Chapter 1
INTRODUCTION



1 Introduction

1.1 Background to the AISWM Programme

The South African government in partnership with the German Development Cooperation has embarked upon the implementation of an **advanced integrated solid waste management** (AISWM) Programme for the Republic of South Africa.

The Programme prepares projects in pilot municipalities and disseminates knowledge, experience and the practical application of advanced waste treatment (AWT) and broader AISWM systems in the context of South African municipalities.

AISWM is not a universally known term. The term is used to describe integrated solid waste management (ISWM) making use of systems and technologies, within a framework of policies, legislation and practices, that reduce dependency on landfill for disposal of waste. The Programme defines **AISWM** as *the coherent and sustainable application of approaches and solutions that have the effect of reducing the amount of waste that needs to be landfilled*.

AISWM is the process of advancing waste management practices up the hierarchy away from landfill and towards creating energy, recycling, composting, reuse and reduction. **AISWM** does not necessarily demand the use of sophisticated and expensive technology; rather it involves a blend of management systems and appropriate technologies that succeed in sustainably diverting waste away from landfill.

The Department of Environmental Affairs (DEA) coordinates the Programme at national level, with the Rustenburg Local Municipality (RLM) and uMgungundlovu District Municipality (UMDM) partnering at a local level. Each of the partner municipalities has received tailored consultancy support for the preparation of AISWM projects that may be integrated into, and be sustainable within, their local situation.

The intended results of the Programme are to support the implementation of AISWM systems in municipalities and undertake **knowledge dissemination and training on best practices, examples and lessons learned** from the projects to decision-makers in other municipalities and at national level in South Africa.

A series of five knowledge products (KPs) have been prepared to support capacity building on the subject of AISWM across South Africa. The KPs aim to provide clear, concise and factual information to support decision-making on AISWM and AWT, so that municipalities and their partners can plan and implement the next generation of facilities.

1.2 Relationship between Knowledge Products in this Series

This knowledge product (KP) 4, financial implications of advanced waste treatment, is the fourth KP in the series. It builds on KP1: An Introduction to Advanced Waste Treatment, KP2: Appropriate Technology for Advanced Waste Treatment and KP3: Recognising the Informal Waste Sector in Advanced Waste Treatment.

Knowledge product 4 focuses on the financial aspects of developing and operating different types of advanced waste treatment facilities. This KP provides an overview of the financial implications of moving away from landfill and towards AISWM systems. Benchmark cost ranges and breakdowns are provided for different technologies. The KP further includes guidance on preparing a business case (including planning and financial analysis) for AWT systems. The full suite of KPs is illustrated in Figure 1: Relationship between knowledge products in this series.

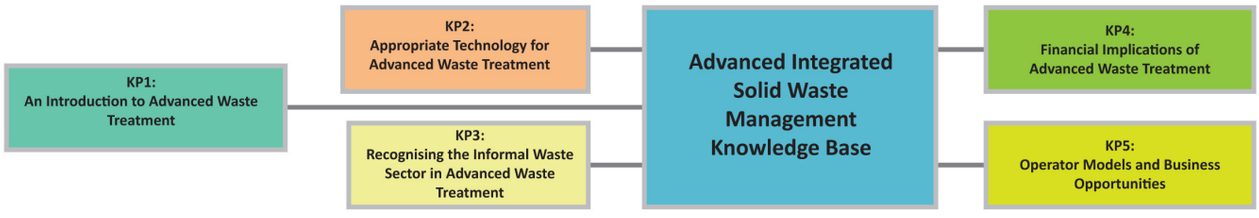

Figure 1: Relationship between knowledge products in this series

1.3 Context of this Knowledge Product

Traditionally, solid waste management (SWM) has been regarded one-dimensionally, with waste being collected and disposed of at 'sinks' better known as landfills. However, since the inception of the *National Environmental Management Waste Act 59 of 2008 (NEMWA)*[1], municipalities have been urged to adopt an integrated multi-dimensional approach to SWM by applying the principles of the waste management hierarchy in the development of their ISWM systems.

The hierarchy includes waste reduction, re-use, recycling and composting, energy creation (via / recovery) and, finally, disposal. Waste reduction is the most desirable outcome and disposal the least. Both the one-dimensional and multi-dimensional approaches are illustrated in Figure 2.

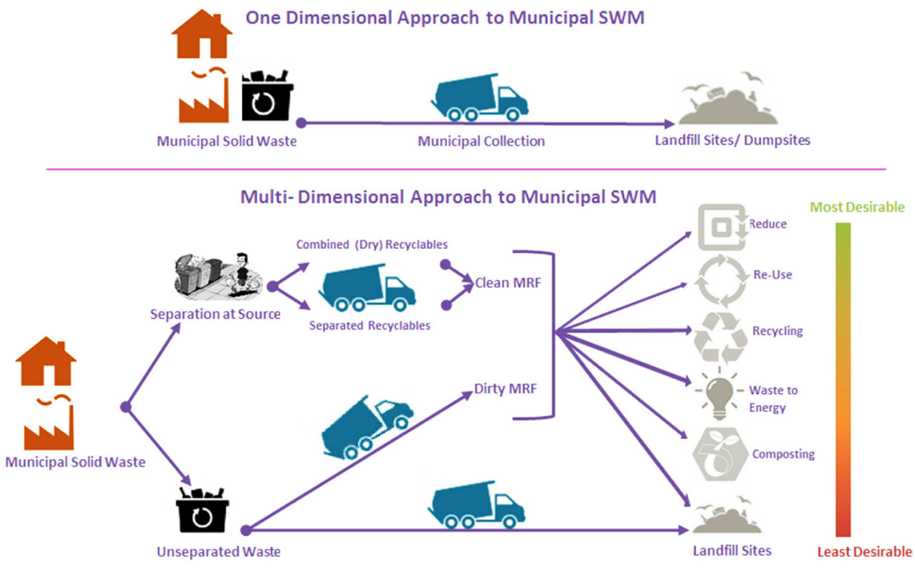

Figure 2: One-dimensional versus multi-dimensional-approach to municipal SWM

(Source: Adapted from DEA 2012:18)

When comparing financial performance, costs and revenues of one-dimensional systems against multi-dimensional systems it should be undertaken with a view to the *long-term* economic implications.

The introduction of advanced waste treatment mechanisms generates repercussions downstream for the collection system with feedstock quality and quantity, and upstream with specific reference to the market for recovered resources. Regardless of the AWT options being pursued, there remains a need for landfill sites in order to manage residual waste and by-products.

The cost of a waste management system is context-dependent. It depends on availability of land, the market demand for secondary resources, the cost of labour and the costs associated with raising capital, amongst other factors. Initially, multi-dimensional AISWM systems will appear more expensive than a one-dimensional system. However, when the economic and social costs (including the otherwise unaccounted externalities) of one-dimensional systems are fully considered, multi-dimensional approaches may become more favourable. The reduced pollution and its associated clean-up costs, more efficient resource use and job creation represent some of the key economic and social benefits of AWT.

Through legislative, financial, institutional, administrative and advisory support by national, provincial and local government, opportunities need to be created ensuring that treatment and recycling of waste becomes more financially viable. Projects of such nature need to consider job creation and wider social impacts, irrespective of the facility being government owned, a public private partnership (PPP) or an entirely privately owned and managed facility.

1 *Available online at https://www.environment.gov.za/sites/default/files/legislations/nema_amendment_act59.pdf, accessed November 2015.*

1.4 Scope of this Knowledge Product

The technologies that are represented in the knowledge products allude to both mainstream and emerging techno- logies that can be applied primarily for the treatment of **municipal solid waste** (MSW). Synergies with other waste streams may exist; however, the intention of this knowledge product is to profile technologies that have a potential mainstream applicability to the diversion of MSW from landfill.

Technologies are divided into three categories: **Promising technologies – short-term**, **potential technologies – medium-term** and **potential technologies – long-term**.

- **Promising technologies – short-term:** (e.g. windrow composting, construction and demolition (C&D) waste recycling and materials recovery facilities (MRF) are assessed as having strong potential for wide scale application for South African municipalities under the current market conditions. A major market-influencing factor is the price of landfill. Municipalities that have succeeded per implementing (and paying for) legally compliant landfill services, will recognise the full cost of these services in their municipal budgets and are likely to find promising technologies to implement under existing budget and price structures. Whether or not this is the case, will depend on the municipality's specific situation.

- **Potential technologies – medium-term:** (e.g. mechanical biological treatment (MBT), anaerobic digestion (AD) and in-vessel composting (IVC), are assessed as being potentially applicable in municipalities where external influencing factors exist that either: a) drive up the cost of landfill, b) where there are synergies in the co-processing of MSW with other waste streams, or c) where there is a particularly strong demand for the outputs from the AWT process. These types of technologies are generally more costly in financial terms than landfill. However, external factors may influence market conditions to an extent that they become financially viable under specific conditions.

- **Potential technologies – long-term:** (e.g. incineration with energy recovery, mechanical heat treatment (MHT), and other advanced thermal treatment (ATT) technologies such as gasification and Pyrolysis, require high capital expenditure. The applicability of these technologies cannot be ruled out; however, their high costs suggest feasibility is improbable in all but the largest metropolitan municipalities. Although the scale of the difference in cost for these technologies when compared to a landfill, or landfill in addition to the lower cost AWT, is significant enough to ensure investment justification it will be difficult unless a very strong case can be presented.

This knowledge product addresses the following questions:

What is the economic rationale for a municipality to invest in AWT? (Chapter 2)

What should municipalities take into consideration whilst preparing a business case for AWT? (Chapter 3)

What are good practices for financial analysis and prioritising investments for municipalities? (Chapter 3)

What are the typical cost structures for different AWT technologies? (Chapter 4)

What are the cost implications for collection and transportation of various AWT technologies? (Chapter 4)

What degree of cost-increase (from the business as usual scenario) should municipalities expect when implementing different AWT facilities? (Chapters 5,6 and 7)