Monitoring report form for CDM programme of activities

(version 01.0)

Complete this form in accordance with the Attachment "Instructions for filling out the monitoring report form for CDM programme of activities" at the end of this form.

MONITORING REPORT		
Title of the programme of activities (PoA)	Uganda Municipal Waste Compost Programme	
UNFCCC reference number of the PoA	2956	
Version number(s) of the PoA-DD(s) applicable to this monitoring report	02.0	
Coordinating/managing entity (CME)	National Environment Management Authority (NEMA)	
Version number of this monitoring report	01	
Completion date of this monitoring report	02/10/2015	
Monitoring period number and dates covered by this monitoring report	Second monitoring period: Duration CPA 1 to CPA 8: 1/05/2012 – 31/12/2013 (first and last days included) Duration CPA 9: 12/12/2012 – 31/12/2013 (first and last days included)	
Monitoring report number for this monitoring period	01.0	
Host Party(ies)	Host Party(ies) of the PoA	Is this a host Party to a specific-case CPA covered in this monitoring report?(yes/no)
	Uganda	YES
Sectoral scope(s)	Sectoral Scope 13	
Selected methodology(ies)	Methodology AMS-III.F.ver.6 – Avoidance of methane emissions trough controlled biological treatment of biomass.	
Selected standardized baseline(s)	Approved Grid Emission Factor for the national power grid of Uganda ASB0006 as per 21st October 2014 Version 01.0 https://cdm.unfccc.int/methodologies/standard_base/new/sb7_index.html (Ref ASB0006 See table 1 of page 5 of 6)	
Total amount of GHG emission reductions or net GHG removals by sinks for all specific-case-case CPAs in the PoA covered in this monitoring report	GHG emission reductions or net GHG removals by sinks reported in the period: 1st May 2012 up to 31st December 2013 or in this monitoring period.	GHG emission reductions or net GHG removals by sinks reported in the period: from 12 December 2012 up to 31st December 2013 or in this monitoring period.
	CPA 2956-0001: 7,496 CPA 2956-0002: 3,086 CPA 2956-0003: 3,006 CPA 2956-0004: 2,048	CPA 2959-0009: 822

	CPA 2956-0005: 1,300 CPA 2956-0006: 3,537 CPA 2956-0007: 1,972 CPA 2956-0008: 2,215	

PART I - Programme of activities

Description of PoA

A.1. Brief description of the PoA

The purpose of the project activity is to avoid methane emissions from Municipal waste landfill by undertaking composting of organic municipal solid waste to make compost manure, and using the organic compost manure 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 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.

A.1.1. Generic CPA(s)

Title, identification/reference number and/or version number of the generic CPA(s) of the PoA	Sectoral scope(s)	Applied methodology(ies) or combination of methodologies and/or standardized baseline(s)
Municipal Waste Composting Project for Mbarara Municipality. Ref: 2956-0009	13	AMS-III.F.ver.6 – Avoidance of methane emissions trough controlled biological treatment of biomass.https://cdm.unfccc.int/methodologies/DB/7RF5DZ2T6T8F88BMPPHNDOATXD40Y0
Municipal Waste Composting Project for Soroti Municipality. Ref: 2956-0008	13	AMS-III.F.ver.6 – Avoidance of methane emissions trough controlled biological treatment of biomass. https://cdm.unfccc.int/methodologies/DB/7RF5DZ2T6T8F88BMPPHNDOATXD40Y0
Municipal Waste Composting Project for Mukono Municipality. Ref: 2956-0007	13	AMS-III.F.ver.6 – Avoidance of methane emissions trough controlled biological treatment of biomass.https://cdm.unfccc.int/methodologies/DB/7RF5DZ2T6T8F88BMPPHNDOATXD40Y0
Municipal Waste Composting Project for Mbale Municipality. Ref: 2956-0006	13	AMS-III.F.ver.6 – Avoidance of methane emissions trough controlled biological treatment of biomass.https://cdm.unfccc.int/methodologies/DB/7RF5DZ2T6T8F88BMPPHNDOATXD40Y0

Municipal Waste Composting Project for Lira Municipality. Ref: 2956-0005	13	AMS-III.F.ver.6 – Avoidance of methane emissions trough controlled biological treatment of biomass.https://cdm.unfccc.int/methodologies/DB/7RF5DZ2T6T8F88BMPPHNDOATXD40Y0
Municipal Waste Composting Project for Kasese Municipality. Ref: 2956-0004	13	AMS-III.F.ver.6 – Avoidance of methane emissions trough controlled biological treatment of biomass.https://cdm.unfccc.int/methodologies/DB/7RF5DZ2T6T8F88BMPPHNDOATXD40Y0
Municipal Waste Composting Project for Kabale Municipality. Ref: 2956-0003	13	AMS-III.F.ver.6 – Avoidance of methane emissions trough controlled biological treatment of biomass. UNFCCC ref: https://cdm.unfccc.int/methodologies/DB/7RF5DZ2T6T8F88BMPPHNDOATXD40Y0
Municipal Waste Composting Project for Fort Portal Municipality. Ref: 2956-0002	13	AMS-III.F.ver.6 – Avoidance of methane emissions trough controlled biological treatment of biomass.https://cdm.unfccc.int/methodologies/DB/7RF5DZ2T6T8F88BMPPHNDOATXD40Y0
Municipal Waste Composting Project for Jinja Municipality. Ref: 2956-0001	13	AMS-III.F.ver.6 – Avoidance of methane emissions trough controlled biological treatment of biomass.https://cdm.unfccc.int/methodologies/DB/7RF5DZ2T6T8F88BMPPHNDOATXD40Y0

A.1.2. Specific-case CPA(s) covered in this monitoring report

Reference number of the specific-case CPA included in the PoA as of the end of this monitoring period	Title, identification/ reference number and version number of the generic CPA to which the specific-case CPA applies	Crediting period dates of the specific-case CPA	Is this specific-case CPA covered in this monitoring report? (yes/no)
2956-0001	Municipal Waste Composting Project for Jinja Municipality.		Yes
2956-0002	Municipal Waste Composting Project for Fort Portal Municipality.		Yes
2956-0003	Municipal Waste Composting Project for Kabale Municipality.		Yes
2956-0004	Municipal Waste Composting Project for Kasese Municipality.		Yes
2956-0005	Municipal Waste Composting Project for Lira Municipality.		Yes
2956-0006	Municipal Waste Composting Project for Mbale Municipality.		Yes
2956-0007	Municipal Waste Composting Project for Mukono Municipality.		Yes
2956-0008	Municipal Waste Composting Project for Soroti Municipality.		Yes
2956-0009	Municipal Waste Composting Project for Mbarara Municipality.		Yes

A.2. Contact information of the coordinating/managing entity (CME) and/or responsible persons(s)/entity(ies)

CME:
The Executive Director,
National Environment Management Authority (NEMA),
P.O.Box 22255,
Kampala, Uganda.
Tel: +256 414 251 064/5/8

Fax: +256-414-257 521
Email: info@nemaug.org
Web: www.nemaug.org
NEMA HOUSE, PLOT 17/19/21 JINJA ROAD

The Resident Representative,
Belgian Development Agency (BTC),
Plot 1B, Lower Kololo Terrace,
P.O. Box 40131,
KAMPALA.
Tel: +256 (0) 414 230543

SECTION B. Implementation of PoA

B.1. Implementation of the management system of the PoA

The municipalities participating in the program are responsible for implementing the solid waste composting activity. Construction of the composting facility, transport of wastes to the composting facility, processing of the waste in the composting facility, selling of compost produced and disposal of rejects from the compost plant etc. are the prime responsibilities of the urban local body that proposes a CPA. As part of the inclusion of the CPA under the PoA a Cooperation Agreement would be signed by each of the CPA proponent (town council, municipal council or city council) with NEMA. Suitable training programs will be conducted for the municipalities proposing a CPA to make them aware of the rules of the CDM and PoA. In addition, the Cooperation Agreement includes specific provisions and declarations that makes CPA proponents acknowledgeable that they are aware and have agreed that their activity is being subscribed under the PoA. The agreement also requires the proponent of CPA to confirm that they have not previously been a part of any CDM project.
The proposed PoA is the first PoA for Municipal waste composting in Uganda: this is confirmed as part of the host country approval letter from the DNA of Uganda. This avoids the case of the CPA being part of another PoA.
NEMA acting on behalf of the municipalities and/or city/town councils participating in the program maintains the data about each of the CPA's and shares the same with the IBRD and the DoE as required. The names of the municipalities and/or city/town councils proposing a CPA are included in the title of each CPA for easy identification. The record keeping is both in paper and in electronic format. The record is of two types: the first is the record of the various CPA and their status; the second is a detailed record of each of the CPA.

B.2. Implementation of single sampling plan(s)

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 C. Post-registration changes to the PoA (including the generic CPA(s))

C.1. Corrections

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 offgrid 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

C.2. Inclusion of a monitoring plan to the registered PoA-DD (including its generic CPA-DD(s)), if a monitoring plan was not included at the time of registration

The Monitoring plan was included in the registered PoA-DD, where the date of approval of the registered PoA-DD is: 16/06/2015; and the Reference number being: 2956

C.3. Permanent changes to the monitoring plan as described in the registered PoA-DD, applied methodology, or applied standardized baseline

Revision of the monitoring plan was requested and was 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

C.4. Changes to the programme design of the registered PoA-DD (including corresponding changes to project design of the generic CPA-DD(s)) and updates to the eligibility criteria for inclusion of specific-case CPAs in the PoA

N/A

C.5. Types of changes specific to afforestation and reforestation activities

N/A

PART II - Specific-case component project activity(ies)

SECTION D. Description of specific-case CPA(s)

CPA 1:
The construction works of the composting site started on 30/10/2007. The plant was commissioned on 7/08/2009. The first delivery of solid waste to the composting plant was on 2/09/2009. 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 on 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 on 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 on 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 on 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 on 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 on 05/08/2009. The project activity was registered on the 19/04/2011, and this is the first monitoring period.

CPA 9:
The construction works of the composting site started on 31/10/2007. The plant was commissioned on 05/08/2009. The project activity was registered on 12/04/2010 as the first monitoring period.

D.1. Brief description of implemented specific-case CPA(s)

CPA 1 (Jinja):
The construction works of the composting site started on 30/10/2007. The plant was commissioned on 7/08/2009. The first delivery of solid waste to the composting plant was on 2/09/2009. The project activity was registered on the 12/04/2010, as the first CPA of the Uganda Municipal Waste Compost program.

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

CPA 3 (Kabale):
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 (Kasese):
The construction works of the composting site started on 30/10/2007. The plant was commissioned on 13/08/2009. The project activity was registered on the 19/04/2011, and this is the first monitoring period.

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

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

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

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

CPA 9 (Mbarara):
The construction works of the composting site started on 31/10/2007. The plant was commissioned on 05/08/2009. The project activity was registered on 12/04/2010 as the first monitoring period.

D.2. Geographical references or other means of identification of the location of the specific-case CPA(s)

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

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

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

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

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

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

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

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

SECTION E. Post-registration changes to specific-case CPA(s)

E.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

N/A

E.2. Corrections

N/A

E.3. Changes to the start date of the crediting period of the specific-case CPA(s)

N/A

E.4. Inclusion of a monitoring plan into the specific-case CPA(s) that was not included at registration

N/A

E.5. Permanent changes to the monitoring plan as described in the registered specific-case CPA-DD(s), applied methodology or standardized baseline

N/A

E.6. Changes to project design of the specific-case CPA(s)

N/A

E.7. Types of changes specific to afforestation and reforestation specific-case CPA(s)

N/A

SECTION F. Description of the monitoring system of specific-case CPA(s)

The following monitoring system applies for all the specific listed CPAs withing the PoA

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

Figure 10: The Project 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 quater throughout the monitoring period.

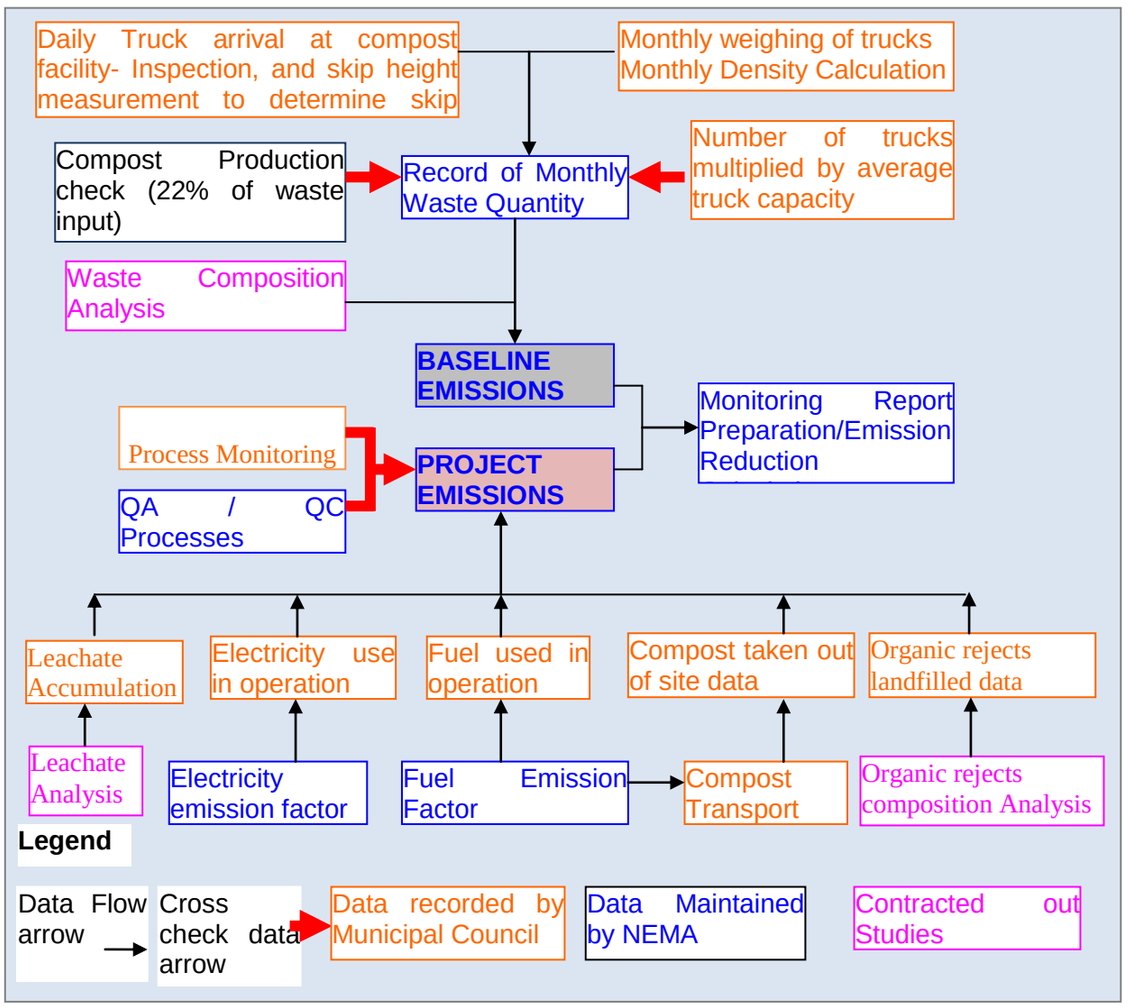

Figure 11: Monitoring Points

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 G. Data and parameters

G.1. Data and parameters fixed ex ante, at registration, inclusion or renewal of crediting period

(Copy this table for each piece of data and parameter)

Data/parameter	**EF_{co2}**
Unit	kg CO2/ 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
Choice of data or measurement methods and procedures	Default CO2 emission factor of diesel used in road transport as per IPCC (2006 IPCC Guidelines for National Greenhouse Gas Inventories) is 74,100 kgCO2/TJ. Calorific Value and density of diesel according to the Uganda Energy Balance data is 43.3 GJ/ton, and 0.85 ton/m3 respectively. The above data results in an emission coefficient of 2.727 kgCO2/litre for diesel. Considering an average efficiency of transport vehicle as 5 km/litre, this translates to an emission factor of 0.545 kgCO2/km.
Purpose of data	To calculate project emissions resulting from fuel consumption
Additional comments	(None)

Data/parameter	**EF_{Fuel}**
Unit	kg CO2/ 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
Choice of data or measurement methods and procedures	Default CO2 emission factor of diesel used in road transport as per IPCC (2006 IPCC Guidelines for National Greenhouse Gas Inventories) is 74,100 kgCO2/TJ. Calorific Value and density of diesel according to Uganda Energy Balance data is 43.3 GJ/ton, and 0.85 ton/m3 respectively. The above data results in an emission coefficient of 2.727 kgCO2/litre for diesel.
Purpose of data	To calculate project emissions resulting from fuel consumption
Additional comments	(None)

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
Choice of data or measurement methods and procedures	Default value acceptable as per IPCC 2006
Purpose of data	To calculate project emissions resulting from fuel consumption for power generation.
Additional comments	(None)

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 %
Choice of data or measurement methods and procedures	-
Purpose of data	To calculate project emissions resulting from electricity consumption
Additional comments	-

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
Choice of data or measurement methods and procedures	Default value acceptable as per IPCC 2006.
Purpose of data	To calculate project emissions resulting from diesel consumption
Additional comments	

Data/parameter	$EF_{composting}$
Unit	Kg CH4/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
Choice of data or measurement methods and procedures	Taken as per AMS-III.F version 06.0

Purpose of data	To calculate project emissions resulting composting activities
Additional comments	-

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
Choice of data or measurement methods and procedures	Default as recommended in methodology AMS-III.F version 06.0
Purpose of data	To calculate project emissions
Additional comments	-

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 in the methodology
Value(s) applied	0.3
Choice of data or measurement methods and procedures	The composting process is proposed under a roof. No rain run-off is expected. The process management would ensure that no leachate from excess watering is generated. Leachate generated due to moist waste input would be sprayed back onto the older waste windrows. In this context no treatment plant is proposed. In case leachate does get produced and which cannot be sprayed back an aerobic treatment system based on reed bed or similar botanical treatment system would be undertaken without use of power. The number for aerobic treatment poorly managed is adopted.
Purpose of data	Calculation of project emission from run off from composting operations
Additional comments	Annually to check if any run off is there. 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
Choice of data or measurement methods and procedures	OX is determined by the following two ways: (1) Conduct a site visit at the solid waste disposal site in order to assess the type of cover of the solid waste disposal site. Use the IPCC 2006 Guidelines for National Greenhouse Gas Inventories for the choice of the value to be applied. (2) Use 0.1 for managed solid waste disposal sites that are covered with oxidizing material such as soil or compost. Use 0 for other types of solid waste disposal sites. Since the landfill in baseline scenario can be considered as a unmanaged landfill with soil cover, the OX in this case is 0. The Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site version 4.0 says the OX be taken as 0.
Purpose of data	To calculate baseline emissions

Additional comments	-

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
Choice of data or measurement methods and procedures	Default value
Purpose of data	Calculation of baseline emissions.
Additional comments	-

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
Choice of data or measurement methods and procedures	Use the following values for MCF: • 1.0 for anaerobic managed solid waste disposal sites. These must have controlled placement of waste (i.e., waste directed to specific deposition areas, a degree of control of scavenging and a degree of control of fires) and will include at least one of the following: (i) cover material; (ii) mechanical compacting; or (iii) leveling of the waste. • 0.5 for semi-aerobic managed solid waste disposal sites. These must have controlled placement of waste and will include all of the following structures for introducing air to waste layer: (i) permeable cover material; (ii) leachate drainage system; (iii) regulating pondage; and (iv) gas ventilation system. • 0.8 for 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. • 0.4 for unmanaged-shallow solid waste disposal sites. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of less than 5 metres. The landfill is unmanaged and >5 m depth
Purpose of data	To calculate baseline emissions
Additional comments	-

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
Choice of data or measurement methods and procedures	Quantity of waste handled at the facility will be measured on a wet basis. Therefore DOC_j values corresponding to the wet waste is used.
Purpose of data	To calculate baseline emissions
Additional comments	-

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
Choice of data or measurement methods and procedures	-
Purpose of data	To calculate baseline emissions
Additional comments	

Data/parameter	**GWP_{CH4}**
Unit	tCO2e/tCH4
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
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of baseline and project emissions
Additional comments	

G.2. Data and parameters monitored

(Copy this table for each piece of data and parameter)

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: 7,169 CPA 2: 3,652 CPA 3: 8,600 CPA 4: 4,515 CPA 5: 1,610 CPA 6: 5,571 CPA 7: 8,155 CPA 8: 4,161 CPA 9: 2,236
Monitoring equipment	Fuel is purchased from a fuel station, whose fuel dispensing pumps are 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	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.
Purpose of data	To determine project emissions
Additional comments	

Data/parameter	**Q_{ycomp}**
Unit	Tonnes
Description	CPA 1-8: Total quantity of compost transported out of the site for the monitoring period of May 2012 to December 2013 CPA 9: Total quantity of compost transported out of the site for the monitoring period of December 2012 to December 2013
Measured/calculated/ default	Measured
Source of data	Compost production and sales register maintained by the operator.
Value(s) of monitored parameter	CPA 1: 359.9 CPA 2: 1,303.3 CPA 3: 1,706.8 CPA 4: 178.93 CPA 5: 332.8 CPA 6: 368.3 CPA 7: 296.5 CPA 8: 437 CPA 9: 208.9

Monitoring equipment	During the monitoring period, all loads were weighted on site with a calibrated weighting scale before loading onto a truck. 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)	N/A
QA/QC procedures	The weighing scale is calibrated
Purpose of data	To determine project emissions resulting from transportation of compost
Additional comments	-

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: 4.09 CPA 2: 7.36 CPA 3: 7.14 CPA 4: 5.52 CPA 5: 0.93 CPA 6: 4.54 CPA 7: 2.53 CPA 8: 4.24 CPA 9: 3.79
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 comments	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: 1.82 CPA 2: 0.94 CPA 3: 0.37 CPA 4: 5.00 CPA 5: 1.00 CPA 6: 2.00 CPA 7: 1.00 CPA 8: 1.42 CPA 9: 2.94
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 comments	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: 0 CPA 2 and CPA 6: 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: 0 CPA 2: 0.02 CPA 3: 0 CPA 4: 0 CPA 5: 0 CPA 6: 0.15 CPA 7: 0 CPA 8: 0 CPA 9: 0
Monitoring equipment	CPA 1: No electricity consumption from the grid. Site was disconnected from the the National grid. CPA 2 and 6: Utility meter. All electricity meters in the country are provided and owned by UMEME. Meter information CPA 2 (Fort Portal): Model: DDS26D Serial Number 240V SINGLE PHASE 2 WIRE Manufacturing year 2009 Meter number UM 200829 /1600IMP/KWH Accuracy class +/- 1 (class 1) Meter information CPA 6 (Mbale): Model: DDS26D Serial Number 240V SINGLE PHASE 2 WIRE Manufacturing year 2009 Meter number U1065456 /1600IMP/KWH Accuracy class +/- 1 (class 1)

Measuring/reading/ recording frequency	CPA 1: N/A CPA 2 and 6: Monthly Note: Other CPAs are not connected to the grid.
Calculation method (if applicable)	CPA 1: N/A, no electricity consumption from the grid. CPA 2 and 6: Conversion from kWh to MWh. CPA 3-5; 7-9: N/A, no electricity consumption from the grid.
QA/QC procedures	-
Purpose of data	To determine project emissions
Additional comments	CPA 1: The power consumption at the site was estimated based on the wattage of the loads CPA 3-5; 7-9: Site connected to solar PV or no electricity at the site.

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 GEF Standardised baseline (approved) https://cdm.unfccc.int/methodologies/standard_base/new/sb7_index.html (Ref ASB0006 See table 1 of page 5 of 6)
Value(s) of monitored parameter	0.573
Monitoring equipment	N/A
Measuring/reading/ recording frequency	As per approved standardised baseline
Calculation method (if applicable)	As per approved standardised baseline
QA/QC procedures	As per approved standardised baseline
Purpose of data	Calculation of project emissions
Additional comments	-

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: 663.11 CPA 2: 5597.82 CPA 3: 768.59 CPA 4: 217.48 CPA 5: 268.29 CPA 6: 740.8 CPA 7: 12162.31 CPA 8: 251.58 CPA 9: 48.69
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 comments	The maximum residual volume and density within the available record was applied to the period May, 2012 – December, 2013 to complete the dataset.

Data/parameter	**P n,j,x, residual**
Unit	%
Description	Weight fraction of the waste type j in the residual waste sent to the landfill.
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	0.3
Pulp, paper and cardboard (other than sludge)	1.2
Food, food waste beverages and tobacco (other than sludge)	24.5
Textiles	0.2
Garden, yard and park waste	24.5
Glass, plastic, metal, other inert waste	48.1

CPA 2:

Waste Type	%
Wood and wood products	0.3
Pulp, paper and cardboard (other than sludge)	0.4
Food, food waste beverages and tobacco (other than sludge)	19.4
Textiles	0.0
Garden, yard and park waste	19.4
Glass, plastic, metal, other inert waste	56.3

CPA 3:

Waste Type	%
Wood and wood products	0.4
Pulp, paper and cardboard (other than sludge)	2.9
Food, food waste beverages and tobacco (other than sludge)	12.4
Textiles	0.0
Garden, yard and park waste	12.4
Glass, plastic, metal, other inert waste	64.8

CPA 4:

Waste Type	%
Wood and wood products	0.6
Pulp, paper and cardboard (other than sludge)	2.8
Food, food waste beverages and tobacco (other than sludge)	18.4
Textiles	0.3
Garden, yard and park waste	18.4
Glass, plastic, metal, other inert waste	56.9

CPA 5:

Waste Type	%
Wood and wood products	1.3
Pulp, paper and cardboard (other than sludge)	1.4
Food, food waste beverages and tobacco (other than sludge)	16.7
Textiles	1.5
Garden, yard and park waste	16.8
Glass, plastic, metal, other inert waste	61.1

CPA 6:

Waste Type	%
Wood and wood products	1.5
Pulp, paper and cardboard (other than sludge)	6.3
Food, food waste beverages and tobacco (other than sludge)	23.5
Textiles	0.0
Garden, yard and park waste	23.0
Glass, plastic, metal, other inert waste	51.6

CPA 7:

Waste Type	%
Wood and wood products	0.5
Pulp, paper and cardboard (other than sludge)	1.3
Food, food waste beverages and tobacco (other than sludge)	22.9
Textiles	0.2
Garden, yard and park waste	22.9
Glass, plastic, metal, other inert waste	51.8

CPA 8:

Waste Type	%
Wood and wood products	0.2
Pulp, paper and cardboard (other than sludge)	0.8
Food, food waste beverages and tobacco (other than sludge)	21.8
Textiles	0.0
Garden, yard and park waste	21.8
Glass, plastic, metal, other inert waste	56.4

CPA 9:

Waste Type	%
Wood and wood products	0.3
Pulp, paper and cardboard (other than sludge)	1.2
Food, food waste beverages and tobacco (other than sludge)	21.2
Textiles	0.0
Garden, yard and park waste	21.2
Glass, plastic, metal, other inert waste	56.4

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 for the period May, 2012 to September, 2012. From October, 2012 on wards in this monitoring period, the sampling and analysis was done by municipality staff trained and certified by Makerere University.
Measuring/reading/ recording frequency	Standard procedures for determining the waste composition are 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. 20 samples were taken for the period May 2012 to December 2013. The average composition is used in all calculations. CPA 2 - 8: Samples are taken once in a month, which translates to 20 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. CPA 9: Samples are taken once in a month, which translates to 12 samples in a year,. Only 11 samples were taken for this monitoring period of December 2012 to December 2013. 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 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; To determine baseline emissions.
Additional comments	

Data/parameter	$Q_{y,ww,runoff}$
Unit	m^3
Description	Volume of run-off water in this monitoring period.
Measured/calculated/ default	CPA 1-9: 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: 2,164.92 CPA 2: 2,299.59 CPA 3: 2,403.46 CPA 4: 1,275.48 CPA 5: 831.17 CPA 6: 2,208.38 CPA 7: 1,982.03 CPA 8: 1,346.30 CPA 9: 1,223.16
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 W_x 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	The records of monthly measurement will be reviewed and signed off by the responsible site manager, and kept on site. Spot checks will be carried out by CME on a quarterly basis.
Purpose of data	Determine the project emissions resulting from run-off.
Additional comments	-

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 CPA 9: 0.001621
Monitoring equipment	Analytical technique for COD measurement conducted by Makerere University.
Measuring/reading/ recording frequency	Once a month
Calculation method (if applicable)	The monthly values were averaged.
QA/QC procedures	
Purpose of data	To determine emissions from runoff.
Additional comments	-

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: 30,927.37 CPA 2: 32,851.24 CPA 3: 34,323.82 CPA 4: 18,221.93 CPA 5: 11,873.93 CPA 6: 31,548.29 CPA 7: 28,314.68 CPA 8: 19,232.89 CPA 9: 17,473.72
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: 0.53 t/m3 CPA 2: 0.61 t/m3 CPA 3: 0.52 t/m3 CPA 4: 0.52 t/m3 CPA 5: 0.42 t/m3 CPA 6: 0.60 t/m3 CPA 7: 0.62 t/m3 CPA 8: 0.46 t/m3 CPA 9: 0.53 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: $\mathbf{W_x} = W_{all\ waste} * (1 - \%_{inerts}) = 30{,}927.37$ tons * (1 – 4.06%) CPA 2: $\mathbf{W_x} = W_{all\ waste} * (1 - \%_{inerts}) = 32{,}851.24$ tons * (1 – 10.11%) CPA 3: $\mathbf{W_x} = W_{all\ waste} * (1 - \%_{inerts}) = 34{,}323.82$ tons * (1 – 10.0%) CPA 4: $\mathbf{W_x} = W_{all\ waste} * (1 - \%_{inerts}) = 18{,}221.14$ tons * (1 – 4.35%) CPA 5: $\mathbf{W_x} = W_{all\ waste} * (1 - \%_{inerts}) = 11{,}873.93$ tons * (1 – 4.7%) CPA 6: $\mathbf{W_x} = W_{all\ waste} * (1 - \%_{inerts}) = 31{,}548.29$ tons * (1 – 3.5%) CPA 7: $\mathbf{W_x} = W_{all\ waste} * (1 - \%_{inerts}) = 28{,}314.68$ tons * (1 – 3.5%) CPA 8: $\mathbf{W_x} = W_{all\ waste} * (1 - \%_{inerts}) = 19{,}232.89$ tons * (1 – 4.3%) CPA 9: $\mathbf{W_x} = W_{all\ waste} * (1 - \%_{inerts}) = 17{,}473.79$ tons * (1 – 2.8%)
QA/QC procedures	
Purpose of data	To determine baseline emissions from composting
Additional comments	

Data/parameter	$P_{n,j,x}$
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)	40.3
Textiles	0.6
Garden, yard and park waste	52.7
Glass, plastic, metal, other inert waste	4.2

CPA 2:

Waste Type	%
Wood and wood products	0.2
Pulp, paper and cardboard (other than sludge)	2.8
Food, food waste beverages and tobacco (other than sludge)	47.3
Textiles	0.3
Garden, yard and park waste	39.3
Glass, plastic, metal, other inert waste	9.7

CPA 3:

Waste Type	%
Wood and wood products	0.2
Pulp, paper and cardboard (other than sludge)	4.7
Food, food waste beverages and tobacco (other than sludge)	27.6
Textiles	1.2
Garden, yard and park waste	56.3
Glass, plastic, metal, other inert waste	5.6

CPA 4:

Waste Type	%
Wood and wood products	0.1
Pulp, paper and cardboard (other than sludge)	1.6
Food, food waste beverages and tobacco (other than sludge)	48.7
Textiles	0.4
Garden, yard and park waste	44.9
Glass, plastic, metal, other inert waste	4.3

CPA 5:

Waste Type	%
Wood and wood products	0.3
Pulp, paper and cardboard (other than sludge)	2.5
Food, food waste beverages and tobacco (other than sludge)	47.4
Textiles	1.1
Garden, yard and park waste	44.0
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)	2.1
Food, food waste beverages and tobacco (other than sludge)	48.4
Textiles	0.5
Garden, yard and park waste	46.0
Glass, plastic, metal, other inert waste	3.8

CPA 7**:**

Waste Type	**%**
Wood and wood products	0.3
Pulp, paper and cardboard (other than sludge)	3.2
Food, food waste beverages and tobacco (other than sludge)	34.9
Textiles	0.9
Garden, yard and park waste	57.2
Glass, plastic, metal, other inert waste	4.5

CPA 8:

Waste Type	**%**
Wood and wood products	0.5
Pulp, paper and cardboard (other than sludge)	2.2
Food, food waste beverages and tobacco (other than sludge)	52.3
Textiles	0.5
Garden, yard and park waste	40.3
Glass, plastic, metal, other inert waste	3.4

CPA 9:

Waste Type	**%**
Wood and wood products	0.3
Pulp, paper and cardboard (other than sludge)	1.9
Food, food waste beverages and tobacco (other than sludge)	46.7
Textiles	0.4
Garden, yard and park waste	48.0
Glass, plastic, metal, other inert waste	3.4

Monitoring equipment	Standard procedures for determining the waste composition are used. The composition of incoming waste was determined by sampling and analysis carried out by Makerere University for the period May, 2012 to September, 2012. From October, 2012 on wards in this monitoring period, the sampling and analysis was done by municipality staff trained and certified by Makerere University.
Measuring/reading/ recording frequency	Standard procedures for determining the waste composition are used. The composition of incoming waste will be determined by sampling and analysis performed by trained personnel. Samples will be taken three times in a month. The average composition shall be used in all calculations.
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 ; Calculation of baseline emissions).
Additional comments	

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 (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 for all the CPAs.)

Monitoring equipment	-
Measuring/reading/ recording frequency	To be carried out on an annual basis
Calculation method (if applicable)	N/A
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	-

G.3. Implementation of specific-case CPA level 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, for the period May, 2012 to September, 2012. From October, 2012 on wards in this monitoring period, the sampling and analysis was done by municipality staff trained and certified by Makerere University.

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,for the period May, 2012 to September, 2012. From October, 2012 on wards in this monitoring period, the sampling and analysis was done by municipality staff trained and certified by Makerere University.

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 H. Calculation of GHG emission reductions or net GHG removals by sinks

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

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

Table 3: Methane emissions generated for the period 1st /05/2012 to 31/12/2013

CPA 1:

Year		**2012-2013**
Waste inflow (t MSW)	t MSW	30,927
CH4 generated (t CO2)	tCO2	10,139
CH4 generated (t CH4)	tCH4	447
CH4 generated (m3 CH4)	m3 CH4	623,005

CPA 2:

Year		**2012-2013**
Annual waste inflow (t MSW)	t MSW	32,851
CH4 generated (t CO2)	tCO2	6,044
CH4 generated (t CH4)	tCH4	83
CH4 generated (m3 CH4)	m3 CH4	115,898

CPA 3:

Year		**2012-2013**
Annual waste inflow (t MSW)	t MSW	34,335
CH4 generated (t CO2)	tCO2	5,667.60
CH4 generated (t CH4)	tCH4	129.08
CH4 generated (m3 CH4)	m3 CH4	180,073

CPA 4:

Year		**2012-2013**
Annual waste inflow (t MSW)	t MSW	18,211.14
CH4 generated (t CO2)	tCO2	3,546
CH4 generated (t CH4)	tCH4	75.44
CH4 generated (m3 CH4)	m3 CH4	105,250

CPA 5:

Year		**2012-2013**
Annual waste inflow (t MSW)	t MSW	11,874
CH4 generated (t CO2)	tCO2	2,279
CH4 generated (t CH4)	tCH4	71
CH4 generated (m3 CH4)	m3 CH4	98,575

CPA 6:

Year		**2012-2013**
Annual waste inflow (t MSW)	t MSW	31,548
CH4 generated (t CO2)	tCO2	6,195
CH4 generated (t CH4)	tCH4	176
CH4 generated (m3 CH4)	m3 CH4	245,516

CPA 7:

Year		2012-2013
Annual waste inflow (t MSW)	t MSW	28,315
CH4 generated (t CO2)	tCO2	5,162
CH4 generated (t CH4)	tCH4	120
CH4 generated (m3 CH4)	m3 CH4	167,062

CPA 8:

Year		2012-2013
Annual waste inflow (t MSW)	t MSW	19,232
CH4 generated (t CO2)	tCO2	3,799
CH4 generated (t CH4)	tCH4	100
CH4 generated (m3 CH4)	m3 CH4	138,959

CPA 9:

Year		2012-2013
Annual waste inflow (t MSW)	t MSW	17,473
CH4 generated (t CO2)	tCO2	3,407
CH4 generated (t CH4)	tCH4	120
CH4 generated (m3 CH4)	m3 CH4	167,062

H.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:

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

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	
$Q_{y,comp}$	359.99	tonnes
$CTy_{,comp}$	4.09	tonnes/truck
DAF_{comp}	1.82	km/truck
EF_{CO2}	0.545 (as established in the PoA-DD)	kgCO2/km
$PE_{transport,y}$	**2**	**tCO2e**

CPA 2:

Parameter	**Value**	**Units**
$Q_{y,comp}$	1,303.30	tonnes
$CTy_{,comp}$	7.36	tonnes/truck
DAF_{comp}	11.04	km/truck
EF_{CO2}	0.545 (as established in the PoA-DD)	kgCO2/km
$PE_{transport,y}$	**9.20**	**tCO2e**

CPA3:

Parameter	Value	
$Q_{y,comp}$	1,706.84	tonnes
$CTy_{,comp}$	7.14	tonnes/truck
DAF_{comp}	0.37	km/truck
EF_{CO2}	0.545 (as established in the PoA-DD)	kgCO2/km
$PE_{transport,y}$	**1.21**	**tCO2e**

CPA 4:

Parameter	**Value**	**Units**
$Q_{y,comp}$	178.93	tonnes
$CTy_{,comp}$	5.52	tonnes/truck
DAF_{comp}	5	km/truck
EF_{CO2}	0.545 (as established in the PoA-DD)	kgCO2/km
$PE_{transport,y}$	**2.21**	**tCO2e**

CPA 5

Parameter	**Value**	**Units**
$Q_{y,comp}$	332.80	tonnes
$CTy_{,comp}$	0.93	tonnes/truck
DAF_{comp}	1	km/truck
EF_{CO2}	0.545 (as established in the PoA-DD)	kgCO2/km
$PE_{transport,y}$	**5**	**tCO2e**

CPA 6:

Parameter	**Value**	**Units**
$Q_{y,comp}$	368	tonnes
$CTy_{,comp}$	4.55	tonnes/truck
DAF_{comp}	2.16	km/truck
EF_{CO2}	0.545 (as established in the PoA-DD)	kgCO2/km
$PE_{transport,y}$	**2**	**tCO2e**

CPA 7:

Parameter	Value	Units
$Q_{y,comp}$	296.50	tonnes
$CTy_{,comp}$	2.53	tonnes/truck
DAF_{comp}	1.35	km/truck
EF_{CO2}	0.545 (as established in the PoA-DD)	kgCO2/km
$PE_{transport,y}$	**2**	**tCO2e**

CPA 8:

Parameter	Value	Units
$Q_{y,comp}$	437	tonnes
$CTy_{,comp}$	4.24	tonnes/truck
DAF_{comp}	1.42	km/truck
EF_{CO2}	0.545 (as established in the PoA-DD)	kgCO2/km
$PE_{transport,y}$	**2**	**tCO2e**

CPA 9:

Parameter	Value	Units
$Q_{y,comp}$	208.9	tonnes
$CTy_{,comp}$	3.8	tonnes/truck
DAF_{comp}	2.9	km/truck
EF_{CO2}	0.545 (as established in the PoA-DD)	kgCO2/km
$PE_{transport,y}$	**2.21**	**tCO2e**

Table 4: 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	0	MWh
CEF_{elec}	0.573	tCO2e/MWh

$PE_{electricity}$	**0**	**tCO2e**

CPA 2:

Parameter	**Value**	**Units**
MWh_e	0.02	MWh
CEF_{elec}	0.573	tCO2e/MWh
$PE_{electricity}$	**0.011**	**tCO2e**

CPA 3:

Parameter	Value	
MWh_e	0	MWh
CEF_{elec}	0.573	tCO2e/MWh
$PE_{electricity}$	**0**	**tCO2e**

CPA 4:

Parameter	Value	
MWh_e	0	MWh
CEF_{elec}	0.573	tCO2e/MWh
$PE_{electricity}$	**0**	**tCO2e**

CPA 5:

Parameter	**Value**	**Units**
MWh_e	0	MWh
CEF_{elec}	0.573	tCO2e/MWh
$PE_{electricity}$	**0**	**tCO2e**

CPA 6:

Parameter	**Value**	**Units**
MWh_e	0.150	MWh
CEF_{elec}	0.573	tCO2e/MWh
$PE_{electricity}$	**0.09**	**tCO2e**

CPA 7:

Parameter	**Value**	**Units**
MWh_e	0	MWh
CEF_{elec}	0.573	tCO2e/MWh
$PE_{electricity}$	**0**	**tCO2e**

CPA 8

Parameter	**Value**	**Units**
MWh_e	0	MWh
CEF_{elec}	0.573	tCO2e/MWh
$PE_{electricity}$	**0**	**tCO2e**

CPA 9

Parameter	**Value**	**Units**
MWh_e	0	MWh
CEF_{elec}	0.573	tCO2e/MWh
$PE_{electricity}$	**0**	**tCO2e**

Table 5: 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	
$F_{cons,y}$	7,169	litres
EF_{fuel}	2.727 (as provided in the POADD)	kgCO2/ litre
$PE_{fuel,onsite,y}$	**20**	**tCO_2e/yr**

CPA 2:

Parameter	**Value**	**Units**
$F_{cons,y}$	3,824	litres
EF_{fuel}	2.727 (as provided in the POADD)	kgCO2/ litre
$PE_{fuel,onsite,y}$	**10.43**	**tCO_2e/yr**

CPA 3:

Parameter	Value	
$F_{cons,y}$	8,600	litres
EF_{fuel}	2.727 (as provided in the POADD)	kgCO2/ litre
$PE_{fuel,onsite,y}$	**23.45**	**tCO_2e/yr**

CPA 4:

Parameter	**Value**	**Units**
$F_{cons,y}$	4,515	litres
EF_{fuel}	2.727 (as provided in the POADD)	kgCO2/ litre
$PE_{fuel,onsite,y}$	**12.31**	**tCO_2e/yr**

CPA 5:

Parameter	**Value**	**Units**
$F_{cons,y}$	1610	litres
EF_{fuel}	2.727 (as provided in the POADD)	kgCO2/ litre
$PE_{fuel,onsite,y}$	**4**	**tCO_2e/yr**

CPA 6:

Parameter	**Value**	**Units**
$F_{cons,y}$	5,571	litres
EF_{fuel}	2.727 (as provided in the POADD)	kgCO2/ litre
$PE_{fuel,onsite,y}$	**15**	**tCO_2e/yr**

CPA 7.

Parameter	**Value**	**Units**
$F_{cons,y}$	8,154	litres
EF_{fuel}	2.727 (as provided in the POADD)	kgCO2/ litre
$PE_{fuel,onsite,y}$	**22**	**tCO_2e/yr**

CPA 8:

Parameter	**Value**	**Units**
$F_{cons,y}$	4,161	litres
EF_{fuel}	2.727 (as provided in the POADD)	kgCO2/ litre
$PE_{fuel,onsite,y}$	**11.35**	**tCO_2e/yr**

CPA 9:

Parameter	Value	Units
$F_{cons,y}$	2,236	litres
EF_{fuel}	2.727 (as provided in the POADD)	kgCO2/ litre
$PE_{fuel,onsite,y}$	**6.10**	**tCO_2e/yr**

Table 6: 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	29,670.53	tonnes
$EF_{composting}$	4 (as provided in the POADD)	Kg CH4 / ton
GWP_{CH4}	25	tCO2e/tCH4
$PE_{comp.}$	**2,492**	**tCO2e**

CPA 2:

Parameter	**Value**	**Units**
Q	29,530.63	tonnes
$EF_{composting}$	4 (as provided in the POADD)	Kg CH4 / ton
GWP_{CH4}	25	tCO2e/tCH4
$PE_{comp.}$	**2,480.57**	**tCO2e**

CPA 3:

Parameter	Value	
Q	30,900	tonnes
$EF_{composting}$	4 (as provided in the POADD)	Kg CH4 / ton
GWP_{CH4}	25	tCO2e/tCH4
$PE_{comp.}$	**2,595.58**	**tCO2e**

CPA 4:

Parameter	**Value**	**Units**
Q	17,428	tonnes
$EF_{composting}$	4 (as provided in the POADD)	Kg CH4 / ton
GWP_{CH4}	25	tCO2e/tCH4
$PE_{comp.}$	**1,463.96**	**tCO2e**

CPA 5:

Parameter	**Value**	**Units**
Q	11,311.28	tonnes
$EF_{composting}$	4 (as provided in the POADD)	Kg CH4 / ton
GWP_{CH4}	25	tCO2e/tCH4
$PE_{comp.}$	**950**	**tCO2e**

CPA 6:

Parameter	Value	Units
Q	30,604	tonnes
$EF_{composting}$	4 (as provided in the POADD)	Kg CH4 / ton
GWP_{CH4}	25	tCO2e/tCH4
$PE_{comp.}$	**2,571**	**tCO2e**

CPA 7:

Parameter	Value	Units
Q	27,312.77	tonnes
$EF_{composting}$	4 (as provided in the POADD)	Kg CH4 / ton
GWP_{CH4}	25	tCO2e/tCH4
$PE_{comp.}$	**2,294**	**tCO2e**

CPA 8:

Parameter	Value	Units
Q	18,412.86	tonnes
$EF_{composting}$	4 (as provided in the POADD)	Kg CH4 / ton
GWP_{CH4}	25	tCO2e/tCH4
$PE_{comp.}$	**1,546.68**	**tCO2e**

CPA 9:

Parameter	Value	Units
Q	16,985.93	tonnes
$EF_{composting}$	4 (as provided in the POADD)	Kg CH4 / ton
GWP_{CH4}	25	tCO2e/tCH4
$PE_{comp.}$	**1,426.82**	**tCO2e**

Table 7: Project emissions from composting

4. Project emission from runoff from composting operations

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

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

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	
$Q_{ww,runoff}$	2,164.92	
$COD_{ww,runoff}$	2727	g/m3
$B_{o,ww}$	0.25	kg / kg COD
$MCF_{ww,\ treatment}$	0.3	
UF_b	1.06	
GWP_{CH4}	25	
PE_{runoff}	**12**	**tCO_2e**

CPA 2:

Parameter	Value	Units
$Q_{ww,runoff}$	2,299.59	
$COD_{ww,runoff}$	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}	**10.32**	**tCO_2e**

CPA 3:

Parameter	Value	
$Q_{ww,runoff}$	2,403	
$COD_{ww,runoff}$	2114	g/m3
$B_{o,ww}$	0.25	kg / kg COD
$MCF_{ww,\ treatment}$	0.3	
UF_b	1.06	
GWP_{CH4}	25	
PE_{runoff}	**8.48**	**tCO_2e**

CPA 4:

Parameter	Value	Units
$Q_{ww,runoff}$	1275	
$COD_{ww,runoff}$	2268	g/m3
$B_{o,ww}$	0.25	kg / kg COD
$MCF_{ww,\ treatment}$	0.3	
UF_b	1.06	
GWP_{CH4}	25	
PE_{runoff}	**5.75**	**tCO_2e**

CPA 5:

Parameter	Value	Units
$Q_{ww,runoff}$	831.17	
$COD_{ww,runoff}$	2693	g/m3
$B_{o,ww}$	0.25	kg / kg COD
$MCF_{ww,\ treatment}$	0.3	
UF_b	1.06	
GWP_{CH4}	25	
PE_{runoff}	**4**	**tCO_2e**

CPA 6:

Parameter	Value	units
$Q_{ww,runoff}$	2,208	
$COD_{ww,runoff}$	2755	g/m3
$B_{o,ww}$	0.25	kg / kg COD
$MCF_{ww,\ treatment}$	0.3	
UF_b	1.06	
GWP_{CH4}	25	
PE_{runoff}	**10**	**tCO_2e**

CPA 7:

Parameter	Value	Units
$Q_{ww,runoff}$	1982.03	
$COD_{ww,runoff}$	2628	g/m3

$B_{o,ww}$	0.25	kg / kg COD
$MCF_{ww, treatment}$	0.3	
UF_b	1.06	
GWP_{CH4}	25	
PE_{runoff}	**10**	**tCO_2e**

CPA 8:

Parameter	**Value**	**units**
$Q_{ww,runoff}$	1346.30	
$COD_{ww,runoff}$	255	g/m3
$B_{o,ww}$	0.25	kg / kg COD
$MCF_{ww, treatment}$	0.3	
UF_b	1.06	
GWP_{CH4}	25	
PE_{runoff}	**6.83**	**tCO_2e**

CPA 9:

Parameter	**Value**	**units**
$Q_{ww,runoff}$	1223.16	
$COD_{ww,runoff}$	2553	g/m3
$B_{o,ww}$	0.25	kg / kg COD
$MCF_{ww, treatment}$	0.3	
UF_b	1.06	
GWP_{CH4}	25	
PE_{runoff}	**6.21**	**tCO_2e**

Table 8: 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	20
Electricity Consumption	0.00
Transport of Waste	0.00
Transport of Compost	2
Methane from composting	2,492
Emission from run off	12
Emissions from residuals	117
Project emissions	**2,643**

Table 9: Project emissions over the monitoring period 1st /05/2012 to 31st /12/2013

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	10.43
Electricity Consumption	0.01
Transport of Waste	-
Transport of Compost	9.2
Methane from composting	2,480.57
Emission from run off	10.32
Emissions from residuals	446.67
Project emissions	**2,957**

CPA 3:

Fuel used in equipment	23.45
Electricity Consumption	0.00
Transport of Waste	0.00
Transport of Compost	1.21
Methane from composting	2595.58
Emission from run off	8.48
Emissions from residuals	31.61
Project emissions	**2,660**

CPA 4.

Fuel used in equipment	12.31
Electricity Consumption	0.00
Transport of Waste	0.00
Transport of Compost	2.21
Methane from composting	1463.96
Emission from run off	5.75
Emissions from residuals	12.91
Project emissions	**1,497**

CPA 5:

Fuel used in equipment	4.39
Electricity Consumption	0.00
Transport of Waste	0.00
Transport of Compost	4.89
Methane from composting	950.15
Emission from run off	4.45
Emissions from residuals	14.48
Project emissions	**977**

CPA 6:

Fuel used in equipment	15.19
Electricity Consumption	0.09
Transport of Waste	0.00
Transport of Compost	2.38
Methane from composting	2570.71
Emission from run off	10.16
Emissions from residuals	58.47
Project emissions	**2,656**

CPA 7:

Fuel used in equipment	22
Electricity Consumption	0
Transport of Waste	0
Transport of Compost	2
Methane from composting	2294
Emission from run off	10
Emissions from residuals	860
Project emissions	**3,188**

CPA 8:

Fuel used in equipment	11.35
Electricity Consumption	0.00
Transport of Waste	0.00
Transport of Compost	2.00
Methane from composting	1546.68
Emission from run off	6.83
Emissions from residuals	16.73
Project emissions	**1,584**

CPA 9:

Fuel used in equipment	6.10
Electricity Consumption	0.00
Transport of Waste	0.00
Transport of Compost	2.21
Methane from composting	1426.82
Emission from run off	6.21
Emissions from residuals	1143.04
Project emissions	**2,584**

Table 11: Project emissions over the monitoring period from 1st /05/2012 to 31/12/2013

H.3. Calculation of leakage

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

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

Specific-case CPA reference number	Baseline emissions or baseline net GHG removals by sinks (tCO_2e)	Project emissions or actual net GHG removals by sinks (tCO_2e)	Leakage (tCO_2e)	GHG emission reductions or net GHG removals by sinks (tCO_2e) achieved in the monitoring period		
				From 1/05/2012 up to 31/12/2013	From 12/12/2012 up to 31/12/2013	Total amount
2956-0001	10,139	2,643	0	7,496		7,496
2956-0002	6,044	2,958	0	3,086		3,086
2956-0003	5,667	2,661	0	3,006		3,006
2956-0004	3,546	1,498	0	2,048		2,048
2956-0005	2,279	979	0	1,300		1,300
2956-0006	6,195	2,658	0	3,537		3,537
2956-0007	5,162	3,190	0	1,972		1,972
2956-0008	3,799	1,584	0	2,215		2,215
2956-0009	3,407	2,585	0		822	822
Total						**25,482**

H.5. Comparison of GHG emission reductions or net GHG removals by sinks with estimates in the included CPA-DD(s)

Specific-case CPA reference number	Value estimated in ex ante calculation in the included CPA-DD(s)	Actual values achieved by the specific-case CPA(s) during this monitoring period
2956-0001	13,944	7,496
2956-0002	5,258	3,086
2956-0003	2,235	3,006
2956-0004	2,535	2,048
2956-0005	5,002	1,300
2956-0006	4,929	3,537
2956-0007	5,090	1,972
2956-0008	4,731	2,215
2956-0009	9,577	822
Total		**25,482**

H.6. Remarks on difference from the estimated value in the included CPA-DD(s)

The amount of emission reductions achieved in this monitoring period is lower than the estimated value in the registered CPA-DD in some CPAs, and higher in other CPAs.

Appendix 1. Contact information of coordinating/managing entity and/or responsible persons/entities

Coordinating/managing entity and/or responsible person/entity	☐ Coordinating/managing entity ☒ Person/entity responsible for completing the CDM-MR-FORM
Organization name	Belgian Development Agency
Street/P.O. Box	P.O.Box 40131, Kampala
Building	Lower Kololo Terrace, Plot 1B
City	Kampala
State/Region	Kampala
Postcode	256
Country	Uganda
Telephone	+256 414 237 690
Fax	+256 414 346 530
E-mail	james.kakeeto@ccu.go.ug
Website	www.btcctb.org
Contact person	James Kakeeto
Title	CDM Project Officer
Salutation	Mr.
Last name	Kakeeto
Middle name	-
First name	James
Department	CDM Capacity Development
Mobile	+256 752 612 249
Direct fax	-
Direct tel.	+256 752 612 249