Levers for change
Lack of funding for capital infrastructure	• The capital infrastructure required for alternatives is not suited to funding from municipal sources (such as tariffs); instead, municipalities rely on funding from national sources for such infrastructure.	• Lack of infrastructure for separate collection, sorting and processing of waste; which reduces the viability of recycling.	• Dedicated fund for waste infrastructure. • PPPs.
Difficult to raise tariffs	• Covering the higher OPEX costs associated with alternatives would require that tariffs are raised, which is difficult from a political and affordability perspective.	• Lack of separate collection, sorting and processing of waste; which reduces the viability of recycling.	• Private sector involvement. • Integration of waste pickers in collection in order to reduce costs. • Create local markets whereby waste is processed and used close to source, to reduce transport costs.
Lack of skills	• Municipalities generally lack skills and capacity for waste management (for example, municipal solid waste officials are often not trained in waste management); and many municipalities still struggle with the basics (collection and disposal). • There is a lack of understanding regarding economic and financial aspects. For example, there is a lack of expertise to conduct full cost accounting; to quantify the value of waste; and to properly assess the costs and benefits of landfilling vs. alternatives; including	• There is a lack of expertise and knowledge to understand and properly assess the wide range of alternative technology options and their appropriateness (and associated risks), leading to confusion and uninformed decisions, or inaction. • Ignorance of the true cost of waste management among municipal officials and community members; and therefore of the benefits of alternatives; leading to a failure to move away from the status quo.	• Waste management training and capacity development; e.g. building on the DSI-funded post-graduate degree courses offered in waste management at North-West University (NWU) and University of KwaZulu-Natal (UKZN). • Training in economic and financial aspects, and particularly in full cost accounting. • Awareness raising on what is included in waste tariffs and what it costs the municipality to manage waste, on a per household per year basis.

Type of barrier	Root causes Specific issues/examples	End result	Potential solutions / Levers for change
	externalities, indirect costs and benefits, and avoided costs.		
Lack of data	• There is a lack of data to inform decisions, e.g. a lack of baseline information on the volumes and types of waste generated, waste composition, and of whether the quality of the waste is suitable for specific alternative technology options.	• Planning is based on estimates and best guesses. • IWMPs are not practical or customized to local conditions. • Feasibility studies to introduce alternative treatment options are overly costly due to the lack of accurate data.	• Reporting to the South African Waste Information System (SAWIS) should be incentivized. For example, provision of funding for landfill infrastructure should be conditional on reporting to SAWIS (conditional grants).

5.5 (Perceived) lack of benefits from alternative waste management options

Table 11: Issues related to the (perceived) lack of benefits from alternative waste management options, and potential solutions

Root causes		End result	Potential solutions / Levers for change
Type of barrier	**Specific issues/examples**		
Where there is airspace available, there is no incentive to divert waste	• In the case of municipalities who still have many years of available airspace, there is no apparent benefit associated with saving landfill airspace (except in the very long term). Municipalities have invested CAPEX in the establishment of landfills; so as long as there is still airspace remaining, municipalities need to continue landfilling so as to recover these 'sunk' costs; and can't justify spending additional CAPEX on alternative infrastructure.	• Diversion of waste away from landfill is not considered an important issue by municipalities with sufficient landfill space for the foreseeable future. As such, the national policy imperative to move waste up the hierarchy and support a circular economy is not gaining traction.	• Landfill bans on certain waste streams.
Failure to properly understand or account for the benefits	• Financial cost-benefit analyses and short-term municipal budgeting processes do not currently incorporate externalities, indirect benefits, or avoided costs. • Specifically, they do not account for the value of waste, the long term benefits of diverting waste from landfill (particularly when there are many years of landfill airspace still available), or benefits in terms of the production of energy and other by-products from alternative waste treatment.	• The benefits of diversion of waste away from landfill are not recognized or understood by municipalities.	• Upgrade accounting principles and provide capacity building to include broader accounting of impacts.
Market prices are too low	• In many cases, market prices for recyclables are too low relative to the costs of recovering such	• The costs associated with collection and recovery of recyclables, specifically	• "Top-up" incentives (e.g. paid to collectors per kg of material collected).

Type of barrier	Root causes Specific issues/examples	End result	Potential solutions / Levers for change
	materials; and as such there is no profit to be made.	plastics, often outweighs the value of the material as a secondary resource.	
Fluctuating market price of virgin materials	• Virgin material prices are linked to commodity prices (e.g. oil prices).	• The fluctuating market price of virgin materials relative to recycled materials means that there is no guaranteed market for recycled materials, which disincentivises investment in recycling infrastructure.	• Income guarantees/price support for recyclers, to provide a buffer against market volatility.
Lack of markets	• The global demand for recyclables has crashed as a result of the Chinese ban on waste imports; while the local market is limited in many cases. • Lack of off-take agreements to guarantee a market.	• Lack of markets for recyclables and secondary resources. In turn, this reduces the viability of recovery and recycling, with the result that these materials are disposed of to landfill instead. • In particular, recycling is not considered a viable option in many, especially rural, municipalities in South Africa. • The business case for SMME involvement in recycling is more viable than for big corporates, but SMMEs are more vulnerable to price fluctuations.	• Tax credits/rebates for using recycled materials. • Minimum recycled content for products. • Adapting standards to accommodate recycled content. • Quality standards for products made from recycled material. • Government procurement policies favouring recycled materials. • Awareness raising to change perceptions regarding quality. • Off-take agreements.
Virgin materials tend to be cheaper	• Some recycled materials (or the end- products produced from such materials) are unable to compete in the market, because virgin alternatives tend to be cheaper. This is particularly the case when oil prices are low, which reduces the price of virgin plastics and other virgin materials, such that recycled materials are unable to compete.	• Recycled materials (or the products produced from such materials) are unable to compete in the market; and as such there is no incentive for recycling or for the use of recycled materials.	• Virgin material taxes. • Elimination of perverse subsidies on virgin materials.

5.6 Behavioural and institutional issues

Table 12: Behavioural and institutional issues, and potential solutions

Root causes		End result	Potential solutions / Levers for change
Type of barrier	**Specific issues/examples**		
Lack of an effective enabling environment created by national government	• There is a perception that national government legislation, policy and other initiatives are fragmented and uncoordinated; and that decisions are made without a full understanding of the problem or without the required information; and in particular without taking into account the local context.	• Lack of enabling environment for waste diversion from landfill. There needs to be an appropriate balance between regulation and stimulation of the circular economy.	• Streamline policy and legislation and make it adaptable to local conditions. • Less regulation is likely to be more conducive than more regulation.
Producers don't take responsibility for their products at end of life	• In the absence of Extended Producer Responsibility schemes, producers generally do not take responsibility for the waste generated as a result of the products that they put on the market; managing this waste then becomes the municipality's problem.	• If neither producers nor municipalities see recycling as their responsibility, then no progress is likely to be seen in diverting waste from landfill.	• Extended producer responsibility (EPR). Manufacturers need to be responsible for the waste they produce – e.g. they need to contribute to the costs of disposal, focus on design for recycling, etc. Financial incentives need to be designed in such a way that funds flow back to the value chain rather than through taxation.
It is difficult to change deeply entrenched behavioural patterns among waste generators	• Behavioural patterns are affected by, among other things, values, attitudes and culture (for example, South Africa is generally characterized by a 'throwaway' culture; while taking care of the environment is generally low on the priority list); and are therefore deeply entrenched and difficult to change.	• Lack of S@S, therefore the quantity and quality of waste recovered is not sufficient for alternative treatment or recycling.	• Education and awareness raising (e.g. including recycling in school curricula to raise awareness among the youth will help address the issue of taking responsibility for one's own waste). • Involvement of and benefits for local communities.

Type of barrier	Root causes Specific issues/examples	End result	Potential solutions / Levers for change
	• In particular, people do not tend to associate with waste, but see it as the municipality's responsibility; and the value of waste is not appreciated.		
	• It is easier to simply throw waste in the trash; separating waste for recycling takes additional time and effort.	• Lack of S@S, therefore the quantity and quality of waste recovered is not sufficient for alternative treatment or recycling.	• Provision of convenient recycling infrastructure/ services (e.g. S@S, provision of separate bins/bags, strategically positioned drop-off centres, mobile BBC's, etc.) • Incentives for waste generators to separate waste at source; such as o Quantity-based ('pay-as-you-throw') tariffs (where feasible) o Deposit-refund schemes o Credits/vouchers for separating at source.
	• There is a lack of knowledge or awareness around recycling – e.g. around how, what and where to recycle.	• Lack of S@S, therefore the quantity and quality of waste recovered is not sufficient for alternative treatment or recycling.	• Information provision, education and awareness raising.
	• Generally speaking, there is a lack of convenient recycling facilities in many areas, and in particular a lack of separation at source with kerbside collection of recyclables.	• Lack of S@S, therefore the quantity and quality of waste recovered is not sufficient for alternative treatment or recycling.	• Provision of convenient recycling infrastructure/ services (e.g. S@S, provision of separate bins/bags, strategically positioned drop-off centres, mobile BBC's, etc.)
	• Even in cases where separation at source programmes are implemented, participation rates are generally low. There are various reasons for this, including a lack of	• Low participation in S@S, therefore the quality of waste recovered is not sufficient for alternative treatment or recycling.	• Ensure reliable service delivery – provision of bins/bags, collections as per schedule, communication regarding delays.

Type of barrier	Root causes Specific issues/examples	End result	Potential solutions / Levers for change
	awareness, poor service delivery resulting in people losing faith in the system, etc.		
Institutional issues within municipalities	• Since municipalities' mandate is to collect and dispose of waste (see Table 7), they do not see recycling as their responsibility.	• If neither producers nor municipalities see recycling as their responsibility, then no progress is likely to be seen in diverting waste from landfill.	• Clear distinction of roles and responsibilities for diversion of waste from landfill is required.
	• Since municipalities' mandate is to collect and dispose of waste, KPI's for municipal solid waste managers are focused on disposal of waste to landfill.	• There is no incentive to divert waste away from landfill.	• Adapt KPI's of municipal solid waste managers to include diversion of waste from landfill toward appropriate alternatives.
	• Since municipalities' mandate is to collect and dispose of waste; landfilling is, historically, what municipalities are accustomed to doing. It is therefore seen as 'easy' and 'convenient'. On the other hand, alternatives are unchartered territory; and there is a fear of the unknown, an unwillingness to take risks, and institutional resistance to change.	• Inaction.	• Clear distinction of roles and responsibilities for diversion of waste from landfill is required.
	• There is a lack of accountability for the implementation of Integrated Development Plans (IDPs) and Integrated Waste Management Plans (IWMPs); and in particular, there is a lack of political will or commitment to implement alternatives to landfilling.	• IDPs and IWMPS are developed as tick-box exercises with limited implementation.	• Penalties for non-performance against IDPs and IWMPs are required.
	• Waste is low on the priority list for municipalities; funds tends to be directed to other priorities; such as health, roads and	• Financial allocation to waste management is limited; such that there is a lack of funding for improved landfill	• Dedicated fund for waste management infrastructure

Type of barrier	Root causes Specific issues/examples	End result	Potential solutions / Levers for change
	sanitation; while there is also corruption and mismanagement of funds.	infrastructure to ensure compliance (which would raise cost of landfilling and incentivize diversion), and for implementation of alternatives.	
	• Municipalities tend to operate in silos.	• Lack of shared learning, participation, or learning from what has worked well previously (e.g. in terms of how to implement projects in an efficient and cost-effective way); leading to costly mistakes being repeated, and/or inaction.	• Provincial municipal waste management forums for municipalities to share knowledge and experiences.
Lack of collaboration and partnerships: Generally speaking, there is a lack of effective collaboration and partnerships among the various actors in the value chain	• Lack of collaboration between producers and municipalities / the South African Local Government Association (SALGA).	• Uncoordinated efforts that are unable to gain momentum.	• Clearly defined roles and responsibilities, and closer collaboration.
	• Poor relationships between municipalities and private sector waste companies (in particular, there is a need for increased involvement of private sector waste management companies, e.g. through public-private partnerships (PPPs).	• Lack of trust between municipalities and private sector; and failure to get projects off the ground.	• Development of guidelines for municipalities to enter into PPPs.
	• Competition/lack of collaboration between the formal sector (municipalities and private sector collectors) and informal waste reclaimers.	• Uncoordinated recycling activities and/or lack of S@S programmes; which become unviable if waste reclaimers obtain high value materials first, or negatively impact reclaimers' livelihoods if they are denied access.	• Integrate informal waste reclaimers into the collection system; based on the Waste Picker Integration Guideline for South Africa (DEA and DST, 2019).

6 Guidelines for implementing economic instruments to incentivise diversion of waste from landfill

It should be clear from previous sections of this report that there are a wide range of complex challenges and barriers to the diversion of waste from landfill in South Africa; including legislative barriers (Section 3.1), economic/financial barriers (Sections 3.2 to 3.5), and behavioural and institutional issues (Section 3.6). As such, a comprehensive and coherent set of mutually reinforcing regulatory, economic and other interventions is required to address the various issues and ensure implementation of the waste hierarchy (see Section 5).

In this Section, however, we focus specifically on addressing the economic and financial challenges identified in Section 3; namely:

- Low cost of landfilling
- High cost of alternative waste management options
- Lack of funding
- (Perceived) lack of benefits from alternative waste management options

In particular, the focus is on economic instruments and incentives that can potentially be implemented by national government to address these issues. In other words, the focus is specifically on the economic instruments that could play a role in incentivising the diversion of waste from landfill, with a specific focus on those that could be implemented by national government. The aim of this section is to provide some practical guidance regarding the implementation of these instruments in the South Africa context (in line with Objective 5 of the study). The information in this section is also provided in a dedicated guideline intended for national government, which aims to provide practical guidance regarding the selection, design and implementation of economic instruments for incentivizing the diversion of waste from landfill toward alternative waste management options.

Potential economic instruments that can be used to address each of the economic and financial issues are summarised in Table 13 (bold font); based on the outcomes of the review of international experience and lessons learned (Section 4), and the identification of instruments for addressing the specific root causes for the dominance of landfilling in the South African context (Section 5).

Table 13: Economic and financial root causes for the dominance of landfilling as a waste management option, and potential economic instruments for incentivising the diversion of waste from landfill

Economic and financial issues / challenges		Potential economic instruments to address the issues
Low cost of landfilling	• Many landfill sites in SA are unregulated, unlicensed and/or non-compliant, and therefore the cost of landfilling is artificially low	• Funding to upgrade waste management infrastructure (e.g. through a **dedicated fund for waste infrastructure**) • Provision of funding for landfill infrastructure should be conditional on landfill sites being licensed and/or on the degree of compliance with permit conditions/ Norms and Standards (**conditional grants**)
	• Lack of full cost accounting for waste services	• Provision of funding for landfill infrastructure should be conditional on full cost accounting practices being followed (**conditional grants**)
	• Lack of cost recovery for waste services	• Provision of funding for landfill infrastructure should be conditional on the degree to which tariffs are cost reflective (**conditional grants**)
	• Externalities are not internalised	• In the long term, once all of the prerequisites have been addressed; if the cost of landfilling remains too low relative to alternatives; a **landfill tax** could be considered; following the guidelines, recommendations and timelines of the Landfill Tax Feasibility Study (once available) and the National Pricing Strategy (DEA, 2016).
High cost of alternative waste management options	• High capital costs	• Funding for the infrastructure required for alternatives (e.g. through a **dedicated fund for waste infrastructure**) • **Tax credits for investing in infrastructure for alternative waste treatment**
	• High operating costs	• **Subsidies paid per unit or per kg of material processed through alternative waste treatment**
Lack of funding	• Lack of funding for capital infrastructure	• **Dedicated fund for waste infrastructure**
	• Difficult to raise tariffs for higher operating costs	• Not specifically addressed through economic instruments
(Perceived) lack of benefits from alternative waste management options	• Market prices are too low	• **'Top-up' incentives** (e.g. paid to collectors per kg of material collected), to increase the value of recyclables and thereby incentivise collection/recovery
	• Fluctuating market price of virgin materials (linked to global commodity prices)	• **Income guarantees/price support** for recyclers, to provide a buffer against market volatility
	• Lack of markets	• **Tax credits/rebates for using recycled materials**
	• Some recycled materials (or end-products from such materials) unable to compete in the market (virgin alternatives cheaper)	• **Virgin material taxes** • **Elimination of perverse subsidies** on virgin materials

In the remainder of this Section, guidance is provided with respect to implementation of these instruments. Note that the various types of subsidies, tax concessions and related instruments are discussed collectively, since these types of instruments share many common elements. As such, this Section focuses on the following instruments:

1. Conditional grant funding for waste infrastructure (through a dedicated fund for waste infrastructure, with conditions attached to funding).
2. Landfill tax.
3. Subsidies, tax concessions and incentives (includes tax credits for investing in infrastructure for alternative treatment, subsidies paid per unit or per kg of material processed through alternative waste treatment, tax credits/rebates for using recycled materials, income guarantees/price support to recyclers, and 'top up' incentives to collectors).
4. Virgin material taxes (and elimination of perverse subsidies).

The National Pricing Strategy for Waste Management (DEA, 2016) provides some guidance regarding the steps to be taken in selecting an appropriate economic instrument (Section 3 of the Strategy) and setting waste management charges (Section 4). It also provides some preliminary guidance regarding the implementation of economic instruments (Section 5); although this is fairly generic in nature. In particular, it provides a recommended process for considering government intervention (see Figure 7). Finally, the Strategy provides recommendations regarding the institutional arrangements for the collection and disbursement of revenues from the various types of economic instruments (Section 6 of the Strategy), and for monitoring and evaluation (Section 7). (DEA, 2016).

In general, the process to be followed in considering government intervention (in the form of economic instruments) is as follows (see Figure 7) (DEA, 2016):

1. Identification of environmental problem and (fiscal) objective(s)
    - E.g. is the objective to create an appropriate set of incentives and thereby change behaviour, by addressing a specific market failure (e.g. internalising an environmental externality); or is it to raise revenue?
2. Should the government intervene?
    - Government intervention in the form of environmental taxation or other economic instruments is generally only justified where there is a specific market failure (e.g. an environmental externality) to be addressed.
    - A number of pre-conditions need to be in place before economic instruments can be implemented; including
        i. Well-functioning markets (including removal of existing price distortions) and related institutions
        ii. Institutional capacity (e.g. for acquiring relevant information, monitoring compliance and illegal activities, and enforcement).
        iii. Political will

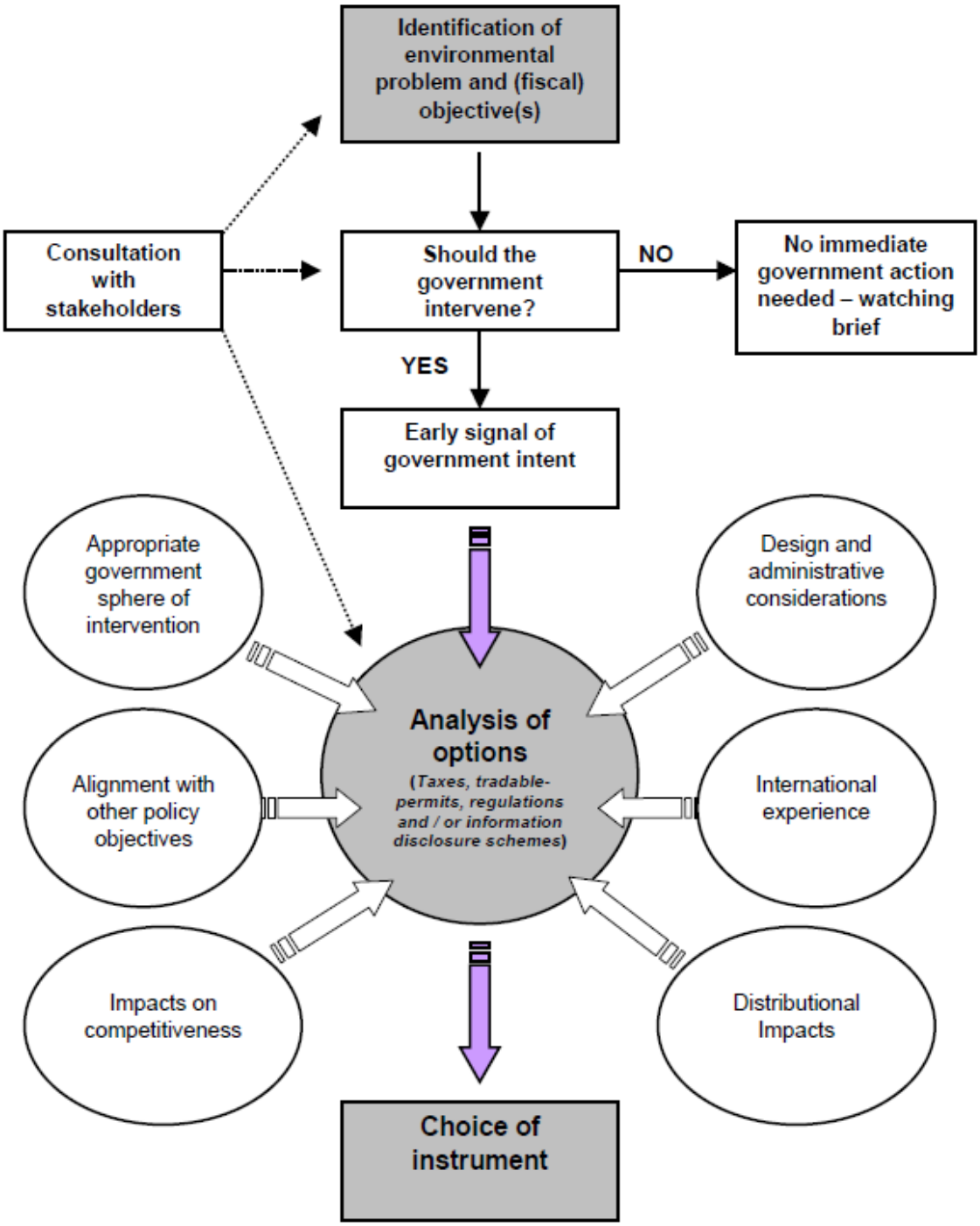

Figure 7: Process for considering government intervention (DEA, 2016).

- Economic instruments are not recommended in cases where there are underlying structural issues to be addressed. For example, where pervasive under-pricing exists due to landfill sites being largely unlicensed or non-compliant, a lack of full-cost accounting, and/or tariffs being set below the levels required for cost-recovery (see Section 3.2), these issues need to be corrected before considering the implementation of a landfill tax, which could create further distortions (DEA, 2016).
- In particular, in the case of landfills; licensing of landfill sites, compliance with permit conditions and with the Norms and Standards, full cost accounting, and cost-

reflective tariffs (enabling full cost recovery) for waste management services need to be in place before a landfill tax can be considered.

3. Early signal of government intent
4. Analysis of options (selecting an appropriate economic instrument to address the identified market failure and create the required incentives)
5. Choice of instrument

Thereafter, once a preferred economic instrument has been identified, a process of evaluation of the appropriateness and potential impacts of the instrument needs to take place. This should include an assessment of the full social, economic and environmental costs and benefits, including potential impacts on municipalities, producers and/or consumers (DEA, 2016). Specifically, the following criteria should be applied for assessing economic instruments (National Treasury, 2006):

- Environmental effectiveness
- Tax revenue
- Support for the tax
- Legislative aspects
- Technical and administrative issues
- Competitiveness effects
- Distributional impacts
- Adjoining policy areas

Finally, once it has been established that the identified instrument is appropriate; and that the overall social, economic and environmental benefits outweigh the costs; the process of instrument design can be undertaken, including the establishment of the required administrative mechanisms. The instrument should be designed so as to maximise social, economic and environmental benefits, and minimise social, economic and environmental costs (including potential competitiveness and distributional impacts).

Sections 6.1 – 6.4 build on the information presented above and in the National Pricing Strategy, by providing further guidance regarding the implementation of specific economic instruments that can be potentially be implemented by national government in order to incentivise the diversion of waste from landfill.

6.1 Conditional grant funding for waste infrastructure

6.1.1 What is it?

As seen in Section 3, many of the barriers to diverting waste from landfill relate to the following:

- Many disposal sites are not properly engineered/sanitary landfill sites (and therefore the costs of disposal are artificially low, creating incentives for continued disposal).
- High capital costs of waste infrastructure (this applies to upgrading or developing new landfills that comply with the 2013 Norms and Standards; as well as to the development of alternatives to landfill disposal).

- A lack of funding for municipalities to invest in upgrading landfill sites, or developing the infrastructure required to put in place alternative waste treatment technologies.

In the case of landfill sites specifically, there is a lack of funding to upgrade/improve landfill infrastructure such that landfills comply with licence conditions and with the Norms and Standards for Disposal of Waste to Landfill (DEA, 2013). Not only would upgrading landfill sites reduce the environmental impacts associated with disposal of waste to landfill, it would also raise the cost of landfilling, which would in turn create incentives for waste to be diverted from landfill.

In the case of alternatives to landfilling, funding is likewise required to develop municipal infrastructure, such as:

- Composting and/or anaerobic digestion (AD) facilities for the treatment of organic waste
- Materials recovery facilities (MRFs) for the sorting and recovery of recyclable waste
- Buy-back centres, particularly in formal neighbourhoods (or, mobile buy-back centres) for the collection of recyclable materials collected by communities and informal waste pickers. Locating buy-back centres closer to where the waste is generated will enable informal collectors to work more efficiently and therefore recover more materials per day.
- Drop-off centres for the collection of recyclable waste and organic waste streams not typically collected by the municipality.

In addition, grants could potentially be provided not only to municipalities, but also for the establishment of recycling businesses, thereby contributing toward the development of small businesses.

Currently, the Municipal Infrastructure Grant (MIG) is the only source of funding from national government that can be accessed by municipalities for waste-related infrastructure. However, waste projects have to compete with projects from other sectors (e.g. water, sanitation and electricity), which are typically prioritised (World Bank, 2019a).

As such, the potential need for a dedicated fund for waste management infrastructure should be considered (World Bank, 2019a; 2019b). According to a World Bank study, “one common approach to developing waste infrastructure is to develop a national ‘Waste Infrastructure Development Fund’ to which municipalities can apply for capital support to improve infrastructure” (World Bank, 2019b). Examples of countries with this type of funding mechanism include India (the Jawaharlal Nehru National Urban Renewal Mission, JNNURM) and the UK (Waste Infrastructure Fund).

However, in the case of funding for upgrading landfill infrastructure, such a fund should ideally have conditions attached, to ensure that municipalities implement the necessary waste management reforms in order to access such funding.

Conditional grants are grants that are provided by national government to provincial or local government on condition that certain criteria are met; as opposed to unconditional grants, which are provided with ‘no strings attached.’

According to the Financial and Fiscal Commission (2000), conditional grants are particularly well suited for financing the building up of public infrastructure to an acceptable level to enable improved service provision. In the case of conditional grants for solid waste infrastructure, in particular landfills, conditions which could be attached to grants include the following:

- Licensing of landfill sites
- Compliance with license conditions / Norms and Standards
- Application of full cost accounting principles
- Application of cost-reflective solid waste tariffs and landfill tipping fees
- Cost recovery for waste services
- Reporting to the South African Waste Information System (SAWIS)

The intention of attaching such conditions to grants is to create incentives for municipalities to ensure that these fundamental issues are addressed, in order to improve the state of waste management; while also increasing the costs of landfilling to reflect best practice, ensuring that tariffs reflect the full costs of disposal to landfill. In turn, this would create incentives to divert waste away from landfilling, towards alternatives.

For example, according to GIZ (2015), "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, for example, under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) programme. This programme provides finance for local authority infrastructure, based on criteria such as the percentage of cost recovery, and the collection efficiency of solid waste user charges. A benchmarking system is applied, which "helps with the identification of local authority interventions worthy of financial support" (GIZ, 2015).

6.1.2 How to implement it?

It is proposed that a dedicated fund for waste infrastructure be established, in the form of a conditional grant allocation to municipalities. Conditional allocations from national government to local government are provided for in Sections 214 and 227 of the Constitution (RSA, 1996). According to Section 227, in addition to the equitable share received by municipalities to perform their functions and provide basic services, municipalities "may receive other allocations from national government revenue, either conditionally or unconditionally" (RSA, 1996).

Section 214 of the Constitution highlights that allocations to local government, and the conditions on which such allocations may be made, must be provided for by an Act of Parliament. Such an Act can only be enacted after "organised local government and the Financial and Fiscal Commission have been consulted, and any recommendations of the Commission have been considered" (RSA, 1996). The Act must also take into account:

- the national interest
- any provision that must be made in respect of the national debt and other national obligations

- the needs and interests of the national government, determined by objective criteria
- the need to ensure that the municipalities are able to provide basic services and perform the functions allocated to them
- the fiscal capacity and efficiency of the municipalities
- developmental and other needs of municipalities
- obligations of the municipalities in terms of national legislation
- the desirability of stable and predictable allocations of revenue shares
- the need for flexibility in responding to emergencies or other temporary needs, and other factors based on similar objective criteria (RSA, 1996).

In the case of a dedicated fund for waste infrastructure, some specific issues and challenges that will need to be addressed include:

- The need for careful design to ensure that the parameters, accessibility requirements and conditions of such a fund are clearly defined (World Bank, 2019b). As mentioned above, some of the relevant conditions required to incentivise improved waste management practises, higher landfilling costs, and, ultimately, increased diversion from landfill would include:
    - Whether or not landfill sites are licensed
    - The extent to which landfill sites are in compliance with license conditions / Norms and Standards
    - The extent to which municipalities are conducting full cost accounting of waste services
    - The extent to which cost-reflective solid waste tariffs and landfill tipping fees are being applied
    - The degree to which the full costs of providing waste management services are recovered
    - The extent to which municipalities and landfill sites are reporting to SAWIS
- The need to provide municipalities with technical support to develop appropriate proposals for funding (World Bank, 2019b).
- Funding for waste infrastructure should be allocated on a “cost sharing” basis to incentivise the municipality taking ownership. In other words, municipalities should be required to match the funding from their own budgetary allocation, to ensure that they take responsibility and ownership of the infrastructure, and that ‘white elephants’ are avoided.

In establishing such a fund, a broader consultative process should also be followed, as per Sections 72 and 73 of the Waste Act.

Once established, conditional grant allocations to local government are published annually as annexures to the Division of Revenue Bill for the financial year in question, and then enacted in the Division of Revenue Act (The Presidency, 2013; Vulekamali, 2021). Specifically, a dedicated grant for waste infrastructure would be set out in Schedule 5b, which relates to specific-purpose allocations to municipalities, including infrastructure grants (The Presidency, 2013). The Division of Revenue

Bill specifies the value of such grants for the budget year, as well as projected values over the medium-term expenditure framework (MTEF) period (Vulekamali, 2021).

Conditional grants are managed by the relevant national government line department, which submits frameworks and allocations to National Treasury (Vulekamali, 2021). Consultation is also required with a number of other key stakeholders, including other national and provincial departments, the South African Local Government Association, NGOs, the office of the Auditor-General, and civil society organisations (Vulekamali, 2021).

6.2 Landfill tax

6.2.1 What is it?

Landfill taxes are generally levied by national government, per tonne of waste disposed at landfill sites. The aim is to increase the overall cost of landfilling, and thereby to discourage landfilling in favour of alternative waste management options.

Landfill taxes are aimed at addressing the externalities associated with disposal of waste to landfill. Externalities refer to the positive or negative side effects (external benefits or costs) of a particular economic activity or process, which are not incurred by those undertaking the activity (e.g., the landfill owner/operator), but are instead borne by other parties, broader society, and/or future generations (Nahman, 2011). In the case of disposal of waste to landfill, externalities include the environmental, social and health impacts arising from this form of disposal; such as emissions of leachate and methane, odours, visual impacts, etc. (Nahman, 2011). Landfill taxes aim to "internalise" these externalities, by incorporating the external costs within the cost structure of those undertaking the activity (e.g. the landfill owner/operator); such that they can then be incorporated within landfill tipping fees and/or waste tariffs.

6.2.2 How to implement it?

In South Africa, all national taxes are imposed through the introduction of Money Bills by the Minister of Finance in the National Assembly, as per Section 77 of the Constitution (RSA, 1996). According to Section 77, Money Bills must be considered in accordance with the procedure under Section 75 (Ordinary Bills not affecting provinces) (RSA, 1996).

According to DEA (2016), before considering the implementation of a landfill tax, extensive consultation with stakeholders (including municipalities) is necessary to establish the need for and appropriateness of such a tax. Factors to consider include:

- Suitability of the tax for addressing the problem at hand. Specifically, what is the reason for the current under-pricing of waste services in South Africa (e.g. artificially low landfilling costs, lack of full cost accounting, lack of cost recovery, externalities, etc.); and is a landfill tax the most appropriate means of addressing this? According to DEA (2016), if landfill costs are artificially low, and the full costs of providing waste collection and disposal services are

not being recovered, these issues need to be addressed before considering the implementation of a landfill tax (DEA, 2016).

- The availability of alternatives, and price elasticity of demand for landfill disposal; in relation to the purpose of the tax (reducing disposal of waste to landfill, or raising revenue).
- Monitoring and enforcement capacity; specifically, the existence of weighbridges to record the quantities of waste entering landfill sites; and to control illegal dumping (DEA, 2016; 2018b).
- Socio-economic (and in particular, distributional) impacts; such as impacts on municipal finances and on low-income households (DEA, 2016).

Each of these issues is addressed in turn below:

- **Suitability of a landfill tax for addressing under-pricing of waste services in South Africa:**
    - Before considering the implementation of a landfill tax, it is crucial to understand whether such a tax is in fact the most suitable mechanism for addressing the problem at hand (i.e., the under-pricing of waste services in South Africa). As discussed in Section 6.2.1, landfill taxes are aimed at addressing a specific type of market failure; specifically, the externalities associated with disposal of waste to landfill.
    - However, it is important to bear in mind that externalities are not the only (or even the main) reason for under-pricing of waste services in South Africa. As seen in Section 3.2, the under-pricing of waste services extends beyond the failure to internalise external costs. Other reasons for the under-pricing of waste services include:
        - Artificially low cost of landfilling, due to landfill sites being deficient/unsanitary/non-engineered (i.e. landfill sites are unregulated, unlicensed and/or non-compliant with permit conditions and/or with the Norms and Standards)
        - Lack of full cost accounting
        - Lack of cost recovery for waste services.
    - It is important to bear in mind that landfill taxes are not designed to address issues relating to artificially low landfill costs, lack of full cost accounting, and lack of cost recovery. These are underlying structural issues that need to be addressed before landfill taxes could be considered. Indeed, implementing landfill taxes before these fundamental issues are addressed could lead to further distortions.
    - In addition, it should be noted that externalities represent only a small proportion of the overall 'gap' between current landfill tipping fees and the full costs of disposal to landfill:
        - For example, Nahman (2011) found that the externalities associated with landfilling of solid waste in the City of Cape Town are in the order of R111 per tonne.
        - By contrast, the gap between current landfill tipping fees and the costs of landfill disposal in line with the Norms and Standards is much higher. Taking into account that many municipalities do not charge disposal fees at all, the average disposal fee among municipalities sampled by DEA (2018b) is R92

per tonne. On the other hand, estimates of the cost of landfilling in line with the Norms and Standards are in the range of R480 per tonne (Hanekom, 2016; Haider, 2016). As such, the failure to comply with the Norms and Standards results in landfill tipping fees being approximately R388 per tonne less than the cost of compliant landfilling. Even this ignores other elements of the full cost of landfilling, such as allowances for post-closure and rehabilitation.

- It should therefore be clear that issues relating to non-compliance with the Norms and Standards, the lack of full cost accounting, and failure to set cost-reflective tariffs have a far bigger impact on the under-pricing of landfill disposal, as compared to the failure to address externalities. This reiterates the point that these prerequisites should be addressed before an environmental tax aimed at addressing externalities (i.e. a landfill tax) can be considered; since externalities represent only a small proportion of a far broader problem.

- **Availability of alternatives, price elasticity of demand for landfill, and the purpose of the tax (reducing disposal or raising revenue):**
  - Price elasticity of demand refers to the responsiveness of behaviour to changes in price; that is, the extent to which the tax would be effective in stimulating a reduction in waste disposed to landfill.
  - In the absence of viable alternatives, price elasticity of demand for landfill is likely to be low. In this context, a landfill tax will not be effective in reducing disposal to landfill; it will only be effective in raising revenues.
  - A landfill tax can only act as an effective price signal (i.e. it will only be effective in diverting waste from landfill) if alternative disposal options are available (i.e. when price elasticity of demand is high), which will allow for municipalities and private disposers to reduce their tax burden by switching to more desirable alternatives (DEA, 2018b).
  - In the South African context, given the lack other viable alternatives, and of enforcement capacity; the likely result is that illegal dumping (or disposal at unregulated sites) will increase, as this is the most feasible alternative for avoiding the tax. This will result in worse environmental outcomes as compared to disposal at regulated landfill sites, while also reducing the potential for revenue to be generated.

- **Monitoring and enforcement capacity:**
  - DEA have commissioned a study into the feasibility of a landfill tax as a deterrent to divert waste away from landfill (DEA, 2018b). While the final report has not been released, some preliminary lessons can be drawn from the Status Quo Report (DEA, 2018b) that was produced as part of the study. Specifically, DEA (2018b) finds that South Africa does not currently have adequate systems in place (in particular, functioning weighbridges) to adequately measure and report on the quantities of waste entering landfill sites, which is a prerequisite for a landfill tax to be

implemented. For example, only 7% of operational landfills in South Africa have functioning weighbridges (DEA, 2018b).
    - Furthermore, DEA (2018b) finds that "an increase in the cost of landfilling as a result of a landfill tax may lead to perverse incentives and tax avoidance. Tax avoidance in the form of illegal dumping or increase in disposal at unregulated landfills, would have a worse environmental outcome than before" (DEA, 2018b). Most South African municipalities are unlikely to have capacity for the increased monitoring and policing of illegal dumping that will likely be required as a result of the tax.
    - Again, only once these prerequisites are in place, could a landfill tax be considered.

- **Socio-economic impacts:**
    - According to DEA (2018b), municipalities will be negatively impacted by a landfill tax, as they "will have to pay a new charge that may not be recoverable from customers, and will receive less tariff revenue if the objective of diversion of waste is achieved" (DEA, 2018b). A landfill tax will therefore have a negative impact on municipal finances, which are (generally speaking) already constrained. The additional costs of a landfill tax would need to be covered either through grant funding, or internal cross-subsidisation within the municipality (DEA, 2018b).

It is clear from the above that a number of prerequisites need to be put in place, before a landfill tax can be considered. To summarise, these include:

- Licensing of landfill sites and compliance with permit conditions and with the 2013 Norms and Standards; to ensure that the actual costs of landfilling accurately reflect the costs associated with best management practices, rather than deficient landfilling
- Viable alternatives to landfill disposal (such as options for recycling), such that municipalities, private disposers and waste generators can respond to the price signal in an appropriate way, and that the tax does not stimulate an increase in illegal dumping
- Effective access control, functioning weighbridges and adequate reporting systems, to enable accurate monitoring and reporting of waste quantities entering landfill sites
- Capacity to monitor and control illegal dumping
- Full cost accounting of waste services
- Cost recovery for waste services, through cost reflective gate fees and waste tariffs
- Municipalities must be in a sufficiently sound financial position for payment of the tax.

As such, the National Pricing Strategy (DEA, 2016) provides an Action Plan, which included a number of fundamentals which needed to be put in place, prior to the consideration of economic instruments such as a landfill tax. In particular, Action 1 set targets addressing the pervasive under-pricing of waste services through full cost accounting and ensuring that municipalities charge for waste management services to an extent that the costs are recovered; over the 2015-2018 period. Similarly, Goal 6 of the 2011 NWMS (DEA, 2011) set a target for all municipalities to conduct full cost accounting of waste services and set cost-reflective tariffs, by 2016. However, according to DEFF (2021), aside from the large metros, few municipalities have achieved this.

Importantly, putting in place some of the pre-requisites listed above (e.g. fully compliant landfill sites, functional weighbridges, improved management and enforcement, etc.) will in and of itself increase the cost of landfilling (and thereby result in a diversion of waste from landfill); even without the imposition of a landfill tax. Therefore, once these fundamentals have been addressed, it could potentially be found that there is no longer a need for a landfill tax.

In addition, the externalities associated with landfilling can be mitigated to a certain extent through improved landfill infrastructure and management. For example, fully engineered landfill sites, constructed with liners to contain leachate, and landfill gas capture systems to prevent methane emissions, will have a lower environmental impact as compared to landfill sites without such systems in place. In this case, the external costs of landfilling would have been internalised in the costs to the municipality of constructing and managing the landfill site.

In other words, there is a trade-off between the financial costs of landfilling, and the external costs. Engineered landfill sites, which are compliant with the Norms and Standards for Disposal of Waste to Landfill (DEA, 2013), will have higher capital and operating costs, but lower environmental costs; whereas non-compliant landfill sites will have lower capital and operating costs, but higher environmental costs. It is therefore clear that addressing the artificially low costs of landfilling through compliance with the Norms and Standards will not only raise the cost of landfilling, thereby creating incentives to divert waste toward alternatives; but will also reduce the environmental impact associated with landfilling. Again, this might mean that there will no longer be a need for a landfill tax.

Only once the above-mentioned prerequisites have been addressed; and only if the cost of landfilling remains too low relative to alternatives; could a landfill tax be considered; following the guidelines, recommendations and timelines of the Landfill Tax Feasibility Study (once available) and the National Pricing Strategy (DEA, 2016).

Once a decision has been made that a landfill tax is required, the focus switches to the design of the tax, including the setting of an appropriate level of the tax. The tax needs to be designed in such a way as to “maximise positive impacts and minimise negative impacts on the economy, society and environment; which should also involve extensive consultation with affected parties” (DEA, 2016).

According to DEA (2016), as with any tax, “it is important that due diligence and extensive consultation be conducted in the setting of the tax level, rather than setting taxes at an arbitrary level, which can often do more harm than good” (DEA, 2016). Specifically, the tax should be levied per tonne of waste landfilled, at a level reflecting the external cost (taking into account environmental, social, health and other impacts) per tonne of waste landfilled.

As mentioned above, Nahman (2011) valued the externalities associated with landfilling of solid waste in the City of Cape Town at R111 per tonne; although this figure is not necessarily applicable to South Africa as a whole, and would need to be updated. If a landfill tax were to be implemented, it is suggested that a comprehensive economic valuation study be commissioned to quantify the externalities associated with landfill disposal in South Africa, and to determine an appropriate level for the tax. Such a study should be based on the following broad approach (DEA, 2016):

- Identify the environmental, social and health impacts associated with landfilling (e.g. methane emissions, leachate, etc.)
- Quantify the impacts in physical terms (e.g. tCO_2e of methane emissions per tonne of waste)
- Value (quantify in monetary terms) the external costs per tonne of waste landfilled, using an appropriate economic valuation technique (such as the Contingent Valuation Method, the Hedonic Pricing Method, the Benefits Transfer Method, Production Function approaches, etc.; and/or through the application of appropriate shadow prices (e.g. carbon prices, in the cases of methane emissions).

Differentiated tax rates could also be considered, based on levels of compliance with environmental standards. For example, sites with lower environmental standards (e.g. sites without liners or landfill gas capture systems) should have a higher tax imposed on them, while sites with higher environmental standards (e.g. those that comply with the Norms and Standards) could be rewarded with lower tax rates (or be exempt from the tax altogether). Such an approach is justified from an economic perspective; since sites with higher environmental standards will have internalized much of the environmental externalities within their financial costs; and should therefore face lower or zero rates of environmental taxation. This would incentivize a reduction in disposal specifically to sites with lower standards, in favour of those with higher standards. It would also create incentives for upgrading of landfill sites to comply with the Norms and Standards.

Thereafter, it would be necessary to conduct extensive consultation on the level of the tax; and to conduct extensive modelling of the impacts of the tax in terms of social, economic and environmental outcomes (taking into account price elasticity of demand for the service in question, among other variables). In particular, attention should be paid to potential negative unintended consequences, such as illegal dumping.

Another important consideration when designing the tax relates to what will be done with the tax revenues. In this regard, the Waste Management Bureau, which is responsible for implementing the "disbursement of incentives and funds derived from waste management charges" under Section 34E of the Waste Amendment Act (The Presidency, 2014), has an important role to play.

It is worth considering that, as with existing product taxes, "the use of the revenue raised through a landfill tax is likely to be controversial" (DEA, 2018b). Ideally, the revenues should be channelled back to the solid waste sector; for example, to finance improved waste management services, infrastructure, or facilities; or to finance complementary policies to support alternatives to landfilling, such as subsidies (see Section 6.3).

Indeed, DEA (2016) suggests that environmental taxes should ideally be implemented in combination with a subsidy; as this would ensure that the instrument is 'revenue neutral'; in that revenues raised through the tax can be used to fund the payment of subsidies for the establishment of alternative waste management technologies. In addition, a complementary tax-subsidy combination would help to reinforce the appropriate behaviour (i.e. recycling); rather than simply implementing a punitive tax without providing appropriate alternatives. In other words, activities imposing negative externalities (e.g. landfilling) can be discouraged by means of a tax, while the

revenue collected can be used to encourage activities (such as recycling) which give rise to 'positive externalities', by means of subsidies (National Treasury, 2006). Alternatively, revenues from a landfill tax could be used to fund "specific waste management investments, general improvement in waste management services, waste-related environmental remediation, or other applications" (Inter-American Development Bank, 2003:30).

In principle, there are three options as to how revenues can be channelled back to the solid waste sector; namely full ring-fencing, soft/partial earmarking, and allocations through the normal budget process. In the South African case, ring-fencing of tax revenues is not possible. However, in the absence of some form of earmarking, there is no guarantee that any funds will be channelled back to the solid waste sector. A compromise may be to use 'soft' or 'partial' earmarking, whereby "revenues will flow via the fiscus with the provision that special consideration be given to fund certain activities, but with no fixed commitment to allocate all the revenues from a specific source to such activities" (National Treasury, 2006:105). Alternatively, allocations can be made through the normal budget process. However, in this case, there is no guarantee of revenues being channelled back to the solid waste sector. In general, there are no clear guidelines to determine whether earmarking is appropriate; instead, the desirability of earmarking needs to be assessed case-by-case, and, where earmarking is granted, regularly re-evaluated to ensure its ongoing desirability (National Treasury, 2006).

Finally, the proposed new tax must be introduced by the Minister of Finance as a Money Bill in the National Assembly, as per Section 77 of the Constitution (which follows the same process as for Section 75 Bills) (PMG, 2021). This process, which is led by National Treasury, involves:

- Announcement of proposal for a new tax in the Budget
- Publication of a policy paper or draft bill for stakeholder consultation, subject to Cabinet approval (either on the day of the Budget speech, or thereafter)
- Consideration of comments received
- Revision of the policy or bill to address comments received
- Introduction of the Bill in Parliament
- Debating the Bill within the Parliamentary process, including by the Standing Committee on Finance, the Select Committee on Finance, and the National Assembly (Hemraj, 2021).

Once the tax has been signed into law, it should be phased in gradually, according to a schedule that is provided to the target group in advance, to ensure that the impacts of the tax can be managed (DEA, 2016).

6.3 Subsidies, tax concessions and incentives

6.3.1 What is it?

While environmental taxes (such as landfill taxes) are aimed at addressing 'negative' externalities (such as environmental impacts) by increasing the cost (and thereby reducing the demand) for activities giving rise to such impacts; subsidies essentially act in the opposite direction: They aim to

support activities that give rise to 'positive externalities' (e.g. job creation and environmental benefits); such as recycling and other alternative waste treatment technologies.

Subsidies could potentially be applied at various points along the value chain, in order to create incentives for improved product design (using recycled materials, or designing products for recyclability), reduced waste generation, or diversion of waste from landfill; or to support the development of markets for recyclables, recycled materials, or products produced using recycled materials (DEA, 2016). Similarly, as an alternative to direct, explicit subsidies, 'implicit' subsidies could be provided in the form of various types of tax concessions, such as tax rebates or exemptions.

Specifically, subsidies or tax credits/rebates could potentially be paid to various actors, including:

- Producers, e.g. to provide incentives to design products for recyclability; or to use recycled materials/inputs
- Households, to provide incentives to separate their waste
- Collectors (either waste collection authorities, private sector companies, or informal collectors), in order to provide incentives to collect recyclable materials
- Businesses undertaking alternative waste treatment (e.g. recycling), in order to support such activities and increase the viability of alternative waste treatment relative to landfilling (DEA, 2018b).

Internationally, a wide range of subsidy-based instruments are used to incentivise movement up the waste management hierarchy (DEA, 2018b). Specific examples of such instruments include:

- Incentivising design for recycling / design for the environment; e.g. subsidisation of products that are designed for recyclability, or that don't generate non-recyclable waste (DEA, 2018b).
- Incentivising the desired waste management behaviour among waste generators; e.g. preferential tax treatment provided to businesses for improved waste management practices or initiatives; as in the USA and Poland (UNEP, 2005; DEA, 2018b).
- Incentivising diversion of waste from landfill; e.g. through rebates on waste collection/disposal charges for activities that divert waste from landfill, based on the avoided costs.
- Incentivising investment in recycling infrastructure; e.g. through recycling investment tax credits, in which government gives a credit on income taxes to organisations investing in recycling infrastructure (Walls, 2006); or through providing price support, investment grants, accelerated depreciation, or soft loans designed to encourage private enterprises to invest in such infrastructure (UNEP, 2005).
- Supporting informal waste collectors, e.g. through mobile buy-back centres, payment for waste pickers' labour, compensation through subsidies (Dias and Samson, 2016), subsidised rental of warehouses for cooperatives/small businesses (Perrupato-Stahl, 2016), etc.
- Financial support of recycling activities, e.g. tax rebates for recycling (DEA, 2018b), preferential loans for the recycling industry (DEA, 2018b), subsidies paid per unit or per kg of material recycled, or lump-sum grants paid to communities or recycling centres (as is common in the USA) (Walls, 2006).

- Incentivising demand for secondary materials (DEA, 2018b), e.g. tax rebates or credits to industries for using recycled materials as an input in their products (UNEP, 2005); or providing preferential treatment in terms of public procurement practices to suppliers using recycled content (DEA, 2016). In turn, this will create a market for recycled materials, which will increase the viability of recycling activities.
- Stabilising the market for recycled materials (i.e. providing a buffer against market price volatility), e.g. through providing income guarantees to recycling facilities (DEA, 2016); or providing price support (on top of market prices) to recyclers, to enable recycled materials to compete with virgin materials even at times when market conditions are unfavourable (e.g. when virgin material prices are low as a result of low oil prices); while still allowing recyclers to receive sufficient income to ensure their viability.
- Other forms of 'implicit subsidisation'; e.g. municipal support of formal and informal recyclers and composting operations through the provision of land and equipment and the supply of material free of charge; funding of feasibility studies and research into recycling opportunities (DEA, 2018b); funding the capital cost of MRFs; providing soft loans; etc. (DEA, 2018b).

In particular, given the specific challenges identified during this project (see Section 3), a number of specific types of subsidies, tax concessions or similar instruments may be relevant in the South African context in order to create incentives for the diversion of waste from landfill. These include:

- Tax credits for investing in infrastructure for alternative waste treatment
- Subsidies paid per unit or per kg of material processed through alternative waste treatment
- 'Top-up' incentives (e.g. paid to collectors per kg of material collected), to increase the value of recyclables and thereby incentivise collection/recovery
- Income guarantees/price support for recyclers
- Tax credits/rebates for using recycled materials

Table 14 lists some of the challenges identified in Section 3; focusing specifically on those for which there may be a role for subsidy-type instruments. It also identifies which specific type of instrument is relevant in each case.

Depending on the specific challenge to be addressed (middle column of Table 14), different types of subsidies could be implemented, at different points along the value chain. When considering subsidies, it is important to identify where in the value chain they could be applied in order to have the "largest impact on diverting waste from landfill" (DEA, 2018b).

For example, in the South African context, informal waste pickers play a significant role in the collection of recyclables and in the diversion of waste from landfill, but are vulnerable to fluctuations in the market value of recyclables, which means that they often 'cherry-pick' only the highest value materials, and are not able to derive a sufficient income when market conditions are unfavourable. As such, incentivising informal reclaimers, and ensuring that they are adequately compensated for the valuable service that they provide (in terms of their contribution to the recycling industry, and the cost savings that they generate for municipalities through airspace savings); is of critical importance.

Table 14: Potential role of subsidies, tax concessions and related instruments in addressing economic/financial root causes for the dominance of landfilling as a waste management option

Economic and financial issues where there may be a role for subsidy-type instruments		**Relevant type of subsidy / tax concession / incentive**
High cost of alternatives	• High capital costs	• **Tax credits for investing in alternative waste treatment technology infrastructure**
	• High operating costs	• **Subsidies paid per unit or per kg of material processed through alternative waste treatment**
Lack of benefits from alternatives	• Market prices are too low	• **'Top-up' incentives** (e.g. paid to collectors per kg of material collected), to increase the value of recyclables and thereby incentivise collection/recovery
	• Fluctuating market price of virgin materials (linked to global commodity prices)	• **Income guarantees/price support for recyclers**, to provide a buffer against market volatility
	• Lack of markets	• **Tax credits/rebates for using recycled materials**

For example, the concept of 'top-up' incentives to informal waste pickers, in the form of an additional amount paid per kg of material collected, over-and-above the market value of the materials, may be relevant (Godfrey, 2019). Since both industry and municipalities benefit from the activities of informal reclaimers, such incentives could potentially be funded through EPR schemes (specifically through EPR fees or Advance Recycling Fees), or by passing on savings in disposal costs; or through some combination of these. The aim of such payments would be to incentivise increased collection (across a wider range of materials, rather than only cherry-picking the highest-value materials), to encourage pickers to sell recyclables directly to EPR-linked buy-back centres (Godfrey, 2019), and to compensate them for their activities.

6.3.2 How to implement it?

Since subsidies involve allocations of public funds for a specific purpose, they would fall under the scope of Section 77 of the Constitution (RSA, 1996; PMG, 2021), relating to Money Bills. Likewise, tax concessions and incentives would also fall under the scope of Section 77, which includes measures which reduce or grant exemptions from national taxes (RSA, 1996). As such, as with landfill taxes (see Section 6.2.2); subsidies, tax concessions and incentives would need to be tabled in the National Assembly as a Money Bill by the Minister of Finance, in accordance with the procedure under Section 75 (Ordinary Bills not affecting provinces) (RSA, 1996).

The various types of subsidy-based instruments listed in Table 14 should be explored by the Department of Trade, Industry and Competition (the dtic) and National Treasury, in order to "support the development of downstream recycling and recovery markets" (DEA, 2016).

When implementing subsidies, tax concessions and incentives; a number of issues need to be considered:

- In the case of subsidies provided to private sector recyclers, "the distributional effects and impacts on competitiveness need to be carefully assessed. Subsidies should only be

provided where a market would otherwise not exist and where access to the subsidy is not privileged" (DEA, 2018b: 56).

- Once subsidies have been implemented, there is a danger that they could become "institutionalised", with the recipients "claiming financial harm if the support is reduced or stopped" (Forum for Economics and the Environment, 2002). For example, in the case of subsidies to recycling companies; often the companies involved are not financially viable after the subsidy is removed, and the policy therefore fails. Possible reasons include the lack of a stable market for recyclables, or the inability of recycled materials to compete with virgin materials (see Section 3.5). The challenge is therefore to ensure that these companies remain sustainable, i.e., that recycling remains financially viable, even after the subsidy is removed. This requires that:
    - The system is designed in such a way that the support provided to the industry is gradually reduced over time. In theory, as the industry grows, economies of scale will be realised and costs will be reduced, such that the industry could ultimately become self-sustaining. In principle, as alternative waste treatment industries become more competitive, they could ultimately become more attractive than landfilling, particularly if the costs of landfilling increase (e.g. if landfills are able to achieve compliance with the Norms and Standards) (see Section 3.2).
    - There is a need to ensure that distortions in the recycling market are permanently removed, so that the market can ensure an optimal level of recycling, without ongoing government support.

In addition, when implementing subsidy-based instruments, a key challenge relates to how such subsidies will be funded. Generally speaking, three options are available:

1. Funding from general government revenues
2. Funding subsidies through a complementary revenue-raising instrument
3. "Self-funding" subsidies, which are funded through savings in disposal costs.

In the first approach, subsidies are funded from general government revenues, with allocations made through the normal budgetary process. In this case, the funds used to pay subsidies could have been raised from any source of government revenues.

Secondly, in theory, the revenues required to fund subsidies for recycling activities could potentially be raised through a complementary revenue-raising instrument, such as a product tax, EPR fee, advance recycling fee or landfill tax. As discussed in Section 6.2, a tax-subsidy combination can in principle be an effective way of creating an appropriate set of mutually reinforcing incentives (i.e., a tax is implemented on an 'undesirable' behaviour, such as waste generation or disposal; while a subsidy is provided for a 'desirable' behaviour, such as recycling). In addition, a tax-subsidy combination can in principle be designed in such a way as to remain revenue-neutral, in that revenues raised through the tax are used directly to fund the subsidy.

Indeed, according to National Pricing Strategy (DEA, 2016): "There is increasing evidence that a coherent combination of tax and subsidy-based instruments is far more effective than implementing any single instrument in isolation. A tax-subsidy combination has the dual benefit of ensuring a source of funding for the payment of subsidies (and an environmentally-related avenue

for directing revenues received from the tax); and allowing for a coherent and complementary set of incentives to be created, whereby incentives are created to both discourage environmentally damaging behaviour (through the tax) and encourage environmentally friendly behaviour (by both providing and subsidising a viable alternative)".

Examples of such tax-subsidy combinations include:

- Subsidies provided for the use of recycled materials in production; in combination with a tax on virgin materials (see Section 6.4); so as to create price differentiation in the market for inputs that favours the use of recycled materials over virgin materials (DEA, 2016).
- Similarly, subsidies could be applied on the purchase of products that are made from recycled materials or that are designed for recyclability; in combination with a tax on products made from virgin materials or that are not designed for recyclability; so as to create price differentiation in the product market; favouring those products that are made from recycled materials or are designed for recyclability over those that are not.
- An upstream combination tax/subsidy is a tax (paid by producers) which is levied on produced intermediate goods, thereby providing incentives for producers to alter their material inputs and product design; the revenues from which are then used to fund a financing mechanism to support recycling activities; i.e., a subsidy provided to collectors, recyclers, waste management firms or local government in order to incentivise recycling (DEA, 2016).
- Revenues generated through a landfill tax (see Section 6.2) could be used to fund subsidies provided to waste collectors and processors per unit of waste collected or processed.
- EPR fees can be used to "provide funding to cover the costs of establishing and implementing systems for collection, sorting and other treatment required prior to the sale of materials to recyclers; or the provision of incentives, subsidies, infrastructure and/or information to consumers, collectors and /or processors; so as to increase the supply of recyclables" (DEA, 2016).
- Deposit-refund schemes are essentially a combination of a product tax and a subsidy for returning used items for reuse or recycling, as discussed in Section 4.3.7.
- An advance recycling fee (ARF) can be combined with a recycling subsidy. An ARF is a tax assessed on product sales, with the explicit aim of raising revenue to cover the cost of recycling (Walls, 2006; DEA, 2016). In this case, the revenue could be used to fund subsidies paid per unit or per kg of material processed through alternative waste treatment (Walls, 2006). ARFs "are often assessed per unit of the product sold, but can also be assessed on a weight basis. ARFs may be visible to the consumer when [s]he purchases a product – i.e., a separate line item on the bill, similar to sales tax – or they can be assessed upstream on producers and later be incorporated into the product retail price" (Walls, 2006). The level of the ARF is determined (generally by an industry association) "based on the estimated costs of collection, treatment, recycling, re-use and/or recovery of the product" (DEA, 2016).

Advance recycling fees (ARFs) may have a particularly important role to play in this respect. Unlike product taxes (which are intended primarily to reduce demand for environmentally harmful

products, with revenue raising as a secondary benefit), advance recycling fees (ARFs) are "intended primarily to raise revenues to cover recycling costs, with potential secondary benefits in terms of reducing demand" (DEA, 2016). As with EPR fees, revenues from ARFs can be used to fund financial incentives (payments) to consumers, collectors or processors per unit or per kg of material returned, collected or recycled. Several studies have shown that a combination of an ARF and a recycling subsidy is an economically efficient approach to achieving multiple policy objectives (Walls, 2006).

Specific examples of how such tax-subsidy combinations have been applied in practice are as follows:

- Estonia: Revenue from a landfill tax is "made available by Government to subsidise private sector recycling activities. Recyclers can apply for up to 50% of their costs to establish recycling facilities" (DEA, 2016).
- Western Canada: Sales and imports of motor oil, oil containers and filters are subject to an ARF, payable by the seller. Revenues from the ARF are "used to fund collection and recycling programs, via the payment of a recycling subsidy to authorized collectors, transporters, and processors for every litre of oil, every container, and every filter that is recycled or reused. The level of both the ARF and the recycling subsidy is set by a non-profit industry association... The value of the return incentive varies by location, in accordance with differences in transport costs. In turn, the level of the ARF takes into account the revenues required to support the recycling programs through the payment of the return incentives" (DEA, 2016).
- China: Producers and importers of electronic and electrical products pay a fee on each unit produced (for domestic use) or imported. The fees are paid into an 'electronic waste disposal fund'. The fund is used to subsidise the collection and safe disposal of waste electrical and electronic equipment (WEEE). Fees are paid "on a quarterly basis, via the tax authority, or when declaring imports via the customs authority… Certified recyclers who can provide proof of the WEEE they have recycled or disposed of are eligible to apply for a subsidy, which is also unit-based. Fee and subsidy rates are set based on a series of consultations with experts, producers, importers and recyclers. The rates are adjusted as necessary as collection and disposal costs change, again based on extensive consultation. Importantly, the fee is set at a much lower rate than the subsidy; such that the authorities distribute and utilize the funds without surplus (i.e. no revenue is generated). The value of the subsidy is based on the basic cost of the recycling and disposal (which in turn varies for each of the five targeted types of WEEE), excluding collection costs; while the fee is typically set at between 10 and 20% of the subsidy" (DEA, 2016).

However, a potential obstacle to an effective tax-subsidy combination in the South African context is that ring-fencing of tax revenues is not possible. As such, the system would need to be designed in such a way that guarantees that sufficient funds will be made available for the payment of subsidies, even if this is done through soft/partial earmarking, or through the normal budgetary process (See Section 6.2).

Alternatively, an ARF could in principle be levied by industry (e.g. as part of an EPR scheme, in which the Producer Responsibility Organisation (PRO) would be responsible for the allocation of revenues), rather than in the form of a tax levied by government. This may help to ensure that

revenues from the ARF are used to fund the payment of subsidies. For example, the Western Canada used oil program referred to above is "an industry-run program in which an industry association sets the level of the ARF and the recycling subsidy" (Walls, 2006). The role of government in such a programme is to pass legislation mandating that that such a fee be paid, and by whom.

Finally, subsidies could be designed so as to be "self-funding", based on the savings in disposal costs that arise as a result of the diversion of waste from landfill. This is the approach adopted in the UK recycling credit scheme, in which the subsidies paid to collectors and recyclers are funded through the savings in terms of avoided disposal costs that arise as a result of the diversion of waste from landfill, through the actions of the collectors/recyclers. In other words, savings in collection and disposal costs as a result of increased recycling are passed on from disposal authorities to organisations undertaking collection and sorting of recyclables (DEFRA, 2006), in order to incentivise recycling activities. In this scheme, "credits are calculated as a percentage of the collection and disposal avoidance costs and thus ensure some income for recycling businesses, even when the market demand for recyclables is low" (Inter-American Development Bank, 2003). In this way, the scheme is "not a drain on the central government budget, as it is simply a transfer payment between different tiers of local government and third parties" (Turner et al., 1996).

Finally, as with taxes (see Section 6.2.2), the proposed new subsidy must be introduced by the Minister of Finance as a Money Bill in the National Assembly, as per Section 77 of the Constitution (which follows the same process as for Section 75 Bills) (PMG, 2021). This involves:

- Announcement of proposal for a new subsidy in the Budget
- Publication of a policy paper or draft bill for stakeholder consultation, subject to Cabinet approval
- Consideration of comments received
- Revision of the policy or bill to address comments received
- Introduction of the Bill in Parliament
- Debating the Bill within the Parliamentary process, including by the Standing Committee on Finance, the Select Committee on Finance, and the National Assembly (Hemraj, 2021).

6.4 Virgin material taxes (and elimination of perverse subsidies)

6.4.1 What is it?

Generally speaking, market prices for virgin materials tend to be lower than those for recycled materials (DEA, 2018b). This means that recycled materials are often unable to compete with virgin materials (see Section 3.5.6), which inhibits the development of markets for recycled materials.

In principle, taxes on virgin materials would help recycled materials to compete, by increasing the prices of virgin materials relative to recycled materials; thereby encouraging the use of recycled materials, and the development of markets for such materials (DEA, 2018b). The aim of a tax on virgin materials is to reduce the use of such materials as an input in the production of goods, in favour of secondary (recycled) materials. In the context of diverting waste from landfill, the

intention of a virgin material tax is to increase the price of virgin materials relative to recycled materials, and therefore to increase demand for recycled materials as an alternative to using virgin materials in production. This would in turn create incentives for the collection and recovery of recyclable materials for recycling, and thereby increase the diversion of recyclable materials from landfill.

A common example of virgin material taxes are those applied on construction aggregates, such as sand and gravel. A number of European countries have taxes on virgin aggregates, including the UK, Sweden and Denmark (Söderholm, 2011).

In some cases, rather than a specific tax on virgin materials; there may be a need to first eliminate any perverse subsidies on such materials. Subsidies on virgin materials can be seen as an implicit 'tax' on recycled materials; since they create perverse incentives for the use of virgin materials rather than recycled materials. Eliminating subsidies on virgin materials would therefore contribute towards making recycled materials more competitive, and thereby grow the market for recycled materials.

For example, the National Recycling Coalition (1999) identified nine separate subsidies in the USA, costing between $3 to $5 billion per year, which artificially lower the price of virgin materials (as well as landfilling), and thereby negatively impact on recycling. It was recommended that these subsidies be eliminated. However, it was also noted that "while the elimination of these subsidies is an important first step, their elimination alone will not guarantee an improvement in the market demand and prices paid for recovered materials" (National Recycling Coalition, 1999). In other words, elimination of subsidies on virgin materials should form part of a complementary package of instruments.

6.4.2 How to implement it?

As with landfill taxes, virgin material taxes would need to be introduced by the Minister of Finance as a Money Bill in the National Assembly (Section 77 of the Constitution), following the procedure under Section 75 (RSA, 1996).

As with any economic instrument, the first step in considering the implementation of a virgin material tax is to establish the need for such an instrument, in consultation with relevant stakeholders, including relevant government departments and industries (particularly businesses across the supply chain that would be impacted by such a tax) (DEA, 2016). A tax on virgin materials will have impacts across the economy, not only within the solid waste sector; and as such widespread consultation will be required. Some specific issues to consider will include, among others:

- The nature and structure of the industry in question – e.g. the degree of competition vs. monopoly, etc.
- Externalities (external costs) associated with the use of the virgin material throughout its life cycle, which would justify the imposition of a tax. Ideally, a comparative life cycle assessment of both the virgin material and the recycled alternative should be conducted,

to establish the extent to which the alternative material is indeed superior from an overall environmental perspective, across the full life cycle.

- Potential impacts on businesses, and on consumers (since taxes on virgin materials will in all likelihood be passed on to consumers in the form of higher product prices). In particular, it needs to be established whether the tax may have disproportionate impacts on smaller businesses and/or lower income consumers (DEA, 2016).
- Price elasticity of demand for the material in question, in relation to the intention of the instrument (changing behaviour vs. raising revenue) (DEA, 2016). Since the intention of a tax on virgin materials is to reduce the demand for such materials in favour of recycled alternatives, a key determinant of the price elasticity of demand in this case is likely to be the extent to which the alternative material provides similar (or superior) performance characteristics in terms of functionality and quality, and the extent to which it meets relevant standards.

Once the need for a virgin material tax has been established, the focus switches toward the design of the tax, including the setting of an appropriate level of the tax. As with any tax, a tax on a virgin material would need to be designed in such a way as to "maximise positive impacts and minimise negative impacts on the economy, society and environment; which should also involve extensive consultation with affected parties" (DEA, 2016).

In terms of setting the level of the tax, as with landfill taxes, "it is important that due diligence and extensive consultation be conducted in the setting of the tax level, rather than setting taxes at an arbitrary level, which can often do more harm than good" (DEA, 2016).

A tax on virgin materials should be levied per tonne of material purchased, at a level that reflects the external cost per tonne. Specifically, it should "be based on the external (social, environmental and health) costs associated with the use of the virgin material relative to the use of the secondary (recycled) substitute; taking into account costs and benefits throughout the lifecycle of the materials in question. In practical terms, these costs could be based on the damage costs associated with the extraction and processing of the virgin material input (to the extent that these are not already incorporated in prices for the virgin material, perhaps through an existing environmental levy on extraction of the material)" (DEA, 2016). As such, as with the case of a landfill tax, a study would need to be commissioned (unless relevant studies have already been conducted) to determine the external (social, environmental and health) costs associated with the use of the virgin material throughout its life cycle, relative to the recycled alternative (DEA, 2016).

As with the case of a landfill tax; extensive consultation on the level of the taxes would need to be conducted; as well as "modelling of the impacts of the tax in terms of social, economic and environmental outcomes (taking into account price elasticity of demand for the material in question, among other variables)" (DEA, 2016). According to DEA (2016), differentiation of the tax rate (based on, for example, the size of the business) should be considered; so as to minimise the impacts on smaller businesses.

Finally, as with a landfill tax (see Section 6.2.2); the proposed new tax must be introduced by the Minister of Finance as a Money Bill in the National Assembly, as per Section 77 of the Constitution (PMG, 2021). This process, which is led by National Treasury, involves:

- Announcement of proposal for a new tax in the Budget
- Publication of a policy paper or draft bill for stakeholder consultation, subject to Cabinet approval (either on the day of the Budget speech, or thereafter)
- Consideration of comments received
- Revision of the policy or bill to address comments received
- Introduction of the Bill in Parliament
- Debating the Bill within the Parliamentary process, including by the Standing Committee on Finance, the Select Committee on Finance, and the National Assembly (Hemraj, 2021).

7 Conclusions

The aim of this study was to understand the root causes for the current dominance of landfilling as a waste management option in South Africa, and to identify relevant solutions for addressing the issues and for increasing the diversion of waste from landfill toward alternative waste management options; in line with the waste management hierarchy and with the concept of a circular economy.

The focus was on identifying economic instruments that can be implemented by national government to create incentives for the diversion of waste from landfill. In this respect, a guideline was developed for national government, providing guidance for the selection, design and implementation of such instruments. Specifically, the focus was on economic instruments that can be implemented by national government to create incentives for waste to be diverted from landfill toward alternative waste management options, such as recycling and recovery.

An important finding of the study is that environmental taxes and other economic instruments are only justified where there is a specific market failure (e.g. an environmental externality) to be addressed. Markets and related institutions that are otherwise well-functioning, as well as the requisite institutional capacity and political will, are important prerequisites.

Landfill taxes, for example, are not appropriate when there are underlying structural issues; e.g. pervasive under-pricing of waste services due to landfill sites being unlicensed or non-compliant, lack of full-cost accounting, tariffs being set below the levels required for cost-recovery, etc. These issues need to be corrected before considering a landfill tax, which could create further distortions. Landfill taxes are only designed to address environmental externalities, and not the various other root causes behind the low cost of landfilling and under-pricing of waste services. Specific prerequisites that need to be addressed before landfill taxes can be considered in South Africa are as follows:

- Licensing of landfill sites, and compliance with permit conditions and with the Norms and Standards for Disposal of Waste to Landfill (Department of Environmental Affairs, 2013)

- Viable alternatives to landfill disposal (e.g. options for recycling) to enable a change in behaviour without stimulating an increase in illegal dumping
- Effective access control, functioning weighbridges and adequate reporting systems, to enable accurate monitoring and reporting of waste quantities
- Capacity to monitor and control illegal dumping
- Full cost accounting for waste services, and cost reflective gate fees and waste tariffs, to enable cost recovery
- Municipalities must be in a sufficiently sound financial position for payment of the tax.

Importantly, putting in place some of these prerequisites will in and of itself increase the cost of landfilling (and thereby result in a diversion of waste from landfill); even without the imposition of a landfill tax. Therefore, once these fundamentals have been addressed, it could potentially be found that there is no longer a need for such a tax. In this way, the potential negative impacts of a landfill tax (e.g. stimulating an increase in illegal dumping, negative impacts on municipal finances, etc.) can be avoided.

In addition to economic instruments that can be implemented by national government, the project also looked more broadly at the range of actions required by all relevant role-players in order to address the various barriers to moving up the waste hierarchy in South Africa. A wide range of root causes for the dominance of landfilling as a waste management option in South Africa were identified, including:

- Legislative barriers
- Low cost of landfilling
- High cost of alternative waste management options
- Lack of funding and other resources
- (Perceived) lack of benefits from alternative waste management options
- Behavioural and institutional issues

A broad range of potential solutions were identified for addressing the various issues and increasing the diversion of waste from landfill toward alternative waste management options. Given the complex nature of the problem, and the broad range of issues to be addressed, no single type of intervention on its own is likely to be effective; nor will actions by any one role-player be effective in isolation. Instead, implementing the waste hierarchy and transitioning to a circular economy will require a coherent set of mutually reinforcing regulatory, economic and other interventions; with actions required by all relevant role-players.

In particular, in addition to the ‘downstream’ measures for diverting waste from landfill that were the focus of this particular study; there is also a need to focus on waste avoidance and reduction, in line with the waste hierarchy; rather than solely relying on ‘end-of-pipe’ solutions to deal with the waste problem.

Specifically, there is a need to focus on improved product design (e.g. Design for Recycling (DfR), or Design for Environment (DfE) more broadly); in line with the circular economy. In particular, with

the current focus on EPR addressing the paper and packaging, electrical and electronic equipment and lighting sectors; there is a need for actions to address organic and Construction and Demolition (C&D) waste; which make up the bulk of the waste going to landfill, and for which significant untapped opportunities exist. In the absence of liners to control leachate, and landfill gas capture systems, organic waste in particular is problematic in terms of its environmental impacts.

Future research should therefore to focus on:

- Appropriate measures for ensuring waste avoidance and reduction, without generating undue negative socio-economic impacts
- Measures to incentivise improved product design (DfR / DfE) and the transition to a circular economy
- Measures to incentivise the diversion of organic and C&D waste from landfill, and the beneficiation of these waste streams.

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