Journal of Cleaner Production xxx (2016) 1–12

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Verification of outcomes from carbon market under the clean development mechanism (CDM) projects in landfills

Silvia Stuchi Cruz [a, *], Sônia Paulino [b], Delhi Paiva [b]

[a] DPCT, University of Campinas, Brazil
[b] EACH, University of São Paulo, Brazil

ARTICLE INFO

Article history:
Received 17 November 2015
Received in revised form
5 April 2016
Accepted 5 April 2016
Available online xxx

Keywords:
Co-benefits indicator
Clean development mechanism
Landfill

ABSTRACT

This paper addresses the issue of verifying the outcomes of using the Clean Development Mechanism – CDM – in landfills. Our research focuses on the São Paulo Metropolitan Area and outlines six CDM projects: Bandeirantes, São João, Caieiras, Itapevi, Pedreira, and Lara. Twenty-three indicators are proposed, organized into two dimensions: social and environmental. The process of constructing indicators was participatory. The Delphi technique was then applied leading to its validation by experts. The dimensions were subdivided into five topics: participation, emphasizing the participation of associations and cooperatives surrounding landfills; the interface between agents involved, each with different interests; benefits, focusing on the implementation of CDM in the solid waste sector (especially waste pickers' cooperatives and technology transfer); environmental quality monitoring, highlighting the issue of odor; and gas emissions monitoring related to the efficiency of the biogas capture system. The aforementioned results corroborate the importance of the indicators developed based on interdisciplinary and multi-agent approaches which take into account the different stakeholders.

1. Introduction

The Kyoto Protocol was adopted in 1997 (Brazil, 1997) at the Third Conference of Parties of the United Nations Framework Convention on Climate Change (UNFCCC) and came into force in 2005. This Protocol established that countries included in Annex I were forced to reduce their greenhouse gas (GHG) emissions by at least 5% between 2008 and 2012, in relation to 1990 emission levels. In order to assist Annex I countries to comply with their GHG emission reduction targets, the Protocol established the Clean Development Mechanism (CDM).

The CDM encompasses activities aimed at reducing greenhouse gas (GHG) emissions by establishing projects across a wide range of sectors, including landfill sites. Of the Brazil's total GHG emissions, considering the period 1970–2014, 460.5 MtCO2e are from the waste sector, which represents 1.9% of Brazil's emissions accumulated in this period. Another important fact (and worrying) is that in the same period, emissions from the waste sector jumped from 12 million tCO2e to 68.3 million tCO2e, that is an increase of approximately 450%, in a period of 44 years (SEEG, 2015).

In line with article 12 of the Kyoto Protocol, these projects must also contribute to promoting sustainable development in host countries by generating social and environmental co-benefits.

CDM encompasses both global issues linked to climate change and the promotion of development within the local context. Fig. 1 summarizes climate change policies in the global and local spheres in the waste sector within the Brazilian context.[1]

Although CDM projects have this twofold goal, the United Nations Framework Convention on Climate Change (UNFCCC) has not established indicators to evaluate the co-benefits promoted. According to the Marrakech Accords (Decision 17/CP. 7), the host country, represented by the Designated National Authority (DNA) and based on the rules and regulations of the CDM Executive Board, is responsible for determining whether a CDM project activity contributes to sustainable development (UNFCCC, 2001).

Several studies focusing on the analysis of CDM results have demonstrated the difficulties – or even the failure – of GHG reduction projects in contributing to the promotion of local benefits

* Corresponding author.
E-mail address: silviacruz@ige.unicamp.br (S. Stuchi Cruz).

[1] CIMGC – Inter-ministerial Commission on Climate Change: composed of nine ministries and coordinated by the Ministry of Science, Technology, and Innovation, established with the goal of coordinating issues on climate change and. The CIMGC sets up criteria and takes decisions on Brazilian CDM projects.

http://dx.doi.org/10.1016/j.jclepro.2016.04.022
0959-6526/

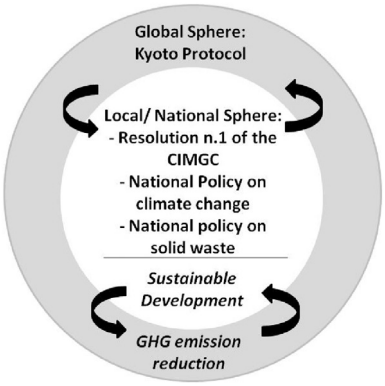

Fig. 1. Global and local policies for addressing climate change.
Source: Cruz and Paulino (2015, p.4).

and guaranteeing stakeholder participation (Olsen and Fenhann, 2008; Boyd et al., 2009; Kollmuss et al., 2008; Nussbaumer, 2009).

The key challenges regarding the effectiveness of the objective of promoting local sustainable development through the implementation of CDM projects are: a lack of methodology and evaluation indicators; a lack of clarity and definition about the co-benefits generated by the projects (Ürge-Vorsatz et al., 2014); and a low participation of stakeholders (Arens et al., 2014; Olsen et al., 2015).

Given that in contrast to emission reductions – which are monitored and checked periodically by the certifying bodies based on methodologies defined by the UNFCCC (2015a) – the sustainable development (SD) contribution of CDM projects requires regulatory aspects that define procedures to monitor and ensure its effectiveness (Santucci et al., 2014; Cruz and Paulino, 2015). In addition to the emission reduction potential in the solid waste sector, which can be achieved through CDM projects on landfills (collection and use of biogas), as proposed by the Kyoto Protocol and UNFCCC, we must have a better understanding of the objectives of this mechanism also in terms of co-benefits generation.

Despite criticism of the evaluation of co-benefits and participation in GHG emission reduction projects being both necessary and genuine, it is important to highlight the efforts made to reduce these shortfalls. Studies such as Olsen and Fenhann (2008), Nussbaumer (2009), Rindefjäll et al. (2011), Subbarao and Lloyd (2011), Cruz et al. (2014) and the recent studies performed by UNFCCC (2011, 2012a, 2012b, 2014a, 2014b, 2015b) seek to evaluate how these projects can contribute to local SD.

In Brazil, in order to promote local SD the specification of projects must be based on information provided in Annex III of Resolution n.1 of the Inter-Ministerial Commission on Global Climate Change.[2] This establishes both the benefits to the local area and how project activities contribute to each of the following aspects: environmental sustainability; improvement in working conditions and net job creation; income distribution; training and technological development; and finally, regional integration and working in conjunction with other sectors (Brazil, 2003).

Although the CDM project descriptions related to SD are presented according to Annex III rules, these aspects are still not significant in Brazilian projects (Americano, 2008; Cole and Liverman, 2011). The Letter of Approval (LoA), a document which confirms that the project contributes to the SD of a particular country, is issued by the DNA and is exclusively based on the expected results (local contributions) of the project in terms of SD, and not on verified results (Tewari, 2012).

In parallel to the regulated market – regulated by the Kyoto Protocol – the Voluntary Carbon Market (VCM) has emerged, characterized by non-established mandatory emission reduction targets, enabling the purchase of carbon credits generated on a voluntary basis. In the VCM, the generation of local co-benefits by Project implementation is not mandatory. However, the importance of measuring the co-benefits generated by these projects is identified, this due to demand from the credit buyers, in order to guarantee credibility of the carbon credits issued.

The contribution of the projects to the local SD in the VCM is measured by Standards with criteria more specific than those proposed by the regulated carbon market. The certification systems (CDM Gold Standard, Social Carbon, Climate, Community and Biodiversity – CCB, among others) require the evaluation of co-benefits for all projects which aim to obtain the certification (Arens et al., 2014; Olsen et al., 2015).

The Standards have methods for evaluating co-benefits throughout the crediting period of the Project, through monitoring plans covering indicators with positive or negative results and/or presenting progress reports, verified by a third party, increasing the credibility of the documents.

In relation to the regulated carbon market, Farias et al. (2013) point out a substantial uncertainty about the second period of the Kyoto Protocol (2013–2020), and consequently, about the structure of Global Climate Governance (GCG) in the post-Kyoto period – one subsequent to the end of the second period of commitment, which will come into force from 2020. At COP 20 that took place in early December 2014 in Lima, Peru, it was elaborated a document named by "Lima for Climate Action" in order to organize and define how the negotiations would be made to the COP 21. An important decision was took in Lima: the clarification regarding the "developed and developing countries" (UNFCCC, 2014a,b), as all the parties were obliged to describe their Intended Nationally Determined Contributions – INDCs.

This measure emphasizes the need to create a framework that allowed maximize the level of participation of the Parties, which was significant for effective results at COP 21 held in Paris in December 2015. By early 2016, 160 countries presented their INDCs.[3] The Paris Agreement proposes that, from 2023, the INDCs will be reviewed and adjusted at intervals of five years, thus, calibrating the activities and reduction targets required to the Parties.

The Brazilian INDC was set up to reduce emissions in absolute terms: by 31% in 2025 37% by 2030 and by 45% compared to 2005 (BRASIL, 2015). Report which summarizes the INDCs submitted by the parties shows that more than half of the reported documents indicate that the parties plan to use-market instruments (carbon credits) from international, regional or national schemes, such as the clean development mechanism (CDM) to achieve part of their emission reduction targets (Kossoy et al., 2015; UNFCCC, 2015a).

There is no clear indication of how will be the format of the mechanism to replace and/or improve the CDM. The nearest stretch of the Paris Agreement that addresses this issue is found in Art. 6.[4]

In this context, new economic instruments based on requirements for allowing for the mitigation objectives in a flexible

[2] Inter-Ministerial Commission on Global Climate Change is the Designated National Authority (DNA) in Brazil.

[3] INDC available at UNFCCC: http://www4.unfccc.int/submissions/INDC/.

[4] "Parties shall, where engaging on a voluntary basis in cooperative approaches that involve the use of internationally transferred mitigation outcomes towards nationally determined contributions, promote sustainable development and ensure environmental integrity and transparency, including in governance, and shall apply robust accounting to ensure, inter alia, the avoidance of double counting, consistent with guidance adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement" (UNFCCC, 2015a, p. 24,b).

Please cite this article in press as: Stuchi Cruz, S., et al., Verification of outcomes from carbon market under the clean development mechanism (CDM) projects in landfills, Journal of Cleaner Production (2016), http://dx.doi.org/10.1016/j.jclepro.2016.04.022