TYPE III - OTHER PROJECT ACTIVITIES

Project participants shall apply the general guidelines to the SSC ~~general guidance to the small-scale~~ CDM methodologies, information on additionality (attachment A to Appendix B) and general guidance on leakage in biomass project activities (attachment C to Appendix B) provided at <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html> *mutatis mutandis*.

III.F. Avoidance of methane emissions through composting ~~controlled biological treatment of biomass~~

Technology/measure

1. This methodology comprises measures to avoid the emissions of methane to the atmosphere from biomass or other organic matter that would have otherwise been left to decay anaerobically in a solid waste disposal site (SWDS), or in an animal waste management system (AWMS), or in a wastewater treatment system (WWTS). In the project activity, controlled ~~biological~~ aerobic treatment by composting of biomass ~~treatment of biomass~~ is introduced. ~~through one, or a combination, of the following measures~~:

   ~~(a) Aerobic treatment by composting and proper soil application of the compost;~~

   (b) ~~Anaerobic digestion in closed reactors equipped with biogas recovery and combustion/flaring system~~.

2. The project activity does not recover or combust landfill gas from the disposal site (unlike AMS-III.G “Landfill methane recovery”), and does not undertake controlled combustion of the waste that is not treated biologically in a first step (unlike AMS-III.E “Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment”). Project activities that recover biogas from wastewater treatment shall use methodology AMS-III.H “Methane recovery in wastewater treatment”. Project activities involving co-digestion of organic matters shall use the proposed new methodology SSC-III.AO “Methane recovery through controlled anaerobic digestion”.

3. Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.

4. This methodology is applicable to the composting ~~treatment~~ of the organic fraction of municipal solid waste and biomass waste from agricultural or agro-industrial activities including manure. ~~Project activities involving anaerobic digestion and biogas recovery from manure shall apply AMS-III.D or AMS-III.R.~~

5. This methodology includes construction and expansion of treatment facilities as well as activities that increase capacity utilization at an existing facility. For project activities that increase capacity utilization at existing facilities, project participant(s) shall demonstrate that special efforts are made to increase the capacity utilization, that the existing facility meets all applicable laws and regulations and that the existing facility is not included in a separate CDM project activity. The special efforts should be identified and described.

6. This methodology is also applicable for co-composting ~~treating~~ wastewater and solid biomass waste, where wastewater would otherwise have been treated in an anaerobic wastewater treatment system without biogas recovery. The wastewater in the project scenario is used as a source of moisture and/or nutrients to the biological treatment process e.g. composting of empty fruit bunches (EFB), a residue from palm oil production, with the addition of palm oil mill effluent (POME) which is the wastewater co-produced from palm oil production.

7. In case of co-composting, if it can not be demonstrated that the organic matter would otherwise been left to decay anaerobically, baseline emissions related to such organic matter shall be accounted for as zero, whereas project emissions shall be calculated according to the procedures presented in this methodology for all co-composted substrates.

8. Project participants shall apply the procedures related to the "competing use for the biomass" according to the latest "General guidance on leakage in biomass project activities".

9. The location and characteristics of the disposal site of the biomass, animal manure and co-composting wastewater in the baseline condition shall be known, in such a way as to allow the estimation of its methane emissions, using the provisions of AMS-III.G, AMS-III.E (concerning stockpile), AMS-III.D "Methane recovery in animal manure management systems" or AMS-III.H respectively. ~~Guidance in paragraphs 4 and 6 and 7 in AMS-III.E concerning stockpile shall be followed in this regard~~.

Project activities for composting of animal manure shall also meet the requirements under paragraphs 1, ~~2(a)~~ and 2(c) of AMS-III.D. Further no bedding material is used in the animal barns or intentionally added to the manure stream in the baseline. Blending materials may be added in the ~~or~~ project scenario to increase the efficiency of the composting process (e.g. to achieve a desirable C/N ratio or free air space value), however, only monitored quantity of solid waste or manure or wastewater diverted from the baseline treatment system is used for emission reduction calculation.

The following requirement shall be checked *ex ante* at the beginning of each crediting period in the case of composting of solid waste:

(a) Establish that identified landfill(s)/ stockpile(s) can be expected to accommodate the waste to be used for the project activity for the duration of the crediting period; or

(b) Establish that it is common practice in the region to dispose off the waste in solid waste disposal site (landfill)/ stockpile(s).

10. The project participants shall clearly define the geographical boundary of the region referred in paragraph 9 (b), and document it in the CDM-PDD. In defining the geographical boundary of the region, project participants should take into account the source of the waste ~~the usual distances for transporting the waste utilized by the project activity into account,~~ i.e. if waste is transported up to 50 km, the region may cover a radius of 50 km around the project activity. In addition, it should also consider the distance to which the final product after composting will be transported. In either case, the region should cover a reasonable radius around the project activity

that can be justified with reference to the project circumstances but in no case it shall be more than 200 km. Once defined, the region should not be changed during the crediting period(s).

11. In case produced compost ~~residual waste from the biological treatment (slurry, compost or products from those treatments)~~ is handled aerobically and submitted to soil application, the proper conditions and procedures (not resulting in methane emissions) must be ensured.

12. In case produced compost ~~residual waste from the biological treatment (slurry, compost or products from those treatments) are~~ is treated thermally/mechanically, the provisions in AMS-III.E related to thermal/mechanical treatment shall be applied.

13. In case produced compost ~~residual waste from the biological treatment (slurry, compost or products from those treatments) are~~ is stored under anaerobic conditions and/or delivered to a landfill, emissions from the residual ~~waste~~ organic content shall to be taken into account and calculated as per the latest version of the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site".

~~16. For project activities involving controlled anaerobic digestion and production of biogas, technical measures shall be used (e.g., flared, combusted) to ensure that all biogas produced by the digester is captured and gainfully used or combusted/flared.~~

~~17. The recovered biogas from anaerobic digestion may also be utilised for the following applications instead of flaring or combustion:~~

- ~~(a) Thermal or electrical energy generation directly; or~~
- ~~(b) Thermal or electrical energy generation after bottling of upgraded biogas; or~~
- ~~(c) Thermal or electrical energy generation after upgrading and distribution using one of the following options:~~
  - ~~(i) Upgrading and injection of biogas into a natural gas distribution grid with no significant transmission constraints; or~~
  - ~~(ii) Upgrading and transportation of biogas via a dedicated piped network to a group of end users; or~~
- ~~(d) Hydrogen production.~~

~~18. If the recovered biogas is used for project activities covered under paragraph 12 (a), that component of the project activity shall use a corresponding category under Type I.~~

~~19. If the recovered biogas is used for project activities covered under paragraph 12 (b) or 12 (c) relevant provisions in AMS-III.H related to upgrading of biogas, bottling of biogas, injection of biogas into a natural gas distribution grid and transportation of biogas via a dedicated piped network shall be used.~~

~~20. If the recovered biogas is used for project activities covered under paragraph 12 (d) that component of the project activity shall use corresponding methodology AMS-III.O.~~

Boundary

14. The project boundary is the physical, geographical site:

(a) Where the solid waste would have been disposed and the methane emission occurs in absence of the proposed project activity;

(b) In the case of projects co-composting wastewater, where the co-composting wastewater would have been treated anaerobically in the absence of the project activity;

(c) Where the treatment of biomass through composting ~~or anaerobic digestion~~ takes place;

(d) Where the ~~residual waste from biological treatment or~~ products from composting ~~those treatments, like~~ (compost) ~~and slurry, are~~ is handled, disposed, submitted to soil application, or treated thermally/mechanically;

~~(e) Where biogas is burned/flared or gainfully used;~~

(f) And the itineraries between them (a, b, c, and d ~~and e~~), where the transportation of waste, wastewater, where applicable manure, ~~compost/slurry/~~product of treatment (compost) ~~or biogas~~ occurs.

Baseline

15. The baseline scenario is the situation where, in the absence of the project activity, biomass and other organic matter (including manure where applicable) are left to decay within the project boundary and methane is emitted to the atmosphere. The baseline emissions are the amount of methane emitted from the decay of the degradable organic carbon in the biomass solid waste or manure. When wastewater is co-composted, baseline emissions include emissions from wastewater co-composted in the project activity. The yearly Methane Generation Potential for the solid waste is calculated using the first order decay model as described in the latest version of the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site". Baseline emissions from the manure composted are calculated as per the procedures of AMS-III.D.

Baseline emissions shall exclude emissions of methane that would have to be captured, fuelled or flared to comply with national or local safety requirement or legal regulations.

~~$BE_y = BE_{CH4,SWDS,y} + BE_{CH4,manure,y} - MD_{y,reg} * GWP\_CH_4$~~

$$BE_y = BE_{CH4,SWDS,y} + BE_{ww,y} + BE_{CH4,manure,y} - MD_{y,reg} * GWP\_CH_4 \quad (1)$$

Where:

$BE_{CH4,SWDS,y}$	Yearly methane generation potential of the solid waste composted or anaerobically digested by the project activity during the years *x* from the beginning of the project activity (*x*=1) up to the year *y* estimated as per the latest version of the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" (tCO_2e). The tool may be used with the factor "f=0.0" assuming that no biogas is captured and flared. With the definition of year *x* as 'the year since the landfill started receiving wastes project activity started diverting wastes from landfill disposal, *x* runs from the first year of landfill operation crediting period (*x*=1) to the year for which emissions are calculated (*x*=*y*)'
$MD_{y,reg}$	Amount of methane that would have to be captured and combusted in the year *y* to comply with the prevailing regulations (tonne)
$BE_{CH4,manure,y}$	Where applicable, baseline emissions from manure composted by the project activities, as per the procedures of AMS-III.D
$BE_{ww,y}$	Where applicable, baseline emissions from the wastewater co-composted, calculated as per the procedures in AMS-III.H
GWP_CH_4	*GWP* for CH_4 (value of 21 is used)

Methane emission potential of co-composted wastewater is estimated as:

$$MEP_{y,ww} = Q_{y,ww,in} * COD_{y,ww,untreated} * B_{o,ww} * MCF_{ww,treatment} * UF_b \quad (2)$$

Where:

$Q_{y,ww,in}$	Volume of wastewater entering the co-composting facility in the year *y* (m^3)
$COD_{y,ww,untreated}$	Chemical oxygen demand of the wastewater entering the co-composting facility in the year *y* ($tonnes/m^3$)
$B_{o,ww}$	Methane producing capacity for the wastewater (IPCC default value of 0.21 kg CH_4/kg.COD)[1]
$MCF_{ww,treatment}$	Methane correction factor for the wastewater treatment system in the baseline scenario (MCF value as per table III.F.1)
UF_b	Model correction factor to account for model uncertainties (0.94)[2]

The Methane Correction Factor (MCF) shall be determined based on the following table:

[1] The IPCC default value of 0.25 kg CH_4/kg COD was corrected to take into account the uncertainties. Project activities may use the default value of 0.6 kg CH4/kg BOD, in case the parameter $BOD_{5,20}$ is used to determine the organic content of the wastewater. In this case the monitoring shall be based in direct measurements of $BOD_{5,20}$, i.e., the estimation of BOD values based on COD measurements is not allowed.

[2] Reference: FCCC/SBSTA/2003/10/Add.2, page 25.

Table III.F.1. IPCC default values[3] for Methane Correction Factor (MCF)

Type of wastewater treatment and discharge pathway or system	MCF value
Discharge of wastewater to sea, river or lake	0.1
Aerobic treatment, well managed	0
Aerobic treatment, poorly managed or overloaded	0.3
Anaerobic digester for sludge without methane recovery	0.8
Anaerobic reactor without methane recovery	0.8
Anaerobic shallow lagoon (depth less than 2 metres)	0.2
Anaerobic deep lagoon (depth more than 2 metres)	0.8
Septic system	0.5

Project Activity Emissions

16. Project activity emissions consist of:

(a) CO_2 emissions due to incremental transportation distances;

(b) CO_2 emissions from electricity and/or fossil fuel consumption by the project activity facilities;

(c) In case of anaerobic digestion: methane emissions from physical leakages of the anaerobic digester;

(d) In case of composting: Methane emissions during composting process;

(e) In case of composting (including co-composting of wastewater): Methane emissions from runoff water;

(f) In case the residual waste from the biological treatment (slurry, compost or products from those treatments) compost is stored under anaerobic conditions and/or delivered to a landfill: the methane emissions from the disposal/storage of these residual waste/products compost.

$$PE_y = PE_{y,transp} + PE_{y,power} + PE_{y,phy\ leakage} + PE_{y,comp} + PE_{y,runoff} + PE_{y,res\ waste}$$

$$PE_y = PE_{y,transp} + PE_{y,power} + PE_{y,comp} + PE_{y,runoff} + PE_{y,res\ waste} \quad (3)$$

[3] Default values from chapter 6 of volume 5. Waste in 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Where:

PE_y	Project activity emissions in the year *y* (tCO_2e)
$PE_{y,transp}$	Emissions from incremental transportation in the year *y* (tCO_2e)
$PE_{y,power}$	Emissions from electricity or fossil fuel consumption in the year *y* (tCO_2e)
~~$PE_{y,phy\ leakage}$~~	~~In case of anaerobic digestion: methane emissions from physical leakages of the anaerobic digester in year *y* (tCO_2e)~~
$PE_{y,comp}$	~~In case of composting:~~ Methane emissions during composting process in the year *y* (tCO_2e)
$PE_{y,runoff}$	~~In case of composting:~~ Methane emissions from runoff water in the year *y* (tCO_2e)
$PE_{y,res\ waste}$	In case produced compost ~~residual waste/slurry/products are~~ is subjected to anaerobic storage or disposed in a landfill: methane emissions from the anaerobic decay of the residual organic content ~~waste/products~~ (tCO_2e)

17. Project emissions due to incremental transport distances ($PE_{y,transp}$) are calculated based on the incremental distances between:

(i) The collection points of biomass and/or manure and the compost treatment site as compared to the baseline solid waste disposal site or manure treatment site;

(ii) When applicable, the collection points of wastewater and treatment site as compared to baseline wastewater treatment site;

(iii) Treatment sites and the sites for soil application, landfilling and further treatment of the produced compost ~~residual waste/products~~.

~~$$PE_{y,transp} = (Q_y / CT_y) * DAF_w * EF_{CO2} + (Q_{y,treatment,i} / CT_{y,treatment,i}) * DAF_{treatment,i} * EF_{CO2}$$~~

$$PE_{y,transp} = (Q_y / CT_y) * DAF_w * EF_{CO2} + (Q_{y,treatment} / CT_{y,treatment}) * DAF_{treatment} * EF_{CO2} \quad (4)$$

Where:

Q_y	Quantity of raw waste/manure treated and/or wastewater co-treated in the year *y* (tonnes)
CT_y	Average truck capacity for transportation (tonnes/truck)
DAF_w	Average incremental distance for raw solid waste/manure and/or wastewater transportation (km/truck)
EF_{CO2}	CO_2 emission factor from fuel use due to transportation ($kgCO_2$/km, IPCC default values or local values may be used)
~~i~~	~~Type of residual waste/products and or compost~~
$Q_{y,treatment}$	Quantity of ~~residual waste/products and/or~~ compost ~~i~~ produced in year *y* (tonnes)
$CT_{y,treatment}$	Average truck capacity for ~~residual waste/products/~~compost ~~i~~ transportation (tonnes/truck)
$DAF_{treatment}$	Average distance for ~~residual waste/products/~~compost ~~i~~ transportation (km/truck)

18. For the calculation of project emissions from electricity and/or fossil fuel consumption by the project activity facilities ($PE_{y,power}$) all the energy consumption of all equipment/devices installed by the project activity shall be included e.g., energy used for aeration and/or turning of compost piles/heaps, chopping of biomass for size reduction, screening, drying of the final compost product and for the runoff wastewater treatment. Emission factors for grid electricity used shall be calculated as described in AMS-I.D “Grid connected renewable electricity generation”. For project activity emissions from fossil fuel consumption the emission factor for the fossil fuel shall be used (tCO_2/tonne). Local values are to be used, if local values are difficult to obtain, IPCC default values may be used. ~~If recovered biogas is used to power auxiliary equipment of the project it should be taken into account accordingly, using zero as its emission factor.~~

~~In case of the controlled anaerobic digestion of biomass, methane emissions due to physical leakages from the digester and recovery system ($PE_{y,phy\ leakage}$) shall be considered in the calculation of project emissions. The physical leakage emissions are estimated as follows:~~

$$PE_{y,phy\ leakage} = Q_y * EF_{anaerobic} * GWP\_CH_4 \quad (5)$$

~~Where:~~

~~$EF_{anaerobic}$~~	~~Emission factor for anaerobic digestion of organic waste (t CH_4/ton waste treated). Emission factors can be based on facility/site-specific measurements, country specific values or IPCC default values (table 4.1, chapter 4, Volume 5, 2006 IPCC Guidelines for National Greenhouse Gas Inventories). IPCC default values are 2 g CH_4/kg waste treated on a dry weight basis and 1 g CH_4/kg waste treated on a wet weight basis~~

19. Methane emissions during composting ($PE_{y,comp}$) shall be calculated as follows:

$$PE_{y,comp} = Q_y * EF_{composting} * GWP\_CH_4 \quad \textbf{(6)}$$

Where:

$EF_{composting}$	Emission factor for composting of organic waste and/or manure (t CH_4/ton waste treated). Emission factors can be based on facility/site-specific measurements, country specific values or IPCC default values (table 4.1, chapter 4, Volume 5, 2006 IPCC Guidelines for National Greenhouse Gas Inventories). IPCC default values are 10 g CH_4/kg waste treated on a dry weight basis and 4 g CH_4/kg waste treated on a wet weight basis. $EF_{composting}$ can be set to zero for the portions of Qy for which the monitored oxygen content of the composting process in all points within the windrow are above 8%. This can be done via sampling with maximum margin of error of 10% at a 905% confidence level. For this purpose a portable oxygen meter can be used with lancets of at least 1 m length. In the case of forced aerated in-vessel and forced aerated pile composting systems continuous measurements may also be done using online sensors

20. Project emissions from runoff water from the composting yard ($PE_{y,runoff}$) are calculated as follows:

$$PE_{y,runoff} = Q_{y,ww,runoff} * COD_{y,ww,runoff} * B_{o,ww} * MCF_{ww,treatment} * UF_b * GWP\_CH_4 \quad \textbf{(7)}$$

Where:

$Q_{y,ww,runoff}$	Volume of runoff water in the year y (m^3)
$COD_{y,ww,runoff}$	Chemical oxygen demand of the runoff water leaving the composting yard in the year y (tonnes/m^3) For *ex ante* estimation, the volume of runoff water may be based in the area of the composting yard and the yearly average rainfall, and the COD for domestic wastewater may be used. For *ex post* calculations the measured volume and COD shall be used
$B_{o,ww}$	Methane producing capacity of the wastewater (IPCC default value of 0.251 kg CH_4/kg.COD)
$MCF_{ww,treatment}$	Methane correction factor for the wastewater treatment system where the runoff water is treated (*MCF* value as per ~~Table III.F.1~~ relevant provisions in AMS-III.H)
UF_b	Model correction factor to account for model uncertainties (1.1206)[4]

[4] Reference: FCCC/SBSTA/2003/10/Add.2, page 25.

21. Methane emissions from anaerobic storage and/or disposal in a landfill of the residual waste/products/produced compost from the biological treatment ($PE_{y,res\ waste}$) are calculated as per the latest version of the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site". In addition, if storage of biomass under anaerobic conditions takes place due to the project activity that doesn't occur in the baseline situation, methane emissions due to anaerobic decay of this biomass shall also be considered.

Leakage

22. If the project technology is the equipment transferred from another activity or if the existing equipment is transferred to another activity, leakage effects are to be considered (LE_y).

Monitoring

23. In the case of construction of new composting facilities or expansion of capacity of existing composting facilities, the emission reduction achieved by the project activity will be measured as the difference between the baseline emission and the sum of the project emission and leakage.

$$ER_y = BE_y - (PE_y + LE_y) \quad \textbf{(8)}$$

Where:

ER_y	Emission reduction in the year y (tCO_2e)
LE_y	Leakage emissions in year y (tCO_2e)

In the case of increase of capacity utilization of existing composting facilities, the emission reduction achieved by the project activity will be measured as the difference between the baseline emission and the sum of the project emission and leakage, multiplied by the factor r as follows:

$$ER_y = (BE_y - PE_y - LE_y) * (r - 1) \quad \textbf{(9)}$$

The value for r is defined as:

$$r = TWCOM_y / WCOM_{BAU} \quad \textbf{(10)}$$

Where:

$TWCOM_y$	Total quantity of waste composted in year of (tonnes) at the facility
$WCOM_{BAU}$	Registered annual amount of waste composted (tonnes) at the facility on a business as usual basis calculated as the highest amount of annual compost production in the last five years prior to the project implementation

In case of controlled anaerobic digestion and biogas production the emission reductions will be calculated as follows and the following monitoring requirements apply:

(a) The emission reductions achieved by the project activity will be determined *ex post* through direct measurement of the amount of biogas fuelled, flared or gainfully used. It is possible that the project activity involves biomass treatment with higher methane conversion factor (MCF) than the MCF for the biomass which otherwise would have been left to decay in the baseline situation. Therefore the emission reductions achieved by the project activity is limited to the *ex post* calculated baseline emissions minus project and leakage emissions using the actual monitored data for the project activity (e.g., Q_y and fossil fuels/electricity used). The emission reductions achieved in any year are the lowest value of the following:

$$ER_{y,ex\ post} = min\left((BE_{y,ex\ post} - PE_{y,ex\ post} - LE_{y,ex\ post}), (MD_y - PE_{y,power,ex\ post} - PE_{y,transp,ex\ post} - PE_{y,res\ waste,ex\ post} - LE_{y,ex\ post})\right) \quad (11)$$

Where:

$ER_{y,ex\ post}$	Emission reductions achieved by the project activity based on monitored values for year *y* (tCO2e)
$BE_{y,ex\ post}$	Baseline emissions calculated using equation 1) using *ex post* monitored values (e.g., Q_y) (tCO2e)
$PE_{y,ex\ post}$	Project emissions calculated using equation 3) using *ex post* monitored values (e.g., Q_y, transport distances, the amount of electricity/fossil fuels used, emissions from anaerobic storage). This calculation shall include project emissions from physical leakage (tCO2e)
$LE_{y,ex\ post}$	Leakage emissions calculated using *ex post* monitored values (tCO2e)
MD_y	Methane captured and destroyed or used gainfully by the project activity in year *y* (tCO_2e)
$PE_{y,transp,ex\ post}$	Emissions from incremental transportation based on monitored values in the year *y* (tCO_2e)
$PE_{y,power,ex\ post}$	Emissions from the use of fossil fuel or electricity for the operation of the installed facilities based on monitored values in the year *y* (tCO_2e)
$PE_{y,res\ waste,ex\ post}$	Methane emissions from the anaerobic decay of the residual waste/products based on monitored values in the year *y* (tCO_2e)

(b) In case of flaring/combustion MD_y will be measured using the conditions of the flaring process:

$$MD_y = BG_{burnt,y} * w_{CH4,y} * D_{CH4} * FE * GWP\_CH_4 \quad (12)$$

Where:

$BG_{burnt,y}$	Biogas[5] flared/combusted in year *y* (m^3)
$w_{CH4,y}$	Methane content[7] in the biogas in the year *y* (mass fraction)
D_{CH4}	Density of methane at the temperature and pressure of the biogas in the year *y* ($tonnes/m^3$)
FE	Flare efficiency in the year *y* (fraction)

(c) The method for integration of the terms to calculate MD_y to obtain the results for one year of measurements within the confidence level, as well as the methods and instruments used for metering, recording and processing the data obtained, shall be described in the project design document and monitored during the crediting period;

(d) The amount of biogas recovered and fuelled/flared or gainfully used shall be monitored *ex post*, using flow meters. The fraction of methane in the biogas should be measured with a continuous analyzer or, alternatively, with periodical measurements at a 95% confidence level[6]. Temperature and pressure of the biogas are required to determine the density of methane combusted;

(e) Regular maintenance should ensure optimal operation of flares. The flare efficiency, defined as the fraction of time in which the gas is combusted in the flare, multiplied by the efficiency of the flaring process, shall be monitored and calculated as per the provision in the "Tool to determine project emissions from flaring gases containing methane";

(f) Project activities where a portion of the biogas is destroyed through flaring and the other portion is used for energy may consider to apply the flare efficiency to the portion of the biogas used for energy, if separate measurements are not performed;

(g) Flow meters, sampling devices and gas analysers shall be subject to regular maintenance, testing and calibration to ensure accuracy;

(h) The monitoring plan should include on site inspections for each individual digester included in the project boundary where the project activity is implemented for each verification period.

For the case involving composting of manure, ($BE_{y,ex\ post}$ – PE_y) is calculated annually; $BE_{y,expost}$ is calculated as per procedures of equation 6 of AMS-III.D and PE_y is as per equation 3 of this methodology. $BE_{y,ex\ post}$ is also calculated using equation 1 of AMS III D, substituting terms

5 Biogas and methane content measurements shall be on the same basis (wet or dry).

6 Fraction of methane (CH4) in biogas shall be measured using equipment that can directly measure methane content in the biogas, estimation of methane content of biogas based on measurement of other constituents of biogas such as CO2 is not permitted.

$N_{LT,y} * VS_{LT,y}$ with measured quantity of manure[7] times the laboratory measured values of volatile solids (on sample basis). Where applicable (e.g. to use developed country VS values and to apply equation 2 of AMS-III.D) guidance in paragraph 30 and paragraph 31 of AMS-III.D shall be complied with.

24. For all cases, the following parameters shall be monitored and recorded annually during the crediting period:

- Quantity of waste biologically treated (Q_y) and its composition through representative sampling. Monitoring of waste and its composition shall take place in accordance with the requirements in the latest version of the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"; an exception is made in the case of manure, where only the quantity of manure is monitored;
- Quantity of methane that would have to be captured and combusted to comply with the prevailing regulations ($MD_{y,reg}$) where applicable;
- When project activity includes co-treating of wastewater, the volume of co-treated wastewater ($Q_{y,ww,in}$) and its COD content through representative sampling;
- When project activity consists of composting, the volume of runoff water.[8] ($Q_{y,ww,runoff}$) and its COD content ($COD_{y,ww,runoff}$) through representative sampling. In case relevant: $TWCOM_y$ and $WCOM_{BAU}$;
- Parameters related to project emissions (PE_y) described above such as: CT_y, DAF_w, $CT_{y,treatment}$, $Q_{y,treatment}$, $CT_{y,treatment}$, $DAF_{treatment}$ and parameters for determining $PE_{y,res\ waste}$;
- The annual amount of fossil fuel or electricity used to operate the facilities or power auxiliary equipment shall be monitored, e.g., energy/fossil fuels used for aeration, turning of compost piles, pre-processing of the biomass (e.g., size reduction, screening) and where relevant drying of the final compost product. Alternatively it shall be assumed that all relevant electrical equipment operate at full rated capacity, plus 10% to account for distribution losses, for 8760 hours per annum.

25. In case of projects involving increase of capacity utilization of existing composting facilities, the historical records of annual amount of waste treated at the facility in the last five years prior to the project implementation and additional information to cross check the historical records (e.g. invoices of compost sales) shall be provided for project activity validation.

[7] Manure weight may be measured or alternatively manure volume can be measured together with the density of the manure determined from representative sample (90/10 precision).

8 Consisting of the wastewater applied in excess (i.e., moisture over and above the field capacity of the biomass being composted) and rainwater in the case of unroofed sites.

26. The operation of composting facilities shall be documented in a quality control program, monitoring the conditions and procedures that ensure the aerobic condition of the waste during the composting process (e.g. temperature, moisture during different composting stages).

27. Soil application of the compost or slurry in agriculture or related activities will be monitored. This includes documenting the sales or delivery of the compost final product/slurry. It shall also include an in situ verification of the proper soil application of the compost/slurry to ensure aerobic conditions for further decay. Such verification shall be done at representative sample of user sites. The conditions for proper soil application ensuring aerobic conditions can be established by a local expert taking into account the soil conditions, crop types grown and weather conditions.

Project activity under a programme of activities

28. The following conditions apply for use of this methodology in a project activity under a programme of activities:

In case the project activity involves the replacement of equipment, and the leakage effect of the use of the replaced equipment in another activity is neglected, because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment needs to be implemented. The monitoring should include a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose scrapped equipment should be stored until such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified.

29. Relevant parameters shall be monitored as indicated in the Table III.F.1 below. The applicable requirements specified in the "General Guidelines to SSC CDM Methodologies" (e.g. calibration requirements, sampling requirements) are also an integral part of the monitoring guidelines specified below and therefore shall be referred by the project participants.

Table III.F.1 Parameters for monitoring during the crediting period

No.	Parameter	Description	Unit	Monitoring/recording Frequency	Measurement Methods and Procedures
1	Q_y , $Q_{y,treatment,i}$	Quantity of solid waste(excluding manure), produced compost	tons	Monthly	On-site data sheets recorded monthly using weigh bridge. Weighbridge will be subject to periodic calibration (in accordance with stipulation of the weighbridge supplier) , also cross check with sales of compost
2	$Q_{y,ww,runoff}$	The runoff wastewater from composting yard	m^3	Monitored with periodic measurements sufficient to comply with confidence/precision level of 90/10	Measurements are undertaken using flow meters or direct measurement of the accumulative volume overtime. Consisting of the wastewater applied in excess (i.e., moisture over and above the field capacity of the biomass being composted) and rainwater in the case of unroofed sites
3	$COD_{y,ww,runoff}$	The chemical oxygen demand of the runoff wastewater from composting yard	t COD/m^3	Samples are representatively taken from unfiltered wastewater and measurements shall ensure a 90/10 confidence/precision level	Measure the COD according to national or international standards. COD is measured through representative sampling

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III.F. Avoidance of methane emissions through composting (cont)

No.	Parameter	Description	Unit	Monitoring/recording Frequency	Measurement Methods and Procedures
4	CT_y, $CT_{y,treatment}$	Average truck capacity for transportation	tons/truck		On site measurement
5	DAF_w, $DAF_{treatment}$	Average incremental distance for raw solid or product transportation	km/truck	Annually	On site measurement, assumption to be approved by DOE
6	$TWCOM_y$	Total quantity of waste composted in year y at the facility	tons	Monthly	In the case of increase of capacity utilization of existing composting facilities, it is used for the calculation of the factor *r*
7		Check of aerobic conditions of the composting process			Technical measures shall be provided to ensure the aerobic conditions of the composting process. Oxygen content of the gas phase inside the windrows needs to be monitored, it can be done via multiple sample measurements throughout different stages of the composting process, with maximum margin of error of 10% at a 90% confidence level. For this purpose a portable oxygen meter can be used with lancets of at least 1 m length to measure oxygen in representative points within the spatial dimensions of window. In the case of forced aerated in-vessel and forced aerated pile composting systems continuous measurements may also be done using online sensors. O_2-measurement-instrument will be subject to periodic calibration (in accordance with stipulation of instrument-supplier)

No.	Parameter	Description	Unit	Monitoring/recording Frequency	Measurement Methods and Procedures
8		Parameters related to emissions from electricity and/or fuel consumption			As per the procedure in the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" and/or "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion". Alternatively it shall be assumed that all relevant electrical equipment operate at full rated capacity, plus 10% to account for distribution losses, for 8760 hours per annum
9		Parameters related to methane emissions from anaerobic disposal in a landfill of the solid waste (excluding manure)/compost			As per the latest version of the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"
10		Parameters related to baseline methane emissions from animal manure			As per relevant provisions in AMS-III.D
11		Parameters related to baseline emissions from wastewater co-composted			As per relevant provisions in AMS-III.H

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History of the document

Version	Date	Nature of revision
09	EB 58, Annex # 26 November 2010	To deconsolidate AMS-III.F to limit the methodology to composting only; anaerobic digestion of biomass will be covered in the new methodology AMS-III.AO.
08	EB 48, Annex 20 17 July 2009	To include composting of manure and to clarify that the baseline waste disposal methods are to be assessed *ex ante*.
07	EB 47, Annex 24 28 May 2009	Provide more guidance regarding the calculation of project emissions from the compost taking into account specific characteristics of the composting technology/measure employed.
06.1	09 February 2009	Corrected title of "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site".
06	EB 41, Annex 19 02 August 2008	The applicability of the methodology is expanded to include controlled anaerobic digestion of solid organic waste which otherwise would have been left to decay in a waste disposal site.
05	EB 33, Annex 34 27 July 2007	Revision of the approved small-scale methodology AMS-III.F to allow for its application under a programme of activities (PoA)
04	EB 31, Annex 25 04 May 2007	Includes project activities that enhance the capacity utilization of existing compost facilities and provides methods to determine the eligible increased capacity utilization based on the historical records of the annual amount of waste composted at the facility.
03	EB 28, Meeting Report, Para.54 15 December 2006	The applicability of the category is expanded to include co-composting of wastewater along with biomass solid wastes; Methods to calculate baseline emissions from the co-composted wastewater are included and parameters for avoided methane emissions from the composted solid waste are revised. See paragraph 50 of the EB 28 meeting report. Removed the interim applicability condition i.e. 25 ktCO2e/y limit from all Type III categories.
02	EB 24, Meeting Report, Para. 64 12, May 2006	Introduced the interim applicability condition i.e. 25 ktCO2e/y limit from all Type III categories.
01	EB 23, Annex 22 24 February 2006	Initial adoption.
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