CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

Apa Integrated Waste Management Project
Ver.1
Date: March 15, 2011

A.2. Description of the project activity:

Lagos, the largest city in Nigeria with around 11 million[1] inhabitants is facing a huge problem of Municipal Solid Waste (MSW) management as all other cities in Nigeria and the whole Africa. The Lagos Waste Management Authority (LAWMA) and the Lagos State Government (LASG) are taking strong measures towards mitigating problems that cause poor waste management of MSW to populations, the economy as well as the environment. The best action to achieve that is to create wealth from the existing and to be collected waste in the city of Lagos.

There are many ways of creating wealth from waste. To name a few, one can do composting, landfill, recycling, reusing of waste collected, or a good combination of all these actions. INTOL-JPI Environ Management Services (hereafter INTOL-JPI or INTOL) has been selected by the LAWMA and LASG to implement and Integrated Waste Management Facility in Apa, a small village near Lagos agglomeration. This integrated solution will be a good example of converting waste to wealth in a very sustainable way as planned by the Lagos authorities and could be used as pilot project for all other states of Nigeria.

The principal objectives of the Integrated Waste Management Facility in Apa are:

- Daily collection of 1500 tons of waste in Lagos deposited at a transfer station[2] and then trucked to the project site[3]
- Sorting, recycling and reusing of what is possible using a Material Recycling Facility (MRF) that will be constructed as part of the project,
- Good handling of non reusable and non recyclable waste (like medical and hazardous waste)[4],

[1] Source: http://www.unhabitat.org/pmss/listItemDetails.aspx?publicationID=3034, retrieved on June 13, 2011

[2] The transfer station is located directly out of the main city of Lagos, around 30 km away from the project site. The facility for the transfer station exists already and there was no need to relocate it. The waste will be compacted there before transported by trucks to the project site.

[3] The waste collected daily is brought to the transfer station and it's from the transfer station that the waste is sent to the project site.

[4] In Nigeria, all different types of waste can be found on dumpsites including, hazardous waste, medical waste…

- State-of-the-art composting of the degradable part of the waste. The compost will be sold to local farmers and used as fertilizer. The Ministry of Agriculture has provided a warehouse for the compost produced and this will be the selling point for the compost under the supervision of the Ministry
- Landfill of residues and non composted degradable waste after the compost need is fulfilled,
- Capturing and flaring the landfill gas (LFG) from the landfill

Without this integrated solution, the waste will continue to be collected – if at all – and dumped uncontrolled in the existing dumpsite at Olushosun, Soulos and Abule-Egba and therefore emit the methane produced by decay to the environment.

Project's contribution to sustainable development

This project is a perfect example of a sustainable development initiative as it touches all the three pillars of the sustainable development concept, i.e. social, environment and economical:

<u>Social advantages of the project</u>
This project will have multiple social benefits to local populations:

- The actual dumpsites are closed to the living environment and socially is a big threat to the populations with odors, noises and risk of explosions and sicknesses related to bad disposal of waste
- From time to time there are conflicts between scavengers. This will be avoided when a controlled site is constructed and same scavengers are given better paid jobs in a cleaner environment. Although the new landfill site is around 60 kilometers away from Lagos, many scavengers living anyway on the dumpsite are willing to relocate to Apa to get better jobs. INTOL-JPI will provide dwelling to scavengers without relatives in the vicinity of the project site. For scavengers not willing to relocate, INTOL-JPI is negotiating with the Lagos State Governement (LASG) and Lagos Waste Management Authority (LAWMA) the best solutions for their social integration.
- Reduction of health and safety dangers posed by waste disposed in the existing uncontrolled dumpsites
- Many people in Lagos sink boreholes for household water service near the existing dump sites, so waste disposal and treatment at the project site in Apa will reduce the likelihood of groundwater contamination

<u>Economical advantages of the project</u>
The project will create high and measurable wealth to the country:

- Around 100 skilled and unskilled direct jobs and around 200 indirect jobs will be created
- Scavengers living now unhealthy on and of dumpsite will be offered better and cleaner jobs by the project activities

- The compost produced by state-of-the-art technology will be top quality and sold to farmers for agricultural activities. Farmers will then improve their production and revenues
- There will be a clear North-South technology transfer to support this project
- The project will also generate carbon credits that will be sold to developed countries with obligations to reduce greenhouse gases according to the Kyoto Protocol
- Benefits to Apa Kingdom such as paved roads and influx of investment

Environmental advantages of the project

- More waste will be collected in Lagos thanks to the installation of this project. This participate to the beautification of Lagos as wished by the LASG
- The actual dumpsites are close to the living environment and produce noises and odors and there is always risk of explosion. This will be avoided by the construction of the sanitary site.
- The methane that is now produced by decay and emitted to the environment from actual dumpsites will be avoided. This is a clear contribution of Nigeria to the fight against climate change. The project will reduce around 1.7 million tons of carbon dioxide equivalents in 7 years that would have been emitted into the atmosphere.

Technology transfer

A part from the sustainable advantages of the project, it’s a clear technology transfer project. It involves start-of-the-art technology for sorting, composting and landfill transferred from the North to the South. The government of Nigeria is giving full support to the project and intends to use it as success story paving the way to many similar projects in Nigeria inhabited by over 150 million people.

A.3. Project participants:

Name of Party involved ((host) indicates a host Party)	Private and/or public entities	Kindly indicate if the Party involved wishes to be considered as project participant (yes/no)
Nigeria (host)	INTOL-JPI Environ Management Systems	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Federal Republic of Nigeria

A.4.1.2. Region/State/Province etc.:

Lagos

A.4.1.3. City/Town/Community etc.:

Apa Badagry

A.4.1.4. Details of physical location, including information allowing the unique identification of this project activity (maximum one page):

The project is located in Apa, a village in the Badagry county, one of the local government (city) of the Lagos State. Apa is at one hour travel by car from the Murtala Muhammed International Airport of the Lagos State and 30 minute from the border between the Federal Republic of Nigeria and Benin.
The project site at Apa is a virgin site where no dumping of waste nor farming activities have been going on before the starting of the actual project.

Map 1 and Map 2 below locate Lagos in Nigeria and Badagry in Lagos.

The project GPS coordinates are: 6°26'18''N and 2° 48'34''E

Map 1: Lagos in Nigeria (Source: CIA Factbook)

Map 2: Badagry (Apa) in Lagos

A.4.2. Category(ies) of project activity:

The project falls under Sectoral **Category 13**: Waste handling and disposal

A.4.3. Technology to be employed by the project activity:

The project activity includes the realization of two main facilities: the composting facility and the sanitary landfill.

Composting facility

Mechanical waste sorting and treatment plant

The treatment plant is built as a three lines plant, whereof line 1 and 3 are equipped with a bag opener and line 2 with a shredder.
The whole waste is brought to the site from the transfer station by trucks and weighted at the delivery. After this the waste are unloaded in the delivery hangar. A visual sorting of raw parts and oversized materials from the waste is performed with the help of wheel loader and grab-digger. These raw parts and oversized materials which are impossible to be processed are directly removed.
The plant personnel use wheel loaders and diggers to feed processing lines with waste. Each processing line is fed with a different waste type accordingly and a combination of manual and mechanical sorting happens successively until the organic fraction is totally isolated at the end of the sorting lines. This organic fraction is then transported to the triangular windrow composting facility where the composting process can start.
All other waste types including hazardous, medical, tires, plastics... are brought to the MRF. Reusable and recyclable waste will be sold back to the market whilst hazardous and medical waste will be carefully disposed of.

Windrow composting operation

Preparation of input materials

The raw compost materials must be prepared in a suitable form for composting, in order to produce a potentially suitable input material for the composting process. Producing the proper C/N ratio and the proper moisture is thereby just as important as the removal of disturbing components by suitable sifting and sorting and producing the proper lumpiness by reducing coarse waste material.

Developing a new windrow

The raw composting materials are delivered to the decomposition area by suitable transporting vehicles and are set up as windrows with the aid of wheel loaders or backhoes. An even and loose filling of the windrow in the size suitable for the transfer unit must be done. The windrows may not be compacted when set up. The windrow is first processed immediately after the set-up, in order to achieve a homogenous windrow structure.

Daily work processes

The windrows must be checked daily in reference to their temperature and moisture. The temperature of the windrow's core must thereby be determined by suitable stick probe thermometer on various points of the longitudinal axis of the windrows and an average value must be developed from the measured values. The moisture is also calculated on several points of a windrow, the material here must be analysed from a depth of at least 30 cm.

Weekly work processes

The windrows are turned at regular intervals, three times per week during decomposition weeks 1 to 4, twice per week during decomposition weeks 5 to 8 and once per week during decomposition weeks 8 to 12. In the event of an unsatisfactory decomposition process, additional turning processes are required, i.e. the turning process must be set up with a time limit. The windrows are irrigated, if necessary, based on the daily assessment of the moisture. The windrows are sampled once per week. Material samples are removed from the compost at several points of a windrow immediately after turning. Single samples of a windrow are combined in a collective sample and the sample volume is reduced by dividing until the sample quantity is achieved. The samples of all windrows are then analysed individually and separate for their decomposition degree and moisture, in order to assess the decomposition progress. Based on the results, further measures for the following week are defined.

Decomposition of a completed windrow

After the desired composting quality has been achieve, the windrow can be cleared with the wheel loader, loaded on suitable transport vehicles and transported to the refining process.

Refining process of the produced compost

The compost is refined by sifting the material. The obtained refined material is the end product compost; the filter overflow can be reused as structure material when setting up new compost windrows after being cleaned from trash.

Process parameters of composting

Composting is influenced by several process parameters. The most important parameters are listed here with the description of their effects on the composting process.

C: N Ratio

The decomposition organisms require nutrients for the decomposition processes in addition to oxygen, water and minerals. Simply said, nitrogen compounds (N), in order to develop endogenic protein for growth and reproduction, as well as high-energy hydrocarbon compounds (C) to maintain the life processes. The solar energy is thereby partially released again as heat by the green plants in the basic components of life.

More carbon than nitrogen is basically necessary for quick decomposition and good composting quality. A beneficial C:N ratio is within the range of 30:1 (one part nitrogen to 30 parts of carbon).
If the ratio is greater than 40:1, nitrogen deficiency occurs and the micro-organisms cannot properly develop. This results in a slow-down of the decomposition and subsequently in mature compost low in nutrients. If not enough carbon is available (less than 15:1), nitrogen is lost to the atmosphere as ammonia, which can be determined by its typical odour. However, the C/N ratio of a mixture cannot be precisely calculated in reality. The C/N ratio tightens after the completed decomposition and a value in the range of 15:1 can be anticipated for mature compost.

Moisture

The micro-organisms need sufficient moisture for an optimal development, since the required oxygen is absorbed during the liquid phase. The water content in the windrows should equal an average of between 40% and 65% (parts by weight). If the oxygen supply is interrupted, the bacteria cultures become inactive and the decomposition process is reduced or stopped completely at insufficient moisture content. If the water content is too high, the oxygen is displaced from the cavities and results in decay processes. Unpleasant odours and a reduction of the decomposition are the result.

The correct moisture can be determined with the fist-check. A hand full of material from the windrow, removed from a depth of at least 20 cm, is forcefully pressed together in a fist. If the material is too dry, it falls apart again after opening the fist. If the material is too wet, water runs out between the fingers when pressed together. The sample remains in hand as a compact ball after opening the fist, if the moisture is optimal. The material feels like a dried sponge.

Oxygen

The oxygen supply of the windrows is of decisive importance for a quick decomposition of the organic substance. The chimney effect provides a continuous exchange of air in the pores of the windrow.
A sufficient oxygen supply of all sectors of the windrow is only guaranteed by a proper pore volume of the windrows. This is provided by the share of rough-structured material in the

windrow and the lose application of the windrow at the beginning of the decomposition process. The windrows must be routinely turned, in order to balance settlement effects in the windrow by the weight of the windrow. The windrow is therefore turned three times per week during the first two decomposition weeks, twice per week during the subsequent four weeks and once or twice during each additional week.

If insufficient rough structure material is available, frequent turning will be required. According to a certain rule of thumb, turning is completed if the height of the windrow is reduced by 10 %, measured on the height of the windrow directly after turning.

Landfill design

The landfill design is done by SCS Engineers, a company with excellent track record in the field. Since 1970, SCS Engineers has delivered economically and environmentally sound solutions for solid waste management, site remediation, and environmental engineering projects throughout the world. The award-winning firm provides professional engineering, construction, long-term operations and maintenance, and scientific services to private and public sector clients directed towards environmental protection and conservation of resources through a network of 41 offices in 14 US states.

The proposed landfill site will cover an area of 10.2 hectares of which approximately 7 hectares will be designated for development of waste disposal “cells”. The preliminary design consists of about 4 or 5 cells with the first two cells each covering about 1 hectare while the remaining cells cover slightly larger areas. The proposed site will also comprise facilities for scales and scalehouse, recycling (incorporating an administration building), leachate treatment, and composting.

Landfill Design Implementation Steps

1. Site Development Plan to include:
    - Site Topography
    - Site Layout (showing landfill configuration, supporting buildings, access roads, scales and scalehouse, etc.)
    - Utilities
    - Stormwater controls
    - Groundwater monitoring wells
    - Leachate collection and treatment or disposal
    - Gas collection control and disposal (flaring system)
    - Final cover system
    - Liner system

2. Construction
3. Operations
4. Closure
5. End Use.

Landfill Design

The design of the landfill will be based on a composite double-liner system with leachate collection system incorporating High Density Polyethylene (HDPE) geo-membrane. This design consideration is based on waste disposal at the facility that would include small-scale household hazardous materials such as mosquito repellents and household cleaning spray containers. The bottom liner system will include the following (from top to bottom):

- 0.3 m thick Drainage material
- Upper Geocomposite Drainage Net (Primary)
- Upper 60-mil HDPE Geomembrane (Primary)
- Lower Geocomposite Drainage Net (Secondary)
- Lower 60-mil HDPE Geomembrane (Secondary)
- 0.6 m thick Compacted Clay Subbase (k ≤ 1 x 10-7 cm/sec)
- Base Grade

The leachate collection system piping network will be incorporated into the bottom cell design. Removal of the leachate from the cell would be via gravity or force main piping penetration sleeved through the geo-membrane layer. The leachate will then be conveyed to the on-site leachate treatment facility.

Design for an active landfill gas (LFG) collection system will incorporate components such as vertical gas collection wells, horizontal gas collection systems, gas collection header lines, blower, condensate collection system, and gas treatment system.

Landfill Geometry

According to the Environmental Impact Assessment (EIA) report prepared by Unilag Consult, a Consultancy Service division of the University of Lagos, Lagos, Nigeria, the drilling logs for three (3) groundwater borings performed around the proposed landfill site showed a range of elevation above sea level between 7.69 and 17.72 meters. However, the corresponding static water levels showed a range of 0.31 to 4.17 meters.

Based on the shallow water levels, no excavation below the ground surface would be made beyond clearing and grubbing of existing trees and shrubs to remove all root matter. As a result, and based on the landfill size available for waste disposal, the preliminary final height of the waste cells will be considered at around 15 to 20 meters for final capping with side slopes of 3H:1V (i.e. for each vertical foot increment of waste height, there must be a 3-foot horizontal run).

To control the influence of rainfall, a minimum 0.6 meter high separation beam, constructed of drainage material between the existing and future cell, will be covered with removable geo-membrane flap temporarily welded to the cell geo-membrane to collect and separate rain water from mixing with waste in the existing cell. During waste disposal operations, daily soil or other approved cover material shall be placed over the waste to reduce rainwater infiltration and maintain anaerobic condition for landfill gas generation.

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

Years	Estimation of annual emission reductions in tons of CO_2e
2012	98 305
2013	172 301
2014	226 963
2015	268 336
2016	300 492
2017	326 181
2018	347 268
Total estimated reductions (tons of CO_2e)	**1 739 845**
Total number of years	7 years renewable
Annual average of estimated reductions over the first crediting period	248 549

A.4.5. Public funding of the project activity:

INTOL-JPI has not benefited from any public funding from Annex I Countries for this project.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

Approved baseline and monitoring methodologies that apply for this project are:

AM0025, Ver. 12 (EB 55): "Avoided emissions from organic waste through alternative waste treatment processes"

ACM0001, Ver.11 (EB 47): "Consolidated baseline and monitoring methodology for landfill gas project activities"

In line with the application of AM0025 and ACM0001, the Project also refers to the latest approved versions of the following tools:

- Tool for the demonstration and assessment of additionality (Version 05.2, EB39)
- Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (Version 05, EB55)
- Tool to calculate the emission factor for an electricity system (Version 02, EB50)
- Tool to determine project emissions from gas flaring containing methane (Version 04, EB28)
- Tool to calculate baseline, project and/or leakage emissions from electricity consumption (Version 01, EB39)

B.2. Justification of the choice of the methodology and why it is applicable to the project activity:

Justifying the use of AM0025: Avoided emissions from organic waste through alternative waste treatment processes

This methodology addresses project activities where fresh waste (i.e. the organic matter present in new domestic and commercial waste/municipal solid waste) originally intended for landfilling, is treated. By treating the fresh waste through alternative treatment options these methane emissions are avoided from the landfill. The GHGs involved in the baseline and project activity are CO_2, CH_4 and N_2O. The table below summarizes the justification of the use of AM0025

Applicability criteria	Project activity specifications
The project activity involves one or a combination of the following waste treatment options for the fresh waste that in a given year would have otherwise been disposed of in a landfill: *(a) A composting process in aerobic conditions;* *(b) Gasification to produce syngas and its use;* *(c) Anaerobic digestion with biogas collection and flaring and/or its use;* *(d) Mechanical/thermal treatment process to produce refuse-derived fuel (RDF)/stabilized biomass (SB) and its use. The thermal treatment process (dehydration) occurs under controlled conditions (up to 300 degrees Celsius). In case of thermal treatment process, the process shall generate a stabilized biomass that would be used as fuel or raw material in other industrial process. The physical and chemical properties of the produced RDF/SB shall be homogenous and constant over time;* *(e) Incineration of fresh waste for energy generation, electricity and/or heat. The thermal energy generated is either consumed on-site and/or exported to a nearby facility. Electricity generated is either consumed on-site, exported to the grid or exported to a nearby facility. The incinerator is rotating fluidized bed or circulating fluidized bed or hearth or grate type.*	The Project includes the installation and operation of a municipal solid waste sorting and **composting** plant. The compost is produced aerobically and will be used as fertilizer by Nigerian farmers
In case of composting, the produced compost is either used as soil conditioner or disposed of in landfills;	
The proportions and characteristics of different types of organic waste processed in the project activity can be determined, in order to apply a multiphase landfill gas generation model to estimate the quantity of landfill gas that would have been generated in the absence of the project activity;	Ex-ante proportions and characteristics of different types of organic waste are available[5], and will be sampled during the monitoring for ex-

[5] See PDD of registered project N#3841 on the UNFCCC website: http://cdm.unfccc.int/Projects/DB/AENOR1278677451.53/view, retrieved on June 13, 2011

<table>
<tr><td></td><td>post calculations of emissions reduction.</td></tr>
<tr><td>Waste handling in the baseline scenario shows a continuation of current practice of disposing the waste in a landfill despite environmental regulation that mandates the treatment of the waste, if any, using any of the project activity treatment options mentioned above;</td><td rowspan="3">Environmental regulations in Nigeria do not mandate the use of any waste treatment option, thus the Project compost activity does not fall under any enforced compliance trend</td></tr>
<tr><td>The compliance rate of the environmental regulations during (part of) the crediting period is below 50%; if monitored compliance with the MSW rules exceeds 50%, the project activity shall receive no further credit, since the assumption that the policy is not enforced is no longer tenable;</td></tr>
<tr><td>Local regulations do not constrain the establishment of RDF production plants/thermal treatment plants nor the use of RDF/stabilized biomass as fuel or raw material;</td></tr>
<tr><td>In case of RDF/stabilized biomass production, project proponent shall provide evidences that no GHG emissions occur, other than biogenic CO2, due to chemical reactions during the thermal treatment process (such as Chimney Gas Analysis report);</td><td rowspan="3">The Project activity does neither involve RDF/ stabilized biomass production, industrial/hospital waste thermal treatment process nor waste incineration</td></tr>
<tr><td>The project activity does not involve thermal treatment process of neither industrial nor hospital waste;</td></tr>
<tr><td>In case of waste incineration, if auxiliary fossil fuel is added into the incinerator, the fraction of energy generated by auxiliary fossil fuel is no more than 50% of the total energy generated in the incinerator.</td></tr>
</table>

Conclusion from the table above: The project activity component which involves composting of waste that would have otherwise been disposed of in existing uncontrolled landfills, avoiding emissions from organic waste through alternative waste treatment processes, meets AM0025 methodology requirements.

Justifying the use of ACM0001: Consolidated baseline and monitoring methodology for landfill gas project activities

This methodology addresses project activities where LFG from a landfill site originally intended for release to the atmosphere, is captured and flared and/or use to produce energy and/or use to supply consumers through natural gas distribution network. The GHGs involved in the baseline and project activity are CO_2 and CH_4.

Applicability criteria	**Project activity specifications**
This methodology is applicable to landfill gas capture project activities, where the baseline scenario is the partial or total atmospheric release of the gas and the project activities include situations such as: *(a) The captured gas is flared; and/or* *(b) The captured gas is used to produce energy (e.g. electricity/thermal energy). Emission reductions can be claimed for thermal energy generation, only if the LFG displaces use of fossil fuel either in a boiler or in an air heater. For claiming emission reductions for other thermal energy equipment (e.g. kiln), project proponents may submit a revision to this methodology;* *(c) The captured gas is used to supply consumers through natural gas distribution network. If emissions reductions are claimed for displacing natural gas, project activities may use approved methodology AM0053.*	The Project includes the construction and operation of a sanitary landfill and the methane produced will be captured and flared

Conclusion from the table above: The project activity component which involves capturing and flaring of the landfill gas that would have otherwise been released in the atmosphere, meets ACM0001 Methodology requirements

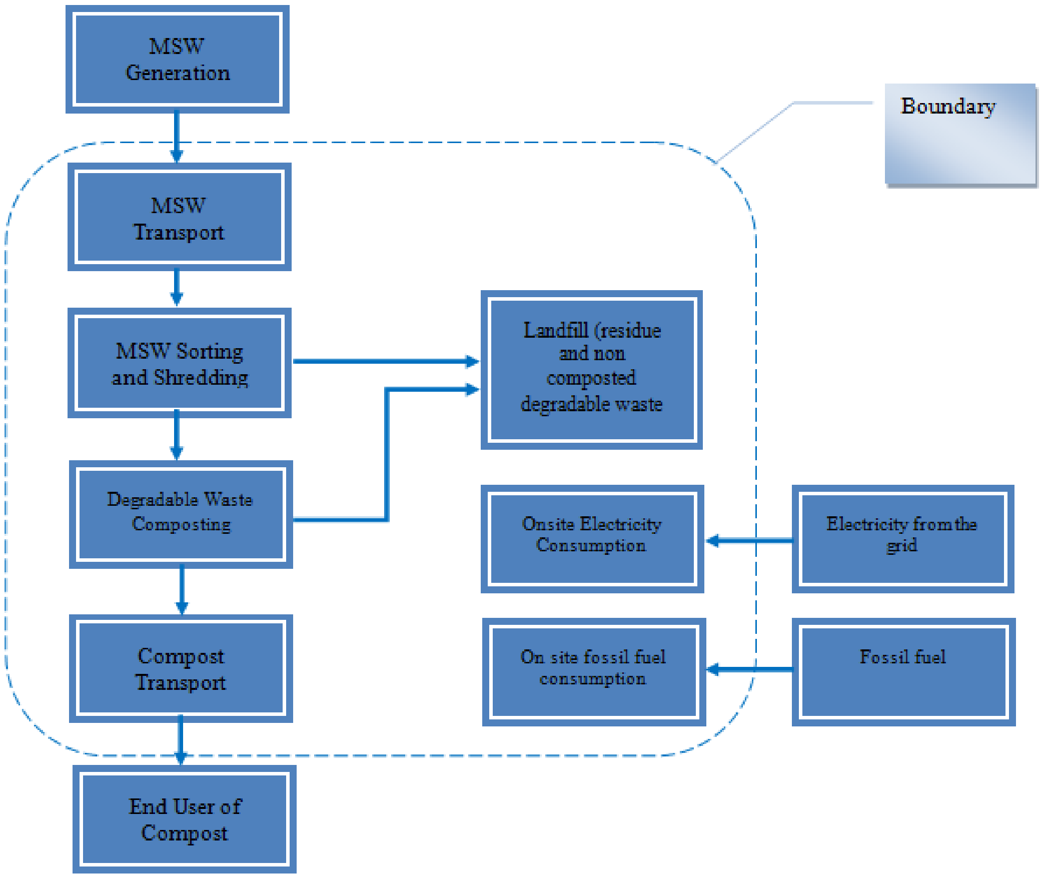
B.3. Description of the sources and gases included in the project boundary:

Project boundary:

The physical location of the project is in Apa where composting and landfill gas flaring will be implemented. The boundary of the project is therefore defined in accordance with the aforementioned methodologies, i.e:

- The spatial place where the composting is taking place
- The spatial place where the landfill gas is captured and flared

The boundary of the project is shown on the diagram below:



Project boundary

<u>**Describing sources and gases included in the project boundary**</u>

	Source	Gas		Justification/Explanation
Baseline	Emissions from decomposition of waste at the landfill site	CH_4	Included	Methane is the main gas that is emitted from decay of MSW at actual landfill sites
		N_2O	Excluded	We conservatively exclude N_2O as its emissions are very small compare to CH_4
		CO_2	Excluded	CO_2 emissions from the decomposition of organic waste are neglected
	Emissions from electricity consumption	CO_2	Excluded	Nothing is done at all before project activities, so there is no electricity consumed in the baseline
		CH_4	Excluded	Nothing is done at all before project activities, so there is no electricity consumed in the baseline
		N_2O	Excluded	Nothing is done at all before project activities, so there is no electricity consumed in the baseline

	Emissions from thermal energy generation	CO_2	Excluded	No thermal energy is going to be generated
		CH_4	Excluded	No thermal energy is going to be generated
		N_2O	Excluded	No thermal energy is going to be generated
Project activity	On-site fossil fuel consumption due to the project activity other than for electricity generation	CO_2	Included	Used as back up fuel or to run equipments
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small
	Emissions from on-site electricity use	CO_2	Included	Electricity used onsite comes from the Nigerian grid
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small
	Direct emissions from the waste treatment processes	N_2O	Included	Important emission source for composting activities
		CO_2	Excluded	No incineration, gasification or combustion is involved here, so there is no CO_2 emitted as a result of waste treatment
		CH_4	Included	It's difficult to have complete aerobic conditions, so trace of methane will be the result of partial anaerobic conditions
	Emissions from wastewater treatment	CO_2	Excluded	There is no wastewater involved in this project and therefore no wastewater treatment emissions
		CH_4	Excluded	There is no wastewater involved in this project and therefore no wastewater treatment emissions
		N_2O	Excluded	There is no wastewater involved in this project and therefore no wastewater treatment emissions

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

Selection of the most plausible baseline scenario

Step 1: Identification of alternative scenarios

As required by the methodologies, Step 1 of the latest version of the "*Tool for demonstration and assessment of additionality*" is used to identify all realistic and credible baseline alternatives.

Identification of alternatives to the project activity (Step 1 of the Tool)

Sub-step 1a: Define alternatives to the project activity:

According to methodologies used for this project, defining a plausible baseline scenario requires to identify all possible scenarios before doing a comprehensive selection. For this project, project participants have identified the following realistic plausible three scenarios:

- M 1: The project activity implemented not as CDM project;
- M II: Disposal of waste in a landfill with LFG captured and flared;
- M III: The business-as-usual continues in Lagos, i.e. MSW is still collected and dumped in Olushosun, Soulos and Abule-Egba existing uncontrolled dumpsites without any capture and flaring.

Note: No energy is exported to a grid and/or to a nearby industry, or used on-site, and so no realistic and credible alternatives should be separately determined for:

- Power generation in the absence of the project activity;
- Heat generation in the absence of the project activity

Assessment of the potential waste management alternatives

INTOL-JPI is a Special Purpose Vehicle (SPV) that was incorporated under the law of Nigeria in 2008 with the aim of building an integrated waste management facility in the country and making profit from doing so. Looking carefully at the scenarios above, we note that scenario M I and M II involve significant investment without any foreseeable revenue if INTOL-JPI is to implement those scenarios. Designing, constructing and operating a landfill with LFG flaring (scenario M II) or having a fully integrated waste management facility with composting and landfill flaring (scenario M I) can require up to 25 million Euro investment. It is therefore not possible that INTOL-JPI does that investment without expecting any extra revenue.

The scenario M III however shows that nothing is actually done, i.e. there is no extra investment to what is done now to collect the MSW in Lagos State and dump it in the existing landfill sites.

Without any foreseeable revenue, this scenario will be the best one for any for-profit organization

Conclusion of Step 1a: In the absence of the Project activity, the only realistic and credible alternative baseline is scenario M III – Continuation of the current practice.

Sub-step 1b: Consistency with mandatory laws and regulations:

In Lagos State as well as in the whole Nigeria, there are no enforced laws and regulations, neither obliging waste management companies to properly dispose of or treat waste, nor forbidding waste treatment or disposal in the form of any of the three scenarios listed above. That means any of the scenarios can be implemented without infringing any law.

Conclusion of sub-step 1b: All the credible alternatives identified above comply with the current laws and regulatory requirements of Nigeria.

Step 2: Identify the fuel for the baseline choice of energy source taking into account the national and/or sectoral policies as applicable

Not applicable since no electricity generation from waste is included in the Project activity

Step 3: Step 2 and/or Step 3 of the latest approved version of the "Tool for demonstration and assessment of additionality" shall be used to assess which of these alternatives should be excluded from further consideration (e.g. alternatives facing prohibitive barriers or those clearly economically unattractive):

As specified in the Tool ("*Proceed to Step 2 (Investment analysis) or Step 3 (Barrier analysis)"*), the
Project participants decided to use Step 3 (Barrier analysis).

Step 3: Barrier analysis

INTOL-JPI, the Project promoter, is to determine whether the Project activity faces barriers that:

(a) Prevent the implementation of this type of proposed project activity; and
(b) Do not prevent the implementation of at least one of the alternatives; using the following sub-steps:

Sub-step 3a. Identify barriers that would prevent the implementation of the proposed CDM project activity:

The proposed Project activity consists of sorting and composting of the organic fraction of MSW in Lagos. Its successful implementation faces the following described barriers:
The following categories of barriers:

(i) Investment Barriers,
(ii) Technological Barriers and
(iii) Barriers due to prevailing practice

1. Investment barriers

This project requires very high investment of 25 million Euro to realize all involved activities from waste collection to final compost sold to farmer and LFG flared. This is a huge amount of money to be invested in Nigeria, a country with high risk perception for foreign direct investors. For local investors, it is also unlikely they will put their money in such a project without any clear incentive like revenue from carbon credits. It is worth having a glance at risks that local or foreign investors will face in investing in such a project:

- Interest rate

The interest rates that local banks offer vary from 16.7% to 22.8% on average per bank and per business area according to the Central Bank of Nigeria[6]. That is too high for local investors who will better look for other opportunities than to start an integrated waste treatment facility that takes a lot of time to design, implement and operate and cannot easily achieve and IRR of above 20% within, say 5 years.

- Value of collateral

Added to the high interest rate that local banks offer to potential investors, the value for collateral requested is very high to favor any investor. The Central Bank of Nigeria gives a collateral request from banks to investors as high as 150% of the value of the loan[7]. It is challenging for local Nigerian enterprises to get such huge collateral for over 25 million Euro investment.

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[6] Source:
http://www.cenbank.org/OUT/2010/PUBLICATIONS/BSD/COPY%20OF%20COPY%20OF%20INTEREST%20RATE%2029-1-%202010.PDF, retrieved on June 15, 2011

[7] Source:
http://www.cenbank.org/fss/wed/SME%20Issues,%20Challenges%20and%20Prospects_Peter%20Mousley.pdf (page 5), retrieved on June 15, 2011

- Risk perception of (foreign) investors

The World Bank together with the International Finance Corporation ranks comprehensively year in year out countries in the world according to the “Ease of Doing Business” in those countries. Out of 181 countries, Nigeria is ranked 137th in 2011[8]. This ranking indicates how difficult it is to do business in Nigeria, and any foreign investor coming in to do a business like starting an integrated waste management project will be very reluctant in doing so, unless there is some clear incentive.

The ranking takes many factors into account and rank them before coming up with the overall ranking of the selected country. It is worth having a close look at selected factors and see what rank Nigeria occupies to give more insight to readers. To have a clear picture we compare some parameters giving the ranking to the situation on average in OECD (Organization for Economic Co-operation and Development) countries in the table below

Ease of…	**Rank Nigeria 2011**	**Brief comparison to OECD**
Starting a business	110	It takes 31 days to start a business in Nigeria and only 13.4 in OECD countries
Dealing with construction permits	167	It takes 350 days to complete all construction permits in Nigeria whilst only 161.5 in OECD.
Registering property	179	In 32.7 days one can register a property in an OECD country, but it takes as much as 82 days to do the same in Nigeria
Paying taxes	134	A business owner in Nigeria needs 35 payments and 938 hours per year to complete his tax declaration whilst in OECD in takes only 14 payments and 199.3 hours

As quintessence, it is clear many investment barriers are infringing the design and implementation of an integrated waste management facility like the Apa one from happening. The revenue from carbon credits sale and the commitment to participate to the reduction of greenhouse gases into the atmosphere are the main reasons INTOL-JPI is working hard on making this project happening.

2. Technological barriers

There is to date no sanitary landfill project in Nigeria involving LFG flaring, nor is there any composting project at the scale of the actual project activity with state-of-the-art technology that

[8] Source: http://www.doingbusiness.org/ExploreEconomies/?economyid=143, retrieved on June 15, 2011

takes into account social and environmental protection. Because of this uniqueness, the project participants as well as the project activity will be facing many barriers:

- Lack of skilled labor force

There is to date no available labor force in Nigeria with skills required to implement and operate a large scale composting and LFG capture and flaring plant, just because the technology has not yet been available in the country so far. This will be a huge hurdle to INTOL-JPI who will have to import a very expensive labor force from abroad whilst spending to develop the capacity of its local engineers. MUT Technology and SCS Engineers, respectively composting and landfill technology providers will have to send staffs for very long period of time in Apa to construct and operate the project in the beginning. But their staffs will be reduced gradually when local engineers are enough trained to run the project themselves. INTOL-JPI will spend a lot of money on training and capacity building of locals.

- Lack of infrastructure

Constructing and operating the project activity require a lot of equipment that can only be imported because there is nothing to drawn on from Lagos.
One of the main hurdles presented by the lack of infrastructure will be transportation of equipment and waste collected to the project site. Lagos shelters more than 17 million inhabitants and there is most of the time traffic congestion on its highways. To make the project happen and work at full capacity day in day out, INTOL-JPI needs to spend more on transportation. More trucks and drivers for instance need to be bought and hired to make sure waste is available on-site every day.

3. Barriers due to prevailing practice

The business-as-usual model in Lagos and in the whole Nigeria is collection of MSW and dumping without any control in landfills, pits, holes and uncontrolled dumpsite.

This project is breaking with this common practice at least in Lagos, with the hope that many other States will follow to enhance the participation of Nigeria to the global climate change.

Conclusion of Step 3a: Many identified barriers as described above may prevent one or more alternative – especially scenario M I – to occur.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

The business-as-usual scenario (M III), which is waste collected and dumped without any further treatment in an uncontrolled landfill cannot be prevented by any of the barriers discussed above. In fact it is what is being done now and there is no investment barriers as no investment is needed, and nor is there any technology barriers as no technique is needed to collect and dump the waste.

Conclusion of Step 3b: Barriers identified in Step 3a will not prevent implementation of scenario M III

Step 4: Where more than one credible and plausible alternative remains, project participants shall, as a conservative assumption, use the alternative baseline scenario that results in the lowest baseline emissions as the most likely baseline scenario.

Only one credible and plausible alternative remains from above Steps i.e. scenario M III (continuation of the current practice), therefore it is the most likely baseline scenario.

Conclusion of the analysis: The current practice (scenario M III) is the baseline scenario for the project activity and will be used as such for further analysis of the project.

CDM Consideration

Actions	Date	Evidence
Contacts with CDM development firms	December 2008	Emails with BAS Consulting
Notification to the UNFCCC	May 4, 2009	Mail sent to UNFCCC
Letter of Non-Objection from DNA	April 6, 2009	Letter of Non-Objection
Letter of Approval from DNA	May 7, 2010	Letter of Approval
Term Sheet	June 7, 2011	Term Sheet signed with Macquarie
Contract with DOE	xxx	Contract with DOE
ERPA	xxxx	ERPA signed with Macquarie
Financial Closure	xxxx	
Start of validation	xxxxx	Site visit on xxxxx

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

The approved methodological "Tool for the demonstration and assessment of additionality" in its Version 05.02 clearly defines four steps to prove the additionality of projects. The four steps indicated in the tool are:

Step 1: Identify alternatives to the project activity
Step 2: Investment analysis

Step 3: Barrier analysis
Step 4: Common practice analysis

The Steps 1 to 3 were analyzed in paragraph B.4 above.

Step 4: Common practice analysis

The project is not common practice in Nigeria. To date, only 1 similar project has been registered as CDM project in Lagos, but the physical implementation of the project is still ongoing and it's not possible so far to draw lessons from it while implementing this project activity. And also, no legislation is now put in place enforcing the use of sanitary disposal of MSW. This step is therefore irrelevant

Conclusion: The assessment done here in paragraph B.5 clearly shows that the project is additional as it meets all requirements described in the latest "Tool for the demonstration and assessment of the additionality".

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Describing succinctly again the baseline and project activities:

- The baseline scenario involves waste be dumped in the existing landfill at Olushosun, Soulos and Abule-Egba without any further treatment
- The project activity will be waste diverted to Apa side with:
    - A part of the waste composted
    - Another part dumped in a sanitary landfill and LFG captured and flared
- The waste will have to be transported by trucks to the side, leading to emissions from fuel consumption for running trucks.

Based on the above description, ex ante baseline emissions, project emissions and leakage emissions are estimated below:

Baseline emissions

The baseline emissions are clearly emissions avoided from dumping the waste at the existing site and is calculated as follow:

$BE_y = (MB_y - MD_{reg,y}) + BE_{EN,y}$

Where:

BE_y = Is the baseline emissions in year *y* (tCO_2e)
MB_y = Is the methane produced in the landfill in the absence of the project activity in year *y* (t4CO2e)
$MD_{reg,y}$ = Is methane that would be destroyed in the absence of the project activity in year *y* (t4CO2e)
$BE_{EN,y}$ = Baseline emissions from generation of energy displaced by the project activity in year *y* (tCO2e)

In the case of this project, there is no energy displaced by the project, hence

$BE_{EN,y} = 0$

And then

$BE_y = (MB_y - MD_{reg,y})$

Adjustment Factor (AF)
In cases where regulatory or contractual requirements do not specify MDreg,y, an Adjustment Factor (AF) shall be used and justified, taking into account the project context. In doing so, the project participant should take into account that some of the methane generated by the landfill may be captured and destroyed to comply with other relevant regulations or contractual requirements, or to address safety and odor concerns.

MDreg,y = MBy * AF

Where:

AF = Is Adjustment Factor for MBy (%)

The parameter AF shall be estimated as follows:

- In cases where a specific system for collection and destruction of methane is mandated by regulatory or contractual requirements, the ratio between the destruction efficiency of that system and the destruction efficiency of the system used in the project activity shall be used;
- In cases where a specific percentage of the generated amount of methane to be collected and destroyed is specified in the contract or mandated by the regulation, this percentage divided by an assumed efficiency for the collection and destruction system used in the project activity shall be used.

For this project activity, there is neither a law or regulation nor a contract mandating the collection and destruction of methane in the baseline, hence

AF = 0 and then

MDreg,y = MBy * AF = 0

The Adjustment Factor (AF) shall however be revised at the start of each new crediting period taking into account the amount of GHG flaring that occurs as part of common industry practice and/or regulation at that point in the future.

Rate of compliance

In cases where there are regulations that mandate the use of one of the project activity treatment options and which is not being enforced, the baseline scenario is identified as a gradual improvement of waste management practices to the acceptable technical options expected over a period of time to comply with the MSW Management Rules. The adjusted baseline emissions (*BEy,a*) are calculated as follows:

$BEy,a = BEy * (1 - RATE^{Compliance} y)$

Where:

BEy = Is the CO_2-equivalent baseline emissions

$RATE^{Compliance}y$ = Is the state-level compliance rate of the MSW Management Rules in that year *y*. The compliance rate shall be lower than 50%; if it exceeds 50% the project activity shall receive no further credit

In such cases BEy,a should replace BEy in the equation to estimate emission reductions.

For this project, there is no law and regulation in place enforcing the treatment of waste. There is therefore no need to comply to any rule or regulation and hence

$RATE^{Compliance}y = 0$

Summing up all above considerations the following equation is left to estimate baseline emissions:

$$BE_y = MB_y$$

Where:

BE_y = Is the baseline emissions in year y (tCO_2e)

MB_y = Is the methane produced in the existing dumpsite if the project is not implemented

The “Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site” in its Version 04 gives the formula to calculate the methane emissions that would in the absence of project activity be generated based on the First Order Decay (FOD) model as follow:

$$BE_{ch4,\,SWDS,\,y} = \varphi.(1-f).GWP_{CH_4}.(1-OX)\frac{16}{12}.F.DOC_f.MCF.\sum_{x=1}^{y}\sum_{j}W_{j,x}.DOC_j.e^{-k_j.(y-x)}.(1-e^{-k_j})$$

Where:

$BE_{ch4,\,SWDS,\,y}$ = Methane emissions avoided during the year y from preventing waste disposal at the actual solid waste disposal site (SWDS) during the period from the start of the project activity to the end of the year y (tCO_2e)

φ = Model correction factor to account for model uncertainties (0.9)

f = Fraction of methane captured at the SWDS and flared, combusted or used in another manner

GWP_{ch4} = Global Warming Potential (GWP) of methane, valid for the relevant commitment period

OX = Oxidation factor (reflecting the amount of methane from SWDS that is oxidised in the soil or other material covering the waste

F = Fraction of methane in the SWDS gas (volume fraction) (0.5)

DOC_f = Fraction of degradable organic carbon (DOC) that can decompose

MCF = Methane correction factor

$W_{j,x}$ = Amount of organic waste type j prevented from disposal in the SWDS in the year x (tons)

DOC_j = Fraction of degradable organic carbon (by weight) in the waste type j

k_j = Decay rate for the waste type j

j = Waste type category (index)

x = Year during the crediting period: x runs from the first year of the first crediting period (x=1) to the year y for which avoided emissions are calculated (x=y)

y = Year for which methane emissions are calculated

Where different waste types j are prevented from disposal, determine the amount of different waste types ($W_{j,x}$) through sampling and calculate the mean from the samples as follows:

$$W_{j,x} = W_x.\frac{\sum_{n=1}^{z} p_{n,j,x}}{z}$$

Where:

$W_{j,x}$ = Amount of organic waste type j prevented from disposal in the SWDS in the year x (tons)

W_x = Total amount of organic waste prevented from disposal in year x (tons)

$P_{n,j,x}$ = Weight fraction of the waste type j in the sample n collected during the year x

z = Number of samples collected during the year x

In paragraphs B.6.2 and B.7.1 we will elaborate more on the parameters given in these formulas.

We discussed in paragraph B.3 in a very comprehensive way sources and gases included in the project boundary and clearly came to the conclusion that in the baseline only emissions of methane are considered. Hence baseline emissions are exactly equal to methane emissions avoided, i.e.:

$BE_y = BE_{ch4, SWDS, y}$

Project emissions

During the project activity, emissions will be involved that need to be discounted from the baseline emissions to have real certified emissions reduction.
The project activity has two components, the composting and the LFG flaring. That means project emissions should take into account both components. We will aggregate both components to derive one equation:

$PE_y = PE_{comp,y} + PE_{LFG,y}$

Where:

PE_y = Project emissions during the year y (tCO_2e)

$PE_{comp, y}$ = Project emissions during the year y due to composting (tCO_2e)

$PE_{LFG, y}$ = Project emissions during the year y due to LFG flaring (tCO_2e)

For the composting part of the project, emissions associated are due to the composting process, the electricity (PE_{elec}) consumption on-site and the fuel (PE_{fuel}) consumption on-site[9].
For the landfill part of the project activity, emissions associated are caused by the LFG flaring (PE_{LFG}) process but also for the electricity (PE_{elec}) consumption on-site and the fuel (PE_{fuel}) consumption on-site.

[9] The project activity does not include the following components: (i) anaerobic digestion,(ii) gasification, (iii) combustion of RDF/stabilized biomass, (iv) incineration of MSW or (v) the wastewater treatment. Therefore, project emissions from these sources are not considered in the calculation.

The project emissions' formula is therefore:

$PE_y = PE_{comp, y} + PE_{LFG, y} + PE_{elec, y} + PE_{fuel, y}$

Where:

PE_y = Project emissions during the year y (tCO_2e)
$PE_{comp,y}$ = Project emissions during the year y due to composting (tCO_2e)
$PE_{LFG,y}$ = Project emissions during the year y due to LFG flaring (tCO_2e)
$PE_{elec, y}$ = Project emissions during the year y due to electricity consumption on site (tCO_2e)
$PE_{fuel, y}$ = Project emissions during the year y due to fuel consumption on site (tCO_2e)

<u>Project emissions due to composting</u>

During the composting process N_2O emissions might be released to the atmosphere. Also CH_4 emissions might be released because total aerobic conditions are hardly reached, and if at all not all the time during the composting process. We derive then the formula to calculate project emissions due to composting from the methodology AM0025 as:

$PE_{comp,y} = PE_{comp, N2O, y} + PE_{comp, CH4, y}$

Where:

$PE_{comp, N2O, y}$ = N_2O emissions during the composting process in year y (tCO_2e)
$PE_{comp, CH4, y}$ = CH_4 emissions during the composting process due to anaerobic conditions in year y (tCO_2e)

N_2O emissions

According to Schenk[10] et al. a total loss of 42 mg N2O-N per kg composted dry matter can be expected (from which 26.9 mg N2O during the composting process). The dry matter content of compost is around 50% up to 65%.
Based on these values, project participants should use a default emission factor of 0.043 kg N_2O per ton of compost for $EF_{comp, N2O}$ and calculate emissions as follows[11]:

$PE_{comp, N2O, y} = M_{comp, y} * EF_{comp, N2O} * GWP_{N2O}$

[10] Manfred K. Schenk, Stefan Appel, Diemo Daum, "N2O emissions during composting of organic waste", Institute of Plant Nutrition University of Hannover, 1997
[11] Assuming 650 kg dry matter per ton of compost and 42 mg N2O-N, and given the molecular relation of 44/28 for N2O-N, an emission factor of 0.043 kg N2O / ton compost results.

Where:

$PE_{comp, N2O, y}$ = N_2O emissions during the composting process in year y (tCO_2e)

$M_{comp, y}$ = Total quantity of compost produced in year y (tons/a)

$EF_{comp, N2O}$ = Emission factor for N_2O emissions from the composting process (tN_2O/tcompost)

GWP_{N2O} = Global Warming Potential of N_2O (tCO_2/tN_2O)

CH_4 emissions

During the composting process, aerobic conditions are neither completely reached in all areas nor at all times. Pockets of anaerobic conditions – isolated areas in the composting heap where oxygen concentrations are so low that the biodegradation process turns anaerobic – may occur. The emission behaviour of such pockets is comparable to the anaerobic situation in a landfill. This is a potential emission source for methane similar to anaerobic conditions which occur in unmanaged landfills. The duration of the composting process is less than the duration of the crediting period. This is because of the fact that the compost may be subject to anaerobic conditions during its end use, which is not foreseen that it could be monitored. Assuming a residence time for the compost in anaerobic conditions equal to the crediting period is conservative. Through pre-determined sampling procedures the percentage of waste that degrades under anaerobic conditions can be determined. Using this percentage, project methane emissions from composting are calculated as follows:

$$PE_{comp, CH4, y} = MB_{comp, y} * GWP_{CH4} * S_{a, y}$$

Where :

$PE_{comp, CH4, y}$ = Methane emission due to anaerobic conditions in the composting process in year y (tCO_2e)

$S_{a, y}$ = Share of the waste that degrades under anaerobic conditions in the compositing plant during year y (%)

$MB_{comp, y}$ = Quantity of methane that would be produced in the landfill in the absence of the composting activity in year y (tCH_4). $MB_{comp, y}$ is estimated by multiplying MB_y by the fraction of waste diverted, from the landfill, to the composting activity (f_c) relative to the total waste diverted from the landfill to all project activities. (Since all the waste is composted, $MB_{comp, y} = MB_y$)

GWP_{CH4} = Global Warming Potential for methane (tCO_2e/tCH_4)

Calculating the parameter $S_{a,y}$

$S_{a,y}$ is determined by a combination of measurements and calculations. Bokhorst et al.[12] and Richard et al.[13] show that if oxygen content is below 5% - 7.5%, aerobic composting processes are replaced by anaerobic processes. To determine the oxygen content during the process, project participants shall measure the oxygen content according to a predetermined sampling scheme and frequency.

These measurements should be undertaken for each year of the crediting period and recorded each year. The percentage of the measurements that show an oxygen content below 10% is presumed to be equal to the share of waste that degrades under anaerobic conditions (i.e. that degrades as if it were landfilled), hence the emissions caused by this share are calculated as project emissions ex-post on an annual basis:

$S_{a,y} = S_{OD,y}/S_{total,y}$

Where :

$S_{OD,y}$ = Number of samples per year with an oxygen deficiency (oxygen content below 10%)

$S_{total,y}$ = Total number of samples taken per year, where $S_{total,y}$ should be chosen in a manner that ensures the estimation of $S_{a,y}$ with 20% uncertainty at a 95% confidence level

Project emissions due to LFG flaring

During the LFG flaring, emissions will be created because the flaring is not 100% efficient. The methodology ACM0001 suggests estimating project emissions using the "Tool to determine project emissions from flaring gases containing methane". The tool presents many steps used for the calculation of the project emissions and the ultimate step (step 7) is the following formula that we will use here:

$$PE_{LFG,y} = \sum_{h=1}^{8760} TM_{RG,h} * (1 - \eta_{flare,h}) * \frac{GWP_{CH4}}{1000}$$

Where:

$PE_{LFG,y}$ = Project emissions from flaring of the LFG in the year y (tCO_2e)

$TM_{RG,h}$ = Mass flow rate of methane in the LFG per hour (kg/h)

$\eta_{flare,h}$ = Flare efficiency each hour h

[12] Jan Bokhorst, Coen ter Berg – Mest & Compost Behandelen beoordelen & Toepassen (Eng: Manure & Compost – Treatment, judgement and use), Louis Bold Instituut, Handbook under number LD8, Oktober 2001.

[13] Tom Richard, Peter B. Woodbury, Cornell composting, operating fact sheet 4 of 10, Boyce Thompson Institute for Plant Research at Cornell University.

GWP_{CH4} = Global Warming Potential of methane valid for the commitment period (tCO_2e/tCH_4)

Based on the "Tool to determine project emissions from flaring gases containing methane", we choose in this project to use a default fixed flare efficiency of 90% and follow the requirements of the tool. The tool in fact says: "To use a 90% default value. Continuous monitoring of compliance with manufacturer's specification of flare (temperature, flow rate of residual gas at the inlet of the flare) must be performed. If in a specific hour any of the parameters are out of the limit of manufacturer's specifications, a 50% default value for the flare efficiency should be used for the calculations for this specific hour"

Project emissions due to electricity consumption on site

According to the approved methodology AM0025, project emissions due to electricity used on site are calculated using the formula:

$PE_{elec,\,y} = EG_y * CEF_{elec}$

Where:

$PE_{elec,\,y}$ = Project emissions during the year y due to electricity consumption on site (tCO_2e)

EG_y = Is the amount of electricity generated on and on-site fossil fuel generator or consumed from the grid as a result of the project activity, measured using an electricity meter (MWh)

CEF_{elec} = Carbon emissions factor for the electricity consumption in the project activity (tCO_2e/MWh)

Leakage emissions

The leakage emissions in this project are from the transportation of waste from the transfer station to the waste site and the transportation of compost from the waste site to distribution points[14]. We derive the formulas for calculating leakage emissions from transportation from AM0025.

$L_y = L_{trans,\,waste,\,y} + L_{trans,\,comp.,\,y}$

Where :

L_y = Leake emissions in year y (tCO_2e)

[14] The distribution point will be the warehouse of the Federal Ministry of Agriculture in Lagos, located at about 35km from the project site. The Ministry of Agriculture will be the main seller of the compost.

$L_{trans, waste, y}$ = Leakage emissions from transportation waste in year y to the project site (tCO_2e)
$L_{trans, comp., y}$ = Leakage emissions from transportation compost in year y to the distribution points (tCO_2e)

The formula that will be used for the transportation, whether of waste or compost is the same and is:

$$L_{trans, y} = \sum_{i}^{n} NO_{vehicle,i,y} * DT_{i,y} * VF_{cons,i} * NCV_{fuel\_trans} * D_{fuel} * EF_{fuel\_trans}$$

Where:
$NO_{vehicle, i, y}$ = Is the number of vehicles for transport with similar loading capacity per year
$DT_{i, y}$ = Is the average additional distance travelled by the vehicle type i compared to baseline in year y (km)
$VF_{cons, i}$ = Is the vehicle fuel consumption in litres per kilometre for vehicle type i (l/km)
NCV_{fuel_trans} = Is the Calorific value of the fuel used for transportation (MJ/kg or other unit)
D_{fuel} = Is the fuel density (kg/l), if necessary
EF_{fuel_trans} = Is the emission factor of the fuel used for transportation (tCO_2/MJ)

Emissions Reduction

The following formula applies for the calculation of emissions reduction:

$ER_y = BE_y – PE_y – L_y$

Where:
ER_y = Emissions reduction on year y (tCO_2e/y)
BE_y = Baseline emissions on year y (tCO_2e/y)
PE_y = Project emissions on year y (tCO_2e/y)
L_y = Leakage emissions on year y (tCO_2e/y)

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	**AF**
Data unit:	-
Description:	Adjustment Factor
Source of data used:	Publicly available information in Nigeria
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	It's publicly known in Nigeria that there is no law and regulation enforcing the capturing and destruction of GHG from existing dumpsites and hence no adjustment is needed on the baseline emissions
Any comment:	The Adjustment Factor will be assessed at each new crediting period and adjusted if necessary

Data / Parameter:	**$Rate^{Compliance}$**
Data unit:	0
Description:	Rate of compliance to existing regulation
Source of data used:	Publicly available information in Nigeria
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	It's publicly known in Nigeria that there is no law and regulation enforcing the capturing and destruction of GHG from existing dumpsites and hence no compliance to any law is needed
Any comment:	-

Data / Parameter:	**φ**
Data unit:	-
Description:	Correction factor to account for the FOD model uncertainties
Source of data used:	"Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"
Value applied:	0.9
Justification of the choice of data or description of	The Tool used as source clearly states the value of 0.9 as a default value to be use to correct the model uncertainties

measurement methods and procedures actually applied :	
Any comment:	-

Data / Parameter:	**OX**
Data unit:	-
Description:	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste
Source of data used:	Visit on site and discussion with INTOL
Value applied:	0.0
Justification of the choice of data or description of measurement methods and procedures actually applied :	Since the waste is not covered at all, the Tool suggests using the value of 0.0. A value of 0.1 would have been used if the waste was covered with compost or soil
Any comment:	-

Data / Parameter:	**F**
Data unit:	-
Description:	Fraction of methane in the SWDS gas (volume fraction)
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	The default value of 0.5 is used as suggested by the Tool to use this IPCC value
Any comment:	-

Data / Parameter:	**DOC_f**
Data unit:	-
Description:	Fraction of degradable organic carbon (DOC) that can decompose
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.5

Justification of the choice of data or description of measurement methods and procedures actually applied :	The "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" suggests to use this default value of 0.5 for calculations
Any comment:	-

Data / Parameter:	**MCF**
Data unit:	-
Description:	Methane correction factor
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.8
Justification of the choice of data or description of measurement methods and procedures actually applied :	The "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" suggests to use this default value of 0.8 for calculations, as the project activity falls to the category : "**Unmanaged solid waste disposal sites - deep and/or with high water table**. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of greater than or equal to 5 meters and/or high water table at near ground level. Latter situation corresponds to filling inland water, such as pond, river or wetland, by waste"
Any comment:	-

Data / Parameter:	**DOC_j**
Data unit:	-
Description:	Fraction of degradable organic carbon (by weight) in the waste type j
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)
Value applied:	The waste in the actual dumpsite in Lagos is wet and we will use then the "wet values" in the table below, defaults values given by the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"

Waste type j	**DOC_j (% wet waste)**
Wood and wood products	**43**
Pulp, paper and cardboard (other than sludge)	**40**
Food, food waste, beverages and tobacco (other than sludge)	**15**

	Textiles	**24**
	Garden, yard and park waste	**20**
	Glass, plastic, metal other inert waste	**0**
Justification of the choice of data or description of measurement methods and procedures actually applied :	The Tool gives these values as default value to be used	
Any comment:	-	

Data / Parameter:	$\mathbf{k_j}$
Data unit:	-
Description:	Decay rate for the waste type j
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)
Value applied:	Lagos has a tropical temperature and waste is wet (i.e. >1000mm annual precipitation), so we use the default values give in the following table:

Waste type j		**Tropical (MAT>20°C) Wet (MAP>1000mm)**
Slowly degrading	Pulp, paper, cardboard (other than sludge), textiles	**0.07**
	Wood, wood products and straw	**0.035**
Moderately degrading	Other (non-food) organic putrescible garden and park waste	**0.17**
Rapidly degrading	Food, food waste, sewage sludge, beverages and tobacco	**0.40**
MAT = Mean Annual Temperature MAP = Mean Annual Precipitation		

Justification of the choice of data or	In Lagos: MAT = 26.5°C (Source: http://www.worldclimate.com/cgi-

description of measurement methods and procedures actually applied :	bin/data.pl?ref=N06E003+1102+65201W, Retrieved on June 15, 2011) MAP = 1740.7 mm (source: http://www.worldclimate.com/cgi-bin/data.pl?ref=N06E003+2100+65201W, Retrieved on June 15, 2011)
Any comment:	-

Data / Parameter:	**CEF_{elec}**
Data unit:	tCO_2e/MWh
Description:	Carbon emissions factor for the electricity consumption in the project activity
Source of data used:	Extracted from registered project N#3841 on the UNFCCC website: http://cdm.unfccc.int/Projects/DB/AENOR1278677451.53/view, retrieved on June 14, 2011
Value applied:	0.68
Justification of the choice of data or description of measurement methods and procedures actually applied :	The National Control Center for energy production and distribution of Nigeria updates regularly the emission factor
Any comment:	

Data / Parameter:	**$DT_{MSW,y}$**
Data unit:	km
Description:	Average distance travelled by a truck transporting MSW to the waste site in year y
Source of data used:	Estimation of the project owner INTOL-JPI
Value applied:	30x2x365=21'900 (for conservativeness we assume trucks are making round trip)
Justification of the choice of data or description of measurement methods and procedures actually applied :	The waste will be brought by the LAWMA to the transfer station that is located 30km from the project site. From there INTOL-JPI will have the responsibility to bring then waste on the project site for further treatment as described in this document
Any comment:	

Data / Parameter:	**$DT_{comp, y}$**
Data unit:	km
Description:	Average distance travelled by a truck transporting compost to warehouse of the Ministry of Agriculture in year y
Source of data used:	Estimation of the project owner INTOL-JPI
Value applied:	35x2x365=25’550 (for conservativeness we assume trucks are making round trip)
Justification of the choice of data or description of measurement methods and procedures actually applied :	INTOL-JPI together with the Ministry of Environment have agreed that the compost produced will be transported to the warehouse of the Ministry located 35km from the Apa site. It is there that farmer will by the compost for agricultural use.
Any comment:	

Data / Parameter:	**$VF_{cons, i}$**
Data unit:	l/km
Description:	Fuel consumption for vehicle type i
Source of data used:	Indication by the project owner from vehicle provider
Value applied:	0.33
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	**NCV_{fuel_trans}**
Data unit:	MJ/kg
Description:	Calorific value of the fuel (diesel) used by transportation vehicles
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	43
Justification of the choice of data or description of measurement methods and	

procedures actually applied :	
Any comment:	

Data / Parameter:	**D_{fuel}**
Data unit:	kg/l
Description:	Density of the fuel (diesel) used for transportation
Source of data used:	Wikipedia
Value applied:	0.85
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	**EF_{fuel_trans}**
Data unit:	tCO_2/MJ
Description:	Emission factor of the fuel used by transportation vehicles
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	0.0000741
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	**$\eta_{flare, h}$**
Data unit:	%
Description:	Flare efficiency per hour of the LFG flaring unit
Source of data used:	UNFCCC methodological “Tool to determine project emissions from flaring gases containing methane”
Value applied:	90
Justification of the choice of data or	The default value is chosen based on the Tool

description of measurement methods and procedures actually applied :	
Any comment:	-

B.6.3. Ex-ante calculation of emission reductions:

We developed in paragraph B.6.1. formulas to calculate emissions reductions associated to the project activity in Apa. Here we perform calculations to determine numerical values.

Baseline emissions calculation

We use the FOD model and the parameters described in paragraph B.6.1. to calculate baseline emissions. The formula used is what we derived in paragraph B.6.1. i.e.:

$$BE_y = \varphi.(1-f).GWP_{CH_4}.(1-OX)\frac{16}{12}.F.DOC_f.MCF.\sum_{x=1}^{y}\sum_{j}W_{j,x}.DOC_j.e^{-k_j.(y-x)}.(1-e^{-k_j})$$

Waste type category (j)	Fraction of the category in the total waste (%)[15]	Decay rate (k_j) for the waste type j	Fraction of the degradable organic carbon (DOC_j)in the waste type j (% wet waste)
Wood and wood products	3.2	0.035	43
Pulp, paper and cardboard (other than sludge)	17.4	0.07	40
Food, food waste, beverages and tobacco (other than sludge)	63.1	0.40	15
Textiles	16.3	0.07	24
Garden, yard and park waste	0.0	0.17	20
Glass, plastic, metal, other inert waste	0.0	0	0

Parameter	Description	Value
φ	Model correction factor	0.9
f	Fraction of methane captured in the baseline	0.0
GWP_{CH4}	Global Warming Potential of methane	21

[15] Extracted from registered project N#3841 on the UNFCCC website: http://cdm.unfccc.int/Projects/DB/AENOR1278677451.53/view, retrieved on June 14, 2011. INTOL-JPI is looking at contracting a company to do the waste sampling at least quarterly as indicated by the UNFCCC methodology for composting (AM0025).

OX	Oxidation factor	0.0
F	Fraction of methane in the SWDS	0.5
DOC_f	Fraction of degradable organic carbon that can decompose	0.5
MCF	Methane correction factor	0.8

Year	Baseline emissions (tCO_2e)
2012	107 693
2013	185 582
2014	243 122
2015	286 672
2016	320 521
2017	347 562
2018	369 758
Total	**1 860 911**

Project emissions calculation

Project emissions from composting

$PE_{comp,y} = PE_{comp, N2O, y} + PE_{comp, CH4, y}$									
Year	**$PE_{comp, y}$ (tCO_2e)**	**$PE_{comp, N2O, y} = M_{comp, y}*EF_{comp, N2O}*GWP_{N2O}$**				**$PE_{comp, CH4, y} = MB_{comp, y}*GWP_{CH4}*S_{a,y}$**			
		$PE_{comp,N2O,y}$ (tCO_2e)	**$M_{comp,y}$ (tons/a)**	**$EF_{comp, N2O}$ (tN_2O/tcomp)**	**GWP_{N2O} (tCO_2e)**	**$PE_{comp, CH4, y}$ (tCO_2e)**	**$MB_{comp, y}$ (tCH_4)**	**GWP_{CH4} (tCO_2e)**	**$S_{a,y}$ (%)**
2012	3’087	933	70’000	0.000043	310	2’153	5’128	21	2
2013	4’645	933	70’000	0.000043	310	3’712	8’837	21	2
2014	5’795	933	70’000	0.000043	310	4’862	11’577	21	2
2015	6’666	933	70’000	0.000043	310	5’733	13’651	21	2
2016	7’343	933	70’000	0.000043	310	6’410	15’263	21	2
2017	7’884	933	70’000	0.000043	310	6’951	16’551	21	2
2018	8’328	933	70’000	0.000043	310	7’395	17’608	21	2
Total	**43’749**								

Project emissions from LFG flaring

Note: The UNFCCC “Tool to determine project emissions from flaring gases containing methane” explicitly details the procedure to calculate the mass flow rate. But data necessary to perform the calculations will be recorded ex post to the commissioning of the project and aggregated to calculate ex post project emissions from flaring each year before Verification. In paragraph B.7.1 (Data and Parameters to be Monitored) and in paragraph B.7.2 (Monitoring

Plan) it is clearly explained how these data will be efficiently recorded and monitored throughout the lifecycle of the project. These data are: $fv_{CH4,h}$; $FV_{RG,h}$; T_{flare}. We are using a default flaring value of 90% and this reduce a lot the amount of data that need to be monitored according to the Tool.

For the sake of estimations, here we conservatively suppose 30% of the whole waste will be diverted to the landfill and 70% composted. This is conservative because with INTOL-JPI's goal of producing 70'000 tons of compost yearly, we do not foresee more than 30% of waste still remaining.

With then the estimation of 30% waste going to the landfill, we apply the FOD model as we did to calculate baseline emission. We will then have 30% of baseline methane emissions going to the flare and we apply the flare efficiency to estimate project emissions in this case.

30%	we estimate 30% of waste go to the landfill		
Ex post Estimated Project emissions from LFG flaring			
		FOD emissions estimation	**flare efficiency**
year	**Emissions**	**(tCO2e/year)**	**(%)**
2012	3 231	32 308	90%
2013	5 567	55 675	90%
2014	7 294	72 937	90%
2015	8 600	86 002	90%
2016	9 616	96 156	90%
2017	10 427	104 269	90%
2018	11 093	110 928	90%
Total	**55 827**		

The following table will however be used to calculate real project emissions after project implementation

$PE_{LFG,y} = \sum_{h=1}^{8760} TM_{RG,h} * (1-\eta_{flare,h}) * \frac{GWP_{CH4}}{1000}$				
Year	**$PE_{LFG,y}$ (tCO_2e)**	$\sum_{h=1}^{8760} TM_{RG,h}$ **(ton/year)**	$\eta_{flare,h}$ **(%)**	GWP_{CH4} **(tCO_2e)**
2012			90	21
2013			90	21
2014			90	21
2015			90	21
2016			90	21
2017			90	21
2018			90	21
Total				

Project emissions from electricity consumption on site

$PE_{elec, y} = EG_y * CEF_{elec}$			
Year	**$PE_{elec, y}$ (tCO_2e)**	**EG_y (MWh)**	**CEF_{elec} (tCO_2e/MWh)**
2012	27.2	40	0.68
2013	27.2	40	0.68
2014	27.2	40	0.68
2015	27.2	40	0.68
2016	27.2	40	0.68
2017	27.2	40	0.68
2018	27.2	40	0.68
Total	**190.4**		

Summary of project emissions

$PE_y = PE_{comp, y} + PE_{LFG, y} + PE_{elec, y} + PE_{fuel, y}$				
Year	**PE_y (tCO_2e)**	**$PE_{comp, y}$ (tCO_2e)**	**$PE_{LFG, y}$ (tCO_2e)**	**$PE_{elec, y}$ (tCO_2e)**
2012	6 345	3 087	3 231	27.2
2013	10 239	4 645	5 567	27.2
2014	13 116	5 795	7 294	27.2
2015	15 294	6 666	8 600	27.2
2016	16 986	7 343	9 616	27.2
2017	18 338	7 884	10 427	27.2
2018	19 448	8 328	11 093	27.2
Total	**99 768**	**43 750**	**55 827**	**190.4**

Leakage emissions calculation

Leakage emissions from waste transport

$L_{trans, MSW,y} = \sum_{i}^{n} NO_{vehicle,i,y} * DT_{i,y} * VF_{cons,i} * NCV_{fuel\_trans} * D_{fuel} * EF_{fuel\_trans}$							
Year	**$L_{MSW, y}$ (tCO_2e)**	**$NO_{vehicles, MSW}$**	**$DT_{MSW, y}$ (km)**	**$VF_{cons, MSW}$ (l/km)**	**NCV_{MSW} (MJ/kg)**	**D_{MSW} (kg/l)**	**EF_{MSW} (tCO_2/MJ)**

2012	2’966	109’950	30	0.33	43	0.85	0.0000741
2013	2’966	109’950	30	0.33	43	0.85	0.0000741
2014	2’966	109’950	30	0.33	43	0.85	0.0000741
2015	2’966	109’950	30	0.33	43	0.85	0.0000741
2016	2’966	109’950	30	0.33	43	0.85	0.0000741
2017	2’966	109’950	30	0.33	43	0.85	0.0000741
2018	2’966	109’950	30	0.33	43	0.85	0.0000741
Total	**20’760**						

Parameters to estimate $NO_{vehicles, MSW}$		
Description	**Unit**	**Value**
Yearly operation	Days	365
Waste transported to site	Tons/day	1500
Truck capacity	Tons	5

Leakage emissions from compost transport

$L_{trans, comp, y} = \sum_{i}^{n} NO_{vehicle,i,y} * DT_{i,y} * VF_{cons,i} * NCV_{fuel\_trans} * D_{fuel} * EF_{fuel\_trans}$							
Year	**$L_{MSW, y}$ (tCO_2e)**	**$NO_{vehicles, Comp}$**	**$DT_{comp, y}$ (km)**	**$VF_{cons, comp}$ (l/km)**	**NCV_{comp} (MJ/kg)**	**D_{comp} (kg/l)**	**EF_{comp} (tCO_2/MJ)**
2012	77	2’433	35	0.33	43	0.85	0.0000741
2013	77	2’433	35	0.33	43	0.85	0.0000741
2014	77	2’433	35	0.33	43	0.85	0.0000741
2015	77	2’433	35	0.33	43	0.85	0.0000741
2016	77	2’433	35	0.33	43	0.85	0.0000741
2017	77	2’433	35	0.33	43	0.85	0.0000741
2018	77	2’433	35	0.33	43	0.85	0.0000741
Total	**538**						

Parameters to estimate $NO_{vehicles, comp}$		
Description	**Unit**	**Value**
Yearly operation	Days	365
Compost transported to distribution	Tons/day	200
Truck capacity	Tons	30

Summary of leakage emissions

$Ly=L_{trans, waste, y} + L_{trans, comp., y}$			
Year	**Ly (tCO_2e)**	**$L_{trans, waste, y}$ (tCO_2e)**	**$L_{trans, comp., y}$ (tCO_2e)**
2012	3'043	2'966	77
2013	3'043	2'966	77
2014	3'043	2'966	77
2015	3'043	2'966	77
2016	3'043	2'966	77
2017	3'043	2'966	77
2018	3'043	2'966	77
Total	**21'298**		

B.6.4 Summary of the ex-ante estimation of emission reductions:

$ER_y = BE_y – PE_y – L_y$				
Year	**ER_y (tCO_2e)**	**BE_y (tCO_2e)**	**PE_y (tCO_2e)**	**L_y (tCO_2e)**
2012	98 305	107 693	6 345	3 043
2013	172 301	185 582	10 239	3 043
2014	226 963	243 122	13 116	3 043
2015	268 336	286 672	15 294	3 043
2016	300 492	320 521	16 986	3 043
2017	326 181	347 562	18 338	3 043
2018	347 268	369 758	19 448	3 043
Total	**1 739 845**	**1 860 911**	**99 768**	**21 298**

B.7. Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Baseline emissions parameters

Data / Parameter:	**f**
Data unit:	-
Description:	Fraction of methane captured at the existing SWDS and used for any purpose
Source of data to be used:	Site visit. There is no installation capturing methane in the existing dumpsites and using it the gas for any purpose
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	Yearly site visit will be conducted at the actual dumpsites and also the legislation will be followed. This to check that there is no capture of methane or if there is, then discount the value in the CERs calculation
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	**GWP_{ch4}**
Data unit:	tCO_2e/tCH_4
Description:	Global Warming Potential of methane, valid for the commitment period
Source of data to be used:	Decision under UNFCCC and the Kyoto Protocol
Value of data applied for the purpose of calculating expected emission reductions in section B.5	21 (to be applied for the first commitment period of the Kyoto Protocol)
Description of measurement	Monitored annually

methods and procedures to be applied:	
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	W_x
Data unit:	tons
Description:	Total amount of waste prevented from disposal in year x
Source of data to be used:	Measurement by INTOL-JPI
Value of data applied for the purpose of calculating expected emission reductions in section B.5	**Year** / **Wx**: 2012 – 547’500; 2013 – 547’500; 2014 – 547’500; 2015 – 547’500; 2016 – 547’500; 2017 – 547’500; 2018 – 547’500
Description of measurement methods and procedures to be applied:	The amount of the incoming waste will be measured daily by a weight bridge constructed on that purpose This will be aggregated annually
QA/QC procedures to be applied:	The weight bridge will be calibrated every month
Any comment:	-

Year	**Wx**
2012	547’500
2013	547’500
2014	547’500
2015	547’500
2016	547’500
2017	547’500
2018	547’500

Data / Parameter:	$P_{n,j,x}$
Data unit:	-
Description:	Weight fraction of the waste type j in the sample n collected during the year x
Source of data to be used:	Data available at validation are extracted from registered project N#3841 on the UNFCCC website: http://cdm.unfccc.int/Projects/DB/AENOR1278677451.53/view, but sampling will be done by PP during project activity.
Value of data applied for the purpose of calculating expected	

Waste type j	$P_{n,j,x}$
Wood and wood products	**3.2%**

emission reductions in section B.5		Pulp, paper and cardboard (other than sludge)	**17.4%**
		Food, food waste, beverages and tobacco (other than sludge)	**63.1%**
		Textiles	**16.3%**
		Garden, yard and park waste	**0%**
		Glass, plastic, metal other inert waste	**0%**
Description of measurement methods and procedures to be applied:	The waste will be sampled, sorted and the waste type j will be weighted.		
QA/QC procedures to be applied:	The size and frequency of sampling will be statistically significant with a maximum uncertainty range of 20% at a 95% confidence level. As a minimum, sampling should be undertaken four times per year.		
Any comment:	-		

Data / Parameter:	**z**
Data unit:	-
Description:	Number of samples collected during the year x
Source of data to be used:	Measurement by INTOL-JPI
Value of data applied for the purpose of calculating expected emission reductions in section B.5	N/A
Description of measurement methods and procedures to be applied:	Monitored and aggregated
QA/QC procedures to be applied:	-
Any comment:	-

Project emissions parameters

Project emissions parameters for composting

Data / Parameter:	**GWP_{N2O}**
Data unit:	tCO_2e/tN_2O
Description:	Global Warming Potential of nitrous oxide, valid for the commitment period
Source of data to be used:	Decision under UNFCCC and the Kyoto Protocol
Value of data applied for the purpose of calculating expected emission reductions in section B.5	310 (to be applied for the first commitment period of the Kyoto Protocol)
Description of measurement methods and procedures to be applied:	Monitored annually
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	**GWP_{CH4}**
Data unit:	tCO_2e/tCH_4
Description:	Global Warming Potential of methane, valid for the commitment period
Source of data to be used:	Decision under UNFCCC and the Kyoto Protocol
Value of data applied for the purpose of calculating expected emission reductions in section B.5	21 (to be applied for the first commitment period of the Kyoto Protocol)
Description of measurement methods and procedures to be applied:	Monitored annually
QA/QC procedures to be applied:	-

Any comment:	-

Data / Parameter:	$\mathbf{M_{comp,\,y}}$
Data unit:	tons
Description:	Total quantity of compost produced in year y
Source of data to be used:	Aggregated value of daily record by INTOL-JPI
Value of data applied for the purpose of calculating expected emission reductions in section B.5	70’000 tons
Description of measurement methods and procedures to be applied:	The compost produced will be packed in bags weighting 50 kgs. Bags will be counted everyday and the result aggregated yearly
QA/QC procedures to be applied:	The result will be cross checked with sales invoices
Any comment:	-

Data / Parameter:	$\mathbf{EF_{comp,\,N2O}}$
Data unit:	tN_2O/tcompost
Description:	Emission factor for nitrous oxide emissions from the composting process
Source of data to be used:	The methodology AM0025 (Ver. 11) on page 11 gives the default value to be used
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.000043 (or 0.043 kg N_2O per ton compost produced)
Description of measurement methods and procedures to be applied:	Monitored annually
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	**$S_{a,y}$**
Data unit:	%
Description:	Share of the waste that degrades under anaerobic conditions in the composting plant during year y
Source of data to be used:	-
Value of data applied for the purpose of calculating expected emission reductions in section B.5	2%
Description of measurement methods and procedures to be applied:	Statistically significant
QA/QC procedures to be applied:	O2-measurement-instrument will be subject to periodic calibration (in accordance with stipulation of instrument-supplier). Measurement itself to be done by using a standardized mobile gas detection instrument. A statistically significant sampling procedure will be set up that consists of multiple measurements throughout the different stages of the composting process according to a predetermined pattern (depths and scatter) on a weekly basis.
Any comment:	-

Data / Parameter:	**$S_{OD,y}$**
Data unit:	-
Description:	Number of sample with oxygen deficiency (i.e. oxygen content below 10%)
Source of data to be used:	Oxygen measurement device
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	Statistically significant

QA/QC procedures to be applied:	O2-measurement-instrument will be subject to periodic calibration (in accordance with stipulation of instrument-supplier). Measurement itself to be done by using a standardized mobile gas detection instrument. A statistically significant sampling procedure will be set up that consists of multiple measurements throughout the different stages of the composting process according to a predetermined pattern (depths and scatter) on a weekly basis.
Any comment:	

Data / Parameter:	**$S_{total, y}$**
Data unit:	-
Description:	Number of samples
Source of data to be used:	Oxygen measurement device
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Statistically significant
QA/QC procedures to be applied:	O2-measurement-instrument will be subject to periodic calibration (in accordance with stipulation of instrument-supplier). Measurement itself to be done by using a standardized mobile gas detection instrument. A statistically significant sampling procedure will be set up that consists of multiple measurements throughout the different stages of the composting process according to a predetermined pattern (depths and scatter) on a weekly basis.
Any comment:	Total number of samples taken per year, where $S_{total,y}$ should be chosen in a manner that ensures estimation of $S_{a,y}$ with 20% uncertainty at 95% confidence level. To determine the oxygen content during the process, project participants shall measure the oxygen content according to a predetermined sampling scheme and frequency. These measurements should be undertaken for each year of the crediting period and recorded each year.

Project emissions parameters for LFG flaring

Data / Parameter:	**$fv_{CH4,h}$**
Data unit:	-
Description:	Volumetric fraction of methane in the exhaust gas in the hour
Source of data to be used:	Measurement by project participants using a continuous gas analyzer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Ensure that the same basis (dry or wet) is considered for this measurement and the measurement of the volumetric flow rate of the residual gas ($FV_{RG,h}$) when the residual gas temperature exceeds 60 ºC
QA/QC procedures to be applied:	Analysers must be periodically calibrated according to the manufacturer.s recommendation. A zero check and a typical value check should be performed by comparison with a standard certified gas.
Any comment:	For the sake of simplification according to the “tool to determine project emissions from flaring gases containing methane” project participant will only measure the methane content of the residual gas and consider the remaining part as N_2

Data / Parameter:	**$FV_{RG,h}$**
Data unit:	m^3/h
Description:	Volumetric flow rate of the residual gas in dry basis at normal conditions in the hour h
Source of data to be used:	Measurement by project participants using a flow meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Ensure that the same basis (dry or wet) is considered for this measurement and the measurement of volumetric fraction of all components in the residual gas ($fv_{i,h}$) when the residual gas temperature exceeds 60 ºC

QA/QC procedures to be applied:	Flow meters are to be periodically calibrated according to the manufacturer.s recommendation.
Any comment:	

Data / Parameter:	**T°**
Data unit:	°C
Description:	Temperature of exhaust gases from the landfill
Source of data to be used:	Project owner will read the value
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Value recorded instantly by project owner
Description of measurement methods and procedures to be applied:	Measure the temperature of the exhaust gas stream in the flare by a Type N thermocouple. A temperature above 500 ºC indicates that a significant amount of gases are still being burnt and that the flare is operating
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	**Other flare operation parameters**
Data unit:	-
Description:	This should include all data and parameters that are required to monitor whether the flare operates within the range of operating conditions according to the manufacturer’s specifications including a flame detector in case of open flares.
Source of data to be used:	Project owner will control and record values
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Value recorded instantly by project owner
Description of measurement methods and procedures to be applied:	Measurement methods will be provided by suppliers of equipments

QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$\eta_{flare, h}$
Data unit:	%
Description:	Flare efficiency per hour of the LFG flaring unit
Source of data to be used:	Measurement device provided by technology provider
Value of data applied for the purpose of calculating expected emission reductions in section B.5	90 (UNFCCC methodological "Tool to determine project emissions from flaring gases containing methane")
Description of measurement methods and procedures to be applied:	The default value is chosen based on the "Tool to determine project emissions from flaring gases containing methane"
QA/QC procedures to be applied:	
Any comment:	

Project emissions parameters for electricity consumption on site

Data / Parameter:	EG_y
Data unit:	MWh
Description:	the amount of electricity generated on and on-site fossil fuel generator or consumed from the grid as a result of the project activity
Source of data to be used:	Electricity meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	40
Description of measurement methods and procedures to be applied:	Reading the electricity meter and aggregating the output yearly

QA/QC procedures to be applied:	The electricity meter will be constantly tested and maintained to ensure its accuracy.
Any comment:	-

Data / Parameter:	**CEF_{elec}**
Data unit:	tCO_2e/MWh
Description:	Carbon emissions factor for the electricity consumption in the project activity
Source of data to be used:	Extracted from the registered project N#3841 on the UNFCCC website: http://cdm.unfccc.int/Projects/DB/AENOR1278677451.53/view, retrieved on June 14, 2011
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.68
Description of measurement methods and procedures to be applied:	The National Control Center for energy production and distribution of Nigeria update regularly the emission factor. INTOL-JPI will check on regular basis, at least once per year before the verification that they have up to date information about the emission factor
QA/QC procedures to be applied:	-
Any comment:	-

<u>Leakage emissions parameters</u>

Data / Parameter:	**$NO_{vehicle,i,y}$**
Data unit:	-
Description:	Number of vehicles for transport with similar loading capacity per year
Source of data to be used:	INTOL-JPI records (counting)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	(see table below)

Year	**$NO_{vehicke, MSW}$**	**$NO_{vehicle, comp.}$**
2012	109’500	2’433
2013	109’500	2’433
2014	109’500	2’433
2015	109’500	2’433
2016	109’500	2’433
2017	109’500	2’433

		2018	109’500	2’433
Description of measurement methods and procedures to be applied:	Aggregation of trucks’ counting			
QA/QC procedures to be applied:	Cross-check records with quantity of waste treated and compost produced			
Any comment:	-			

Data / Parameter:	**$DT_{i,y}$**
Data unit:	km
Description:	Average distance travelled by vehicles in the year y
Source of data to be used:	Estimate by INTOL-JPI
Value of data applied for the purpose of calculating expected emission reductions in section B.5	(see table below)
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	Cross-check records with quantity of waste treated and compost produced
Any comment:	-

Year	**DT_{MSW}**	**$DT_{comp.}$**
2012	30	35
2013	30	35
2014	30	35
2015	30	35
2016	30	35
2017	30	35
2018	30	35

Data / Parameter:	**$VF_{cons, i}$**
Data unit:	l/km
Description:	Vehicles fuel (diesel) consumption
Source of data to be used:	Value from the trucks’ suppliers
Value of data applied for the purpose of	0.33

calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	Values will be cross-checked with fuel consumption invoices
Any comment:	-

B.7.2. Description of the monitoring plan:

INTOL-JPI is the owner and operator of the project. As such it will be fully responsible for the monitoring of the project. The monitoring of this consist of making sure the project is up and running technically, but also that indicators/monitoring parameters described in this PDD are measured on regular basis and results stored to be made available to the DOE during the yearly verification. The INTOL-JPI's Operations Manager for the Apa site will be responsible for the CDM monitoring of the project and will have in his team a CDM Focal Point.

The Focal Point will collect all data on the required frequency and double-check them when possible and report to the Operations Manager. When an external expertise is needed to collect monitoring data, the Operations Manager will contract companies with sufficient expertise to implement the task under the assistance/supervision of the CDM Focal Point.

Data collection and archiving is organized by the Focal Point. Each described parameter is recorded in an appropriate physical log-book but also electronically in at least three different computers. Physical documents will be scanned to have and save electronic copies whereas electronic documents will be printed out to be stored in physical log-books. All relevant data is transferred and aggregated each month in a separate monitoring file. Review of figures is done monthly between Focal Point and the Operations Manager. Quarterly however, the Focal Point and the Operations Manager will review again figures with the Chief Executive Officer. All information generated under the monitoring protocol will be kept for 2 years after the end of crediting period or the last issuance of CERs for this project activity.

To make sure the whole facility is working perfectly, MUT, the Austrian composting technology provider will run the project for six months during which they will train the staff of INTOL-JPI. If it is further necessary they will also welcome the staff in Austria for further training. SCS

Engineers, the landfill engineering company will also participate in the training and capacity building of INTOL-JPI staff responsible for the landfill capturing and flaring.

The table below summarizes how monitoring of important parameters will be conducted:

Parameter	Description	Measuring procedure	Monitoring Frequency	Control/supervision	Documentation
W_x	Amount of waste prevented from disposal	Incoming trucks will be weighted and values recorded. A weighting bridge will be installed at the entrance of the facility	Daily	Focal Point supervises the work of weight recorders and the Operations Manager contract quarterly a company to calibrate the weighting device	Daily aggregates stored by the Focal Point on soft and hard copy
$P_{n,j,x}$	Waste fraction	Waste sampling will be done by a competent company	Quarterly	Focal Point will supervise the company contracted by the Operations manager	Report from the company contracted
$M_{comp,y}$	Quantity of compost produced	Compost produced will be weighted (stored in bags of 50 kilograms) and cross-checked by trucks weighted with the weighting bridge	Daily	Focal Point supervises the work of weight recorders and the Operations Manager contract quarterly a company to calibrate the weighting device	Daily aggregates stored by the Focal Point on soft and hard copy
$S_{OD,y}/S_{total,y}$	Measuring oxygen contain during composting	MUT, the technology provider will supply the measuring device and train employees to use it	Daily	Focal Point will supervise the measuring operations and make sure the device is calibrated regularly by MUT	Daily aggregates stored by the Focal Point on soft and hard copy
$fv_{CH4,h}$	Volumetric fraction of methane in the exhaust gas	The gas analyzer is installed and records instantly the fraction methane in the gas	Continuously	Data is automatically recorded and Focal Point check daily recorded data. Focal Point also make sure the gas analyzer is calibrated or replaced regularly	Daily aggregates stored by the Focal Point on soft and hard copy
$FV_{RG,h}$	Volumetric flow rate of the exhaust gas	The flow meter is installed and records instantly the flow rate	Continuously	Data is automatically recorded and Focal Point check daily recorded data. Focal Point also make sure the flow is calibrated or replaced regularly	Daily aggregates stored by the Focal Point on soft and hard copy
T°	Temperature of the exhaust gas	Thermocouples display value instantly and values are recorded	Continuously	Data is automatically recorded and Focal Point check daily recorded data.	Daily aggregates stored by the Focal Point on

Parameter	Description	Measuring procedure	Monitoring Frequency	Control/supervision	Documentation
	from LFG	and checked continuously everyday		Focal Point also make sure thermocouples are calibrated or replace every year	soft and hard copy
EG_y	Electricity consumed on site	The electricity meter records continuously the energy consumed	Monthly	Data is automatically recorded and Focal Point check daily recorded data. Focal Point also make sure the electricity meter is calibrated regularly	Monthly aggregates stored by the Focal Point on soft and hard copy
$F_{cons, y}$	Fuel consumption on site	Fuel consumption is recorded and cross checked with fuel invoices	Monthly	Data is automatically recorded and Focal Point check daily recorded data.	Monthly aggregates stored by the Focal Point on soft and hard copy
$VF_{cons,i}$	Vehicles fuel consumption	Fuel consumption is recorded and cross checked with fuel invoices	Monthly	Data is automatically recorded and Focal Point check daily recorded data.	Monthly aggregates stored by the Focal Point on soft and hard copy

B.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies):

Date of completion: 15.06.2011

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SECTION C. Duration of the project activity / crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

01.10.2011

C.1.2. Expected operational lifetime of the project activity:

25 years

C.2. Choice of the crediting period and related information:

C.2.1. Renewable crediting period:

C.2.1.1. Starting date of the first crediting period:

01.01.2012 or whenever the project is registered

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable

C.2.2.2. Length:

Not applicable

SECTION D. Environmental impacts

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

A thorough environmental impact assessment (EIA) has been conducted by Unilag Consult (University of Lagos Consultancy Services). Unilag Consult works with the standards set up by the Federal Ministry of Environment of Nigeria. The EIA touches all the points and set up guidelines that will be followed by INTOL-JPI during implementation and operation of the project to avoid negative impact on the environment. The full EIA is available for the DOE during validation of the project.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

See D.1.

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

As part of the project's impact assessment and acceptance by the community, Unilag Consult and INTOL-JPI organized a stakeholder consultation on October 12, 2008. All the traditional Chiefs of the Apa locality were formally invited and took part to the meeting. Gathering all the traditional Chiefs together is a big challenge and is as well very representative because they are the right person to give the view of the villagers. SCS Engineers, the landfill designer also attended the meeting.

E.2. Summary of the comments received:

See E.3.

E.3. Report on how due account was taken of any comments received:

This information is also available as Appendix 3 of the EIA report

Stakeholders Meeting Held on the 12th October 2008 at the Palace of the Oba of Apa Kingdom, Badagry Lagos State

Attendance

1. Hrm Oba Oyekan Adekanmi Ilufemiloye Ajose Possi III	Oba Of Apa Kingdom
2. High Chief D.A Wusu	Otunba Of Apa Kingdom
3. Chief Stephen Semako Hunfe	Chieftain Of Apa Kingdom
4. Chief Babatunde Okoya	Chieftain Of Apa Kingdom
5. Chief Adeniyi Okoya	Chieftain Of Apa Kingdom
6. Chief Emma. A. Olatunji	Chieftain Of Apa Kingdom (Baale)
7. Bamigbose Sam, Esq	Chieftain Of Apa Kingdom
8. Ms Lola Ejiwunmi	CEO INTOL-JPI Environ Management Systems
9. Mr. Oladele Shekete	INTOL-JPI Environ Management Sytems
10. Mr Deji Fawole	SCS Engineers U.S.A.
11. Prof. Dele Olowokudejo	Unilag Consult EIA Team
12. Dr. A.S.O. Sineye	Unilag Consult EIA Team
13. Dr. Luqman Adeoti	Unilag Consult EIA Team

The meeting commenced at 10.58am by the introduction of all present by Ms Lola Ejiwunmi CEO of INTOL-JPI Environs Management Systems, she stated the purpose of the project is environmental sustainability and waste to wealth. She further explained that the collected waste will be adequately sorted to acquire all available valuables from the waste for economic purposes and the remnant processed to near soil component according to FEPA/LAWMA guidelines of near soil component before been deposited into the landfill to sustain the environment and avoid ground and surface water contamination and land degradation. The proposed life span of the Apa Integrated Waste Management project is twenty five years (25 years). In addition she stated that the landfill design and operation will have adequate technical expertise support from an American based company-SCS Engineers.

The project will have both economical and social-infrastructural benefits which include:

1. Sales of recyclable products

2. Generation of compost which will be further mixed with generated sludge from the sewage plant to improve its organic constituents for agricultural uses

3. Possible generation of electricity both from the wind power, solar and derived waste fuel for the electrification of the site. Power generation shall be supplemented with landfill gases using gas turbines which will be supplied for public use when the landfill is in full operation

4. Provision of access roads to the landfill site

5. Employment of indigenes for the construction and operation of the facility.

Mr. Deji Fawole representing SCS Engineers, the landfill engineering firm from the United States of America provided additional clarifications on the operational principles of the sanitary landfill, he stated that a high ground will be most appropriate for the landfill site to avoid contamination of the ground water, he said his company design an engineered landfill that will have the optimal capacity to collect the leachate. The plastic liners in addition to clay can also be use as landfill liner to provide a low permeable
barier to prevent contamination by leachates migrating downward into underlying INTOL-JPI EIA for the Proposed Integrated Waste Management Project 70 aquifers and through the underlying geological formation. A leachate collection system of pipes will be installed to direct all generated leachate to a sewage plant for further processing.

A system of pipes that will collect the landfill gas will be installed. Daily compaction of waste and covering of the waste with layers of soil and treated sludge will retain the gases and protect the environment from pollution natural. Landfill gas may not be available for power generation for at least 18 months to 2 years.

Landfill cells will be engineered in stages and the end use for the landfill sites include such as construction of residential or commercial building, football fields, recreational parks etc. the height of the landfill depends on the agreed end use proposed by the community.

Mr. Babatunde Okoya said that there are health hazard associated with landfill and mentioned example of landfills in America with aftermath health hazards, Mr Fawole explained that proper landfill design has just been put in place in America as against the landfill designs in 1950's and 60's in America which were without liners, also poor legislation and large generation of hazardous waste contributed to health hazards associated with the landfills. He said the proposed technology for the APA landfill design is what is now been carried out and adopted in America, he further explained that control measures such as covering the waste daily with layer of soil will protect the environment from pollution and contamination, also monthly water sampling using control wells will be used as measure to checkmate leachate seepage.

Prof. Dele Olowokudejo further sustained Mr. Fawole's point that the monitoring wells will monitor contamination of the environment and said the EIA team from University of Lagos will generate baseline data's that will be forwarded to the Federal Environment Protection Agency (FEPA) and Lagos State Environmental Protection Agency (LASEPA) for monitoring.

Dr. Lukman stated that use of geophysical survey will also help in monitoring contamination even without digging of monitoring wells and proper clay or rubber liner will protect the environment and avoid peculation.

Mr. Adeniyi Okoya enquired on how the proponent (INTOL-JPI Environ Management systems) intends to control air pollution; Mr. Fawole explained that daily covering of the waste with a soil layer will control air pollution he also mentioned that the close system method of gas flaring will be adopted and this will also prevent air pollution, he stated further that the flaring is necessary to avoid fire outbreak from excess gas generated.

Mr. Babatunde Okoya asked about the proponent's end use plan for the landfill and Ms Lola Ejiwunmi explained that the agreement with the Lagos State Government gave an option of first refusal by INTOL-JPI Environ Management systems at the end of 25 years.
Mr. Babatunde Okoya kicked against these and said the community should be given the first priority and stated that the land-use act empowers them and buttressed his point by citing the case between the Federal Government and the Lagos State Government, also he stated that the community will require from the technical expert a documented assurance stating the health and safety of their indigenes and environmental sustainability for 10 years.

Dr. Soneye explained that the issue of the land-use act between the Lagos State Government and the Federal Government is political and not in the interest of the community, he stated that its better Lagos State Government, INTOL-JPI Environ Management systems and the Community agree on the end-use, he also mentioned that the EIA will cover all the rules and regulations with regards to the health and safety of their indigenes and environmental sustainability which are the main priorities of the study.

Mr. Adeniyi Okoya stated that the APA community is a friendly community and also willing for development by embracing investors, High Chief Wusu stated that further stakeholders meeting will be necessary for the community leaders to consult with their indigenes and thanks the visiting team.

Prof. Dele Olowokudejo requested for the commencement of EIA study and after a brief recess consultation between the OBA and his chieftain, Mr Adeniyi thanks the team on behalf of OBA and the chieftain of the community and stated that the OBA as therefore granted the commencement of the EIA.

Prof. Dele Olowokudejo stated that the baseline data will be in two stages, with the first to be carried out in the raining season for one week and the second stage during the dry season.

Mr. Adeniyi Okoya said the community will be willing and happy to assist the team in any capacity.

Mr. Bamgbose who came late was introduced and the meeting came to an end at exactly 1.37 PM.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	INTOL-JPI Environ Management Systems
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

NOT APPLICABLE