Monitoring report form
(Version 04.0)

MONITORING REPORT	
Title of the project activity	Uganda Municipal Waste Compost Programme CPA 1: Municipal waste composting Project for Jinja Municipality CPA 2: Municipal waste composting Project for Fort Portal Municipality CPA 3: Municipal waste composting Project for Kabale Municipality CPA 4: Municipal waste composting Project for Kasese Municipality CPA 5: Municipal waste composting Project for Lira Municipality CPA 6: Municipal waste composting Project for Mbale Municipality CPA 7: Municipal waste composting Project for Mukono Municipality CPA 8: Municipal waste composting Project for Soroti Municipality
Reference number of the project activity	2956
Version number of the monitoring report	4
Completion date of the monitoring report	13/08/2014
Registration date of the project activity	12/04/2010
Monitoring period number and duration of this monitoring period	First monitoring period. Duration CPA 1: 12/04/2010 – 30/04/2012 (first and last days included) Duration CPA 2 to CPA 8: 19/04/2011 – 30/04/2012 (first and last days included)
Project participant(s)	**Uganda:** National Environment Management Authority (NEMA) **Netherlands:** Netherlands' Ministry of Infrastructure and the Environment (IenM) **Germany:** BASF SE; Kfw **Austria:** Kommunalkredit Public Consulting GmbH **Belgium:** Kingdom of Belgium – Walloon Region: Walloon Air and Climate Agency; Bruxelles Environment –IBGE **Canada:** Government of Canada – Ministry of Foreign Affairs and International Trade **Japan:** Daiwa Securities Capital Markets Co. Ltd; Fujifilm Corporation; Idemitsu Kosan Co., Ltd,; JX Nippon Oil and Energy Corporation; The Okinawa Electric Power Corporation, Incorporated

	Spain: EDP Energias de Portugal, S.A.; ENDESA Generation, S.A.; GAS NATURAL SDG, S.A.; Hidroelectrica del Cantabrico, S.A.L Kingdom of Spain –Ministry of Agriculture, Food and Environment and Ministry of Economy and Competitiveness **Sweden:** Goteborg Energi AB **Switzerland:** Schweizerische Ruckversicherungsgesellschafts AG (Swiss RE) **Italy:** Government of Italy – Ministry for the Environment, Land, and Sea **Luxembourg:** Government of Luxembourg – Ministry of Sustainable Development and Infrastructure **Norway:** Statkraft Carbon Invest AS; Statoil ASA **Denmark:** Danish Ministry of Climate and Energy – Danish Energy Agency; DONG Naturgas A/S; Nordjysk Elhandel A/S; Maersk Olie og Gas A/S **Finland:** Ruukki Metals Oy
Host Party(ies)	Uganda
Sectoral scope and selected methodology(ies), and where applicable, applied standardized baseline(s)	Sectoral Scope 13 Methodology AMS-III.F.ver.6 – Avoidance of methane emissions trough controlled biological treatment of biomass.
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	CPA 2956-0001: 13,944 CPA 2956-0002: 5,258 CPA 2956-0003: 2,235 CPA 2956-0004: 2,535 CPA 2956-0005: 5,002 CPA 2956-0006: 4,929 CPA 2956-0007: 5,090 CPA 2956-0008: 4,731
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	CPA 2956-0001: 7,944 CPA 2956-0002: 892 CPA 2956-0003: 1,416 CPA 2956-0004: 894 CPA 2956-0005: 812 CPA 2956-0006: 2,091 CPA 2956-0007: 1,302 CPA 2956-0008: 1,198

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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The purpose of the project activity is to avoid methane emissions from Municipal waste landfill by undertaking composting of organic municipal solid waste and using the organic matter in wastes as humus for soil conditioning and plant growth. Solid Waste Management is an important responsibility of the Municipalities. Municipal solid wastes collected in the municipalities was primarily landfilled, as a result of which, significant amount of methane was emitted to the atmosphere.

The technology employed for waste management in the programme is the aerobic windrow based composting.

The following infrastructure is provided at the site:

- A barrier at the boundaries of the site and a gate at entry to avoid any unauthorized entry to site.
- A defined composting area (windrow bays) with a roof. The windrow composting is undertaken within this area and is not affected by storm water.
- An office block.
- Equipment consisting of a tractor mounted front end loader with other attachments, monitoring probes such as temperature probe, a weighing scale and a simple set of sieves for compost sieving.

The roofing cover on the composting platform is to avoid run-off and excess leachate generation due to rainwater percolation through the wastes. Nevertheless, leachate is formed from the decomposing waste which is collected in a leachate tank. The leachate is used for wetting the windrows to provide moisture.

CPA 1:
The construction works of the composting plant in Jinja started on 30/10/2007, with designed capacity of 70 tons per day. The plant was commissioned on 07/08/2009 and waste was first delivered on site on 02/09/2009.

CPA 2:
The construction works of the 70 tons per day (TPD) composting plant in Fort Portal started on 30/10/2007, and the plant was commissioned in 12/08/2009.

CPA 3:
The construction works of the 70TPD composting plant in Kabale started on 30th October 2007, and the plant was commissioned in 07/09/2010 and waste was first delivered on site on 21st September 2010.

CPA 4:
The construction works of the 70TPD composting plant in Kasese started on 30/10/2007, and the plant was commissioned in 13/08/2009. The first fresh waste delivery to the composting site was done in January 2010.

CPA 5:
The construction works of the composting plant in Lira started on 30/10/2007 with designed capacity of 70 tons per day. The plant was commissioned on 04/08/2009. The first fresh waste delivery to the composting site was done in January 2010.

CPA 6:
The construction work of the composting plant in Mbale started on 30/10/2007 with design capacity of 70 tons per day. The plant was commissioned on 6/08/2009. The first fresh waste delivery to the composting site was done in February 2010 after undergoing initial training.

CPA 7:
The construction works of the composting plant in Mukono started on 30/10/2007, with designed capacity of 70 tons per day (TPD). The plant was commissioned on 10/08/2009 and waste was first delivered on site on 14/02/2010.

CPA 8:
The construction works of the composting plant in Soroti started on 30/10/2007 with design capacity of 70 tons per day (TPD). The plant was commissioned on 05/08/2009. The first fresh waste delivery to the composting site was done in January 2010 after undergoing initial training.

The emission reductions generated during this monitoring period for the are calculated to be:
CPA 2956-0001: 7,944 tCO2e
CPA 2956-0002: 892 tCO2e
CPA 2956-0003: 1,416 tCO2e
CPA 2956-0004: 894 tCO2e
CPA 2956-0005: 812 tCO2e
CPA 2956-0006: 2,091 tCO2e
CPA 2956-0007: 1,302 tCO2e
CPA 2956-0008: 1,198 tCO2e

A.2. Location of project activity

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The boundaries of the programme are the host country Uganda. The location of each CPA included in this monitoring period are:

CPA 1: Municipal waste composting Project for Jinja Municipality

Parameters	Details
Name of the Urban Local Body	Jinja
Type (town, municipal, city Council)	Municipal Council
Latitude and Longitude	0.450486, 33.233444
District	Jinja
Host Country	Uganda

Table 1a: Location Details of Jinja Municipal Council

CPA 2: Municipal waste composting Project for Fort Portal Municipality
Fort Portal Municipal Council is located in the Western part of the country, at about 500 km from the Ugandan Capital of Kampala. The composting facility is located at Kiteere Village, Kibimba Parish in West division of Fort Portal Town.

Parameters	Details
Name of the Urban Local Body	Fort Portal
Type (town, municipal, city Council)	Municipal Council
Latitude and Longitude	0.686833, 30.2685
District	Fort Portal
Host Country	Uganda

Table 2b: Location Details of Fort Portal Municipal Council

CPA 3: Municipal waste composting Project for Kabale Municipality
Kabale is at a distance of about 422 km from the Ugandan Capital of Kampala. The composting facility is located at Kirengyere Village, Nyabushabi Parish in Kyanamira Sub-County, Kabale District. The location of the project activity is summarized in the table below.

Parameters	Details
Name of the Urban Local Body	Kabale
Type (town, municipal, city Council)	Municipal Council
Latitude and Longitude	1.2533, 30.0261
District	Kabale
Host Country	Uganda

Table 3c: Location Details of Kabale Municipal Council

CPA 4: Municipal waste composting Project for Kasese Municipality
The project activity is located in Kasese Municipal Council, Kasese District. Kasese is at a distance of about 435km from the Ugandan Capital of Kampala. The composting facility is located at Railway Cell, Kasese Ward in Busonga County of Kasese Municipality.

Parameters	Details
Name of the Urban Local Body	Kasese
Type (town, municipal, city Council)	Municipal Council
Latitude and Longitude	0.156333, 30.086
District	Kasese
Host Country	Uganda

Table 4d: Location Details of Kasese Municipal Council

CPA 5: Municipal waste composting Project for Lira Municipality
The project activity is located in Lira Municipal Council, Lira District. Lira is located in the central part of Uganda, at the North of Lake Kwania. Lira is at a distance of about 300 km from the Ugandan Capital of Kampala. The composting facility is located at Aler District farm located approximately 12 kilometers from Lira Municipality. Table 1 below summarizes the location details of Lira Municipality.

Parameters	Details
Name of the Urban Local Body	Lira
Type (town, municipal, city Council)	Municipal Council
Latitude and Longitude	2.3466, 32.9321
District	Lira
Host Country	Uganda

Table 5e: Location Details of Lira Municipal Council

CPA 6: Municipal waste composting Project for Mbale Municipality
The project activity is located in Mbale Municipal Council. Mbale is located in Eastern part of Uganda at the boarder of Mount Elgon National Park, which lies itself across the border with Kenya. Mbale is at a distance of about 220 km (via Tirinyi) from Ugandan Capital of Kampala. The map of Uganda below shows the location of Male. The composting facility is located at in Doko Cell, Namatala Ward (Parish) Mbale Municipal Council.

Parameters	Details
Name of the Urban Local Body	Mbale
Type (town, municipal, city Council)	Municipal Council
Latitude and Longitude	1.0805, 34.1493
District	Mbale
Country	Uganda

Table 6f: Location Details of Mbale Municipal Council

CPA 7: Municipal waste composting Project for Mukono Municipality
The project activity is located in Mukono Municipal Council, Mukono District. Mukono is located in the central part of the country, in the vicinity of the Ugandan Capital of Kampala or at about 20 km from there. Mukono District is boarded by Lake Victoria to the South and Jinja District to the East. The composting facility is located at in Katikolo Village, Mukono Municipal Council, at about 7 Km south to the Central Business Centre of Mukono.

Parameters	Details
Name of the Urban Local Body	Mukono
Type (town, municipal, city Council)	Municipal Council
Latitude and Longitude	0.3032, 32.7265
District	Mukono
Host Country	Uganda

Table 7g: Location Details of Mukono Municipal Council

CPA 8: Municipal waste composting Project for Soroti Municipality

The project activity is located in Soroti Municipal Council. Soroti is located in Uganda. Soroti District is located in the central part of the country, on the Western part of the Lake Kyoga, and at about 250 km from the Ugandan Capital of Kampala. The composting facility is located at in Aminit Village within Soroti Municipal Council, at about 5 Km from the Central Business District of Soroti.

Parameters	Details
Name of the Urban Local Body	Soroti
Type (town, municipal, city Council)	Municipal Council
Latitude and Longitude	1.7378, 33.6372
District	Soroti

Country	Uganda

Table 8h: Location Details of Soroti Municipal Council

A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Uganda (host)	National Environment Management Authority (NEMA)- Public Entity	No
Netherlands	International Bank of Reconstruction and Development as Trustee of the Community Development Carbon Fund (CDCF) - Public entity	Yes
Germany	BASF SE; KfW	No
Austria	Kommunalkredit Public Consulting GmbH	No
Belgium	Kingdom of Belgium – Walloon Region: Walloon Air and Climate Agencyl; Bruxelles Environment - IBGE	Yes
Japan	Daiwa Securities Capital Markets Co. Ltd; Fujifilm Corporation; Idemitsu Kosan Co., Ltd JX Nippon Oil & Energy Corporation The Okinawa Electric Power Corporation, Incorporated	No
Spain	EDP Energias de Portugal, S.A.; ENDESA Generation, S.A.; GAS NATURAL SDG, S.A.; Hidroelectrica del Cantabrico, S.A; Kingdom of Spain –Ministry of Agriculture, Food and Environment and Ministry of Economy and Competitiveness	Yes
Sweden	Goteborg Energi AB	No

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Switzerland	Schweizerische Ruckversicherungsgesellschafts AG (Swiss RE)	No
Italy	Government of Italy – Ministry for the Environment, Land, and Sea	Yes
Luxembourg	Government of Luxembourg – Ministry of Sustainable Development and Infrastructure	Yes
Norway	Statkraft Carbon Invest AS; Statoil ASA	No
Denmark	Danish Ministry of Climate and Energy – Danish Energy Agency; DONG Naturgas A/S; Nordjysk Elhandel A/S; Maersk Olie og Gas A/S; Aalborg Portland A/S	Yes
Finland	Ruukki Metals Oy	No

A.4. Reference of applied methodology and standardized baseline

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Approved Methodology for small-scale for CDM Project AMS III F "*Avoidance of Methane emissions through controlled biological treatment of biomass*" Version 6, Scope 13, EB 41

"Tool to calculate baseline, project and/or leakage emissions from electricity consumption" version 01.

"Tools to determine methane emissions avoided from disposal of waste at a solid waste disposal site" version 4.0.

"Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" version 02.

A.5. Crediting period of project activity

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- CPA 1: 12/04/2010 – 11/04/2017 (Renewable)
- CPA 2 to CPA 8: 19/04/2011 – 18/04/2018 (Renewable)

A.6. Contact information of responsible persons/ entities

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Zijun Li
GCCCF
The World Bank Group
1818 H Street, NW. 20433
Washington DC, U.S.A
Tel: 001-202-458-7658

World Bank is a project participant of the project activity.

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

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In general, there has not been any event during the monitoring period that affects the applicability of the methodology in any of the CPAs requesting emission reductions. Implementation of the CPAs has been performed as follows:

CPA 1:
The construction works of the composting site started on 30/10/2007. The plant was commissioned on 07/08/2009. The first delivery of solid waste to the composting plant was on 02/09/2009. The project activity was registered on the 12/04/2010, as the first CPA of the Uganda Municipal Waste Compost program.

CPA 2:
The construction works of the composting site started on 30/10/2007. The plant was commissioned in 12/08/2009. The project activity was registered on the 19/04/2011, and this is the first monitoring period.

CPA 3:
The construction works of the composting site started on 30/10/2007. The plant was commissioned in September 2010. The first delivery of solid waste to the composting plant was on 21st September 2010. The project activity was registered on the 19/04/2011, and this would be the first monitoring period.

CPA 4:
The construction works of the composting site started on 30/10/2007. The plant was commissioned in 13/08/2009. The project activity was registered on the 19/04/2011, and this is the first monitoring period.

CPA 5:
The construction works of the composting site started on 30/10/2007. The plant was commissioned in 4/08/ 2009. The project activity was registered on the 19/04/2011, and this would be the first monitoring period.

CPA 6:
The construction work of the composting site started on 30/10/2007. The plant was commissioned in 6/08/2009. The project activity was registered on 19/04/2011, and this would be the first monitoring period.

CPA 7:
The construction works of the composting site started on 30/10/2007. The plant was commissioned in 10/08/2009. The project activity was registered on the 19/04/2011, and this is the first monitoring period.

CPA 8:
The construction works of the composting site started on 30/10/2007. The plant was commissioned in 05/08/2009. The project activity was registered on the 19/04/2011, and this is the first monitoring period.

Table 2 below summarizes the equipment, services and facilities at the sites.

	Item of work	**Specification**
A	• **Civil Works**	
	Aerobic Composting Yard	The composting yard with concrete flooring, divided into 6 windrow bays. It is roofed with iron sheets. Designed for 70TPD. The composting yard drains into the leachate tank.
	Office Block and toilet facilities	An office building is provided where the data files are kept. The toilet facilities for both women and men are provided. Showering/ bathing areas are also provided.
	Water storage tanks	Two 10,000 liters fresh water storage tanks are provided for rainwater harvesting. The water is used to water the windrows, supplementing leachate. It is also used by the site operatives.
	Leachate tank	A leachate tank is provided to collect leachate draining from the decomposing organic waste.
B	**Equipment**	
	Wheel Loader	Fly Wheel Power Net Power Out Put Minimum: 71 kw (96HP) SAE at

	Item of work	Specification
		rated Max Operating Weight: 7.425 Tons Bucket Capacity: 1.3 m^3
	Thermometer probe	Electrical Specifications: Transducer Type: K Thermocouple (NiCr-NiAL) Resolution: 1 ^0C Type: TP01 Range: -50 ^OC to 250 ^0C Apply range Any condition Error: 0 ^OC – 250^oC …..+- 1.5 ^0C
	Weighing Scale	Manufacturer: Salter Capacity: 200 kg
	Sieving machine	Specs: Manual sieving is undertaken using a wire mesh of 5mm square
	Leachate pump	Specs: Money Maker, Hip Pump Max. Suction depth 7m (23ft) Max pumping height 14m (46ft) Push water distance (flat ground) 200m (656 ft) Weight 4.5 kg.
	Standard box	A wooden cubic box measuring 0.5m is provided to measure the density of compost, and rejects.
C	**Services**	
	Water supply	Connection to the national water supply is available at the site.
	Electricity supply	The plant is connected to the grid. Electricity used to for lighting and supplying power to the computer and its accessories. There is no meter connection to the site.
D	**Other Facilities**	
	Landfill	A landfill site is operated to dispose off the rejects and other non-compostable material.

Table 2: Summary of Equipment at Composting Site

- The diagram below shows a simplified process flow of the activities at the composting site from the waste delivery at the gate to the time of compost maturity.

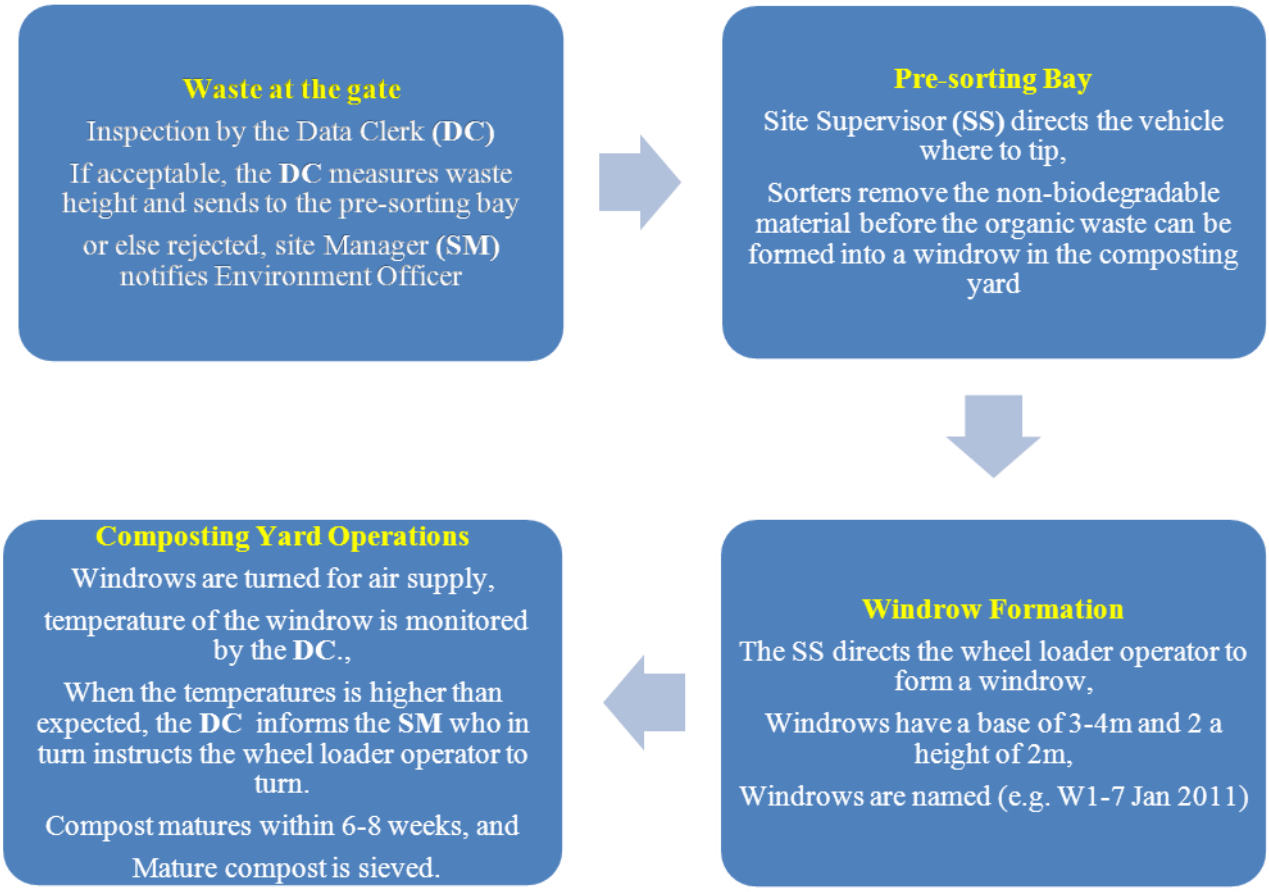

Figure 9: Process flow diagram for the composting activity

CPA 1:
During this monitoring period, the daily waste inputs are recorded to be on average 58.7 tons per day. The site operates for 6 days per week. There are no operations on public holidays. The compost plant operated for 620 days during this monitoring period from 12/04/2010 to 30/04/2012.

In this monitoring period, no overhaul was undertaken and there was no downtime or exchange of equipment.

The site operatives were trained over a period of six months (November 2009 to April 2010) to introduce the aspects of composting and monitoring and compliance with CDM requirements. The processes are captured in an operations manual, for which the operatives were trained. The manual lists the responsibilities of each personnel at the site and to the instruction to fulfil them. The training is a continuous activity based on need and any corrective action that is identifying during the monitoring of the project activities.

CPA 2:
During this monitoring period, the daily waste inputs are recorded to be on average 33.7 tons per day (TPD). The site operates for 6 days per week. There are no operations on public holidays. The compost plant operated for 296 days during this monitoring period from 19/04//2011 to 30/04/2012.

In this monitoring period, no overhaul was undertaken and there was no downtime or exchange of equipment.

The site operatives were trained over a period of six months (November 2009 to April 2010). The composting processes are captured in an operations manual, for which the operatives were trained. The manual lists the responsibilities of each personnel at the site and how to go about them. The training of the site operatives is continuous based on need and any corrective action that is identifying during the monitoring of the project activities.

CPA 3:

Over the monitoring period, the daily waste inputs are recorded to be on average 48.4 tons per day. The site operates for 6 days. There are no operations on public holidays. The site operatives were trained over a period of six months from November 2009 to April 2010. The operatives were also given a two weeks training in October 2010 into composting, monitoring and data management soon as the plant was commissioned. The composting processes are captured in an operations manual, for which the operatives were trained. The manual lists the responsibilities of each personnel at the site and how to go about them. The training of the site operatives is a continuous based on need and any corrective action that is identifying during the monitoring of the project activities.

This being the first monitoring period, the site operators were undergoing on-job training in order to familiarize with the monitoring requirements.

CPA 4:
During this monitoring period, the daily waste inputs are recorded to be on average 32.3TPD. The site operates for 6 days per week. There are no operations on public holidays. The compost plant operated for 256 days during this monitoring period from 19/04//2011 to 30/04/2012.

In this monitoring period, no overhaul was undertaken and there was no downtime or exchange of equipment.

The site operatives were trained over a period of six months (November 2009 to April 2010). The composting processes are captured in an operations manual, for which the operatives were trained. The manual lists the responsibilities of each personnel at the site and how to go about them. The training of the site operatives is continuous based on need and any corrective action that is identifying during the monitoring of the project activities.

CPA 5:
During this monitoring period, the daily waste inputs are recorded to be on average 28.04TPD. The site operates for 6 days per week. There are no operations on public holidays. The compost plant operated for 281 days during this monitoring period from 19/04//2011 to 30/04/2012.

In this monitoring period, no overhaul was undertaken and there was no downtime or exchange of equipment.

The site operatives were trained over a period of six months (November 2009 to April 2010). The composting processes are captured in an operations manual, for which the operatives were trained. The manual lists the responsibilities of each personnel at the site and the instructions on how to fulfil them. The training is a continuous activity based on need and any corrective action that is identifying during the monitoring of the project activities.

CPA 6:
During this monitoring period, daily waste inputs were recorded to be on average 62.3 TPD. The site operates for 6 days per week. There are no operations on public holidays. The compost plant operated for 314 days during this monitoring period from 19/04/2011 to 30/04/2012.

In this monitoring period, no overhaul was undertaken and there was no downtime or exchange of equipment.

The site operatives were trained over a period of six months (November 2009 to April 2010). The composting processes are captured in an operations manual, for which the operatives were trained. The manual lists the responsibilities of each personnel at the site and to the instruction to fulfil them. The training is a continuous activity based on need and any corrective action that is identifying during the monitoring of the project activities.

CPA 7:
During this monitoring period, the daily waste inputs are recorded to be on average 44 tons per day (TPD). The site operates for 6 days per week. There are no operations on public holidays. The compost plant operated for 305 days during this monitoring period from 19/04//2011 to 30/04/2012.

In this monitoring period, no overhaul was undertaken and there was no downtime or exchange of equipment.

The site operatives were trained over a period of six months (November 2009 to April 2010). The composting processes are captured in an operations manual, for which the operatives were trained. The manual lists the responsibilities of each personnel at the site and how to go about them. The training of the site operatives is continuous based on need and any corrective action that is identifying during the monitoring of the project activities.

CPA 8:
During this monitoring period, the daily waste inputs are recorded to be on average 34.21 tons per day (TPD). The site operates for 6 days per week. There are no operations on public holidays. The compost plant operated for 313 days during this monitoring period from 19/04//2011 to 30/04/2012.

In this monitoring period, no overhaul was undertaken and there was no downtime or exchange of equipment.

The site operatives were trained over a period of six months (November 2009 to April 2010). The composting processes are captured in an operations manual, for which the operatives were trained. The manual lists the responsibilities of each personnel at the site and to the instruction on how to fulfill them. The training is a continuous activity based on need and any corrective action that is identifying during the monitoring of the project activities.

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

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The following deviations were approved by the CDM EB on 16/06/2014 as part of PRC – 2956-001
- The waste characterization reports in all CPAs from 19/04/2011 to 30/04/2012 are missing. The results of the reports May and June 2012 are used for calculation purposes.
- The waste characterization reports from 12/04/2010 to 30/04/2012 for the first CPA Jinja, are missing. The values of the characterization reports for the following years have been used for calculations.
- The daily leachate production has been calculated using a rate of 0.091 m^3/ton, multiplied with the total waste delivery to the composting site as a conservative approach, as the initial monitoring procedure could not be applied during this monitored period. A new procedure has been put in place as part of the PRC to be followed on next monitoring periods.
- Aerobic condition of the windrows, regular turning, and compost produced were accepted as alternative means for determination of oxygen availability, due to the procurement delay for this monitored period for the oxygen meters.

The request, evidences and assessment files can be found online as part of PRC – 2956-001 at http://cdm.unfccc.int/PRCContainer/DB/prcp57211029/view

B.2.2. Corrections

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As part of PRC – 2956-001 corrections were made on the PoA-DD to include clarifications on parameters $CT_{y,comp}$, DAF_{comp}, $W_{x\ residual}$, $CEF_{electricity}$, $COD_{y,ww,runoff}$ and $MW_{he,y}$ to cater for its measurement for off-grid CPAs. Corrections were also made on CPA-DD 3 on parameter DOCj
For complete details on the corrections made please refer to PRC – 2956-001 at http://cdm.unfccc.int/PRCContainer/DB/prcp57211029/view

B.2.3. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

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Revision of the monitoring plan has been requested and has been approved by the CDM EB on 16/06/2014 as part of PRC – 2956-001 together with the approved changes to the PoA-DD. A summary of those changes is below:
- Alternative monitoring procedure for annual leachate generation
- Alternative measurement methods and QA/QC procedures for parameters F_{cons}, $P_{n,j,x}$, and $P_{n,j,x,residual}$

The revised files along with the assessment files can be found online at: http://cdm.unfccc.int/PRCContainer/DB/prcp57211029/view

B.2.4. Changes to project design of registered project activity

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Not Applicable.

B.2.5. Changes to start date of crediting period

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Not Applicable.

B.2.6. Types of changes specific to afforestation or reforestation project activity

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Not Applicable.

SECTION C. Description of monitoring system

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Organizational structure and Roles and Responsibilities

A monitoring plan was developed at PoA registration stage, in accordance with all relevant rules and regulations of the CDM. The registered monitoring plan is further interpreted in the CDM Operations and Monitoring Manual (OMP). Following the requirements in the OMP, a CDM Management Unit was established within NEMA organizational structure to manage the preparation and implementation phases of the proposed CDM program of activity. The CDM Management unit is responsible for organizing and supervising all of the monitoring activities required in the registered monitoring plan for the purpose of accurate and timely reporting of CERs generated.

Furthermore, a three-tier management structure has been set up for CDM monitoring. This includes: 1) project team at NEMA level; 2) data review and quality control at municipality level; 3) on-site working team for daily data monitoring and recording.

The diagram below explains the responsibilities of each personnel at each tier.

Tier 1: Project Management at NEMA Level	• Established CDM Management Unit, • Day-to-day activities run by CDM PM, • Conduct routine monitoring (twice every quarter), • Conduct QA/QC on data • Receive Monthly reports • Conduct training
Tier 2: Data Review and Quality Control at Municipality Level	• The Site Manager checks the data collected by the Data Clerk and the Site Supervisor and ensures its consistency and correctness, • The Municipal Environment Officer, who supervises the Site Manager provides another check before the data is compiled into a monthly reporting to NEMA
Tier 3: On-site Team	• Site Supervisor and Data Clerk are responsible for daily data collection • Operations Monitoring Manual provides guidance and detail procedures to be followed

Monitoring Structure

The specific monitoring and reporting tasks and responsibilities for each operator staff are documented in the OMP.

Procedures for data collection

Data collection procedure is described in the OMP. The monitored parameters are briefly presented in the information flow sheet below.

Daily data is recorded in registers (each parameter is recorded on its own data register) by Data Clerk on site. The frequency of recording for each parameter is stated in the OMP. The daily data records are consolidated on a monthly basis to ease handling. The records are cross checked by the site manager to ensure consistency and compliance to the monitoring procedures. The site manager prepares a monthly report from these consolidated records and forwards to NEMA for further checks.

During the routine monitoring of the composting activities (at least once every quarter), the CDM Project Manager from NEMA checks both the hard copy and electronic records to ensure consistency and compliance with the monitoring plan. This is repeated for the following month throughout the monitoring period.

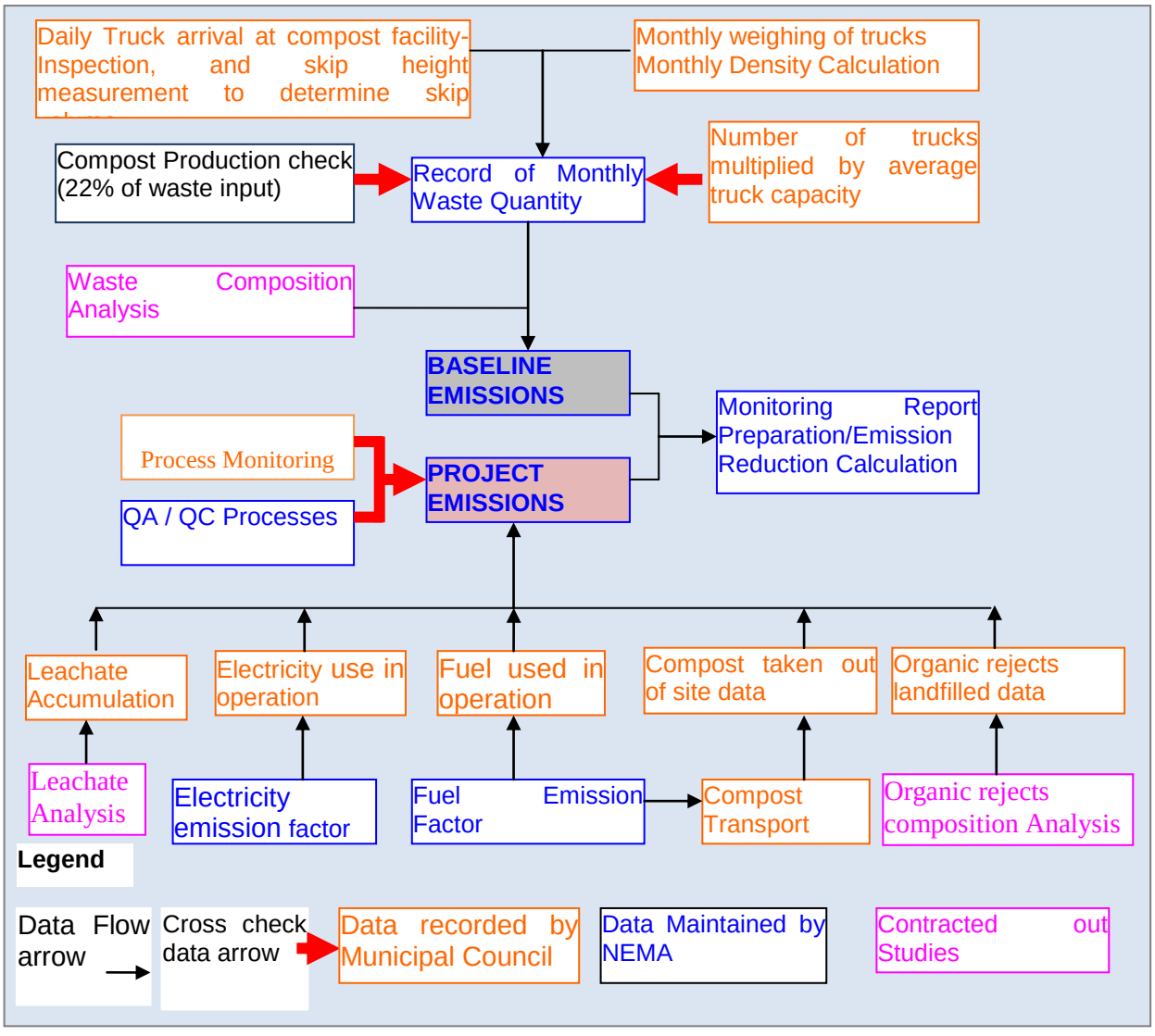

Figure 11: Monitoring Points

QA/QC PROCEDURE

Quality assurance/quality control procedures have been established by NEMA and are enforced along with the implementation of the CPAs involved in the PoA.

Implementation of monitoring activities is guaranteed by Operation and Monitoring Manual issued by NEMA. For electronic and paper based data entry and record keeping system, there is clarity in terms of the procedures and protocols for collection and entry of data, use of registers and spreadsheets and any assumptions made, so that compliance with requirements can be assessed without ambiguity by a third party. Detailed QA/QC procedures are established in these documents including: a) site manager as senior staff in operation team are responsible for data cross-check in the registers and monthly reports; b) an independent monthly check on both paper and electronic records by CDM project managers at NEMA level.

Multiple rounds of training have been organized by NEMA to ensure CPA implementation. The training was conducted at different levels, including introduction of program mandate and implementation procedures to management teams in municipalities, and instruction of detailed implementation requirements and monitoring steps for operational staff working on the ground. Internal training and availability of the operations manual at the site level enables new staff undertake their tasks. Training records are maintained by NEMA.

A record of the following QA /QC procedures is maintained.

- Training procedures and training records
- Operations Manual
- Internal communications regarding monitoring
- System documentation & document control
- Emergency response procedures - procedures which provide emergency concepts in case of unexpected problems with and /or data quality and data access

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

Data / Parameter:	**EF_{co2}**
Unit:	kg CO_2/ km
Description:	Emission factor for diesel vehicles
Source of data:	2006 IPCC Guidelines for National Greenhouse Gas Inventories combined with data from Ugandan references
Value(s) applied):	0.545
Purpose of data:	To calculate project emissions resulting from fuel consumption
Additional comment:	

Data / Parameter:	**EF_{Fuel}**
Unit:	kg CO_2/ litre
Description:	Emission factor for diesel used in construction equipment
Source of data:	2006 IPCC Guidelines for National Greenhouse Gas Inventories combined with density of diesel from Ugandan references
Value(s) applied):	2.727
Purpose of data:	To calculate project emissions resulting from fuel consumption
Additional comment:	-

Data / Parameter:	EF_m
Unit:	TCO_2/ MWh
Description:	Emission factors for different types of fuels used to supply power to the grid
Source of data:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied):	Diesel: 0.68 Heavy Fuel Oil: 0.71 Biomass = 0 Hydro = 0
Purpose of data:	To calculate project emissions resulting from fuel consumption for power generation
Additional comment:	-

Data / Parameter:	η_m
Unit:	%
Description:	Efficiency of power plant.
Source of data:	" Tool to calculate the emission factor for an electricity system" Ver 1.1
Value(s) applied):	39.5 %
Purpose of data:	To calculate project emissions resulting from electricity consumption
Additional comment:	-

Data / Parameter:	$EF_{m\ ipcc,2006}$
Unit:	Kg CO_2/ TJ
Description:	Emission factor for diesel fuel Emission factor for Heavy Fuel Oil (Residual fuel oils)
Source of data:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied):	Diesel: 74100 kg CO_2/ TJ Heavy Fuel Oil: 77400 kg CO_2/ TJ
Purpose of data:	To calculate project emissions resulting from diesel consumption
Additional comment:	-

Data / Parameter:	$EF_{composting}$
Unit:	Kg CH_4/ton waste
Description:	Methane emission per ton wet waste composted
Source of data:	AMS III F version 06
Value(s) applied):	4 kg / ton wet waste
Purpose of data:	To calculate project emissions resulting composting activities
Additional comment:	-

Data / Parameter:	$B_{o,ww}$
Unit:	Kg methane / kg COD
Description:	Methane producing capacity of wastewater
Source of data:	IPCC default value of 0.25 kg / kg COD
Value(s) applied):	0.25

Purpose of data:	To calculate project emissions
Additional comment:	-

Data / Parameter:	**$MCF_{ww, treatment}$**
Unit:	Factor
Description:	Methane Correction water for waste water treatment plant
Source of data:	As per table III F.1
Value(s) applied):	0.3
Purpose of data:	To calculate project emissions
Additional comment:	During this monitoring period, run-off water was checked through multiplying daily run-off water production rate of 0.091 m3/ton with total waste delivery to the composting site as a conservative approach.

Parameters related to baseline emissions

Data / Parameter:	**OX**
Unit:	Factor
Description:	Oxidation factor
Source of data:	Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site version 4.0
Value(s) applied):	0
Purpose of data:	To calculate Baseline emissions
Additional comment:	-

Data / Parameter:	**DOC_f**
Unit:	Factor
Description:	The fraction of DOC that can decompose
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories, and Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site version 4.0
Value(s) applied):	0.5
Purpose of data:	To calculate Baseline emissions
Additional comment:	-

Data / Parameter:	**MCF**
Unit:	Factor
Description:	Methane Correction Factor
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value(s) applied):	0.8
Purpose of data:	To calculate Baseline emissions
Additional comment:	-

Data / Parameter:	**DOC_j**
Unit:	%
Description:	Percent of degradable organic carbon (by weight) in the waste type j

Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)
Value(s) applied):	**Waste Type** / **DOC_j (%)** 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
Purpose of data:	To calculate Baseline emissions
Additional comment:	-

Data / Parameter:	**k_j**
Unit:	Factor
Description:	The decay rate for the waste stream type j
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)
Value(s) applied):	**Waste Type** / **k_j (%) MAT>20°C MAP>1000 mm** Slowly degrading: Pulp, paper and cardboard (other than sludge), textiles: 0.07 Slowly degrading: Wood and wood products: 0.035 Moderately degrading: Other (non-food) organic putrescible garden and park waste: 0.17 Rapidly degrading: Food, food waste, beverages and tobacco (other than sludge): 0.4
Purpose of data:	To calculate Baseline emissions
Additional comment:	-

Data / Parameter:	**GWP_{CH4}**
Unit:	tCO_2e/tCH_4
Description:	Global Warming Potential (GWP) of methane, valid for the relevant commitment period
Source of data:	Decisions under UNFCCC and the Kyoto protocol (a value of 21 is to be applied for the first commitment period of the Kyoto Protocol)
Value(s) applied):	21 for the first KP commitment period 25 for the second KP commitment period
Purpose of data:	-
Additional comment:	Calculation of baseline and project emissions
	-

D.2. Data and parameters monitored

Data / Parameter:	**F_{cons}**
Unit:	Litres
Description:	Fuel consumption for equipment used in the composting process in this monitoring period.

Measured/ Calculated / Default:	Measured
Source of data:	Fuel Purchase Records as the primary source of data.
Value(s) of monitored parameter:	CPA 1: 10,745 CPA 2: 3,506 CPA 3: 5,280 CPA 4: 2,219 CPA 5: 1,684 CPA 6: 3,350 CPA 7: 3,083 CPA 8: 2,534
Monitoring equipment:	Fuel is purchased from a fuel station that is calibrated by the Uganda National Bureau of Standards (UNBS). Duration of operation of the equipment and their fuel rating may be used as alternative method. In case the alternative method is used, the calculations shall be made and the fuel consumption data shall be recorded on monthly basis.
Measuring/ Reading/ Recording frequency:	Monthly
Calculation method (if applicable):	
QA/QC procedures:	A copy of the receipt of the fuel purchased by the operator is kept at the plant.
Purpose of data:	To determine project emissions
Additional comment:	The fuel usage is only for equipment that is operating on-site and does not include fuel usage for trucks that transport the waste to the composting plant or trucks carrying waste rejects to the landfill. This transport would have occurred under the baseline scenario as the composting plant is located at the landfill. Emissions associated with transport of compost are calculated separately.

Data / Parameter:	**Q_{ycomp}**
Unit:	Tonnes
Description:	Total quantity of compost transported out of the site for the monitoring period of April 2010 to April 2012
Measured/ Calculated / Default:	Measured
Source of data:	Compost production and sales register maintained by the operator.
Value(s) of monitored parameter:	CPA 1: 903.59 CPA 2: 1,803.89 CPA 3: 745.77 CPA 4: 117.25 CPA 5: 84.61 CPA 6: 431.34 CPA 7: 460.75 CPA 8: 319.57

Monitoring equipment:	During the monitoring period, all loads were weighed on site with a calibrated weighing scale before loading onto a truck. Jinja CPA1: weighbridge at municipality weighing station was used to weigh the compost loads. Calibration of weighbridge was performed as follows: Name: Weighbridge Model Type: TUK Accuracy class: NA Series number: EML001 Certificate No: 01101034; 01111241; 01120687 Calibration frequency: No such national standard addressing the calibration requirements; to make sure the accuracy of data, once per one or two years is adopted as per manufacturers' recommendation. Date of calibration: 12/10/2010; 15/10/2011; 07/08/2012 Validity: 11/10/2011; 14/10/2012, 06/08/2013 Calibration standard: Class M1 mass pieces Calibration agency: Uganda National Bureau of Standards CPA 2 - 8: The calibration of weighing scales was delayed due to contractual issue. Following the VVS paragraph 238 a), page 49 (VVS v.03.0, EB70 Annex 3), the maximal permissible errors have been applied conservatively to the calculations in the first monitoring period. Scanned copies of the delayed calibrations, as well as the updated calculation spread sheet are being provided to the DOE.
Measuring/ Reading/ Recording frequency:	For each single load of compost taken out of the site
Calculation method (if applicable):	Not applicable
QA/QC procedures:	The weighing scale is calibrated
Purpose of data:	To determine project emissions resulting from transportation of compost
Additional comment:	

Data / Parameter:	**$CT_{y,comp}$**
Unit:	tonnes/truck
Description:	Average truck capacity for transportation of compost
Measured/ Calculated / Default:	Calculated
Source of data:	Outgoing Compost Register maintained by the operator
Value(s) of monitored parameter:	CPA 1: 4.73 CPA 2: 5.93 CPA 3: 5.01 CPA 4: 2.93 CPA 5: 0.52 CPA 6: 5.02 CPA 7: 4.15 CPA 8: 4.05
Monitoring equipment:	
Measuring/ Reading/ Recording frequency:	Average record taken at the end of the year. The individual records are collected whenever the compost is transported out of the site.

Calculation method (if applicable):	Data on number of trips/loads is recorded in the outgoing compost registers The aggregated annual compost sold/given out free ($Q_{y,comp}$) in tons is divided by the number of trips/loads to calculate the average truck capacity (tons/truck).
QA/QC procedures:	
Purpose of data:	To determine project emissions resulting from transportation of compost
Additional comment:	Average record taken at the end of the year. The individual records are collected whenever the compost is transported out of the site.

Data / Parameter:	**DAF_{comp}**
Unit:	Km
Description:	Average distance for compost transportation to end users
Measured/ Calculated / Default:	Measured
Source of data:	Outgoing compost registers maintained by the operator
Value(s) of monitored parameter:	CPA 1: 12.79 CPA 2: 11.04 CPA 3: 8.28 CPA 4: 15.18 CPA 5: 16 CPA 6: 9 CPA 7: 21 CPA 8: 6
Monitoring equipment:	-
Measuring/ Reading/ Recording frequency:	Monitored Daily, and average calculated annually
Calculation method (if applicable):	For each load/trip of compost taken out of the plant, the operator records the distance to destination by speaking to the carrier. The total distance is divided by the total number of trips to calculate the average distance.
QA/QC procedures:	-
Purpose of data:	To determine project emissions resulting from transportation of compost
Additional comment:	This will be calculated annually.

Data / Parameter:	**$MWh_{e,y}$**
Unit:	MWh
Description:	Amount of electricity consumed from the grid in the project activity in this monitoring period.
Measured/ Calculated / Default:	CPA1: Calculated, as meter information is missing. CPA 2 and CPA6: Measured with electricity meter.
Source of data:	CPA 1: Estimate CPA 2: Bills from the electricity distribution company - UMEME
Value(s) of monitored parameter:	CPA 1: 5.46 CPA 2: 0.003 CPA 3: 0 CPA 4: 0 CPA 5: 0 CPA 6: 0.228 CPA 7: 0 CPA 8: 0

<table>
<tr><td>Monitoring equipment:</td><td>CPA 1: Estimated/ calculated (the electricity consumption was metered for the site but for the whole municipality, therefore the consumption for the compost site is calculated as per the onsite power consumption sources of lighting and computer.).
CPA 2; 6: Utility meter. All electricity meters in the country are provided and owned by the Uganda Electricity Distribution Company.

Meter information CPA 2 (Fort Portal):
<table>
<tr><td>Model:</td><td>DDS26D</td></tr>
<tr><td>Serial Number:</td><td>240V SINGLE PHASE 2 WIRE</td></tr>
<tr><td>Manufacturing Year:</td><td>2009</td></tr>
<tr><td>Meter Number:</td><td>UM 200829 /1600IMP/KWH</td></tr>
<tr><td>Accuracy Class:</td><td>+/- 1 (class 1)</td></tr>
</table>
Meter information CPA 6 (Mbale):
<table>
<tr><td>Model:</td><td>DDS26D</td></tr>
<tr><td>Serial Number:</td><td>240V SINGLE PHASE 2 WIRE</td></tr>
<tr><td>Manufacturing Year:</td><td>2009</td></tr>
<tr><td>Meter Number:</td><td>U1065456 /1600IMP/KWH</td></tr>
<tr><td>Accuracy Class:</td><td>+/- 1 (class 1)</td></tr>
</table></td></tr>
<tr><td>Measuring/
Reading/
Recording frequency:</td><td>CPA 1: N/A, calculated for the monitoring period.
CPA 2 and 6: Monthly
Note: Other CPAs are not connected to the grid.</td></tr>
<tr><td>Calculation method
(if applicable):</td><td>CPA 1: Estimated from the loads – electricity was used for lighting and computer operation. The calculation was performed based on 8760 operational hours per year for all consuming units and adding 20% of transmission losses as per the requirements of the tool to calculate emissions from electricity consumption.
CPA 2; 6: Conversion from kWh to MWh.
CPA 3-5; 7-8: N/A, no electricity consumption from the grid.</td></tr>
<tr><td>QA/QC procedures:</td><td></td></tr>
<tr><td>Purpose of data:</td><td>To determine project emissions</td></tr>
<tr><td>Additional comment:</td><td>CPA 1: The power consumption at the site was estimated based on the wattage of the loads
CPA 3-5; 7-8: Site connected to solar PV or no electricity at the site.</td></tr>
</table>

Data / Parameter:	**$CEF_{electricity,}$**
Unit:	tCO2e/MWh
Description:	CO2 Emission Factor of the grid supplying electricity to the project
Measured/ Calculated / Default:	Calculated as per AMS-I.D
Source of data:	Uganda Electricity Transmission Company Limited (UETCL) and the PoADD of the Uganda Municipal Waste Compost Program (ref: 2956)
Value(s) of monitored parameter:	0.2884
Monitoring equipment:	Not applicable
Measuring/ Reading/ Recording frequency:	Annual

Calculation method (if applicable):	The weighted average method of calculation of emission factor is used. Data on electricity generated and supplied to the Uganda National Grid from various sources (fuel types) for the year 2010 was collected from the UETCL and used for the calculation. Emission factor of 0.68 tCO_2/MWh and 0.71 tCO_2/MWh shall be used for diesel and HFO based generation respectively. Hydro and biomass based power will have zero emissions. $CEF_{electricity,2010}$ = (565,135 * 0.68 + 455,142 * 0.71) / 2,453,283
QA/QC procedures:	
Purpose of data:	To determine project emissions
Additional comment:	The data used in the calculation is obtained from the Uganda Electricity Regulatory Authority.

Data / Parameter:	**$EG_{m,y-1}$**
Unit:	MWh
Description:	Total annual electricity generation from various sources in 2010 supplied to the grid.
Measured/ Calculated / Default:	Default
Source of data:	UETCL Business Statistics (2009-2011), licensee reporting schedule, Q1-Q4(2009-2011)
Value(s) of monitored parameter:	$EG_{hydro,2010}$ = 1,347,895 WWh $EG_{diesel,2010}$ = 565,135 MWh $EG_{HFO,2010}$ = 455,142 MWh $EG_{biomass,2010}$ = 85,111 MWh
Monitoring equipment:	The values used are obtained from the Uganda Electricity Regulation Authority.
Measuring/ Reading/ Recording frequency:	Annual
Calculation method (if applicable):	Simple summation of the electricity generation values of different quarters in 2010.
QA/QC procedures:	
Purpose of data:	To determine project emissions
Additional comment:	-

Data / Parameter:	**$W_{x\ residual}$**
Unit:	Tonnes
Description:	Total quantity of residual organic waste landfilled in this monitoring period
Measured/ Calculated / Default:	Measured
Source of data:	Composting plant outgoing registers
Value(s) of monitored parameter:	CPA 1: 3044.25 CPA 2: 599.38 CPA 3: 450.63 CPA 4: 81.98 CPA 5: 130.84 CPA 6: 315 CPA 7: 811.34 CPA 8: 186.04

Monitoring equipment:	The organic waste residues are loaded on a wheel barrow. The number of wheel barrows land filled are counted and recorded on the daily register. The volume of the wheel barrow is known. It was determined that 2 wheel barrows are needed to fill the box used to determine density. Hence the number of the wheel barrows multiplied with the unit volume of each wheel barrows determines the total volume of rejects landfilled.
Measuring/ Reading/ Recording frequency:	Calculated annually from daily records for volume of residual wastes sent to landfill, and monthly records for density and composition analysis.
Calculation method (if applicable):	Volume of the organic rejects landfilled is multiplied with the average density of rejects to determine the quantity of the organic rejects landfilled.
QA/QC procedures:	Operations manual detailing the procedures are available on site, the NEMA officials carry out routine monitoring to verify these records.
Purpose of data:	To determine the quantity of organic rejects landfilled, determination of project emissions.
Additional comment:	The maximum residual volume and density within the available record was applied to the period Apr 10 – Jul 2011 to complete the dataset.

Data / Parameter:	**P n,j,x, residual**
Unit:	%
Description:	Weight fraction of the waste type j in the residual waste sample n collected.
Measured/ Calculated / Default:	Measured
Source of data:	Monthly sampling and analysis of the residual waste stream
Value(s) of monitored parameter:	CPA 1:

Waste Type	**%**
Wood and wood products	0.5
Pulp, paper and cardboard (other than sludge)	1.9
Food, food waste beverages and tobacco (other than sludge)	25.1
Textiles	0.4
Garden, yard and park waste	25.1
Glass, plastic, metal, other inert waste	46.9

CPA 2:

Waste Type	**%**
Wood and wood products	0.7
Pulp, paper and cardboard (other than sludge)	0.6
Food, food waste beverages and tobacco (other than sludge)	22.5
Textiles	0.0
Garden, yard and park waste	22.5
Glass, plastic, metal, other inert waste	53.7

CPA 3:

Waste Type	**%**
Wood and wood products	1
Pulp, paper and cardboard (other than sludge)	2.1
Food, food waste beverages and tobacco (other than sludge)	18.7
Textiles	0.0
Garden, yard and park waste	18.7
Glass, plastic, metal, other inert waste	59.5

CPA 4:

Waste Type	%
Wood and wood products	1.2
Pulp, paper and cardboard (other than sludge)	1.3
Food, food waste beverages and tobacco (other than sludge)	22.5
Textiles	0.5
Garden, yard and park waste	22.5
Glass, plastic, metal, other inert waste	52

CPA 5:

Waste Type	%
Wood and wood products	1.4
Pulp, paper and cardboard (other than sludge)	1.2
Food, food waste beverages and tobacco (other than sludge)	18.7
Textiles	1.1
Garden, yard and park waste	18.7
Glass, plastic, metal, other inert waste	59

CPA 6:

Waste Type	%
Wood and wood products	0.5
Pulp, paper and cardboard (other than sludge)	1.9
Food, food waste beverages and tobacco (other than sludge)	26
Textiles	0.0
Garden, yard and park waste	26
Glass, plastic, metal, other inert waste	45.7

CPA 7:

Waste Type	%
Wood and wood products	0.8
Pulp, paper and cardboard (other than sludge)	2
Food, food waste beverages and tobacco (other than sludge)	25.7
Textiles	0.2
Garden, yard and park waste	25.7
Glass, plastic, metal, other inert waste	45.5

CPA 8:

Waste Type	%
Wood and wood products	0.4
Pulp, paper and cardboard (other than sludge)	1.5
Food, food waste beverages and tobacco (other than sludge)	21.9
Textiles	0.0
Garden, yard and park waste	21.9
Glass, plastic, metal, other inert waste	54.3

Monitoring equipment:	Standard procedures for determining the waste composition are used. The composition of residual waste is determined by sampling and analysis carried out by Makerere University. From second monitoring period onwards, the sampling and analysis will be done by municipality staff trained and certified by Makerere University.
Measuring/ Reading/ Recording frequency:	Standard procedures for determining the waste composition shall be used. The composition of residual waste will be determined by sampling and analysis performed by trained personnel. Samples will be taken three times in three months. The *average* composition shall be used in all calculations. CPA 1: Samples are taken once in a month. 12 samples were taken for the period March 2011 to February 2012. The *average* composition is used in all calculations. CPA 2 - 8: Samples are taken once in a month, which translates to 12 samples in a year. Only 11 samples were taken for this monitoring period. For the missing values, the measured number from the next available month has been used for calculations.
Calculation method (if applicable):	-
QA/QC procedures:	Paper records will are kept on site, as well as copies of training certificates by Makerere University for staff conducting the sampling. Results will be cross-checked by NEMA staff with those obtained during the same month for previous years.
Purpose of data:	To determine the composition of the organic waste landfilled, calculation of project emissions.
Additional comment:	-

Data / Parameter:	$\mathbf{Q_{y,ww,runoff}}$
Unit:	m^3
Description:	Volume of run-off water in this monitoring period.
Measured/ Calculated / Default:	CPA 1-8: Calculated based on measured quantities of waste treated and a conservative leachate estimate of 0.091m^3 of leachate per tonne of fresh waste.
Source of data:	Calculated for this monitored period, as approved on 16/06/2014 by the CDM EB on PRC-2956-001
Value(s) of monitored parameter:	CPA 1: 3,314.59 CPA 2: 907.84 CPA 3: 1,419.29 CPA 4: 753.07 CPA 5: 716.94 CPA 6: 1,779.03 CPA 7: 1220.64 CPA 8: 974.29
Monitoring equipment:	For this monitoring period this parameter has been calculated based on the quantities of waste treated. Please see parameter Wx below for details of the monitoring equipment.
Measuring/ Reading/ Recording frequency:	For this monitored period, records for volume of waste delivered at the composting plant are based on all trips/loads. Please refer to parameter Wx below for complete details.
Calculation method (if applicable):	The daily leachate production rate of 0.091 m3/ton is multiplied with the total waste delivery to the composting site as a conservative approach.
QA/QC procedures:	Three references have been consulted to determine the rate of leachate production in organic waste composting and the upper value of 0.091 m3/ton has been applied to ensure the conservativeness.
Purpose of data:	Determine the project emissions resulting from run-off.

Additional comment:	The project activity was unable to monitor this parameter because of the difficulty in the procedure. For this monitoring period we are assuming that all the leachate generated was accumulated without use at the composting site.

Data / Parameter:	**$COD_{y,ww,runoff}$**	
Unit:	Tonnes / m^3	
Description:	Chemical Oxygen demand of run-off water leaving the composting facility	
Measured/ Calculated / Default:	Measured	
Source of data:	Waste Characterization Reports from Makerere University	
Value(s) of monitored parameter:	CPA 1: 0.002727 CPA 2: 0.002259 CPA 3: 0.00199 CPA 4: 0.002268 CPA 5: 0.002693 CPA 6: 0.002755 CPA 7: 0.002628 CPA 8: 0.00255	
Monitoring equipment:	Analytical technique for COD measurement conducted by Makerere University.	
Measuring/ Reading/ Recording frequency:	CPA 1; 7: Once a Month CPA 2 – 6; 8: Measurements taken once in a month and the annual average are used. Only 11 samples were taken for this monitoring period.	
Calculation method (if applicable):	The monthly values were averaged.	
QA/QC procedures:	-	
Purpose of data:	To determine project emissions from runoff.	
Additional comment:	CPA 2: There was no recorded value in January 2012; the zero value was left out in determining the average. CPA 5-6; 8: To complete the record, the maximum recorded COD was obtained and applied to the months of March and April 2012 before determining the average.	

Data / Parameter:	**W_x**
Unit:	Tonnes
Description:	Total quantity of organic waste prevented from disposal in this monitoring period (tons)
Measured/ Calculated / Default:	Calculated (Weight) and Measured (Volume)
Source of data:	Waste inputs registers and waste composition by third party
Value(s) of monitored parameter:	CPA 1: 36,424.01 CPA 2: 9,976.32 CPA 3: 15,596.59 CPA 4: 8,275.51 CPA 5: 7,878.51 CPA 6: 19,549.75 CPA 7: 13,413.67 CPA 8: 10,706.45
Monitoring equipment:	Standard measuring scales and tapes are used to measure the volume.
Measuring/ Reading/ Recording frequency:	Records for volume of waste delivered at the composting plant are based on all trips/loads. Monthly measurement for density and composition analysis of the incoming waste.

Calculation method (if applicable):	The aggregated annual volume of waste (m3) is converted to weights by using the average density of waste calculated on an annual basis; CPA 1: 0.38 t/m3 CPA 2: 0.61 t/m3 CPA 3: 0.51 t/m3 CPA 4: 0.55 t/m3 CPA 5: 0.55 t/m3 CPA 6: 0.49 t/m3 CPA 7: 0.50 t/m3 CPA 8: 0.45 t/m3 The average quantity of inerts present in the waste (as reported in the waste composition analysis on % weight basis) is deducted to calculate the total quantity of organic waste prevented from disposal (Refer to $\mathbf{P_{n,j,x}}$). This adjustment for inerts is required to calculate emissions from composting ($PE_{y,comp}$), as inerts do not contribute to methane emissions. For the purpose of calculating baseline emissions (BECH4, SWDS,y), it is not required to do these adjustments because the waste composition of the mixed incoming waste is used in the calculations which automatically considers only the organics present. CPA 1: $\mathbf{W_x} = W_{all\ waste} * (1 - \%_{inerts}) = 36{,}424.014$ tons * (1 – 4.07%) CPA 2: $\mathbf{W_x} = W_{all\ waste} * (1 - \%_{inerts}) = 9976.32$ tons * (1 – 9.9%) CPA 3: $\mathbf{W_x} = W_{all\ waste} * (1 - \%_{inerts}) = 15{,}596.59$ tons * (1 – 5.5%) CPA 4: $\mathbf{W_x} = W_{all\ waste} * (1 - \%_{inerts}) = 8{,}275.51$tons * (1 – 4.1%) CPA 5: $\mathbf{W_x} = W_{all\ waste} * (1 - \%_{inerts}) = 7{,}878.51$ tons * (1 – 5.0%) CPA 6: $\mathbf{W_x} = W_{all\ waste} * (1 - \%_{inerts}) = 19{,}549.75$ tons * (1 – 3.9%) CPA 7: $\mathbf{W_x} = W_{all\ waste} * (1 - \%_{inerts}) = 13{,}413.67$ tons * (1 – 4.6%) CPA 8**:** $\mathbf{W_x} = W_{all\ waste} * (1 - \%_{inerts}) = 10{,}706.45$ tons * (1 – 3.7%)
QA/QC procedures:	
Purpose of data:	To determine baseline emissions from composting
Additional comment:	

PDD: One sample per month required. The average is used for calculations.

Data / Parameter:	$\mathbf{P_{n,j,x}}$
Unit:	-
Description:	Weight fraction of the waste type j in the incoming waste in sample n collected during this monitoring period.
Measured/ Calculated / Default:	Measured
Source of data:	Waste Composition Analysis (conducted by a third party – Makerere University Department of Agricultural Production)
Value(s) of monitored parameter:	CPA 1: **Waste Type** / **%** Wood and wood products: 0.1 Pulp, paper and cardboard (other than sludge): 2.2 Food, food waste beverages and tobacco (other than sludge): 41.3 Textiles: 0.6 Garden, yard and park waste: 51.7 Glass, plastic, metal, other inert waste: 4.1 CPA 2: **Waste Type** / **%** Wood and wood products: 0.3 Pulp, paper and cardboard (other than sludge): 2.8

Food, food waste beverages and tobacco (other than sludge)	37.3
Textiles	0.3
Garden, yard and park waste	49.4
Glass, plastic, metal, other inert waste	9.9

CPA 3:

Waste Type	**%**
Wood and wood products	0.3
Pulp, paper and cardboard (other than sludge)	1.5
Food, food waste beverages and tobacco (other than sludge)	28.7
Textiles	0.5
Garden, yard and park waste	63.4
Glass, plastic, metal, other inert waste	5.5

CPA 4:

Waste Type	**%**
Wood and wood products	0.1
Pulp, paper and cardboard (other than sludge)	1.5
Food, food waste beverages and tobacco (other than sludge)	44.8
Textiles	0.4
Garden, yard and park waste	49.2
Glass, plastic, metal, other inert waste	4.1

CPA 5:

Waste Type	**%**
Wood and wood products	0.4
Pulp, paper and cardboard (other than sludge)	2.3
Food, food waste beverages and tobacco (other than sludge)	44.9
Textiles	0.8
Garden, yard and park waste	465
Glass, plastic, metal, other inert waste	5.0

CPA 6:

Waste Type	**%**
Wood and wood products	0.0
Pulp, paper and cardboard (other than sludge)	1.6
Food, food waste beverages and tobacco (other than sludge)	43.3
Textiles	0.4
Garden, yard and park waste	50.8
Glass, plastic, metal, other inert waste	3.9

CPA 7:

Waste Type	**%**
Wood and wood products	0.1
Pulp, paper and cardboard (other than sludge)	1.8
Food, food waste beverages and tobacco (other than sludge)	39.2
Textiles	0.4
Garden, yard and park waste	53.9
Glass, plastic, metal, other inert waste	4.6

CPA 8:

Waste Type	**%**
Wood and wood products	0.3
Pulp, paper and cardboard (other than sludge)	1.8

	Food, food waste beverages and tobacco (other than sludge): 48.9 Textiles: 0.4 Garden, yard and park waste: 44.9 Glass, plastic, metal, other inert waste: 3.7
Monitoring equipment:	Standard procedures for determining the waste composition are used. The composition of incoming waste is determined by sampling and analysis by Makerere University Department of Agricultural Production. From second monitoring period onwards, it will be done by municipality staff that are trained and certified by Makerere University.
Measuring/ Reading/ Recording frequency:	Samples are taken three times in three months which translates to 12 samples in a year. The average composition will be used in all calculations. CPA 1: Samples are taken once in a month. 12 samples were taken for the period March 2011 to February 2012. The *average* composition is used in calculations for this monitoring period. CPA 2 - 8: Samples are taken once in a month, however, only 11 samples were taken, and the *average* composition is used.
Calculation method (if applicable):	-
QA/QC procedures:	Paper records are kept on site, as well as copies of training certificates by Makerere University for staff conducting the sampling. Results will be cross-checked by NEMA staff with those obtained during the same month for previous years.
Purpose of data:	To determine the quantity of organic waste composted (baseline emissions).
Additional comment:	-

Data / Parameter:	**f**	
Unit:	Fraction	
Description:	Fraction of methane captured at the SWDS and flared, combusted or used in another manner	
Measured/ Calculated / Default:	Default	
Source of data:	PoADD of the Uganda Municipal Waste Compost Program (ref: 2956)	
Value(s) of monitored parameter:	0	
Monitoring equipment:	-	
Measuring/ Reading/ Recording frequency:	-	
Calculation method (if applicable):	-	
QA/QC procedures:	None of the landfills in Uganda are equipped with landfill gas capture and flaring facilities. Landfill gas from the SWDs is neither being captured and flared, nor is being used in another manner. Since capture and flare of LFG is not feasible for smaller landfills f = 0 is being fixed in the PoA for all the CPAs.	
Purpose of data:	To determine project emissions.	
Additional comment:	-	

D.3. Implementation of sampling plan

>>

The following parameters are being monitored through a sampling approach developed in the registered monitoring plan:

*Weight Fraction of Waste type j in incoming waste sample**:*** the composition of incoming waste is determined by sampling and analysis taken once every month, 12 times in a year. The size of the sampling is detailed in the OMP. The procedures of sorting fresh wastes into the different constituents
follows the standard methods ASTM D5231 – 92 (2008) for unprocessed municipal solid wastes. NEMA contracted Makerere University Department of Agricultural Production to carry out the sampling and analysis, of which the monthly reports are provided after every analysis.

Weight Fraction of Waste type j in the residual waste sample: the composition of residual waste is determined by sampling and analysis taken once every month, 12 times in a year. The size of the sampling is detailed in the OMP. NEMA contracted Makerere University Department of Agricultural Production to carry out the sampling and analysis, of which the monthly reports are provided after every analysis.

Density of fresh waste: the density of fresh waste is taken once every month, 12 times a year. 2-3 waste skips from different locations are taken to the weighbridge on the day of determining the fresh waste density. The OMP provides a detailed procedure followed.

Density of residual waste: the density of residual waste is taken once every month, 12 times a year. The sample is taken the 15th day of the month (or if it is a non-working day, the next working day) and is composed of the 5th and the 15th barrows of the day. The OMP provides a detailed procedure followed.

Density of compost: the density of fresh waste is taken once every month, 12 times a year. The sample is taken out of the first volume of compost sieved in the month. The OMP provides a detailed procedure followed.

COD of run-off water: the COD of run-off water is determined by sampling and analysis taken once every month, 12 times in a year. The size of sampling and procedure of testing follows the guideline established in ``*The Science of Chemical Oxygen Demand. Technical Information Series No. 9; Standard methods for examination of water and waste water, 15th Edition.*` NEMA contracted Makerere University Department of Agricultural Production to carry out the sampling and analysis, of which the monthly reports are provided after every analysis.

Process monitoring (including measurement of temperature and moisture content): Temperature measurements are done every other day at 5 relevant points of each active windrow. The points are selected along the windrow with regular spacing. Moisture content is taken as regularly once the windrow appears dry at 2 relevant points of each windrow. The points are selected along the windrow with regular spacing. The OMP details the procedure followed.

Aerobic conditions in compost use: A sample survey of the users is carried out. A record of the purchasers of compost is maintained and a random sampling of 2 users is done to assess compost use.

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

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There is no waste water co composting, no electricity or thermal energy consumed at the site in the absence of the project activity and finally no methane which requires to be captured and combusted. The baseline emissions for the composting activity are calculated using the following equation.

$$BE_y = BE_{CH4,SWDS,y} - (MD_{y,reg} * GWP\_CH_4) + (MEP_{y,ww} * GWP\_CH_4)$$

where:

BE is the baseline emissions for the monitoring period (tCO2e)

$BE_{CH4,SWDS}$ = yearly methane generation potential of the solid waste composted by the project during the years "x" from the beginning of the project activity (x=1) up to the year "y" estimated as described in "Tool to determine methane emissions avoided from disposal of waste at solid waste disposal site version 4".

MEP_{ww} = methane emission potential of the wastewater co-composted. The value of this term is zero as co-composting of wastewater is not included in the project activity (tonne)

MD_{reg} = methane emissions that would be captured and destroyed to comply with national or local safety requirement or legal regulations in the monitoring period (tCO2e). In Uganda there is no requirement or regulation to capture and destroy methane and this value is

zero and not considered further.

GWP_{CH4} = Global Warming Potential (GWP) of methane, valid for the relevant commitment period, taken at 21 for the first commitment period of Kyoto protocol.

Thus the above equation reduces to:

$BE = BE_{CH4,SWDS}$ (9)

Where

$$BE_{CH4,SWDS,y} = \varphi \cdot (1-f) \cdot GWP_{CH4} \cdot (1-OX) \cdot \frac{16}{12} \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1}^{y} \sum_{j} W_{j,x} \cdot DOC_j \cdot e^{-k_j \cdot (y-x)} \cdot \left(1 - e^{-k_j}\right)$$

Where:

φ = Model correction factor (default 0.9) to correct for the model-uncertainties

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

GWPCH4 = Global Warming Potential (GWP) of methane, valid for the relevant commitment period

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

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

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

MCF = Methane Correction Factor (fraction)

Wj,y = Amount of organic waste type j prevented from disposal in the SWDS in the year y (tonnes/year)

DOCf = Fraction of degradable organic carbon that can decompose

kj = Decay rate for the waste stream 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 (Wj,x) through sampling and calculate the mean from the samples, as follows:

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

Where:

W*x* = Total amount of organic waste prevented from disposal in the year x (tonnes/year)

p*n,j,x* = Weight fraction of the waste type j in the sample n collected during the year x

z = Number of samples taken during the year x

CPA 1:

Year		**2010-2012**
Waste inflow (t MSW)	t MSW	54,837
CH4 generated (t CO2)	tCO2	12,903
CH4 generated (t CH4)	tCH4	614
CH4 generated (m3 CH4)	m3 CH4	627,333

Table 3: Methane emissions generated for the period 12/04/2010 to 30/04/2012

CPA 2:

Year		**2011**
Annual waste inflow (t MSW)	t MSW	9,976
CH4 generated (t CO2)	tCO2	1,745
CH4 generated (t CH4)	tCH4	83
CH4 generated (m3 CH4)	m3 CH4	115,742

CPA 3:

Year		**2011**
Annual waste inflow (t MSW)	t MSW	15597
CH4 generated (t CO2)	tCO2	2718
CH4 generated (t CH4)	tCH4	129
CH4 generated (m3 CH4)	m3 CH4	180,546

CPA 4:

Year		**2011**
Annual waste inflow (t MSW)	t MSW	8,276
CH4 generated (t CO2)	tCO2	1,585
CH4 generated (t CH4)	tCH4	75
CH4 generated (m3 CH4)	m3 CH4	105,292

CPA 5:

Year		**2011**
Annual waste inflow (t MSW)	t MSW	7,879
CH4 generated (t CO2)	tCO2	1,493
CH4 generated (t CH4)	tCH4	71
CH4 generated (m3 CH4)	m3 CH4	99,154

CPA 6:

Year		**2011**
Annual waste inflow (t MSW)	t MSW	19,550
CH4 generated (t CO2)	tCO2	3,724
CH4 generated (t CH4)	tCH4	177
CH4 generated (m3 CH4)	m3 CH4	247,385

CPA 7:

Year		**2011**
Annual waste inflow (t MSW)	t MSW	13,414
CH4 generated (t CO2)	tCO2	2,489
CH4 generated (t CH4)	tCH4	119
CH4 generated (m3 CH4)	m3 CH4	165,326

CPA 8:

Year		**2011**
Annual waste inflow (t MSW)	t MSW	10,706
CH4 generated (t CO2)	tCO2	2,095
CH4 generated (t CH4)	tCH4	100
CH4 generated (m3 CH4)	m3 CH4	139,210

Table 4: Methane emissions generated for the period 19/04/2011 to 30/04/2012

E.2. Calculation of project emissions or actual net GHG removals by sinks

>>

The ex-ante calculation of emission reductions are completed with the following steps:

Project Emissions (PE_y):

The project emissions in year y for the composting process from equation (1) are:

$$PE_y = PE_{y,transport} + PE_{y,power} + PE_{y,comp} + PE_{y,\ phy\ leakage} + PE_{y,runoff} + PE_{y,reswaste} \quad (1)$$

1. Project emissions from fuel use in transport:

- $PE_{y,transp} = (Q_y/CT_y) * DAF_w * EF_{CO2} + (Q_{y,comp}/CT_{y,comp}) * DAF_{comp} * EF_{CO2}$ (2)

Where:

Q_y = Quantity of raw waste treated in the year "y" (tonnes)
CT_y = Average truck capacity for waste transportation (tonnes/truck)
DAF_w = Average incremental distance for raw solid waste (km/truck)
EF_{Co2} = CO2 emission factor from fuel use due to transportation (kgCO2 /km)
$Q_{y,comp}$ = Quantity of final compost product produced in the year "y" (tonnes)
$CT_{y,comp}$ = average truck capacity for final compost product transportation (tonnes/truck)
DAF_{comp} = average distance for final compost product transportation (km/truck)

The Compost facility is located close to the place where the waste would have been land filled in the absence of the project and thus there is no additional transport of waste to the composting site and the incremental project emissions due to increased transport of waste are considered to be zero.

Only project emissions from fuel use in transport of compost are calculated:

CPA 1:

Parameter	Value	
$Q_{y,comp}$	903.59	tonnes
$CTy_{,comp}$	4.73	tonnes/truck
DAF_{comp}	12.79	km/truck
EF_{CO2}	0.545 (as established in the PoA-DD)	kgCO2/km
$PE_{transport,y}$	**29**	**tCO2e**

CPA 2:

Parameter	**Value**	**Units**
$Q_{y,comp}$	1,803.89	tonnes
$CTy_{,comp}$	5.99	tonnes/truck
DAF_{comp}	11.04	km/truck
EF_{CO2}	0.545 (as established in the PoA-DD)	kgCO2/km
$PE_{transport,y}$	**15.80**	**tCO2e**

CPA3:

Parameter	Value	
$Q_{y,comp}$	745.77	tonnes
$CTy_{,comp}$	5.01	tonnes/truck
DAF_{comp}	8.28	km/truck
EF_{CO2}	0.545 (as established in the PoA-DD)	kgCO2/km
$PE_{transport,y}$	**16.82**	**tCO2e**

CPA 4:

Parameter	**Value**	**Units**
$Q_{y,comp}$	117.25	tonnes
$CTy_{,comp}$	2.93	tonnes/truck
DAF_{comp}	15	km/truck
EF_{CO2}	0.545 (as established in the PoA-DD)	kgCO2/km
$PE_{transport,y}$	**8.28**	**tCO2e**

CPA 5

Parameter	**Value**	**Units**
$Q_{y,comp}$	84.61	tonnes
$CTy_{,comp}$	0.52	tonnes/truck
DAF_{comp}	16.03	km/truck
EF_{CO2}	0.545 (as established in the PoA-DD)	kgCO2/km
$PE_{transport,y}$	**35**	**tCO2e**

CPA 6:

Parameter	Value	Units
$Q_{y,comp}$	431	tonnes
$CTy_{,comp}$	5.02	tonnes/truck
DAF_{comp}	8.87	km/truck
EF_{CO2}	0.545 (as established in the PoA-DD)	kgCO2/km
$PE_{transport,y}$	**10**	**tCO2e**

CPA 7:

Parameter	Value	Units
$Q_{y,comp}$	460.75	tonnes
$CTy_{,comp}$	4.15	tonnes/truck
DAF_{comp}	20.86	km/truck
EF_{CO2}	0.545 (as established in the PoA-DD)	kgCO2/km
$PE_{transport,y}$	**32**	**tCO2e**

CPA 8:

Parameter	Value	Units
$Q_{y,comp}$	319.57	tonnes
$CTy_{,comp}$	4.05	tonnes/truck
DAF_{comp}	6.43	km/truck
EF_{CO2}	0.545 (as established in the PoA-DD)	kgCO2/km
$PE_{transport,y}$	**6.93**	**tCO2e**

Table 5: Project emissions from transport of compost

2. Project emission from onsite energy use

$PE_{power} = PE_{electricity} + PE_{fuel,onsite}$ (3)

$PE_{electricity} = MWh_e * CEF_{elec}$ (4)

Where

MWh_e = amount of electricity consumed from the grid in the project activity, measured using an electricity meter (MWh)

CEF_{elec} = carbon emissions factor for electricity generation (tCO_2/MWh) calculated for 2010

$CEF_{elec} = \sum EF_m \times EG_{m,2010} / \sum EG_{m,2010}$

EF_m = emission factor for fuel m in TCO_2 / MWh (as provided in the POADD)
EF_{diesel} = 0.68 tCO2/MWh
EF_{HFO} = 0.71 tCO2/MWh
Hydro and biomass based power will have zero emissions.

$EG_{m,2010}$ = Total energy generated using fuel m in 2010

CPA 1:

Parameter	Value	Units
MWh_e	5.46	MWh
CEF_{elec}	0.2884	tCO2e/MWh
$PE_{electricity}$	**1.57**	**tCO2e**

CPA 2:

Parameter	Value	Units
MWh_e	0.003	MWh
CEF_{elec}	0.2884	tCO2e/MWh
$PE_{electricity}$	**0.001**	**tCO2e**

CPA 3:

Parameter	Value	
MWh_e	0	MWh
CEF_{elec}	0.2884	tCO2e/MWh
$PE_{electricity}$	**0**	**tCO2e**

CPA 4:

Parameter	Value	
MWh_e	0	MWh
CEF_{elec}	0.2884	tCO2e/MWh
$PE_{electricity}$	**0**	**tCO2e**

CPA 5:

Parameter	**Value**	**Units**
MWh_e	0	MWh
CEF_{elec}	0.2884	tCO2e/MWh
$PE_{electricity}$	**0**	**tCO2e**

CPA 6:

Parameter	**Value**	**Units**
MWh_e	0.228	MWh
CEF_{elec}	0.2884	tCO2e/MWh
$PE_{electricity}$	**0.07**	**tCO2e**

CPA 7:

Parameter	**Value**	**Units**
MWh_e	0	MWh
CEF_{elec}	0.2884	tCO2e/MWh
$PE_{electricity}$	**0**	**tCO2e**

CPA 8

Parameter	**Value**	**Units**
MWh_e	0	MWh
CEF_{elec}	0.2884	tCO2e/MWh
$PE_{electricity}$	**0**	**tCO2e**

Table 6: Project emissions from electricity consumption

$PE_{fuel,onsite} = F_{cons} * EF_{fuel}$ (5)

F_{cons} = Fuel consumption (litre)
EF_{fuel} = Emission factor of the fuel (kgCO2/litre)

CPA 1:

Parameter	Value	
$F_{cons,y}$	10,745	litres
EF_{fuel}	2.727 (as provided in the POADD)	kgCO2/ litre
$PE_{fuel,onsite,y}$	**29**	**tCO_2e/yr**

CPA 2:

Parameter	**Value**	**Units**
$F_{cons,y}$	3,506	litres
EF_{fuel}	2.727 (as provided in the POADD)	kgCO2/ litre
$PE_{fuel,onsite,y}$	**9.56**	**tCO_2e/yr**

CPA 3:

Parameter	Value	
$F_{cons,y}$	5,280	litres
EF_{fuel}	2.727 (as provided in the POADD)	kgCO2/ litre
$PE_{fuel,onsite,y}$	**14.40**	**tCO_2e/yr**

CPA 4:

Parameter	**Value**	**Units**
$F_{cons,y}$	2,219	litres
EF_{fuel}	2.727 (as provided in the POADD)	kgCO2/ litre
$PE_{fuel,onsite,y}$	**6.05**	**tCO_2e/yr**

CPA 5:

Parameter	**Value**	**Units**
$F_{cons,y}$	1684	litres
EF_{fuel}	2.727 (as provided in the POADD)	kgCO2/ litre
$PE_{fuel,onsite,y}$	**5**	**tCO_2e/yr**

CPA 6:

Parameter	**Value**	**Units**
$F_{cons,y}$	3,350	litres
EF_{fuel}	2.727 (as provided in the POADD)	kgCO2/ litre
$PE_{fuel,onsite,y}$	**9**	**tCO_2e/yr**

CPA 7.

Parameter	**Value**	**Units**
$F_{cons,y}$	3,083	litres
EF_{fuel}	2.727 (as provided in the POADD)	kgCO2/ litre
$PE_{fuel,onsite,y}$	**8**	**tCO_2e/yr**

CPA 8:

Parameter	**Value**	**Units**
$F_{cons,y}$	2,534	litres
EF_{fuel}	2.727 (as provided in the POADD)	kgCO2/ litre
$PE_{fuel,onsite,y}$	**6.91**	**tCO_2e/yr**

Table 7: Project emissions from fuel consumption

3. Project emission from methane emission from composting operations

Emissions from the composting process are calculated using the following formula.

$PE_{comp} = Q * EF_{composting} * GWP_{CH4}$ (6)

Where**:**

$EF_{composting}$ is the methane emission factor of composting waste taken at 4 kg methane/ton wet waste treated.

CPA 1:

Parameter	Value	
Q	52,592	tonnes
$EF_{composting}$	4 (as provided in the POADD)	Kg CH4 / ton
GWP_{CH4}	21	tCO2e/tCH4
$PE_{comp.}$	**4,418**	**tCO2e**

CPA 2:

Parameter	**Value**	**Units**

Q	8,985.13	tonnes
$EF_{composting}$	4 (as provided in the POADD)	Kg CH4 / ton
GWP_{CH4}	21	tCO2e/tCH4
$PE_{comp.}$	**754.75**	**tCO2e**

CPA 3:

Parameter	Value	
Q	14,733	tonnes
$EF_{composting}$	4 (as provided in the POADD)	Kg CH4 / ton
GWP_{CH4}	21	tCO2e/tCH4
$PE_{comp.}$	**1,237.54**	**tCO2e**

CPA 4:

Parameter	**Value**	**Units**
Q	7,937	tonnes
$EF_{composting}$	4 (as provided in the POADD)	Kg CH4 / ton
GWP_{CH4}	21	tCO2e/tCH4
$PE_{comp.}$	**666.72**	**tCO2e**

CPA 5:

Parameter	**Value**	**Units**
Q	7483.55	tonnes
$EF_{composting}$	4 (as provided in the POADD)	Kg CH4 / ton
GWP_{CH4}	21	tCO2e/tCH4
$PE_{comp.}$	**629**	**tCO2e**

CPA 6:

Parameter	**Value**	**Units**
Q	18,786	tonnes
$EF_{composting}$	4 (as provided in the POADD)	Kg CH4 / ton
GWP_{CH4}	21	tCO2e/tCH4
$PE_{comp.}$	**1,578**	**tCO2e**

CPA 7:

Parameter	**Value**	**Units**
Q	12,793.85	tonnes
$EF_{composting}$	4 (as provided in the POADD)	Kg CH4 / ton
GWP_{CH4}	21	tCO2e/tCH4
$PE_{comp.}$	**1,075**	**tCO2e**

CPA 8:

Parameter	**Value**	**Units**
Q	10,312.87	tonnes
$EF_{composting}$	4 (as provided in the POADD)	Kg CH4 / ton
GWP_{CH4}	21	tCO2e/tCH4
$PE_{comp.}$	**866.28**	**tCO2e**

Table 8: Project emissions from composting

4. Project emission from runoff from composting operations

Methane emissions from runoff water is calculated using the following formula:

$$PE_{y,runoff} = Q_{y,ww,runoff} * COD_{y,ww,runoff} * B_{o,ww} * MCF_{ww,\ treatment} * UF_b * GWP_{CH4} \quad (7)$$

Where:

$Q_{ww,runoff}$ = Volume of run-off water (m^3)
$COD_{ww,runoff}$ = Chemical Oxygen demand of run-off water leaving the composting facility (gm/ m^3)

$B_{o,ww}$ = Methane producing capacity of waste water taken at IPCC default value of 0.25 kg.kg COD

$MCF_{ww,\ treatment}$ = Methane Correction water for waste water treatment plant as per table III F.1 in the methodology III.F/Version 06

UF_b = Model correction factor to account for uncertainties default of 1.06

GWP_{CH4} = Global Warming Potential (GWP) of methane, valid for the relevant commitment period, taken at 21 for the first commitment period of Kyoto protocol.

CPA 1:

Parameter	Value	
$Q_{ww,runoff}$	3,314.59	
$COD_{ww,runoff}$	2727	g/m3
$B_{o,ww}$	0.25	kg / kg COD
$MCF_{ww,\ treatment}$	0.3	
UF_b	1.06	
GWP_{CH4}	21	
PE_{runoff}	**15**	**tCO_2e**

CPA 2:

Parameter	**Value**	**Units**
$Q_{ww,runoff}$	907.84	
$COD_{ww,runoff}$	2259	g/m3
$B_{o,ww}$	0.25	kg / kg COD
$MCF_{ww,\ treatment}$	0.3	
UF_b	1.06	
GWP_{CH4}	21	
PE_{runoff}	**3.42**	**tCO_2e**

CPA 3:

Parameter	Value	
$Q_{ww,runoff}$	1,419.29	
$COD_{ww,runoff}$	2114	g/m3
$B_{o,ww}$	0.25	kg / kg COD
$MCF_{ww,\ treatment}$	0.3	
UF_b	1.06	
GWP_{CH4}	21	
PE_{runoff}	**5.01**	**tCO_2e**

CPA 4:

Parameter	**Value**	**Units**
$Q_{ww,runoff}$	753.07	
$COD_{ww,runoff}$	2268	g/m3
$B_{o,ww}$	0.25	kg / kg COD
$MCF_{ww,\ treatment}$	0.3	
UF_b	1.06	
GWP_{CH4}	21	
PE_{runoff}	**2.85**	**tCO_2e**

CPA 5:

Parameter	**Value**	**Units**
$Q_{ww,runoff}$	716.94	
$COD_{ww,runoff}$	2693	g/m3
$B_{o,ww}$	0.25	kg / kg COD
$MCF_{ww,\ treatment}$	0.3	
UF_b	1.06	
GWP_{CH4}	21	
PE_{runoff}	**3.22**	**tCO_2e**

CPA 6:

Parameter	**Value**	**units**
$Q_{ww,runoff}$	1,779.03	
$COD_{ww,runoff}$	2755	g/m3
$B_{o,ww}$	0.25	kg / kg COD
$MCF_{ww,\ treatment}$	0.3	
UF_b	1.06	
GWP_{CH4}	21	
PE_{runoff}	**8.18**	**tCO_2e**

CPA 7:

Parameter	**Value**	**Units**
$Q_{ww,runoff}$	1,220.64	
$COD_{ww,runoff}$	2628	g/m3
$B_{o,ww}$	0.25	kg / kg COD
$MCF_{ww,\ treatment}$	0.3	
UF_b	1.06	
GWP_{CH4}	21	
PE_{runoff}	**5.36**	**tCO_2e**

CPA 8:

Parameter	**Value**	**units**
$Q_{ww,runoff}$	974.29	
$COD_{ww,runoff}$	2553	g/m3
$B_{o,ww}$	0.25	kg / kg COD
$MCF_{ww,\ treatment}$	0.3	
UF_b	1.06	
GWP_{CH4}	21	
PE_{runoff}	**4.15**	**tCO_2e**

Table 9: Project emissions from run-off

5. Project emission from landfill of residual of composting operations

The emissions from landfill of residuals from composting activity $PE_{reswaste\ are}$ calculated using the equation

$$BE_{CH4,SWDS,y} = \varphi \cdot (1-f) \cdot GWP_{CH4} \cdot (1-OX) \cdot \frac{16}{12} \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1}^{y} \sum_{j} W_{j,x} \cdot DOC_j \cdot e^{-k_j \cdot (y-x)} \cdot \left(1-e^{-k_j}\right)$$

The quantity of waste and the composition of waste in the above equation correspond to the residual waste. Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (Version 04) is used.

CPA 1:

Compost and inert materials are the two types of residual wastes generated in the project activity during the monitoring period. Only the inert materials are disposed off in the landfill (and are rather mostly recycled), which does not lead to any methane emissions unlike disposal of sludge and compost in the landfill. Therefore emissions associated with anaerobic storage/disposal of residual waste are not applicable for this monitoring period.

Fuel used in equipment (tonnes of CO_2)	29
Electricity Consumption	1,57
Transport of Waste	0.00
Transport of Compost	27

Methane from composting	4,418
Emission from run off	15
Emissions from residuals	468
Project emissions	**4,959**

CPA 2:
Compost and inert materials are the two types of residual wastes generated in the project activity during the monitoring period.

Fuel used in equipment (tonnes of CO_2)	9.56
Electricity Consumption	0.001
Transport of Waste	-
Transport of Compost	15.80
Methane from composting	754.75
Emission from run off	3.42
Emissions from residuals	69.17
Project emissions	**853**

CPA 3:

Fuel used in equipment (tonnes of CO_2)	14.40
Electricity Consumption	0.00
Transport of Waste	0.00
Transport of Compost	16.82
Methane from composting	1237.54
Emission from run off	5.01
Emissions from residuals	26.77
Project emissions	**1,301**

CPA 4.

Fuel used in equipment (tonnes of CO2)	6.05
Electricity Consumption	0.00
Transport of Waste	0.00
Transport of Compost	8.28
Methane from composting	666.72
Emission from run off	2.85
Emissions from residuals	5.77

Project emissions	**690**

CPA 5:

Fuel used in equipment (tonnes of CO2)	5
Electricity Consumption	0.00
Transport of Waste	0.00
Transport of Compost	35
Methane from composting	629
Emission from run off	3
Emissions from residuals	8
Project emissions	**680**

CPA 6:

Fuel used in equipment (tonnes of CO2)	9
Electricity Consumption	0.07
Transport of Waste	0.00
Transport of Compost	10
Methane from composting	1578
Emission from run off	8
Emissions from residuals	25
Project emissions	**1,632**

CPA 7:

Fuel used in equipment(tonnes of CO2)	8
Electricity Consumption	0.00
Transport of Waste	0.00
Transport of Compost	32
Methane from composting	1075
Emission from run off	5
Emissions from residuals	65
Project emissions	**1,186**

CPA 8:

Fuel used in equipment(tonnes of CO2)	6.91
Electricity Consumption	0.00
Transport of Waste	0.00
Transport of Compost	6.93
Methane from composting	866.28
Emission from run off	4.15
Emissions from residuals	12.63
Project emissions	**897**

Table 11: Project emissions over the monitoring period from 19/04/ 2011 to 30/04/ 2012

E.3. Calculation of leakage

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According to the Methodology, there are no transfer of equipment to other project activities that is, Ly = 0 tCO2e.

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO_2e)	Project emissions or actual net GHG removals by sinks (t CO_2e)	Leakage (t CO_2e)	Emission reductions or net anthropogenic GHG removals by sinks (t CO_2e)
Total	CPA1: 12,903 CPA2: 1,745 CPA 3: 2,717 CPA 4: 1,584 CPA 5: 1,492 CPA 6: 3,723 CPA 7: 2,488 CPA 8: 2,095	CPA1: 4,959 CPA2: 853 CPA 3: 1,301 CPA 4: 690 CPA 5: 680 CPA 6: 1,632 CPA 7: 1,186 CPA 8: 897	0	CPA1: 7,944 CPA2: 892 CPA 3: 1,416 CPA 4: 894 CPA 5: 812 CPA 6: 2,091 CPA 7: 1,302 CPA 8: 1,198 **Total: 16,549**

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO_2e)	CPA 1: 13,944 CPA 2: 5,258 CPA 3: 2,235 CPA 4: 2,535 CPA 5: 5,002 CPA 6: 4,929 CPA 7: 5,090 CPA 8: 4,731	CPA1: 7,944 CPA2: 892 CPA 3: 1,416 CPA 4: 894 CPA 5: 812 CPA 6: 2,091 CPA 7: 1,302 CPA 8: 1,198

E.6. Remarks on difference from estimated value in registered PDD

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The amount of emission reductions achieved in this monitoring period is lower than the estimated value in the registered CPA-DD, therefore no further remarks needs to be provided.

E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Item	Actual values achieved up to 31 December 2012	Actual values achieved from 1 January 2013 onwards
Emission reductions or GHG removals by sinks (t CO_2e)	CPA1: 7,944 CPA2: 892 CPA 3: 1,416 CPA 4: 894 CPA 5: 812 CPA 6: 2,091 CPA 7: 1,302 CPA 8: 1,198 **Total: 16,549**	N/A

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Appendix 1. Contact information of project participants and responsible persons/ entities

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for completing the CDM-MR-FORM
Organization name	National Environment Management Authority (NEMA)
Street/P.O. Box	Plot 17/19/21 Jinja Road. P.O. Box 222255 Kampala, Uganda
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E-mail	IBRD-carbonfinance@worldbank.org
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Contact person	
Title	Manager, Carbon Finance Unit

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Document information

Version	*Date*	*Description*
04.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net anthropogenic GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	28 May 2010	EB 54, Annex 34. Initial adoption.

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