Municipal Solid Waste Composition Analysis (Wet Season) Juba, South Sudan

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- Juba City Council
- Juba County Council
- Rajaf Pyam
- Juba University
- Japan International Cooperation Agency (JICA)
- UNEP South Sudan office (for coordinating the process).

1. INTRODUCTION

Supporting improved waste management to help contain the environmental impacts of development is one of UNEP's main focus areas in South Sudan.

The concentration of populations in cities, towns, and camps requires appropriate resources, infrastructure, and services to treat solid and liquid waste. In fast-growing urban areas, waste management has become increasingly important as the strain on infrastructure and treatment facilities can directly impact the environment and subsequently human health. UNEP has therefore undertaken a waste characterization exercise to support Juba City Council and other municipal entities in improving their waste management systems.

The first detailed analysis of Juba's municipal solid waste was undertaken by UNEP in December 2012 during the dry season. (The report is available in hard copy from UNEP's office in Juba or online at http://postconflict.unep.ch/publications.) In compliance with best practice, a second waste analysis exercise was completed in September 2013, during the wet season, in order to capture any seasonal variation in the waste composition through the wet and dry seasons. Both exercises took place at the Lagoon dump site.

This report documents the methodology, findings, and conclusions from the second exercise and provides a consolidation of the results from the two studies.

Waste-sorting activities ongoing at Lagoon dump site, September 2013

2. METHODOLOGY

2.1 Waste Characterization

The waste characterization exercise was undertaken at the Lagoon dump from 22 to 27 September 2013. The project team comprised 14 individuals; a list of team members is provided in Attachment 2.

All equipment and logistical support was provided by UNEP's office in Juba. The Juba City Council, Munuki Payam, and Rajaf Pyam's site management and staff cooperated in the exercise.

The exercise was conducted in compliance with two international publications:

- ASTM (American Society for Testing and Materials), *Standard Test Method for Determination of the Composition of Unprocessed Municipal Solid Waste* D5231–92 (2008)
- UNEP/International Environmental Technology Centre, *Developing Integrated Solid Waste Management Plan Training Manual, Volume 1, Waste Characterisation and Quantification with Projections for Future* (2009)

The approach developed for this exercise satisfied the need for methods to be structured, produce accurate and reliable results, and be repeatable.

Picture 2 – weighing of waste and bulk density calculations on-going during the sampling exercise.

As with the initial exercise in December 2012, the selected method was based on the collection and manual sorting 32 samples, in order to provide the desired level of statistical accuracy (90%) and confidence in compliance with ASTM D5231–92 (2008). Representative sampling undertaken during this exercise is the established international practice for accurately determining waste quantities and waste characteristics.

Vehicles were selected for waste sampling at random as they entered the Lagoon waste disposal site. By interviewing the drivers, care was taken to ensure that samples were captured from each of the three pyams and from the low-, medium-, and high-income communities therein.

The recommended sample weight of approximately 100 kg was used for the study. It has been established, through various studies that measurements taken at this level do not vary significantly from measurements made on far larger samples taken from the same waste.

Nine major waste categories were selected for sampling in compliance with international best practice and the terms of reference for this exercise. These nine waste categories were further broken down into some 45 subcategories, which are detailed in the sample form in Attachment 4.

The nine major waste categories for the characterization exercise are listed below in no order of importance of comparative size:

- Paper and paperboard
- Glass
- Metal
- Plastic
- Textiles
- Organics
- Construction and demolition (C and D) wastes
- Special care wastes
- Other wastes

In compliance with ASTM–D5231 (2008), each waste sample of approximately 100 kg was sorted manually into dedicated containers for each of the respective waste components by a team of ten local staff who had been trained by the team leader prior to the commencement of the exercise. Local staff were all familiar with the site and handling of waste as they were all informally employed at the site as waste pickers.

2.2 Bulk Density

The bulk density of the incoming waste was calculated by executing several steps:

- All containers, each of a known volume (V1), were weighed, and the weight recorded (W1).
- Samples of each consignment of waste were placed in the containers until they overflowed.
- The contents of the containers were settled by dropping them three times onto the ground from an approximate height of 10 cm.
- The containers were then topped-up with additional waste from the selected sample.
- The containers were then weighed again and the weight recorded (W2).
- The bulk density was then calculated using the equation W2–W1/ V1.