CLEAN DEVELOPMENT MECHANISM

CDM-EB99-AA-A08

Concept note

Extending the applicability of CDM methodologies for recycling materials that have higher carbon footprint

Version 01.0

United Nations
Framework Convention on
Climate Change

TABLE OF CONTENTS **Page**

1. Procedural background

1. The Executive Board of the clean development mechanism (CDM) (hereinafter referred to as the Board) at its ninety-eighth meeting agreed to consider a concept note on methodologies for recycling materials that have higher carbon footprints.

2. This work relates to the activity “Development of new methodologies to broaden the applicability of the CDM” under objective 1(c) “Develop simplified and user-friendly standards and procedures that increase efficiency and ensure environmental integrity” with a resource allocation as referred to in table 5 on page 16 of the CDM two-year business and management plan 2018–2019 (EB97, annex 1).

3. The MP, at its seventy-fifth meeting (MP 75), provided its inputs to the potential modes of work to finalize this product.

2. Purpose

4. The purpose of this concept note is to receive further direction from the Board on the activities to be undertaken under this work item.

3. Key issues and proposed solutions

5. Numerous international studies[1] have shown that the recycling of waste materials can result in net savings of GHG emissions. This is because recycling materials into new (“secondary”) products can displace the production of “primary” products that can require significant inputs of energy and raw materials. In order for stakeholders to better understand the GHG impacts of their waste management activities and identify GHG

[1] TURNER, D., WILLIAMS, I., KEMP, S., 2015. **Greenhouse gas emission factors for recycling of source-segregated waste materials.** <https://ac.els-cdn.com/S0921344915301245/1-s2.0-S0921344915301245-main.pdf?_tid=031067d2-e63e-43f3-8bc8-6f738162531d&acdnat=1522928389_fc40fe912b12d5ab1d581ad4adf3fcc4>.

In this article, reference is made to the following studies:

(a) BJÖRKLUND, A., FINNVEDEN, G., 2005. **Recycling revisited—life cycle comparisons of global warming impact and total energy use of waste management strategies**. Resour., Conserv. Recycl. 44, 309–317;

(b) FRANCHETTI, M., KILARU, P., 2012. **Modeling the impact of municipal solid waste recycling on greenhouse gas emissions in Ohio, US**. Resour., Conserv. Recycl. 58, 107–113;

(c) MANFREDI, S., TONINI, D., CHRISTENSEN, T.H., 2011. **Environmental assessment of different management options for individual waste fractions by means of life-cycle assessment modelling. Resour.**, Conserv. Recycl. 55, 995–1004;

(d) Waste & Resources Action Programme (WRAP), 2006. **Environmental Benefits of Recycling. Waste & Resources Action Programme**, Banbury, UK

(e) Waste & Resources Action Programme (WRAP), 2010a. **Environmental Benefits of Recycling - 2010 Update**. <http://www.wrap.org.uk/sites/files/wrap/Environmental benefits of recycling 2010 update.3b174d59.8816.pdf> (accessed 16.07.2015).

emissions reduction opportunities to help achieve national GHG emissions reduction targets, they need to be able to quantify the GHG emissions from material recycling.

6. Accounting for the connections between waste in many sectors, including mining, deforestation, industrial agriculture, manufacturing, transportation, and electricity, represents more than 40 per cent of all greenhouse gas (GHG) emissions.

7. The current economy can be largely described as linear: virgin materials are taken from nature, used to make products, which are then used and eventually disposed of. This model gives rise to chronically high levels of waste and creates dependence between economic development and inputs of new virgin materials. To preserve, and restore the world's finite resources, it is essential to be restorative by intent and design and thus facilitate more recycling and reusing of virgin materials.

8. The model of circular economy differentiates between two types of cycles:[2]

    (a) Biological cycles, in which non-toxic materials are restored into the biosphere while rebuilding natural capital, after being cascaded into different applications;

    (b) Technical cycles, in which products, components and materials are restored into the market at the highest possible quality and, if possible, through repair and maintenance, reuse, refurbishment, remanufacture and ultimately recycling.

9. The successful implementation of circular models depends on the combined leveraging of four key building blocks:

    (a) Rethinking product design facilitates the recovery of components and materials;

    (b) Innovative business models enable changes in incentives and the collection of products;

    (c) New reverse logistics need to be put in place to recovering products back from consumers or users and into the supply chain, and treatment methods need to be improved;

    (d) Several system conditions can help businesses to make the transition, such as education, policy frameworks, collaboration platforms or metrics.

10. However, based on the mandate given by the Board at the time of the adoption of the workplan, the focus of work under this item would be on both the technical and biological cycles elaborated above, but with one element coming from the building blocks, that is the new reverse logistics.

11. The Board has already developed methodologies that address material recovery and recycling, and also to certain extent alternative materials to provide same service (example: displacement of cement and mortar construction with gypsum concrete panels). Two small-scale methodologies were specifically developed to address the recovery and recycling from municipal solid waste ("AMS-III.AJ: Recovery and recycling of materials from solid wastes") and from E-waste ("AMS-III.BA: Recovery and recycling of materials from E-waste") and one methodology was developed for alternative materials ("AMS-

[2] McDONOUGH, W., BRAUNGART M., **Cradle to Cradle: Remaking the Way We Make Things**, 2002; The Ellen MacArthur Foundation, Towards the Circular Economy, Volume 1, 2012.

III.BH: Displacement of production of brick and cement by manufacture and installation of gypsum concrete wall panels").

12. As indicated in paragraph 6, there is a potential to significantly reduce emissions from the production of virgin materials and products, if materials and products recovery and recycling are undertaken in a systematic way and GHG emissions are appropriately estimated.

13. Considering the potential indicated above, the following was presented as solutions and consulted with the MP. i.e. to determine whether to:

(a) Expand the list of materials covered in the currently approved CDM methodologies for recycling materials from municipal solid waste ("AMS-III.AJ: Recovery and recycling of materials from solid wastes") and from E-waste ("AMS-III.BA: Recovery and recycling of materials from E-waste"); or

(b) Develop a standard framework to develop methodologies approaches related to material recovery, recycling and reuse.

14. The MP indicated that both options are mutually inclusive, and therefore it would be useful to initiate work on a standard framework to develop methodological approaches related to material recycling.

3.1. Why is a framework necessary?

15. In the case of waste material recycling, emission factors (EFs) are often expressed per tonne of waste material collected and sent for recycling (kg CO2e/tonne). GHG EFs for waste material recycling are typically developed using life cycle assessments (LCA), applied either partially (focusing solely on the climate change potential impact indicator) or fully. An LCA is a well-established and internationally standardised methodology (ISO, 2006 a[3],b[4]) for quantifying emissions from specified products or systems over their entire life cycle. LCA accounts for both the environmental burdens (e.g. GHG emissions from residual waste disposed of in landfill) and benefits (e.g. the recovery of the recycling of waste materials to produce secondary products that replace the production of primary products). However, choices regarding the definition of system boundaries, model parameterisation, and data selection can significantly affect the calculated results and need to be tailor-made for the purposes of the CDM.

16. Furthermore, GHG EFs are generally developed for specific geographical areas and technologies, and their appropriateness needs to be analysed. To ensure that appropriate and representative GHG EFs are applied, a thorough examination of background information is necessary, relating to:

(a) Methodological choices and approaches taken (BROGAARD et al., 2014[5]) to calculate the specific emissions of GHGs avoided when recycling different types of materials;

---

[3] ISO 14040:2006 Environmental management – Life cycle assessment – Principles and framework

[4] ISO 14044:2006 Environmental management – Life Cycle Assessment – Requirements and guidelines

[5] BROGAARD, L.K., DAMGAARD, A., JENSEN, M.B., BARLAZ, M., CHRISTENSEN, T.H., 2014. **Evaluation of life cycle inventory data for recycling systems.** Resour., Conserv. Recycl. 87, 30–45.

(b) Data sources that are essential (BROGAARD et al., 2014). However, GHG EFs are rarely accompanied by such detailed documentation;

(c) Type of information needed in the context of CDM application (attribution between Annex I Parties and Non-Annex I Parties in terms of production);

(d) The correct choice of secondary data between a range of published and unpublished sources;

(e) The correct substitution ratio (i.e. the amount of primary material production that is avoided because of the recycling of an amount of waste material considering its recyclability, material quality loss, and market substitution ratio).

17. In parallel to developing the framework, it is also suggested to include two additional materials or products in methodologies AMS-III.AJ and AMS-III.BA based on the availability of data, GHG emission reduction potential and consultation with relevant practitioners.

18. The other potential areas for the development of CDM methodologies in material recycling could include:

(a) Collecting regional materials that avoid the emissions associated with transportation over long distances, and importing materials from other regions or countries;

(b) Redistribution of food;

(c) Reuse of textile waste; and

(d) Recycling of polyurethane and batteries.

19. The benefits of the proposed work will be:

(a) To have in place a framework that includes a methodological approach and minimum required information to calculate CO_2 emission factors that can be used for the recycling of different types of materials or products; and

(b) To expand the application of the CDM to the new concepts and technologies of waste management towards the needs of a sustainable economy.

20. The MP, also indicated that beyond just recycling, there is significant potential in looking at material and product reduction, recovery and reuse, while maintaining the same level of service compared to the baseline.

4. Impacts

21. The proposed work will broaden the applicability of CDM to recycling and will reduce the transaction costs by setting the main data and methodological requirements to determine the specific GHG emissions avoided.

22. The proposed work does not foresee any cost implications for third-parties/stakeholders.

5. Subsequent work and timelines

23. Based on the guidance provided by the Board, the MP will work further to develop the draft standards in consultation with practitioners at their next respective meetings and will recommend the draft standards for consideration by the Board in 2019.

24. The two additional materials to the existing methodologies would be undertaken to complete by 2018.

25. The work plan of the Board included the delivery of this concept note. Additional resources would be needed to undertake the proposed work in Para 13 (a) and (b). For including two additional materials in the existing methodology 1.5 Person Months (1.5 PM) and for delivery of framework 4.5 Person Months (4.5 PM). The additional staff time requirements will need to be addressed during the business and management plan (BMAP) mid-year review.

6. Recommendations to the Board

26. The secretariat recommends that the Board approves the work identified under paragraph 13 (a) and (b) above and provide additional guidance for the work under paragraphs 18 and 20.

Appendix. Inputs from the Methodology Panel

1. Among the two options presented by the secretariat, the MP is of the view both the options are mutually inclusive, and therefore it is useful to initiate work on a standard framework to develop methodologies approaches related to material recycling. This framework will indicate the type of information needed and methodological approaches to calculate the specific emissions of GHG avoided when recycling different types of materials, and also parallelly to include two additional material or products in methodologies AMS-III.AJ and AMS-III.BA based on the availability of data, GHG reduction potential and consultation with practitioners.

2. The Panel indicated that beyond just recycling, there is a significant potential in looking at material and product reduction, recovery and reuse, while maintaining same level of service compared to the baseline.

3. The Panel also indicated that other potential areas for development of CDM methodologies in material recycling could include collection of regional materials that avoids the emissions associated with the transportation for long distances and importing materials from other regions or countries / redistribution of food / reuse of textile waste / recycling of polyurethane and batteries.

- - - - -

Document information

Version	*Date*	*Description*
01.0	9 April 2018	Published as an annex to the annotated agenda of EB 99.

Decision Class: Regulatory
Document Type: Information note
Business Function: Methodology
Keywords: e-waste, carbon footprint, new regulatory framework, solid waste