The status of waste information in South Africa – Preliminary findings of the Waste Information Baseline

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ABSTRACT
The Waste Act, 2008, places a responsibility on the Minister of Environmental Affairs to establish a National Waste Information System. It is the intention of the South African Waste Information System (SAWIS), to provide a national baseline of the tonnages of waste recycled, treated, landfilled and exported. Waste information thus collected will inform amongst others, education, awareness raising, planning, reporting and public safety management. However, until SAWIS moves from voluntary reporting to enforced reporting under the planned regulations, the system is unable to provide annual reports on the state of waste. As such, the Department of Environmental Affairs commissioned the CSIR in partnership with COWI to develop a waste in formation baseline for 2011 using existing waste data stored in provincial and national waste information systems, and in public and private reports. This paper presents the preliminary findings of this waste information baseline for South Africa.

1. INTRODUCTION

Despite the establishment of the South African Waste Information System (SAWIS) in 2006, and the implementation of some provincial waste information systems (Godfrey 2004), accurate data and information on waste generation, storage, treatment, reduction, re-use, recycling, recovery and disposal in South Africa, remains difficult to source. This is partly due to the spatially incomplete use of the SAWIS in addition to a current lack of regulations to enforce reporting to the system. It is anticipated that this situation is likely to change in the foreseeable future when the waste information regulations are implemented. Research suggests that the number of waste activities reporting to SAWIS as at 2011, represents only a small fraction of operating waste facilities in the country. For example, the number of landfills reporting data to SAWIS in 2011 represents an estimated 12-13% of currently operating landfills that would be required to submit data as per the SAWIS framework (Godfrey et al. in press; DEAT 2005). Organisations reporting data to SAWIS include municipalities, industries and private waste companies (DEAT 2005). As noted by the Department of Environmental Affairs (DEA), this lack of accurate data has resulted in the setting of uninformed targets for achieving integrated waste management objectives by all three spheres of government, industry, non-governmental organisations and civil society. The Polokwane Declaration (DEAT 2001) is a case in point. The lack of data has also made it difficult for municipalities to develop effective integrated waste management plans (IWMPs) that support action towards implementation of the waste hierarchy.

It is anticipated that the implementation of the National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEMWA) and supporting policies and strategies will achieve better integrated waste management. To measure the actual success of these instruments towards achieving integrated waste management objectives, requires accurate and current baseline and ongoing data from waste generation through to disposal. Such waste data will be essential in determining trends in waste generation and waste management options. In addition, the data will provide the information needed to set realistic targets for achieving the waste management objectives outlined in NEMWA, policies and strategies, e.g. recycling targets. Planning and decision-making in support of

NEMWA is constrained by this lack of data at a national scale, e.g. the need for new waste facilities, the location of facilities, waste facility types, opportunities for alternative technologies, opportunities for job creation, etc.

In the absence of routine waste data collection, and given that the last national baseline was conducted in 1997 (DWAF 2001), the DEA initiated a second national waste baseline study for South Africa with the objective to:

- Assist with the identification of problem waste streams or waste streams that occur in large quantities, and may require specific management strategies to manage their impacts;
- Support research towards determining the most appropriate storage, collection, treatment and disposal options for each waste stream;
- Support the diversion of waste from landfill thereby promoting waste reduction, re-use, recycling and waste exchange opportunities;
- Capacitate stakeholders and communities through public access to waste related information;
- Support government in meeting their national and international reporting obligations;
- In time, trace waste from point of generation through to point of treatment or disposal within South Africa.

This paper reports on the preliminary findings of the waste information baseline for 2011. Although not yet final, the results presented here are deemed to be a fair estimate for the order of magnitude of waste generated in the baseline year.

2. METHOD

To keep the study to a reasonable cost to government an approach of modelling, based on existing data, was adopted. The study thus did not involve significant primary data collection. This was considered acceptable by government and stakeholders given the required levels of accuracy needed to fulfil the baseline objectives.

With this assumption in place, the project adopted a two-pronged approach in developing the 2011 national waste information baseline for South Africa:

1. Collection, collation and interpretation of existing waste data
2. Numerical modelling of the national waste baseline

2.1 Collection, collation and interpretation of existing waste data

Stakeholders already listed on the DEA stakeholder database as well as likely custodians of waste data were invited to a stakeholder consultation workshop where they were requested to guide the project team as to where relevant waste data could potentially be sourced. The indications were that waste data would be available from government departments, consultants doing work for municipalities, research organisations, industry associations and key players in the waste sector.

Data needed to be collected and reported on, according to government's new waste categories as proposed in the draft waste information regulations (RSA 2010). This waste categorisation identifies 17 sub-categories of general waste and 21 sub-categories of hazardous waste (See Tables 1 and 2). A number of the waste types appear in both tables (RSA 2010) since, depending on the characteristics of the specific waste, it may be classified as either general or hazardous waste. Hazardous waste must be classified in accordance with SANS 10234 within 90 days of generation (RSA 2011a). Therefore, it is not possible for the waste information baseline to distinguish these waste streams at this level of detail. A precautionary approach will be followed including data for such waste streams only under hazardous waste. It is anticipated that with the implementation of the waste information regulations (RSA 2010) and waste classification system (RSA 2011a), more accurate information will become available at the desired levels of detail in the foreseeable future.

A desktop study covering a literature search and review of official reports containing waste data was done. The focus was on obtaining as many as possible of the following reports:

- Integrated Waste Management Plans (Provincial, District, Metropolitan and Local municipality);
- Industry Waste Management Plans;
- Hazardous Waste Management Plans (Provincial);
- Integrated Development Plans (Municipality);
- State of the Environment Reports (National, Provincial and Municipality);
- Previous National Baseline Studies (DWAF 2001);
- Surveys conducted at various levels;
- National Government Databases (WARMS, Inventories, SAWIS etc.);
- Industry and waste stream guidelines;
- Sustainability Reports (Industry);

- Landfill audit reports; and
- Annual Reports (Industry).

All the reports were reviewed and relevant waste data extracted. Where waste tonnage or volumes had been calculated, these calculation methods and assumptions used in calculations were also noted.

There are over 2000 waste handling facilities in South Africa (DEAT 2007) but only 46 waste activities reported data to the SAWIS in 2010 (29 Landfills; 9 treatment facilities and 8 re-processors) (Godfrey et al. in press). Although the small fraction of operating waste facilities reporting into the system renders the SAWIS data incomplete for the purposes of establishing a national waste baseline, the data available from the SAWIS was extracted and evaluated.

Where gaps in waste data became apparent, specific stakeholders, as identified at the stakeholder workshop, were contacted directly to provide additional data.

2.2 Numerical modelling of the national waste baseline

All data extracted from existing reports was captured in two extensive Excel spreadsheets, one for general and one for hazardous waste. A waste survey model based on standard tools (Microsoft Excel) was developed to simulate data where gaps in current data exist. Modelling of missing information is based on input of the available waste information combined with geographic information and statistics on demography and economic activities, and expected economic growth. Actual accurate data, where available, was used to populate the model in order to test the accuracy of the simulations. Once the accuracy of the model was verified, estimations of the waste quantities were run, where data was not available.

A total number of 2 358 general waste data points and 810 hazardous waste data points have been collected from all sources consulted. The data points are spread over a number of years (1990-2011), at varying levels of detail, accuracy and not necessarily representative of corresponding years for the different waste streams. As a result, the project team filtered the collected data for accuracy and populated the model with the most accurate estimates for any given year. For example, the Status Quo report of the Western Cape Province (DEADP 2011) seems to follow a logical approach to quantify municipal waste generation in the province. The Western Cape is the only province where all local and district municipalities have integrated waste management plans which informed the provincial plan. Since the municipal IWMPs indicated reservations about the waste data provided (DEADP 2011) e.g. “not accurate”, “theoretical” or “assumed to be typical”, four different calculation methods were used in an effort to establish waste generation figures for the province (DEADP 2011). This approach arrived at an average waste generation figure in the Western Cape for 2010, including a confidence level (± 12.5%). Extrapolating provincial data to national data was possible based on the assumption that waste generation rates are coupled to population size or economic activity. In this regard, population data (StatsSA 2010a) and the per capita waste generation per province (Fiehn and Ball 2005) were used to calculate the percentage contribution of the Western Cape (i.e. 20%), to national municipal waste. The national municipal waste number was therefore derived by multiplying Western Cape data (DEADP 2011) by five (i.e. 20%*5=100%).

In instances where data was available for a specific year e.g. 2008, and waste generation for that specific waste stream is believed to be coupled to population growth, it was possible to extrapolate the data to 2011 by simply dividing the data of 2008 by the population of 2008 (StatsSA 2010a), deriving a per capita waste generation for 2008. The per capita waste generation was then multiplied by the 2011 population data (StatsSA 2010a) to get to the 2011 estimate. Similarly, where data for a specific waste stream was available for a specific year and economic activity rather than population growth is believed to be the driver for waste generation, i.e. construction and demolition waste (GW30), tyres (GW54) and certain hazardous waste types, the gross domestic product (GDP) per province (StatsSA 2010b) was used to extrapolate the data to national figures and to the baseline year.

3. RESULTS AND DISCUSSION

Most IWMPs and provincial hazardous waste management plans indicated uncertainties and reservations about the accuracy of the data reported (DEADP 2011; NWDACE 2006; LDEDET 2006). Data extracted from these reports are therefore only used in the absence of more accurate data. The data presented in Tables 1 and 2 is the initial calculation of national waste data for South Africa. However, at this point in time the data has not yet been fully verified. It is expected to be verified by the project team but also by outside experts and should therefore be read and interpreted with caution. The total for general waste is a case in point where all general waste is merely added, whereas we know that this approach results in double counting of some waste streams.

Table 1: Preliminary finding on general waste for 2011

General Waste 2011		Tonnes
GW01	Municipal waste	19 419 600
GW10	Commercial and industrial waste	1 870 700
GW13	Brine	See HW
GW14	Fly ash and dust from miscellaneous filter sources	See HW
GW15	Bottom ash	See HW
GW16	Slag	See HW
GW17	Mineral waste	See HW
GW18	Waste of Electric and Electronic Equipment (WEEE)	See HW
GW20	Organic waste	20 793 600
GW21	Sewage sludge	See HW
GW30	Construction and demolition waste	748 960
GW50	Paper	1 675 130
GW51	Plastic	1 263 910
GW52	Glass	924 836
GW53	Metals	3 061 150
GW54	Tyres	237 143
GW99	Other	
	General Waste - Total	49 995 029

Table 2: Preliminary finding on hazardous waste for 2011

Hazardous Waste 2011		Tonnes
HW01	Gaseous waste	51
HW02	Mercury containing waste	868
HW03	Batteries	32 912
HW04	POP Waste	396
HW05	Inorganic waste	279 580
HW06	Asbestos containing waste	32 056
HW07	Waste Oils	275 400
HW08	Organic halogenated and /or sulphur containing solvents	108
HW09	Organic halogenated and/or sulphur containing waste	8 043
HW10	Organic solvents without halogens and sulphur	745
HW11	Other organic waste without halogen or sulphur	194 683
HW12	Tarry and Bituminous waste	255 832
HW13	Brine	4 005 850
HW14	Fly ash and dust from miscellaneous filter sources	31 420 500
HW15	Bottom ash	5 717 320
HW16	Slag	5 267 630
HW17	Mineral waste	369 000
HW18	Waste of Electric and Electronic Equipment (WEEE)	61 856
HW19	Health Care Risk Waste	43 673
HW20	Sewage sludge	648 820
HW99	Miscellaneous	326 954
	Hazardous Waste, total	49 034 983

The lack of clear definitions on what is included and excluded in each waste category is a huge challenge that should preferably be addressed in the waste information regulations (RSA 2010) before implementation. This statement applies to both general and hazardous waste categories.

The waste categories for general waste inevitably result in waste being recorded in more than one category. For instance, municipal waste (GW01) includes some industrial and commercial waste generated within municipalities and collected as part of the municipal waste stream (GW10), recyclables (GW50, GW51, GW52 and GW53) and a portion of organic waste (+/- 40%) (Mata-Alvarez et al. 2000; Van Nes 2006). Other waste streams such as paper, plastics, glass and metals includes fractions of municipal, commercial and industrial waste. Determining a method to estimate total general waste, without the risk of double counting, is therefore still a challenge that needs to be addressed within this project.

The preliminary baseline for municipal waste is likely to be a fair estimate for waste generation while the preliminary baseline for hazardous waste streams is likely to be a mix of estimates for generation and waste disposal. It should be noted that waste generation at industrial sites are often not measured, but rather calculated based on input materials and process efficiencies. On-site disposal and internal recycling is therefore seldom measured while off-site recycling and disposal is measured and recorded.

Assigning data to the hazardous waste categories of the waste information regulations (RSA 2010) proved challenging, since hazardous waste is classified according to the SABS code 0228 (DWAF 1998) and more recently SANS 10234 (StanSA 2007). Both these standards are aimed at ensuring safe transport of hazardous substances and as such, classifies hazardous substances based on the type of risk or hazard involved (DWAF 2001; StanSA 2007) rather than on chemical composition. It is therefore impossible to assign data to the correct category in the absence of analytical data. It should further be noted that the new draft standard for assessment of the level of risk associated with disposal (RSA 2011b) as compared to the risk assessment contained in the minimum requirements (DWAF 1998) is also based on different analytical methods. The minimum requirements used the Toxicity Characteristic Leaching Procedure (TCLP) of the United States Environmental Protection Agency and the “Acid Rain” tests (DWAF 1998) while the draft standard is based on total concentration of a particular contaminant in a waste and leach test using the Australian Standard Leaching Procedure (RSA 2011b). The type of leaching procedure will depend on the nature of the waste and/or the particular disposal practice (RSA 2011b).There is thus a possibility that waste types previously classified as general waste may now be classified as hazardous waste and *vice versa.*

Comparing the overall results of this baseline with previous waste baselines should be done with caution. The definition of waste on which the previous baseline (DWAF 2001) was based, was taken from the Environment Conservation Act, 1989 (Act 73 of 1989) to “*be all undesirable or superfluous by-products, emissions, residues or remainders of any process or activity, whether gaseous, liquid or solid, or a combination of these*”. This definition includes by-products and specifically excludes “*any minerals, tailings, waste rock or slimes produced by or resulting from activities at a mine or works as defined in section 1 of the Mines and Works Act*” and effluent from industrial use (RSA 1990). However, the previous baseline included information on mining waste streams for the sake of completeness. Material (including by-products) was recorded as waste when it was committed to storage for three months or longer, or left the site or entered the environment (DWAF 2001).

In contrast, the current baseline is based on the definition of waste in NEMWA which specifically states that “*a by-product is not considered waste*” (RSA 2009). Only foundry sand and refractory waste is included as mineral waste (HW17) (RSA 2010). Brine, an industrial effluent stream which was excluded from the previous baseline, is listed as a waste category under both general and hazardous waste (GW13 and HW13) (RSA 2010) and is reported as salt load (tons per annum) to the environment.

4. CONCLUSIONS

Accurate data on waste in South Africa remain difficult to source. The establishment of the SAWIS created the mechanism where waste data can be centrally stored. The current lack of regulations to enforce reporting of data into SAWIS is a limiting factor. However, it is anticipated that with the implementation of the waste information regulations (RSA 2010) and waste classification regulations (RSA 2011a), more accurate information will become available at the desired levels of detail in the foreseeable future. Stakeholders, and specifically municipalities, must become aware of the benefits of accurate waste data for planning and management purposes.

It is crucial that all data collected in future must be done according to the waste types as proposed in the draft waste information regulations (RSA 2010) to ensure comparability over time. The changes in definition of waste and the subsequent proposed changes in analytical methods for risk assessment resulted in the incomparability of the 2011 baseline with previous baselines accept for municipal waste.

Finally, it should be noted that the waste baseline is presented at national level, providing order of magnitude estimates for each waste stream and aimed at strategic decision making. The results presented are preliminary findings which are still being refined.

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