

Background Briefing Paper for the National Sustainable Development Strategy Solid Waste

**compiled by
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The solid waste sector in South Africa as discussed here includes all private and public activity that deals with solid waste materials arising from production and consumption. Waste is something that is not useful to its owner and that its owner needs to discard.

This briefing paper, laid out as per the Brief to Experts, therefore includes in its scope both municipal solid waste (MSW, which typically can include commercial and light industrial waste), and industrial waste, including resource processing wastes (i.e. from the mining industry and from power generation).

The orders of magnitude of the major solid wastes being disposed of in South Africa in 2005 are: 20 Mt¹ of MSW, 450 Mt of mining related wastes and 30 Mt of power station ashes. In some cities, the quantity of MSW that needs to be disposed is nearing a daily average of 2 kg/person, which is 3-4 times that in many European cities.

1. Trends and Forecasts

1.1 Relevant historical and current trends that affect current and future dynamics

Economic growth

- The economic growth rate is often used by municipalities for calculating projected MSW generation quantities. Currently, MSW quantities are growing faster than the economy in some cities (e.g. at 5% p.a. in Cape Town). The government's economic policy aims to accelerate economic growth from the current 3% p.a. to 6% p.a.
- Global economic growth drives increasing demand for metallic resources, and this underpins strong growth in many sectors of the South African minerals sector. The amount of solid waste to valuable metal is defined primarily by the ore body, ranging from about 1:1 for chromite ore, to 250000:1 for some precious metals (where grades of 4 g/t for gold or platinum are not unusual).
- Growth in the economy and in the resource processing sector results in increased electricity consumption. With generation largely coal-based, this in turn results in more discards from coal mining, and more power station ashes to be disposed.

Service Delivery, Urbanisation, and Poverty Alleviation

- The removal of waste is one of the services that were historically poorly or not at all provided to the majority of South Africans. The provision of this basic service to all sectors of society remains a challenge, particularly in low density rural settlements and in informal peri-urban settlements.
- Urban settlements are more prone to problems related to large volumes of solid wastes (such as running out of landfill airspace), because of the higher amounts of waste being generated, as well as the geographical constraints of a city regarding land availability for waste disposal. It has been estimated that up to eighty percent of South Africa's population will reside in cities or towns by the year 2025.

¹ 1 Mt = 1 million metric tonnes or 1 billion kilogram

- In developing countries, the amount of organic waste in MSW is substantially higher than in developed countries. In South Africa, where the difference between poor and rich is one of the biggest worldwide, stark differences in waste generation patterns can be observed within the boundaries of one city (e.g. City of Cape Town IWMP).

Environmental pressures and responses

- For the management of MSW, municipalities rely heavily on disposal, but with sizeable amounts of materials (probably of the order of 20% of arising solid waste) being recovered for recycling from various points in the flow of waste, by a mix of formal and informal economic activity. Municipal landfills were poorly controlled until the early 1990s. At that time there were some 4000 disposal sites in operation in the country, of which only about 200 met minimum environmental standards. Work into reducing the number of disposal sites (through mandatory closure) is ongoing, and this is accompanied by a clear trend to larger ('regional') sites.
- Solid wastes from the mining and minerals industry are disposed of to landfill, usually in the form of large heaps (dry waste) or slimes dams (wastes in slurry form). The gold industry alone accounts for a total of 300 mine dumps, covering an area of 180 km², most of which are located in close proximity to growing residential areas, sensitive agricultural areas and/or perennial rivers (WRC, 2002). Prior to 1960, these solid waste deposits were largely un-engineered, resulting in a number of catastrophic failures. Today strict legislative controls govern site selection, design, management and rehabilitation, with significant technical advances having been made in the fields of geotechnical stability, and the control of dust and soil erosion.

1.2 Key forecasts for business-as-usual scenario

Running out of landfill airspace for MSW

- The capacity of available MSW landfill sites needs to be expanded in the short to medium term, and new landfill sites are needed outside of settlement boundaries in the medium, and definitely in the long-term.
- This will result in increased needs for transport and related infrastructure, and in increases of related air emissions as well as costs (eventually to be paid by customers of waste management services provided by the municipalities)
- As long as no meaningful waste minimisation measures (reduction, reuse, recycling, and thermal utilisation) will be put in place, waste quantities will continue to grow.

Long-term risks from new and old mine waste sites

- Future production trends (DME, 2004) suggest that the mining and minerals industry will continue to play a significant role, esp. in the coal and PGM sectors. This will lead to a steady increase in the number of new waste deposits. Whilst the advances in engineering of waste disposal sites have been relatively successful in dealing with conventional rehabilitation and reclamation issues such as physical stability and re-vegetation, they do not address chemical stability issues adequately and there is increasing concern that they will not be sufficient to prevent post-closure impacts and guarantee a "walk-away" situation².
- Historical practices have left a legacy of abandoned and unrestored mining waste disposal sites, and it is now widely recognised that such sites are frequently sources of prolonged environmental degradation and pollution, through the continuous generation of contaminated leachate or by spontaneous combustion.

² A walk-away situation is commonly referred to as one which delivers a maintenance free, self sustaining site which complies with acceptable environmental standards over the long-term without further interventions.

1.3 Points of intersection between trends addressed and other trends

Points of intersection with climate change and energy policy

- Decreased disposed MSW volumes would reduce the amount of GHGs emitted from landfills, esp. carbon dioxide and methane. This is of importance against South Africa's role as a developing country and a significant global emitter of GHGs.
- Energetic utilisation of some components of MSW could assist with reducing dependence of fossil fuels, and could in some cases also contribute to achieving renewable energy targets.

Points of intersection with environmental conservation and human health

- The occupation of large sectors of land by waste sites, and the potential impact of such on the surrounding environment will have potential implications in terms of current and future trends relating to:
- Conservation of biodiversity through the direct impact on local aquatic and terrestrial ecosystems, as well as through occupation of nature areas.
- Quality and utilisation of natural resources, such as groundwater, surface waters and soils.
- Health and socio-economic development of local communities.

Points of intersection with economic value addition

- Solid waste deposits from the mining and minerals industry often represent a loss of potentially valuable mineral resources. Ore deposits are generally comprised of a multitude of trace to minor components co-existent with the targeted metal. In many cases, the trace and minor components are extremely scarce relative to their abundance in the earth's crust and hence have high value potential. Discarding such elements in the form of waste output constituents, may substantially reduce the possibility of economically viable recovery.

2. Summary list of relevant policies and strategies

2.1 Key national policy, regulatory and strategic frameworks

- *The Policy on Pollution Prevention, Waste Minimization, Impact Management and Remediation*: This policy outlines government's thinking in relation to pollution and waste management and encompasses all domestic and industrial sectors. *The White Paper on Integrated Pollution and Waste Management* (DME, 2000) advocates a shift from the focus on waste disposal and impact control (i.e. end-of-pipe) to integrated waste management and prevention as well as minimisation.
- *National Waste Management Strategies and Action Plans (NWMS)* (DEAT, 1999): This sets out numerous strategies and plans on how to manage and especially minimise or prevent waste. The first three components selected for implementation are health care waste, recycling and a waste information system.
- *The National Cleaner Production Strategy*: This strategy is being developed by the CSIR for the Department of Environmental Affairs and Tourism, and is currently still in draft form.
- *The Minerals and Mining Policy for South Africa*: This policy covers issues relating to mining business and mineral development, including environmental and waste management. It has informed many of the provisions in the *Mineral and Petroleum Resources Development Act*. Regulations dealing specifically with waste management and pollution control include:

- Regulation 63: Prevention and compliance, which places emphasis on the need to adopt cleaner production principles.
- Regulation 69: Disposal of waste materials
- Regulation 70: Soil pollution and erosion control.
- Regulation 73: Impact assessment, waste characterisation & classification, and the selection, monitoring and de-commissioning of waste deposit sites.
- *Minimum Requirements for Waste Management*: These guidelines, initially drafted and administered by DWA&F and now in their 3rd revision and administered by DEA&T deal with waste disposal by landfill, handling, classification and disposal of hazardous waste, and water monitoring at waste management facilities. The *Environment Conservation Act* stipulates in section 20 that anyone operating a landfill or waste disposal site must obtain a permit which is administered in accordance with the Minimum Requirements directives and guidelines.
- *Environmental Impact Assessment (EIA) regulations*: In accordance with Sections 21, 22 and 26 of the *Environment Conservation Act*, EIAs are required by law for any proposed activity in which handling of waste is involved.

2.2 Key international agreements and policy frameworks

- The key international agreement relating to solid wastes is the *Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal*, which was adopted by the United Nations in 1989 and entered force in 1992. This is a multi-lateral environmental agreement negotiated by the United Nations amongst more than 160 ratifying nations. This convention regulates the import and export of hazardous waste and establishes legal obligations to ensure that such wastes are managed in an environmentally sound way.

2.3 Relevant policies, regulations or strategic frameworks at Provincial and Local Government Level

- *Integrated Waste Management Plans (IWMPs)*: The development of an IWMP by local government is a requirement of the National Waste Management Strategy and the Draft National Integrated Waste Management Bill. Many municipalities have not yet completed such plans, and the quality of those that have been completed varies significantly. Whilst these plans should serve to improve current practices incrementally, none of those known to the author have a reach that will actually lead to a reduction of volumes of wastes going to landfill.

3. Key Challenges and Policy Implications

3.1 Key challenges from a sustainability perspective

- *More with less*: Large per capita waste volumes are indicative of an economy that is too material-intensive. It is environmentally unsustainable for all to consume at the rate of the current elite (or the average North American). Envisaged economic growth must therefore be accompanied by dematerialisation of the economy.
- *Better utilization of resources*: The current inefficient use of resources (employed once and then discarded) is likely to have negative economic, social and environmental impacts in the long term. It must thus be a key challenge to policy-makers to improve overall resource efficiency. Materials must be used cyclically, and where energy recovery from waste is feasible, this must be encouraged so as to reduce the country's dependence on fossil fuels. The academic community should be challenged to develop methods for determining in which situations recycling,

energy recovery or disposal to landfill are actually preferable. (The recent academic literature on the application of life cycle assessment to waste management indicates, e.g. that landfilling of energy-rich wastes such as plastics and paper should generally be avoided.)

- *Impact on groundwater:* Contaminated leachates are potentially generated from both municipal and mineral waste disposal sites over many decades after closure. Monitoring and remediating historical burdens will continue to be a long-term challenge esp. as water resources become scarcer, with implications in terms of public health and safety; preservation of natural resources including biodiversity, water and land; as well as the economic impacts associated with excessive clean-up and site maintenance costs.
- *Land availability:* If the current preference of land disposal does not change, it is likely that suitable land for disposal site will become increasingly scarce esp. around major urban centres.
- *Methane emissions from landfill sites:* It will become increasingly important to prevent such emissions, both for their impact on global warming, and for the value of recovered methane as fuel.
- *The preservation and efficient use of mineral resources:* There is an opportunity to enhance economic growth by developing the capacity to recover potentially valuable co-elements in the form of by-products. Where this cannot be done in the short term, the wastes must be disposed of in such a way so as to render them 're-processable'.

3.2 Policy and strategy development requirements

- *A dematerialisation strategy:* Economic growth must be decoupled from material intensity in production and consumption, so as to ultimately result in lower waste generation rates. Such a strategy should be informed by considerations of *sustainable consumption*, and might need to consider also ways of reigning in wasteful consumption patterns of the elite.
- There needs to be a shift in government's approach to recycling, from passive encouragement to active intervention. This could include aspects such as:
 - Take-back regulations (Producer responsibility);
 - Introduction of source separation systems, e.g. for dry and wet wastes, or separate collection of recyclable materials such as paper, glass and metals;
 - Green procurement policies, so as to stimulate demand for recycled goods.
- A future revision of the *Minimum requirements for the disposal of waste by landfill* should consider the introduction of a regulation of the allowed total organic carbon (TOC) for wastes to be disposed on landfill sites, aiming to redirect waste streams towards other means of treatment or disposal, and thus reducing methane emissions and leachate generation.
- In the context of mineral wastes, the current remedial approach to closure planning needs to be revisited, and the philosophy of the *Minerals and Mining Policy* brought fully in line with a preventative focus. The current regulatory framework fails to address the complexities associated with solid wastes from the mining and mineral processing industry and to provide adequate technical guidance. Of particular concern is a lack of methodologies and tools, as well as clearly defined completion criteria and performance standards, to assist operators in effectively predicting and preventing post-closure impacts and liabilities, as may arise due to the prolonged release of contaminants from solid mine residues and deposits.

3.3 Policy nexus

- Current economic policy calling for fast economic growth has the potential to undo all efforts in the National Waste Management Strategy relating to source reduction. Increased spending by consumers is strongly encouraged, and the effects of this are evident in rapidly rising waste volumes, with some sectors of the population already as or more wasteful of resources than industrialised countries. A dematerialisation strategy, that aims to decouple economic growth from material intensity, is needed.
- Economic policy that views mining products as commodities to be provided at the lowest possible cost can undermine efforts to safeguard the interests of future generations. An example is the practice of exporting high grade coal, resulting in large volumes of discard coal having to be disposed of at very high long-term risk (stockpiles are already estimated at about 1 billion tons). A counter-example is the platinum sector which invests considerable effort in branding so as to boost price and demand, and thus secure sufficient funds to adequately cover the total cost of exploitation. Where mining operations operate close to the margin, minimizing waste and associated pollution, particularly over the long-term, remain sub-optimal. In a period of global resource scarcity, bold steps can be envisaged to ensure a long-term optimal exploitation strategy – even if this might incur some penalties in the short term. With the minister of finance always seeming to be open to suggestions on how to best invest tax overruns, hints might be taken from Herman Daly's suggestions for investing in the preservation of natural capital³.

4. References and Resources

Policy Documents:

City of Cape Town, 2004: *Integrated Solid Waste Management Plan*, prepared by JEFFARES & GREEN and INGEROP AFRICA.

Department of Environmental Affairs and Tourism, 2000: White Paper on Integrated Pollution and Waste Management for South Africa. Notice 227. Pretoria

Department of Environmental Affairs and Tourism (1999). National Waste Management Strategy. Version D. Pretoria.

Department of Minerals and Energy, 2004: South Africa's Mineral Industry 2003/2004, Annual Report (available on-line from <http://www.dme.gov.za/publications/>)

Academic Publications:

Journal of Cleaner Production, 2005: Special Issue on Environmental Assessments and Waste Management.

Water Research Commission (WRC), 2002: Guideline for the Development of Rehabilitation Management Strategies for Reclaimed Gold-Mine Dump Sites in South Africa. WRC Project Reference No 1001, by Pulles, Howard and de Lange (available online from <http://www.wrc.org.za/downloadads/knowledgereview/2002/mines.pdf>)

Research projects underway:

Department of Science and Technology: Energy from Waste in South Africa, led by Agama Energy.

Water Research Commission (WRC): Solid Mineral Waste Impact Predictions (WRC K5/ 1550), by Petrie, J.G. and Broadhurst, J.L., University of Cape Town.

³ see Daly, H.E., 1994: Operationalising Sustainable Development by Investing in Natural Capital, pp. 22-37 in Jansson, A. et al. (eds): Investing in Natural Capital, the ecological economics approach to sustainability. Island Press, Washington D.C., 1994.