MEMORANDUM

Recommendations for Operational Improvements at Oke-Saje Dumpsite in Abeokuta, Ogun State, Nigeria

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PURPOSE

This memorandum documents existing conditions and operations at the Oke-Saje dumpsite and offers recommendations for near- and long-term operational improvements that promote the health and safety of the local community and reduce adverse environmental and climate impact such as water ponding, slope stability, odor, fires, and methane emissions.

BACKGROUND

Disposal of municipal solid waste (MSW) at the Oke-Saje dumpsite began in 2005. It is the only dumpsite in Abeokuta, the capital city of Ogun State. As there is no organics diversion and treatment across the state, all organic waste generated in Abeokuta is disposed of at the Oke-Saje dumpsite. At the dumpsite, waste pickers recover recyclable materials such as plastic, glass, and metal to be sold to a recycling company.

The site was previously a granite quarry acquired by the Ogun state government and later converted to a dumpsite where waste is deposited off the high wall and pushed in place with a dozer. The Ogun State Waste Management Authority (OGWAMA) estimates daily waste generation of about 2.29 kg per capita by a low-density population, 3.54 kg per capita by a medium-density population, and 3.82 kg per capita by a high-density population.

As the dumpsite does not have a weighbridge, the amount of waste disposed of is estimated based on the number of trucks arriving per day, assuming each truck collects 10 tons of waste. Currently, the MSW waste disposed of at the dumpsite is projected to be approximately 166 tons per day.

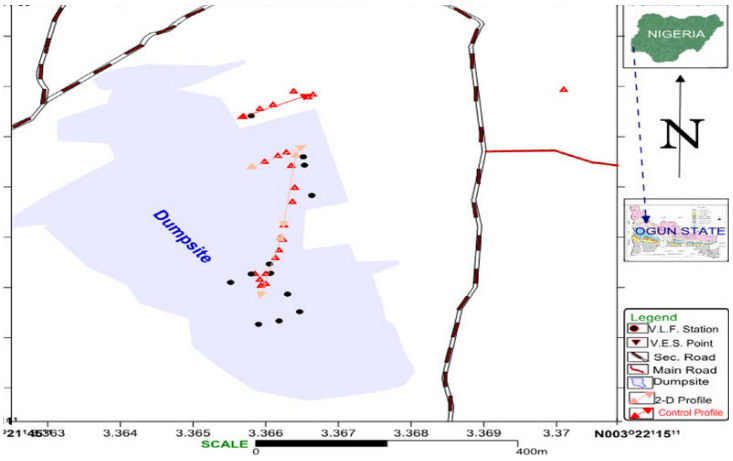

Figure 1: Base Map of Oke-Saje Dumpsite in Abeokuta
Source: OGWAMA

Entrance of Oke-Saje dumpsite

WASTE COMPOSITION

The waste composition is summarized in Table 1. Organic waste is the largest component of the waste stream, followed by plastic bags, locally referred to as “nylon.”

Table 1: Waste composition in Abeokuta

S/N	Waste type	Waste Generation (%)
1	Organic waste	43.4
2	Paper	7.2
3	Nylon	30.5
4	Textile	5.8
5	Plastic	7.1
6	Glass	5.8
7	Others	0.2
	TOTAL	100.0

Source: OGWAMA

SITE VISIT OBSERVATIONS

Following RMI's visit to the Oke-Saje dumpsite on October 5, 2023, the site conditions as well as operations at the dumpsite are summarized below.

Site Characteristics

The site can be accessed through an unpaved dirt road in a residential area. As it rained the day before our visit, the access road and the dumpsite surface were extremely muddy, making it difficult for us to walk or explore the site. It is also difficult for waste trucks to access the working face of the dumpsite, especially on a rainy day and/or for several days after. There are residential dwellings on either side of the quarry and no perimeter fence or access control fence.

Collection truck on the flooded access road on its way to the dumpsite

Waste Handling

The waste is dumped and pushed in place with a rental dozer over the edge of the waste slope into the valley area or the open gorge area and toward the tall wall on the other side of the gorge. OGWAMA estimates that the gorge will be filled with waste within a year, forming a flat plateau in line with the surrounding ground.

The waste height is about 24 m at the deep end of the filled area. The side slope of the waste mass is steeper than approximately 1(V):1(H) due to the waste being pushed off the crest of the waste slope by the dozer and rolling downhill. Waste compaction is achieved only through the passings by the dozer. Furthermore, there is no plan for how far the filling would end toward the downstream direction. The current waste disposal limit or footprint is unknown; however, it is projected to be about 18.62 hectares (46.07 acres).

Environmental Considerations

The exposed waste surface in the inactive area has no daily soil cover or alternative cover material, which makes the site conducive for rodents and birds. There are no environmental control systems such as gas wells or groundwater monitoring wells. Additionally, no fires were observed during our visit.

There is a waterway in the middle of the gorge that runs downstream to the lower ground area. However, there is no mechanism to contain or confine leachate within the waste footprint. There are no stormwater management features such as ditches on either side of the access road, and the dumpsite surface appears to pond water during a heavy downpour.

Informal Sector

Waste pickers at the Oke-Saje dumpsite are organized and coordinated by a private company, Royal Alpha Energy Limited. The company provides training and basic personal protective equipment to waste pickers. It also uptakes recyclables recovered from the site at an agreed price. Once recyclables are collected, the company preprocesses the materials by sorting and bailing sorted recyclables, which are subsequently sold to recyclers for conversion into new products. On the day of the visit, approximately 30 workers were present. Recycled materials are stockpiled on the right side near the entrance of the dumpsite where sorting, bagging, and stockpiling areas are located.

Saje is one of the designated sites assigned to a recycling micro-enterprise strictly for collecting recyclables and sorting for sales to recycling companies. This is an attempt by OGWAMA to introduce a public–private partnership (PPP) and to ensure the informal sector is integrated into the waste management system, provide training and employment opportunities, and collect critical data on the recycling sector.

Collection truck, dozer, and waste pickers at Oke-Saje dumpsite

Bagged recyclables at the dumpsite

RECOMMENDATIONS FOR OPERATIONAL IMPROVEMENT IN THE NEAR TERM

Based on limited information gathered during RMI's site visit, the following are immediate actions that can be taken to improve operations at the dumpsite and address the health and safety of workers at the dumpsite and surrounding community.

1. **Access road:** Establish a drainage ditch on either side of the dirt road to prevent the roadbed and road surface from flooding during the rainy season. The road should be graded with a crown at the centerline to promote surface drainage to the ditch and prevent water from ponding on the road surface. If the road surface is lower than the adjacent access road to the residential area, consider elevating the surface by adding layers of soil and aggregates to avoid flooding of the access road, as seen in the picture above. Construction and demolition (C&D) materials may be used to improve access roads, although these materials are not readily available for free and may carry a high price. The waste management authority can seek support from the government to rebuild and regrade the access road so that it can be used in the rainy season.
2. **Compaction:** The waste that is deposited and pushed off the edge of the waste slope is loose and lacks compaction to strengthen the material being placed. Therefore, it is more prone to slope instability. Due to this instability combined with a lack of equipment on-site, any exterior or final waste slope should be maintained at an angle no steeper than 1(V):3(H). This is important for future closure of the dumpsite to enable the installation of a final cover system.

3. **Fence:** A litter fence should be used to control wind-blown materials, such as paper and plastics, into the neighborhood. It will also deter unwanted entry into the dumpsite.
4. **Daily cover:** Odor and fires can be prevented or minimized if daily soil cover is applied. At a minimum, and especially when an open dumpsite is transitioning into a controlled dumpsite, application of 15 cm of daily soil cover is recommended. This soil cover can be pushed off to a stockpile the next day before filling and reused as daily soil cover before the end of the filling operation. In addition, 0.6 m of intermediate soil cover should be placed for every 10 m of waste height measured vertically. This will create a fire barrier and self-contained zone on every 10 m waste height. For any inactive area not receiving waste for over six months, an additional 15 cm of soil cover should be applied, forming an intermediate soil cover. To minimize the use of daily soil cover materials, the working face should be minimized based on the estimated daily volume of incoming waste. Daily soil cover application and waste compaction must be implemented if the waste height elevation is higher than the ground of the surrounding residential area.
5. **Leachate Pond:** Construction of a well-channeled leachate pond is necessary to drain the pockets of water trapped in the waste during the rainy season, thereby enabling platform stability and easy navigation by a dozer.
6. **Use of inactive area:** Should there be a consideration of using the inactive dumpsite surface area as a staging area for either recycling or composting activities, building a 0.6 to 1 m thick subbase using soil materials and, if possible, geotextile as a separation layer between the waste and soil materials is recommended.
7. **Biocover:** If opting to compost food waste and green waste, the compost may be used as a biocover over a daily soil cover to minimize methane emissions when there is no active gas collection system in place. The compost can also be used to maintain the access road during rainy seasons.

FUTURE CONSIDERATIONS FOR LANDFILL GAS COLLECTION SYSTEM

A basic landfill gas collection system could be installed in the inactive portion of the site if a soil cover of 0.6 – 1 m thick is applied using a solar spark flare system (mounted at each well) or connected to a header pipe that conveys gas to a centralized blower and flare for destruction. More data should be collected to inform the modeling and designing of the gas capture system.

FUTURE CONSIDERATIONS FOR CAPPING THE DUMPSITE

Once the Oke-Saje dumpsite is inactive and no longer accepting waste, capping of the dumpsite may follow the recommendations presented in ISWA's 2016 publication A Roadmap for Closing Waste Dumpsites for various capping systems and considerations at the Oke-Saje dumpsite.

REFERENCES

1. Antonis Mavropoulos et al., *A Roadmap for Closing Waste Dumpsites, the World's Most Polluted Places*, ISWA, 2016. https://www.iswa.org/closing-the-worlds-biggest-dumpsites-task-force/?v=7516fd43adaa.

ACKNOWLEDGMENT

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All photos courtesy of the authors unless otherwise noted.