TYPE III - OTHER PROJECT ACTIVITIES

Project participants shall take into account the general guidance to the methodologies, information on additionality, abbreviations and general guidance on leakage provided at http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html.

III.L. Avoidance of methane production from biomass decay through controlled pyrolysis

Technology/measure

1. This project category comprises measures that avoid the production of methane from biogenic organic matter that would have otherwise been left to decay under clearly anaerobic conditions till the end of the crediting period in a solid waste disposal site without methane recovery. Due to the project activity, decay is prevented through controlled pyrolysis[1].

2. This category is applicable to project activities where it is possible to ensure the pyrolysed residues are no longer prone to anaerobic decomposition. The pyrolysed residues will only be considered biologically inert if the volatile-carbon/fixed-carbon ratio is equal to or lower than 50%.

3. Measures shall include recovery and combustion of non-CO_2 greenhouse gases produced during pyrolysis in order to ensure that no relevant changes in greenhouse gas emissions (other than methane avoidance) occur as a consequence of the project activity and/or need to be accounted for, except for the possibilities of leakage. If the pyrolysis facility is used for heat and electricity generation, that component of the project activity shall use a corresponding methodology under type I project activities.

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

5. The project activity does not recover or combust methane from a landfill unlike AMS III.G. Nevertheless, the location and characteristics of the disposal site in the baseline condition shall be known, in such a way as to allow the estimation of its methane emissions.

6. If the waste would be submitted to landfill disposal in the absence of the project activity, a methodology under type II (energy efficiency) might be used to account for lesser fossil fuel usage in landfilling, due to waste mass and volume reductions achieved by the pyrolysis process.

Boundary

7. The project boundary is the physical, geographical sites:

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

[1] Pyrolysis is defined as the thermo-chemical decomposition of organic materials into a carbon rich residue, non-condensable combustible gases, and condensable vapors, by heating in the absence or lack of oxygen, without any other reagents, except possibly steam.

(b) Where the treatment of solid waste through controlled pyrolysis takes place;

(c) The storage site of the pyrolysed residues;

(d) And in the itineraries between them, where the transportation of wastes and pyrolysis residues occurs.

Project Activity Emissions

8. Project activity emissions consist of:

(a) CO_2 emissions from the pyrolysis of the non-biogenic carbon content of the waste (plastics, rubber and fossil derived carbon). This shall also include CO_2 emissions from the pyrolysis or flaring of gases and vapors produced during the pyrolysis of the non-biogenic carbon content of the waste;

(b) CO_2 emissions from the consumption of auxiliary fossil fuels by the pyrolysis facility;

(c) Incremental CO_2 emissions due to incremental distances between the collection points to the controlled pyrolysis site and to the baseline disposal site as well as transportation of pyrolysed residues from the pyrolysis facility to the disposal site;

(d) CO_2 emissions related to the fossil fuel and/or electricity consumed by the project activity facilities, including the equipment for air pollution control required by regulations. In case the project activity consumes grid electricity, the grid emission factor shall be calculated as described in category I.D.

$$PE_y = PE_{y,pyro} + PE_{y,fuel} + PE_{y,transp} + PE_{y,power}$$

where:

PE_y	Project activity emissions in the year y (tCO_2e);
$PE_{y,pyro}$	Emissions from pyrolysis of non-biogenic carbon in the year y (tCO_2e);
$PE_{y,fuel}$	Emissions from the consumption of auxiliary fuel by the pyrolysis facility in the year y (tCO_2e);
$PE_{y,transp}$	Emissions from fossil fuel consumption due to incremental transportation in the year y (tCO_2e);
$PE_{y,power}$	Emissions from electricity or diesel consumption in the year y (tCO_2e).

9. Anticipated annual quantity and composition of the waste for pyrolysis by the project activity during the crediting period shall be reported in the project design document, including the quantities of biogenic and non-biogenic waste (Qy,biogenic and Qy,non-biogenic). In addition

projections of auxiliary fuel consumption for the pyrolysis process (Qfuel) shall be provided in the project design document.

$$PE_{y,fuel} = Q_{y,fuel} \cdot E_{fuel}$$

where:

$Q_{y,fuel}$ Quantity of fuel used in the year *y* (tonnes);

E_{fuel} CO_2 emission factor for the pyrolysis of the auxiliary fossil fuel (tCO2e/tonne of fuel, use local values, if local values are difficult to get IPCC default values may be used).

If the source of auxiliary fuel is renewable biomass $PE_{y,fuel}$ can be neglected. However, it shall be demonstrated that the fuel being used is compliant with the definition of renewable biomass agreed by the Board (See Annex 18 "Definition of Renewable biomass" of the twenty third meeting report of the Board).

$$PE_{y,pyro} = Q_{y,non-biogenic} \cdot E_{non-biogenic}$$

where:

$Q_{y,non-biogenic}$ Quantity of non-biogenic waste pyrolysed in the year *y* (tonnes);

$E_{non-biogenic}$ CO_2 emission factor for the pyrolysis of the non-biogenic fraction of the waste processed by the project (tCO2e/tonne of non-biogenic waste).

Alternately,

$$PE_{y,pyro} = \frac{Q_{y,non-biogenic}}{Q_{y,total}} \cdot Q_{y,CO_2,pyro}$$

where:

$Q_{y,non-biogenic}$ Quantity of non-biogenic waste pyrolysed in the year *y* (tonnes);

$Q_{y,total}$ Total quantity of waste pyrolysed in the year *y* (tonnes);

$Q_{y,CO_2,pyro}$ CO_2 emitted by the pyrolysis process in the year *y*, including the pyrolysis or flaring of the gases and vapors originating from the waste (tCO_2e).

10. Project activity emissions from trucks for incremental transportation shall be estimated as follows:

$$PE_{y,transp} = \left(\frac{Q_y}{CT_w} \cdot DAF_w + \frac{Q_{y,pyro-residue}}{CT_{pyro-residue}} \cdot DAF_{pyro-residue} \right) \cdot EF_{CO_2}$$

where:

Q_y	Quantity of waste pyrolysed in the year *y* (tonnes);
CT_w	Average truck capacity for waste transportation (tonnes/truck);
DAF_w	Average incremental distance for waste transportation (km/truck);
$Q_{y,pyro-residue}$	Quantity of pyrolysed residues produced in the year *y* (tonnes);
$CT_{pyro-residue}$	Average truck capacity for pyrolysed residues (tonnes/truck);
$DAF_{pyro-residue}$	Average distance over which pyrolysis residues are transported (km/truck);
EF_{CO_2}	CO_2 emission factor of the fuel used for transportation (tCO_2/km, local values or IPCC default values).

Baseline

11. The baseline scenario is the situation where, in the absence of the project activity, biogenic and other organic matter would have been left to decay in clearly anaerobic conditions till the end of crediting period within the project boundary and methane is emitted to the atmosphere.

12. The baseline emissions at any year *y* during the crediting period are calculated based on the amount and composition of wastes pyrolysed since the beginning of the project activity (year "x=1") up to the year *y*, using the first order decay model as referred to in AMS III.G[2]. Baseline emissions shall exclude methane emissions that would have been removed to comply with national or local safety requirement or legal regulations.

$$BE_y = \left(BE_{y,CH_4,SWDS} - MD_{y,reg}\right) \cdot GWP_{CH_4}$$

where:

BE_y	Baseline emissions at year *y* during crediting period (tCO_2e);
$BE_{y,CH_4,SWDS}$	Methane emissions avoided during the year y by preventing waste disposal at the solid waste disposal site during the period extending from the start of the project activity to the end of the year y (tCO2e) calculated as per the method of AMS III.G. All methodological choices, in particular the choice of Methane Conversion factor (MCF) shall be justified with reference to the parameters provided in the FOD Tool considering the baseline waste disposal methods;

[2] Methods of AMS III.G are based on the Methodological tool titled "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site", also referred to as 'FOD Tool' in this document can be accessed on the CDM website however certain exceptions are made when applying to small scale methodologies (e.g. oxidation factor is set to zero) as described in AMS III.G.

$MD_{y,reg}$	Methane that would be destroyed or removed in the year *y* for safety or legal regulation;
GWP_{CH_4}	Global Warming Potential for methane (value of 21).

Leakage

13. If the controlled pyrolysis technology is equipment transferred from another activity or if the existing equipment is transferred to another activity, leakage effects at the site of the other activity are to be considered.

Monitoring

14. 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.

$$ER_y = BE_y - \left(PE_y + Leakage_y\right)$$

where:

ER_y	Emission reduction in the year *y* (tCO_2e)

15. The percentage composition of volatile-carbon, fixed-carbon, ashes and moisture in the pyrolysed waste shall be determined in a representative number of samples. The size and frequency of sampling shall be statistically significant with a maximum uncertainty range of 20% at a 95% confidence level. At a minimum, sampling should be undertaken four times a year. Determinations shall be made according to the “Standard Test Method for Chemical Analysis of Wood Charcoal” - ASTM D1762-84 (2001). The pyrolysed residues will only be considered biologically inert if the volatile-carbon/fixed-carbon ratio is equal to or lower than 50%.

16. The amount of waste pyrolysed each year (*Qy*) shall be measured and recorded. The composition of the waste (weight fraction of each waste type; see EB26/Report – Annex 14 “Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site”) shall be determined through representative sampling and recorded to enable estimation of *ex-post* baseline methane emissions. The size and frequency of sampling shall be statistically significant with a maximum uncertainty range of 20% at a 95% confidence level. At a minimum, sampling should be undertaken four times a year.

17. The quantity of auxiliary fuel used (*Qy,fuel*) shall be measured and recorded unless it is demonstrated that the fuel used is renewable biomass.

18. The quantity of non-biogenic waste pyrolysed (*Qy,non-biogenic*) shall be determined through representative sampling and its average carbon content shall be determined using values taken from 2006 IPCC guidelines to determine the project activity emission attributable to the pyrolysis process.

19. The average truck capacity for the waste (CT_w) and for the pyrolysis residues ($CT_{pyro\text{-}residue}$) and the relevant distances for transportation shall be recorded to enable the calculation of project activity emission attributed to transportation.

20. The power consumption of the project activity facilities and/or power generation by the project activity shall be monitored and recorded.

21. The project participants shall demonstrate annually, through the assessment of common practices at proximate waste disposal sites, that the amount of waste pyrolysed by the project activity facilities would have been disposed in a solid waste disposal site without methane recovery in the absence of the project activity and it would decay anaerobically in the disposal site throughout the crediting period.

Project activity under a programme of activities

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

22. 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.