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Sustainability labelling as a tool for reporting the sustainable development impacts of climate actions relevant to Article 6 of the Paris Agreement

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Abstract

The architecture of global carbon markets has changed significantly since the Paris Agreement and the 2030 Agenda for Sustainable Development Goals (SDGs) were both agreed in 2015. Voluntary, international cooperative approaches are established under Article 6 of the Paris Agreement to help achieve the targets set out in the Parties' respective Nationally Determined Contributions (NDCs) to limit global warming to an increase below 1.5-2ºC. Article 6.4 establishes a sustainable mitigation mechanism and rules modalities and procedures are to be developed internationally based on experience and lessons learned from existing mechanisms, such as the Clean Development Mechanism (CDM) and its Sustainable Development (SD) Tool. Historically the issue of making integrated assessments of sustainable development and mitigation actions has been politically and methodologically controversial for many reasons: developing countries fear that an international definition of SD will interfere with their sovereignty and therefore their ability to define their own development pathways; players in the carbon market fear that markets can only handle one objective, namely mitigation outcomes; and sustainable development is regarded as too complex and costly to be measured and quantified. In an effort to address these concerns, the paper proposes a new methodology for the sustainability labelling of climate mitigation actions relevant to Article 6 approaches. The paper draws on an application of the CDM SD tool to analyse 2098 Component Programme Activities (CPAs) that had entered the CDM Pipeline by January 2017. The paper suggests that assessment of the sustainable development benefits of climate actions can be graded and labelled based on the analysis of qualitative data, which is less costly than applying a quantitative approach.

Keywords:

Sustainable development impacts, mitigation actions, labelling, sustainability reporting, Clean Development Mechanism (CDM), Article 6, cooperative approaches, Paris Agreement

1. Introduction

The 2030 Agenda for Sustainable Development Goals (SDGs) and the Paris Agreement, both adopted in 2015, underpin a new and transformational global agenda for sustainable development and climate action. In light of this, developed and developing countries alike are expected to establish national targets and plans to implement Nationally Determined Contributions (NDCs) (UNFCCC, 2015) and contribute to 17 SDGs (UN, 2015) to help achieve

the goal of limiting global warming to below 1.5 - 2°C above pre-industrial levels. These two historical agreements establish a new architecture for a global carbon market that reflects a change from a binary system consisting of compliance and voluntary markets in the Kyoto Protocol towards a more fragmented system of more or less linked regional, national or sub-national emissions trading schemes (Hermwille and Kreibich, 2017). The new global agenda reflects a change from a climate-centric approach in the Kyoto Protocol to a more balanced approach to development and climate as two equally important goals in the Paris Agreement (Verles, 2016).

1.1 Principles and features of Article 6 approaches

This new agenda is visible in Article 6 of the Paris Agreement, which provides a framework for general cooperation, including approaches to international cooperation to achieve the targets set out in the respective NDCs. Article 6 sets out three approaches with the overall objectives of promoting greater ambition, sustainable development and environmental integrity in the implementation of NDCs by all Parties. The basic principles of Article 6 include the following (ADB, 2018). First, the *bottom–up* ethos of the Paris Agreement, which is also embedded in Article 6, means that similar to the bottom-up determination of NDCs, the governance of cooperative approaches will reflect Parties' national prerogatives to make their own decisions. Second, while governance is more decentralized than in the Kyoto Protocol, there will still be elements of centralization and *global governance*. However, the balance between centralization and decentralization is notably different from the Kyoto Protocol. Third, *transparency* plays a critical role in the governance of the Paris Agreement and in Article 6, as a means to create trust among Parties and raise the level of ambition. Fourth, *Article 6 is unitary,* which means that its various elements cannot be considered in isolation but need to be considered together. Fifth, *the Paris Agreement itself is unitary.* Hence, Article 6 cannot be seen in isolation but must be seen in the context of the Paris Agreement in its entirety. Sustainable development, transparency, environmental integrity and accounting are present not only in Article 6, but throughout the Paris Agreement. Furthermore, links to the 2030 Agenda for the global SDGs are recognised in the Paris Decision to adopt the Paris Agreement. Article 6 will have to build on and be connected to Articles 4 (NDCs), 13 (transparency) and 15 (compliance). At the same time, Article 6 will also inform the more general Paris Agreement framework, particularly the transparency framework in Article 13.7, on information 'to track progress' on NDC implementation. Building on these basic principles, the key features that Article 6 approaches must embody

are environmental integrity and transparency. Environmental integrity entails that double-counting is avoided and requires robust accounting, monitoring, and clear transparency and reporting rules. Transparency entails that all Parties show what they plan to do and how they have done it. Central to the transparency system is a global stocktake of NDC implementation, where the Parties assess their common efforts toward reaching the global temperature goal. Guidance, rules, modalities and procedures, also referred to as the 'rulebook' or 'work programme', are to be developed so that Article 6 approaches can be implemented no later than by COP-24 in November 2018.

1.2 Sustainable development provisions in Article 6

The preamble of Article 6 (§ 6.1) states prominently that sustainable development is a unitary objective of all three approaches. In each of the Article 6 approaches, sustainable development is an objective to be pursued in parallel with climate actions. First, Articles 6.2 and 6.3 establish cooperative approaches enabling Parties without any international oversight to use internationally transferred mitigation outcomes (ITMOs) to achieve their NDCs. The text clearly states that in doing so 'Parties shall […] promote sustainable development and ensure environmental integrity'. Second, Articles 6.4-6.7 establish a mechanism to contribute to the mitigation of greenhouse gas emissions and support sustainable development, also called the 'Sustainable Mitigation Mechanism' by some (Marcu 2016) and 'CDM+' by others. This mechanism will be regulated by an international body mandated by the Parties to the Paris Agreement. Third, Articles 6.8 and 6.9 define a 'framework for non-market approaches to sustainable development' to enhance links and create synergies between mitigation, adaptation, finance, technology transfers and capacity-building (UNFCCC 2015).

1.3 Lessons learned from the CDM and the CDM SD Tool

The Paris Decision to give effect to the Paris Agreement specifies that the Article 6.4 mechanism should be based on 'experience gained with and lessons learned from existing mechanisms' (§37f), such as the Clean Development Mechanism (CDM) and its Sustainable Development Tool. The CDM SD tool uses a taxonomy of SD benefits first developed by Olsen and Fenhann (2008). The tool serves to categorise the SD benefits into the three dimensions of sustainable development, that is, the environmental, social and economic aspects.

Building on the CDM SD tool applied to the Component Programme Activities (CPAs) of CDM Programmes of Activities (PoAs), this paper proposes a new tool for the sustainability

labelling of mitigation actions relevant to developing the work programme for Article 6 approaches to be decided at COP 24 2018. A CDM Programme of Activities (PoA) is a voluntary action by a private or public entity to coordinate and implement any policy, measure or stated goal to achieve anthropogenic greenhouse gas (GHG) emissions reductions or net GHG removals by sinks. The activity has to be additional to any that would occur in the absence of the PoA and may include an unlimited number of activities, including CDM Program Activities (CPAs).

Moreover, the present study aims to show, how a sustainability labelling tool can help overcome the shortcomings related to the CDM SD Tool (Arens et al., 2015), such as the absence of guidance for ex-post assessments and the monitoring and verification of the co-benefits achieved with a view to incentivizing a ‘race to the top’ for the contribution of Article 6 mitigation actions to sustainable development. Historically in the context of the CDM, sustainable development assessment of mitigation actions has been a controversial issue for many years, with diverse political and stakeholder interests constituting the main barriers to promoting the benefits of sustainable development (Dransfeld et al., 2017). The barriers can be classified under their political/institutional aspects and financial/technical aspects. The political/institutional barriers include a lack of clarity regarding the scope and modalities of market mechanisms; a lack of a strong mandate for assessing the benefits of sustainable development; questions of sovereignty regarding the definition and assessment of sustainable development; a lack of any common, universally accepted definition of sustainable development; and a lack of monetary or regulatory incentives for the monitoring, reporting and verification of the benefits of sustainable development. The financial/technical barriers include a lack of clarity regarding possible roles and responsibilities for different stakeholders to assess sustainable development benefits; a lack of standardized technical frameworks for the monitoring, reporting and verification (MRV) of sustainable development benefits; the added complexity of assessing the benefits of sustainable development and the respective transaction costs; and a lack of experience and capacity for the MRV of sustainable development benefits. These barriers are not only rooted in the different positions of the Parties negotiating under the UNFCCC, they are also related to the wider issues of climate and development agendas forming a complex of synergies and trade-offs between the positive and negative impacts of policies and actions. Lessons learned from the CDM SD tool and other sustainability assessment tools and approaches (Olsen et. al, 2017) can serve as an inspiration for development of the Article 6 work programme on how to

overcome such barriers. In particular, the CDM is similar in its objectives and governance arrangements to the new mechanism established under Article 6.4 (Greiner and Howard, 2017; Michaelowa and Hoch, 2016). In the context of the principles and key features of Article 6 approaches, and building on lessons learned and experience from the CDM SD Tool, sustainability labelling is proposed as a reporting tool that would contribute to implementing the transparency provisions under Article 6.

1.4 Structure of the analysis

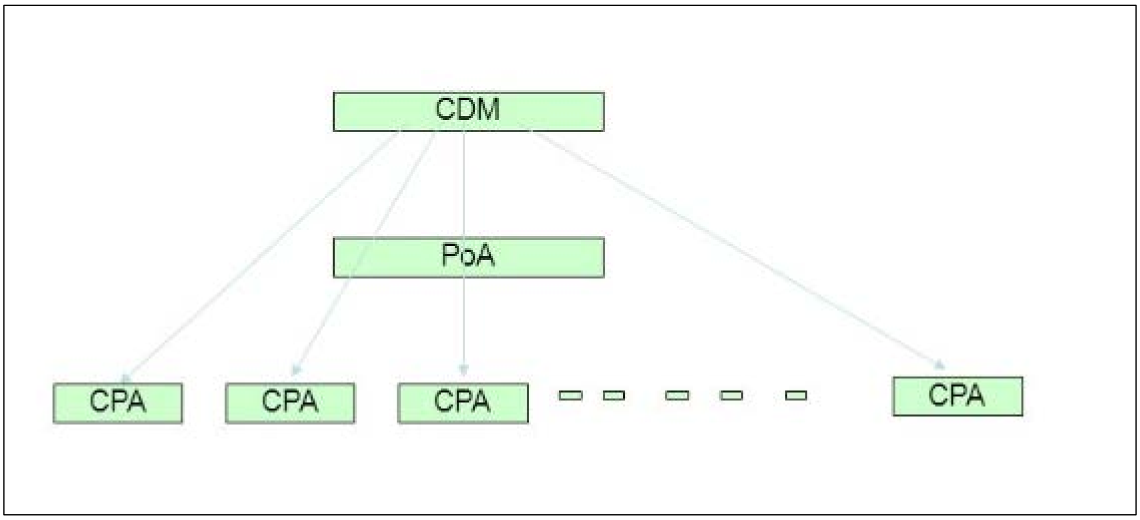
This article draws on the CDM SD Tool and is applied to the analysis of CDM PoAs that had entered the CDM Pipeline by January 2017. First, the article describes a method for the sustainability labelling of mitigation actions, drawing on analysis of the UNEP DTU Partnership PoA pipeline dataset. Secondly, results of the analysis are presented with regard to a description of how the mitigation actions contribute to sustainable development. Thirdly, the strengths and weaknesses of sustainability labelling as a tool for reporting relevant to Article 6 approaches are discussed in the context of lessons learned from applying the CDM SD tool, including the barriers identified to promoting sustainable development through market mechanisms. To conclude, we offer suggestions for how sustainability labelling can be used as a structured reporting tool to promote sustainable development through Article 6 approaches.

2. Data and methods

2.1. UNEP DTU Partnership PoA pipeline data set

The PoA SD pipeline dataset was created in 2013 at the UNEP DTU Partnership and is updated monthly. Updates include knowledge about how PoAs contribute to SD. A PoA is the framework that defines broad parameters for project activities (CPAs) that qualify for inclusion in the PoA. All CPAs follow the same stated goal, and new CPAs can be added to a PoA at any point in time, as shown in Figure 1.

Figure 1 CDM projects components.



The present study uses the UNEP DTU Partnership pipeline as of January 2017, which includes 382 PoAs and 2097 CPAs. It does not include PoAs or CPAs that have been rejected, terminated or resubmitted, and PoAs with fewer than two CPAs have also been excluded from the analysis. Therefore, we are left with 2095 CPAs in the dataset. Figures 4 and 5 show the composition of the sample.

To create the SD dataset, the Project Design Documents (PDDs)[1] of registered PoAs were screened against the taxonomy of SD benefits first developed by Olsen and Fenhann (2008), which serves as the basis of the CDM SD Tool.

The CDM SD tool

The CDM SD tool uses the three dimensions of sustainable development: environmental, social and economic. Based on these, the tool uses a taxonomy consisting of generic SD criteria and indicators. The taxonomy was developed bottom-up from a review of aspects on sustainability, as reported by project developers in the PDDs (Olsen and Fenhann 2008). The taxonomy functions as a menu of generic dimensions, criteria and indicators that project participants may choose from. Criteria and indicators that are not applicable to a project can be avoided, and aspects of SD that are not comprised in the taxonomy can be added using an 'other' indicator. This allows the adoption of a transparent, complete and objective approach

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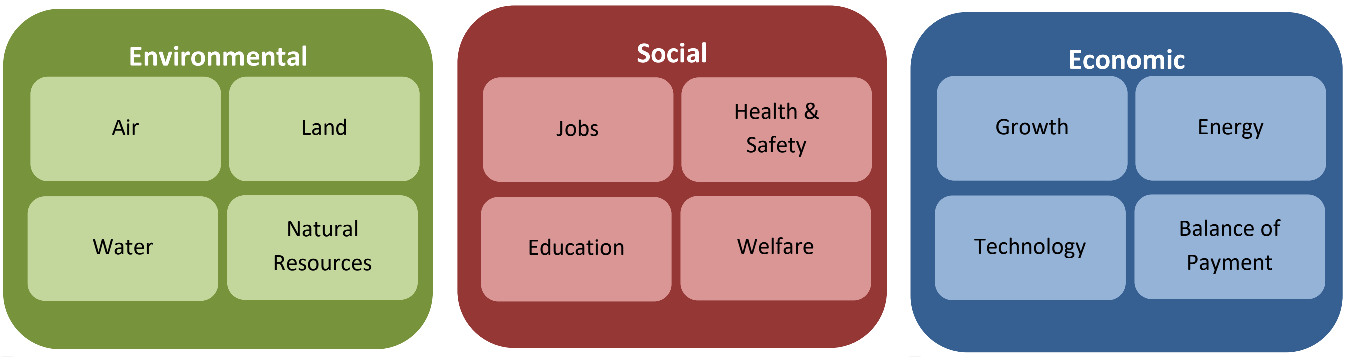
[1] A project developer must indicate in the Project Design Document what the expected input and/or output will be relative to the SD criteria and the method that will be used to measure the project's performance.

to SD assessment. Earlier versions of the CDM SD Tool also included safeguards to avoid the negative impacts and enhanced procedures for stakeholder involvement. However, the Executive Board removed these in their final decision on the CDM SD Tool.

In line with the CDM SD Tool's taxonomy (Figure 2), the SD benefits have been classified into the three dimensions of 'Environmental', 'Social' and 'Economic'. The three dimensions are characterised by criteria and indicators. These are 'yes/no' characteristics rather than quantitative indicators: a 'yes' refers to the existence of the co-benefit, a 'no' to its absence. Aspects of SD that are not included in the taxonomy can be added using an 'other' indicator. This permits the adoption of a transparent, complete and objective approach to SD assessment. Since each PoA includes a number of CPAs, for each PoA the result of the analysis has been transferred to the related CPAs.

Figure2: CDMSD taxonomy Source: UNFCCC (2012), Approved at CDM EB70: https://www.research.net/s/SD_tool_vers7



- **Air**
  - SOx, NOx, GHG
  - Odor, Dust, SPM, Fly ash
  - Noise
- **Land**
  - Compost
  - Manure nutrient and other fertilizers
  - Soil erosion, salinization, acidification
  - Minimum tillage
  - End of life pollution
  - Change access/lost access to land
  - Other
- **Water**
  - Waste water
  - Leaks & diesel dumping
  - Drinking water quality
  - Water extraction rate
  - Conservation
  - Supply, water access
  - Ecological state
  - Purification
  - Other
- **Natural Resources**
  - Minerals
  - Species diversity
  - Plant life
  - Land cover change
  - Other

- **Jobs**
  - Long-term jobs
  - Short-term jobs
  - Sources of income
  - Other
- **Health and Safety**
  - Accidents
  - Crime
  - Diseases
  - Number of hospital visits
  - Sanitation
  - Food safety
  - Indoor air pollution
  - No child labour
  - Other
- **Education**
  - Green development related training
  - Educational services for different groups
  - Project related knowledge circulation
  - Other
- **Welfare**
  - Traffic congestion
  - Commuting times
  - Income/asset distribution
  - Women empowerment
  - Municipal revenue
  - Rural uplift
  - Energy security
  - Other

- **Growth**
  - Investment
  - Industrial/commercial activities
  - Economic growth/higher income
  - Quality of life
  - Increased tax base
  - Infrastructure
  - Production cost
  - Productivity
  - Other
- **Energy**
  - Coverage/availability of supply
  - Access
  - Reliability, affordability
  - Other
- **Technology**
  - Imported technology
  - Local technology
  - Adaptation and viability in local area
  - Other
- **Balance of payments**
  - Dependence on foreign sources of energy
  - Amount of energy produced from clean renewable sources
  - Decrease in risk of political conflicts
  - Economic savings for the government
  - Reduction in energy subsidies
  - Other

2.2 Methods of ranking

Recently a variety of environmental and sustainability ranking and rating tools have been put forward to help project developers and project funders make decisions that take the three dimensions of sustainability into account (Poveda and Young 2015).

2.2.1 Simple ranking approach

A new ranking approach is developed in this paper based on the CDM SD Tool and insights from an analysis of PoAs. Through this approach, grades can be used to describe projects that meet certain requirements for contributing to sustainable development criteria (in terms of a score for SD impacts), thus enabling a generic labelling of SD impacts. The current CDM SD Tool only covers the positive benefits. Hence, each SD criteria is given a score of '1' if there is a positive contribution to SD, or a score of ‘0’ if there is no such contribution. Since there are four criteria per dimension in the CDM SD taxonomy, each dimension can receive a score of between 0 and 4 (Table 3).

Although the most widely known model of sustainable development is the three-pillar model described above (United Nations World Summit, 2005), the model has met criticism. The three-pillar model takes the three dimensions –the environmental, economic and social –and treats them as three requirements for sustainable development. Therefore, this approach assumes equal weights for the SD dimensions and no weights for the SD criteria. In this model, sustainable development is achieved when all three pillars work in agreement (Figure 3).

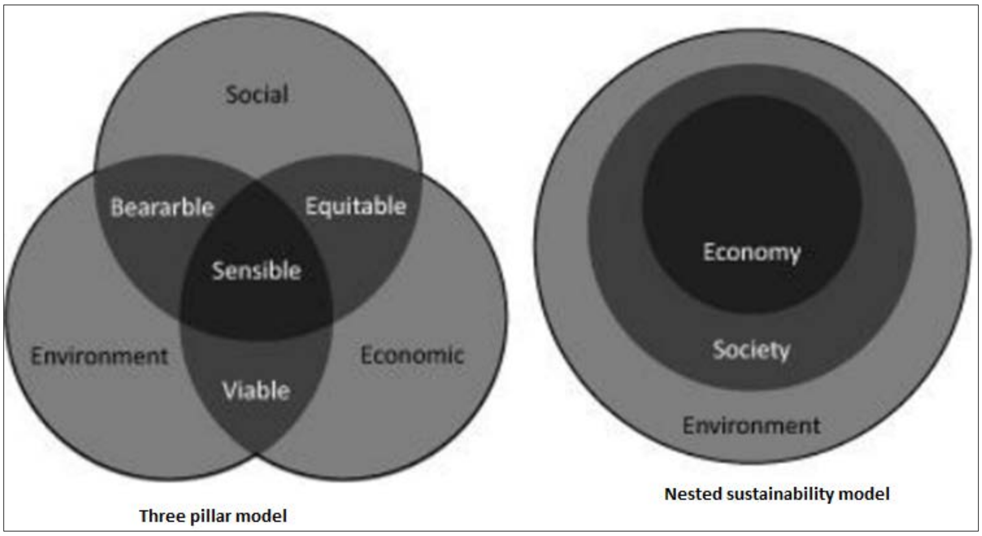


Figure 3: Intersected and nested sustainability models
Source : Adapted from Joumard and Nicolas 2010, Griggs et al. 2013 and Salling and Pryn 2015

There are two basic criticisms of this model. First, there is an assumption that the three pillars are independent. Secondly, there is the observation that the model does not incorporate a time dimension, a core component of the WCED (1987) definition of sustainable development. Therefore, the three-pillar model does not provide much assistance to planners and policy-makers when choosing between the conflicting and interacting factors that can often emerge.

There is another approach, the nested sustainability model, which assumes different weights for SD dimensions. The approach is presented in the following section.

2.2.2 Nested sustainability model

The nested sustainability model depicts the three dimensions of sustainability as three nested spheres, the economic circle being nested within the social circle and the socio-economic circles in turn being nested within the environmental circle. Taking into account the interconnected nature of the three dimensions of sustainability and that different country's priorities for sustainable development differ, this study builds the analysis on a nested sustainability model (Figure 2). The argument is that a mitigation action will be sustainable only if its economic and social implications do not exceed the carrying capacity of the environment. The nested model has been used in both practice and the academic literature (Joumard and Nicolas 2010, Griggs et al. 2013, Salling and Pryn 2015).

Inspired by the nested model, this study defines two weights (W_d, W_c), which account for the dimension (W_d) and the criteria (W_c). The weights are multiplied by the SD scores. According to the nested sustainability model, the three dimensions are ranked, i.e. the longest term dimension is ranked as the most important and so on. Rank order distribution (ROD[2]) weights *(W_d)* are assigned through the Simple Multi-Attribute Rating Technique Exploiting Ranks technique (SMARTER) (Edwards and Barron 1994; Roberts and Goodwin 2002). The ROD methodology is used to convert the ordinal ranking into a numerical weight. It should be noted that several different rank-weighting methods exist (Belton and Stewart, 2002; Alfares and Duffuaa, 2008). This means that the economic dimension is ranked the lowest

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[2] ROD defines approximate weights based on the assumption that valid weights can be calculated through direct rating.

and receives a weight of 0.15, the social dimension is ranked in the middle and receives a weight of 0.32, and the environmental dimension is ranked the highest and receives a weight of 0.52 (Salling and Pryn 2015).

The present study suggests using consultations with stakeholders to estimate and adjust the weights for each criterion. This enables users to adjust the criteria weights depending on sustainable development priorities. Table 1 gives an example. There are several ways of estimating weights. Box 1 in the attachment provides more information on estimation processes in order to allocate the weights for ‘dimension’ and ‘criteria’ using the analytic hierarchy process (AHP) approach. In this article, the weight for ‘criteria’ has been set at 1 for the sake of simplicity.

2.3 Graded approach and labelling

The proposed graded approach uses the total SD score, which simply shows the number of SD criteria in each project (using the simple ranking approach), including the weights (using the nested sustainability approach). There are different combinations for the number of criteria per dimension and, consequently, different SD scores. Table 1a gives the possible combinations of SD benefits and the corresponding total SD score. The possible maximum and minimum total SD scores are identified to be used for defining grades and labels (Table 2).

Table 1a: Total SD criteria number and SD score

SD Categories x weights	Environmental score				Social score				Economical score				Total SD Criteria	Total SD score
	Air x 0,52 (wC*)	Land x 0,52 (wC)	Water x 0,52 (wC)	Conserv x 0,52 (wC)	Job x 0,32 wC	health x 0,32 (wC)	Education0,32(wC)	Welfare x 0,32 (wC)	growth x 0,15 (wC)	energy access x 0.15 (wC)	Technology X 0,15 (wC)	balance of payment x 0,15 (wC)		
CPAType														
EE household**	1	1	1	1	1	1	1	1	1	1	1	1	12	3,96
EE service	1	1	1	1	1	1	1	1	1	1	1	1	12	3,96
Hydro	1	1	1	1	1	1	1	1	1	1	1	1	12	3,96
Methane avoidance	1	1	1	1	1	1	1	1	1	1	1	1	12	3,96
Solar	1	1	1	1	1	1	1	1	1	1	1	1	12	3,96
Biomass energy	1	1	1	1	1	1	0	1	1	1	1	1	11	3.64
Landfill gas	1	1	1	1	1	1	1	1	1	0	1	1	11	3.81
Wind	1	0	1	1	1	1	1	1	1	1	1	1	11	3.44
EEindustry	1	1	1	1	1	1	1	1	1	0	1	0	10	3.66
Energy distribution	1	0	0	1	1	1	1	1	1	1	0	0	8	2.62
Transport	1	0	0	0	1	1	1	1	1	0	1	1	8	2.25
Geothermal	1	0	0	0	1	0	1	1	1	1	0	0	6	1.66
EE supply side	1	0	1	0	1	0	0	0	0	1	1	0	5	1.78
Coal bed/mine	1	0	1	0	1	0	0	1	1	0	0	0	5	1.83
Fugitive	1	0	0	0	1	0	1	0	1	0	1	0	5	1.46
Fossil fuel swich	1	0	0	0	0	1	0	0	1	0	1	0	4	1.14

* WC has been assumed '1'

** table 1 in attachment provides description for each project type

For each dimension, Table 1 gives the total SD score of CPA types according to the number of criteria and the weights from the nested approach. However, in order not to limit the labelling approach to the current data, we expand the result to all possible combinations of criteria for mitigation actions (Table 1b).

Table 1b: Possible combinations of SD benefits and total SD score for labelling

Possible combinations of SD benefits	Environmental			Social			Economical			Total number of SD	Total SD score
	number of criteria	*Dimension weight (W_d)*	*Criteria weight (W_c)*	number of criteria	*Dimension weight (W_d)*	*Criteria weight (W_c)*	number of criteria	*Dimension weight (W_d)*	*Criteria weight (W_c)*		
Combination$_{(x1)}$	**4.00**	**0.52**	**1.00**	**4.00**	**0.32**	**1.00**	**4.00**	**0.15**	**1.00**	**12.00**	**3.96**
x2	4.00	0.52	1.00	4.00	0.32	1.00	3.00	0.15	1.00	**11.00**	**3.81**
x3	4.00	0.52	1.00	4.00	0.32	1.00	2.00	0.15	1.00	**10.00**	**3.66**
x4	4.00	0.52	1.00	3.00	0.32	1.00	4.00	0.15	1.00	**11.00**	**3.64**
x5	4.00	0.52	1.00	3.00	0.32	1.00	3.00	0.15	1.00	**10.00**	**3.49**
x6	4.00	0.52	1.00	3.00	0.32	1.00	2.00	0.15	1.00	**9.00**	**3.34**
x7	4.00	0.52	1.00	2.00	0.32	1.00	4.00	0.15	1.00	**10.00**	**3.32**
x8	4.00	0.52	1.00	1.00	0.32	1.00	4.00	0.15	1.00	**9.00**	**3.00**
x9	4.00	0.52	1.00	1.00	0.32	1.00	3.00	0.15	1.00	**8.00**	**2.85**
x10	4.00	0.52	1.00	1.00	0.32	1.00	2.00	0.15	1.00	**7.00**	**2.70**
x11	4.00	0.52	1.00	1.00	0.32	1.00	1.00	0.15	1.00	**6.00**	**2.55**
x12	4.00	0.52	1.00	4.00	0.32	1.00	1.00	0.15	1.00	**9.00**	**3.51**
x13	4.00	0.52	1.00	3.00	0.32	1.00	1.00	0.15	1.00	**8.00**	**3.19**
x14	4.00	0.52	1.00	2.00	0.32	1.00	1.00	0.15	1.00	**7.00**	**2.87**
x15	3.00	0.52	1.00	4.00	0.32	1.00	1.00	0.15	1.00	**8.00**	**2.99**
x16	3.00	0.52	1.00	3.00	0.32	1.00	1.00	0.15	1.00	**7.00**	**2.67**
x17	3.00	0.52	1.00	2.00	0.32	1.00	1.00	0.15	1.00	**6.00**	**2.35**
x18	3.00	0.52	1.00	1.00	0.32	1.00	1.00	0.15	1.00	**5.00**	**2.03**
x19	3.00	0.52	1.00	1.00	0.32	1.00	4.00	0.15	1.00	**8.00**	**2.48**
x20	3.00	0.52	1.00	1.00	0.32	1.00	3.00	0.15	1.00	**7.00**	**2.33**
x21	3.00	0.52	1.00	1.00	0.32	1.00	2.00	0.15	1.00	**6.00**	**2.18**
x22	3.00	0.52	1.00	4.00	0.32	1.00	3.00	0.15	1.00	**10.00**	**3.29**
x23	4.00	0.52	1.00	2.00	0.32	1.00	3.00	0.15	1.00	**9.00**	**3.17**
x24	3.00	0.52	1.00	4.00	0.32	1.00	2.00	0.15	1.00	**9.00**	**3.14**
x25	4.00	0.52	1.00	2.00	0.32	1.00	2.00	0.15	1.00	**8.00**	**3.02**
x26	3.00	0.52	1.00	3.00	0.32	1.00	3.00	0.15	1.00	**9.00**	**2.97**
x27	2.00	0.52	1.00	4.00	0.32	1.00	4.00	0.15	1.00	**10.00**	**2.92**
x28	3.00	0.52	1.00	3.00	0.32	1.00	2.00	0.15	1.00	**8.00**	**2.82**
x29	3.00	0.52	1.00	2.00	0.32	1.00	4.00	0.15	1.00	**9.00**	**2.80**
x30	2.00	0.52	1.00	4.00	0.32	1.00	3.00	0.15	1.00	**9.00**	**2.77**
x31	2.00	0.52	1.00	3.00	0.32	1.00	4.00	0.15	1.00	**9.00**	**2.60**
x32	3.00	0.52	1.00	2.00	0.32	1.00	2.00	0.15	1.00	**7.00**	**2.50**
x33	3.00	0.52	1.00	2.00	0.32	1.00	2.00	0.15	1.00	**7.00**	**2.50**
x34	2.00	0.52	1.00	3.00	0.32	1.00	3.00	0.15	1.00	**8.00**	**2.45**
x35	2.00	0.52	1.00	3.00	0.32	1.00	2.00	0.15	1.00	**7.00**	**2.30**
x36	2.00	0.52	1.00	2.00	0.32	1.00	4.00	0.15	1.00	**8.00**	**2.28**
x37	2.00	0.52	1.00	2.00	0.32	1.00	3.00	0.15	1.00	**7.00**	**2.13**
x38	2.00	0.52	1.00	2.00	0.32	1.00	2.00	0.15	1.00	**6.00**	**1.98**
x39	2.00	0.52	1.00	1.00	0.32	1.00	2.00	0.15	1.00	**5.00**	**1.66**
x40	2.00	0.52	1.00	4.00	0.32	1.00	1.00	0.15	1.00	**7.00**	**2.47**
x41	2.00	0.52	1.00	3.00	0.32	1.00	1.00	0.15	1.00	**6.00**	**2.15**
x42	2.00	0.52	1.00	2.00	0.32	1.00	1.00	0.15	1.00	**5.00**	**1.83**

x43	2.00	0.52	1.00	1.00	0.32	1.00	4.00	0.15	1.00	**7.00**	**1.96**
x44	2.00	0.52	1.00	1.00	0.32	1.00	3.00	0.15	1.00	**6.00**	**1.81**
x45	2.00	0.52	1.00	1.00	0.32	1.00	2.00	0.15	1.00	**5.00**	**1.66**
x46	2.00	0.52	1.00	1.00	0.32	1.00	1.00	0.15	1.00	**4.00**	**1.51**
x47	1.00	0.52	1.00	2.00	0.32	1.00	1.00	0.15	1.00	**4.00**	**1.31**
x48	1.00	0.52	1.00	1.00	0.32	1.00	2.00	0.15	1.00	**4.00**	**1.14**
x49	1.00	0.52	1.00	1.00	0.32	1.00	1.00	0.15	1.00	**3.00**	**0.99**
X50	0.00	0.52	1.00	1.00	0.32	1.00	1.00	0.15	1.00	**2.00**	**0.47**

For example, for the combination$_{(x1)}$, and according to the data in Table 1: Total SD score => $\sum N * (w_d) * (w_c)$ where N refers to the number of criteria, w_d refers to the 'dimension' weight,

1. 'Environmental' SD score for the project = 4x0.52x1 => 2.08
2. 'Social' SD score for the project = 4x0.32x1 => 1.28

3.'Economic' SD score for the project = 4x0.15x1 => 0.60

=> Total SD score= SD score for 'Environmental'+ SD score for 'Social'+ SD score for 'Economic'

=> 2.08+1.28+0.60= 3.96

and w_c refers to the 'criteria' weight.

An SD score < 0.98 is the minimum score. This refers to CPAs whose SD criteria per dimension are between one and zero (at least one dimension has zero SD criteria number). Table 2 shows the grades using total SD scores and taking sustainability weights into account.

Table 2: Grading the mitigation activities according to SD scores

Total SD score classification	Grades of contribution to SD	
= 3.96 (12 criteria)	best	(4) ☺☺☺☺
3.95 -3.00 (9-11 criteria)	high	(3)☺☺☺
2.99-1.97 (6-9 criteria)	medium	(2) ☺☺
1.96-0.99 (3-6 criteria)	low=minimum acceptable	(1) ☺
<0.98 (0-3 criteria)	Very low= not acceptable	(0)☹

**intervals and grades have been suggested by authors based on analysis of PDDs.*

3. Results

3.1 Results of the PDD analysis

Table 3 lists all project type and sub-type categorisations that have been used in evaluating SD benefits. To supplement this table, a complete list of subtypes can be found in Annex 1, Table1.

Table 3: Project type categorisations selected for evaluation

Type	Sub-types used in CDM projects
Biomass Energy	Bagasse power, Palm oil solid waste, Agricultural residues: other kinds Agricultural residues
Coal Mine/ bed CH4	Coal Mine Methane, Coal Bed Methane, CMM & Ventilation Air Methane
Energy distribution	District heating, Replacement of district heating boilers, Connection of Isolated grid
EE Households:	Lighting, Stoves, Lighting & Insulation & Solar Appliances
EE industry	Chemicals Petrochemicals Paper Cement, Iron & steel Machinery Textiles
EE service	HVAC & lighting, Air conditioning, EE new buildings, Street lighting in service, Water pumping, Water purification, EE public buildings, EE commercial
EE supply side total	Single cycle to combined cycle, Cogeneration, Co-firing with biomass Higher efficiency coal power
Fossil fuel switch	Coal to natural gas, Coal to oil, Lignite to natural gas, New natural gas plant
Fugitive total	Oil field flaring reduction, Oil and gas processing flaring, Natural gas pipelines, Non-hydrocarbon mining

Geothermal	Geothermal electricity, Geothermal heating
Hydro	Run of river, Existing dam, Higher efficiency hydro power, New dam
Landfill gas	Landfill flaring, Landfill power, Landfill aeration, Integrated solid waste management, Switch from fossil fuel to piped landfill gas, Landfill composting
Methane avoidance	Manure, Domestic manure, Waste water, Industrial solid waste Palm oil waste, Aerobic treatment of waste water, Composting
Solar	Solar PV, Solar lamps, Solar PV water disinfection, Solar thermal power
Transport	Bus Rapid Transit, Motorbikes, Mode shift: Road to rail, More efficient train system, More efficient vehicles, Rail: regenerative braking, Metro: efficient operation, Scrapping old vehicles, Biodiesel for transport, Cable cars
Wind	Wind, offshore wind

Source: Fenhann (2017)

Table 4 below provides an overview of the frequency with which SD criteria are mentioned in PDDs.

Table 4: Frequency of each SD criteria mentioned in PDDs by project type

SD dimension/ categories	**CPA numbe**	**Environ**				**Social**				**Econ**			
CPA type		air	land	water	conservation	job	health	education	welfare	growth	energy access	Technology	balance of
Geothermal	2	1	0	0	0	1	0	1	2	1	1	0	0
EE supply side	3	2	0	1	0	2	0	0	0	0	1	1	0

Fossil fuel switch	3	3	0	0	0	0	3	0	0	3	0	2	0
Fugitive	3	1	0	0	0	3	0	2	0	3	0	1	0
Coal bed/mine methane	4	2	0	1	0	2	0	0	1	1	0	0	0
Transport	9	8	0	0	0	4	6	1	4	8	0	5	1
EEindustry	11	9	2	1	2	7	7	3	6	8	0	2	0
Energy distribution	11	1	0	0	8	11	1	3	6	7	11	0	0
Landfill gas	31	26	2	6	0	27	22	7	16	22	0	7	3
Wind	48	4	0	2	22	33	1	2	6	36	11	14	3
Biomass energy	50	8	5	1	36	45	1	0	42	43	8	5	2
EE service	60	17	16	15	26	28	18	4	34	54	3	11	6
Hydro	95	16	14	12	22	77	21	1	24	74	52	28	26
Solar	154	46	12	19	26	121	17	53	52	90	69	50	20
Methane avoidance	1212	152	12	25	106	49	136	16	129	133	4	34	4
EE household	395	211	4	7	332	178	224	123	243	275	27	71	2
Total	2095	508	69	92	582	590	459	217	568	761	188	231	67

The analysis of PDDs (Figure 4) reveals that 41% of CPAs make a contribution to the social dimension, 36% of CPAs to the economic dimension, and only 23% to the environment dimension.

Figure 4: Share of all CPA types to SD benefits dimensions

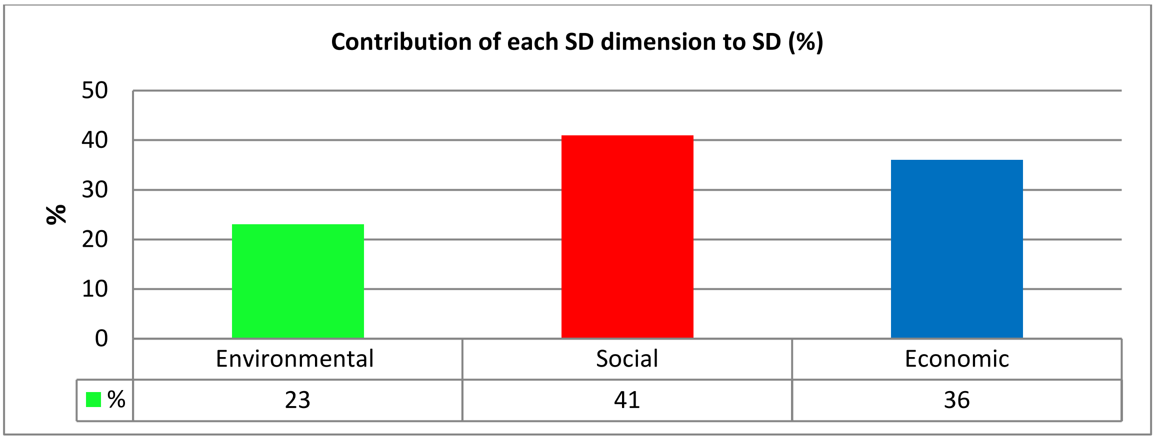

Figure 5: Share of the various sustainable development criteria for CPA types

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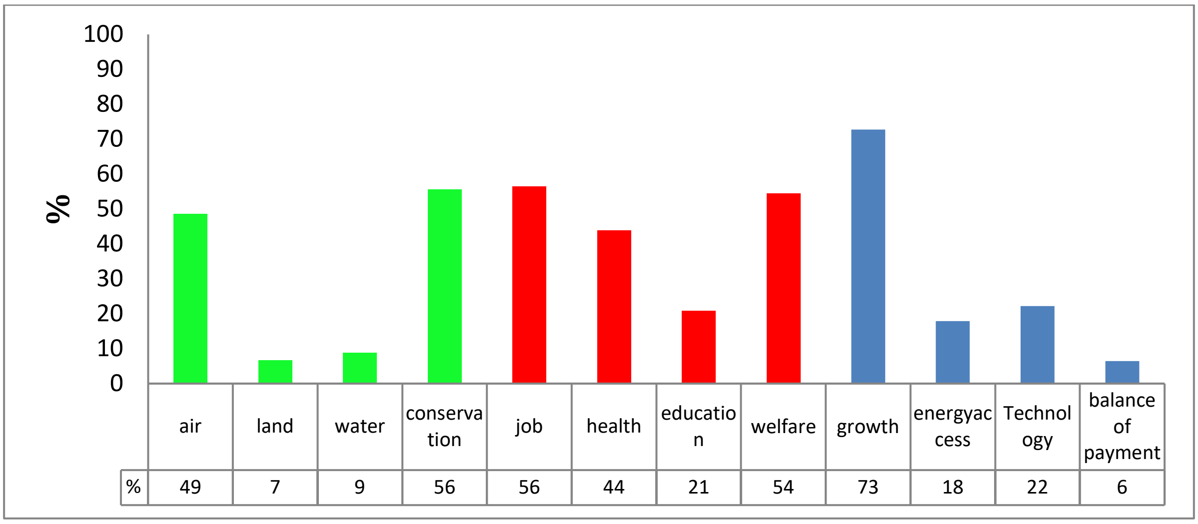
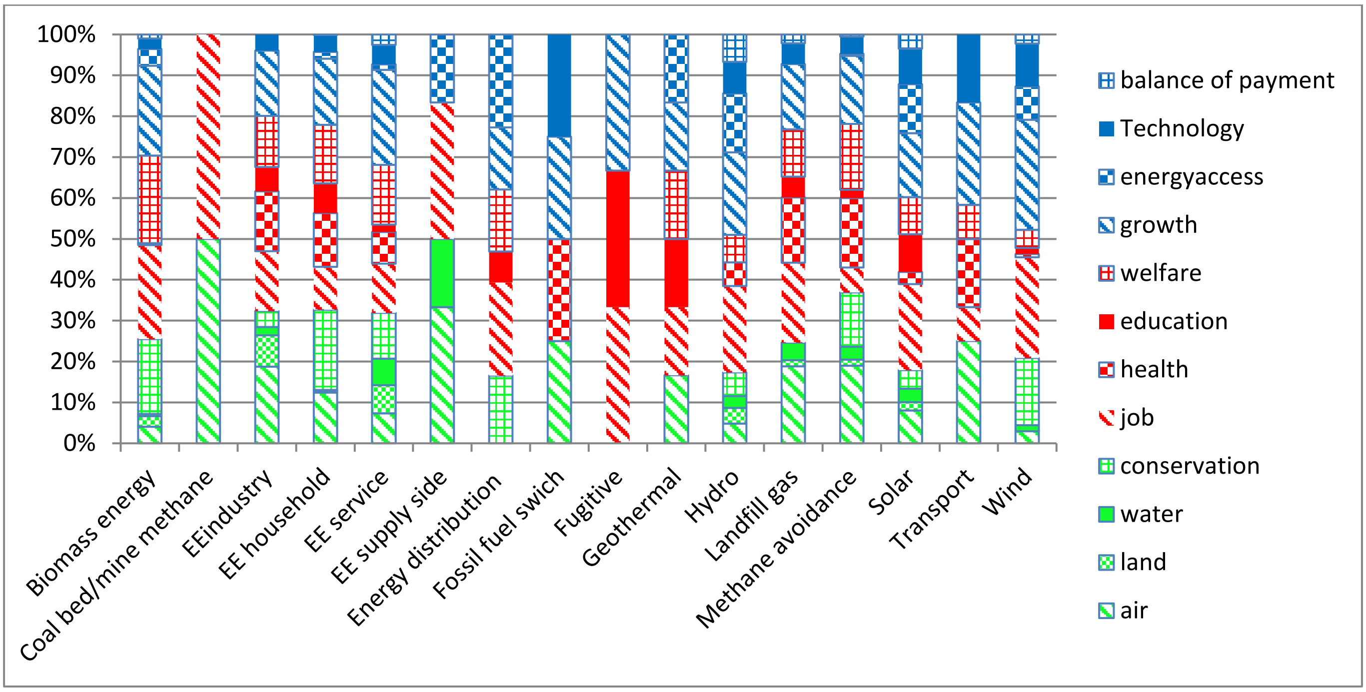


Figure 4 gives the proportions of CPAs with regard to various sustainable development criteria. It shows that *Conservation*, which refers to the protection and management of natural resources, and *Air*, which refers to improving air quality, are two prominent environmental benefits, with 56% and 49% respectively. *Job creation* and *Welfare* are prominent social benefits that have been reported for 56% and 54% of CPAs. *Economic growth* has been reported for 73% of CPAs and has the highest ratio among all the sustainable development criteria.

Figure 5 gives the result of the PDD analysis of the distribution of each SD criteria over each CPA type. The contribution to the benefits to SD varies from project to project. The CPA types *Coal mine/ bed methane, EE supply* and *Methane avoidance* have reported environmental benefits in their PDDs most often (sum of environmental benefits >35%). Improving air quality is the criterion that is cited the most. *Geothermal* and *Landfill gas* have reported social benefits in their PDDs more than any other project types (sum of social benefits >50%). The indicators cited most often are *Job* (by *Landfill gas*, 20%) and *Welfare* (by *Geothermal*, 29%). CPA types such as *Hydro, Wind* and *Fossil fuel switching* have reported economic benefits in their PDDs more often than other projects (sum of social benefits >45%), with *Growth* being the main economic criterion.

Figure 6: Distribution of each SD category over CPA types



3.2 Simple ranking approach when the weight is set to one

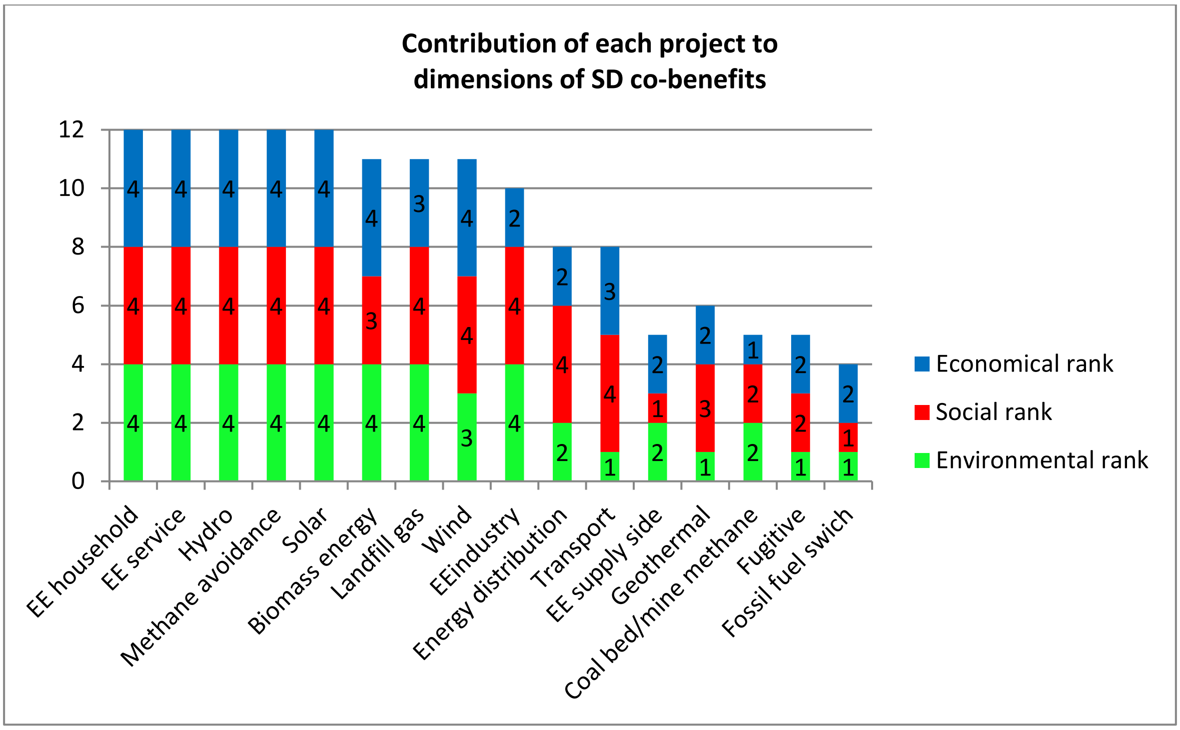
Table 5 ranks project types based on the total SD score for each project type. Each SD criterion receives a code of '1' for positive and a code of ‘0’ for no contribution to SD co-benefits. Since there are four criteria per dimension, the overall score range is between 0 and 12.

Table 5: Total SD score for each project type

SD dimension/ categories	Environmental score				Social score				Economical score				Total SD
	air	land	water	conservation	job	health	education	welfare	growth	energy access	Technology	balance of payment	
CPA Type													
EE household	1	1	1	1	1	1	1	1	1	1	1	1	12
EE service	1	1	1	1	1	1	1	1	1	1	1	1	12
Hydro	1	1	1	1	1	1	1	1	1	1	1	1	12
Methane avoidance	1	1	1	1	1	1	1	1	1	1	1	1	12
Solar	1	1	1	1	1	1	1	1	1	1	1	1	12
Biomass energy	1	1	1	1	1	1	0	1	1	1	1	1	11
Landfill gas	1	1	1	1	1	1	1	1	1	0	1	1	11
Wind	1	0	1	1	1	1	1	1	1	1	1	1	11
EEindustry	1	1	1	1	1	1	1	1	1	0	1	0	10
Energy distribution	1	0	0	1	1	1	1	1	1	1	0	0	8
Transport	1	0	0	0	1	1	1	1	1	0	1	1	8
Geothermal	1	0	0	0	1	0	1	1	1	1	0	0	6
EE supply side	1	0	1	0	1	0	0	0	0	1	1	0	5
Coal bed/mine methane	1	0	1	0	1	0	0	1	1	0	0	0	5
Fugitive (oil,gas Chemicals)	1	0	0	0	1	0	1	0	1	0	1	0	5
Fossil fuel switch	1	0	0	0	0	1	0	0	1	0	1	0	4

Figure 7: Simple ranking of project types based on presence of SD benefits

Figure 7: Simple ranking of project types based on presence of SD benefits



The results in Table 5 and Figure 7 show that *EE household, EE service, Hydro, Methane avoidance* and *Solar* are the CPA types that have mentioned all the SD criteria in their PDD documents. CPA types such as *Fossil fuel switching* have the lowest number of mentions of SD criteria in their PDDs.

3.3 Nested sustainability model

Table 6 gives the SD ranks for each project type when the weights for each dimension *(Wd)* are taken from the nested sustainability model. For the sake of simplicity, and because project developers do not provide data related to weight for each criteria *(Wc)*, that weight is assumed to be 1.

Table 6: Estimates of average SD scores per dimension

CPA Type	total project number	number of criteria	$(W_d)*(Wc)$	number of criteria	*(Wd)* (Wc)*	number of criteria	*(Wd)* (Wc)*	*Total SD score for Environment*	*Total SD score for Social*	*Total SD score for Economic*	Total SD score
EE household	**39 5**	4	0.5 2	4	0.3 2	4	0.1 5	2.0 8	1.2 8	0.6	3.9 6
EE service	**60**	4	0.5	4	0.3	4	0.1	2.0	1.2	0.6	3.9
Hydro	**95**	4	0.5	4	0.3	4	0.1	2.0	1.2	0.6	3.9
Methane avoidance	**16**	4	0.5	4	0.3	4	0.1	2.0	1.2	0.6	3.9
Solar	**15**	4	0.5	4	0.3	4	0.1	2.0	1.2	0.6	3.9
Biomass energy	**50**	4	0.5	3	0.3	4	0.1	2.0	0.9	0.6	3.6
Landfill gas	**31**	4	0.5	4	0.3	3	0.1	2.0	1.2	0.4	3.8
Wind	**48**	3	0.5	4	0.3	4	0.1	1.5	1.2	0.6	3.4
EEindustry	**11**	4	0.5	4	0.3	2	0.1	2.0	1.2	0.3	3.6
Energy distribution	**11**	2	0.5	4	0.3	2	0.1	1.0	1.2	0.3	2.6
Transport	**9**	1	0.5	4	0.3	3	0.1	0.5	1.2	0.4	2.2
EE supply side	**3**	2	0.5	1	0.3	2	0.1	1.0	0.3	0.3	1.6
Geothermal	**2**	1	0.5	3	0.3	2	0.1	0.5	0.9	0.3	1.7
Coal bed/mine	**4**	2	0.5	2	0.3	1	0.1	1.0	0.6	0.1	1.8
Fugitive	**3**	1	0.5	2	0.3	2	0.1	0.5	0.6	0.3	1.4
Fossil fuel swich	**3**	1	0.5	1	0.3	2	0.1	0.5	0.3	0.3	1.1

3.4 Labelling approach

The present study grades each CPA type using a labelling approach. Table 7 gives the results of the study. As can be seen, there are four grades. *EE household, EE service, Hydro* and *Solar* are the CPA types that have the best grade, which means that they have four criteria for each dimension. CPAs such as *Landfill, Biomass energy, EE industry* and *Wind* have the high grade and *EE distribution* and *Transport* the medium grade respectively, which means they have between two and four criteria per dimension, categorized according to the intervals introduced in Table 2. Some CPA types have received grade '1' and have accordingly been categorized as low grade or minimum acceptable for labelling. These CPA types are *Fossil fuel, Fugitive, Coal bed/mine methane* and *Geothermal*. According to Table 7, they have one to two criteria for each dimension (at least one dimension number of SD is equal to 'one'). One category of CPA type receives grade '0', and refers to the situation in which the mitigation action (CPA type here) has 0 to 1 criteria per dimension (at least one dimension has zero SD criteria). Therefore, in order to achieve a better sustainability label, these CPAs need to have more contributions to SD benefits.

Table 7: Total SD score and graded score for each CPA type

SD dimension/ categories	Environmental score				Social score				Economical score				Total SD score with weight	Ranks or scores	Labell
	air × *0.52 *wc=1*	land × *0.52 *wc*	water × *0.52 *wc*	conservation × *0.52 *wc*	job × *0.32* wc*	health × *0.32* wc*	education × *0.32* wc*	welfare × *0.32* wc*	growth × *0.15* wc*	energy access × *0.15* wc*	Technology × *0.15* wc*	balance of payment × *0.15*wc*			
wn*													*∑Sn**		
EE househ	1	1	1	1	1	1	1	1	1	1	1	1	3.96	best	(4) ☺☺☺
EE service	1	1	1	1	1	1	1	1	1	1	1	1	3.96		
Hydro	1	1	1	1	1	1	1	1	1	1	1	1	3.96		
Methane	1	1	1	1	1	1	1	1	1	1	1	1	3.96		
Solar	1	1	1	1	1	1	1	1	1	1	1	1	3.96		
Landfill	1	1	1	1	1	1	0	1	1	1	1	1	3.8	high	(3) ☺☺☹
Biomass	1	1	1	1	1	1	1	1	1	1	1	1	3.64		
EEindustry	1	1	1	1	1	1	1	1	1	0	1	0	3.66		
Wind	1	0	1	1	1	1	1	1	1	1	1	1	3.44		
Energy distrib	1	1	1	0	1	1	1	1	1	0	1	1	2.62	Medium	(2) ☺☺
Transport	1	0	0	1	1	1	1	1	1	1	0	0	2.25		
EE supply	1	0	0	0	1	1	1	1	1	0	1	1	1.66	Low, minimum accept	(1) ☺
Geothermal	1	0	1	0	1	0	0	1	1	0	0	0	1.78		
Coal bed/mi	0	1	1	1	0	0	0	1	1	0	0	0	1.83		
Fugitive	1	0	1	0	1	0	0	0	0	1	1	0	1.46		
Fossil fuel	1	0	0	0	0	1	0	0	1	0	1	0	1.14		

Table 8 compares the number of CERs/y generated by each project type and the SD scores estimated by the present study. As can be seen, projects with a large number of CERs do not necessarily have high SD grades. For instance, projects like *Biomass energy, Wind, Solar* and *Methane avoidance* have fewer CERs, even though they have a large SD score. On the other hand, projects like *Coal bed/ mine methane* and *Geothermal* have lower SD rankings, even though they generate large number of CERs. Stated differently, the number of CERs does not reflect the extent of the benefits to SD.

Table 8: Number of projects and expected or issued CERs by type and category

Type	Number	%	CERs/yr (000)	%	Environmental rank	Social rank	Eco rank	Total rank
Hydro	95	9	151752	72.2	4	4	4	12
Energy distrib.	11	1	14355	6.8	2	4	2	8
Landfill gas	31	3	8604	4.1	4	3	4	11
Coal bed/mine methane	4	0	7232	3.4	2	2	1	5
EE Households	395	38	5879	2.8	4	4	4	12
Transport	9	1	4171	2.0	1	4	3	8
Geothermal	2	0	3898	1.9	1	3	2	6
EE Service	60	6	2947	1.4	4	4	4	12
Fugitive	3	0	2600	1.2	1	2	2	5
EE Industry	11	1	1746	0.8	3	4	4	11
EE Supply side (power plants)	3	0	1333	0.6	2	1	2	5
Fossil fuel switch	3	0	1056	0.5	1	1	2	4
Biomass energy	50	5	612	0.3	4	4	3	11
Wind	48	5	183	0.1	4	4	2	10
Solar	154	15	130	0.1	4	4	4	12
Methane avoidance	161	15	127	0.1	4	4	4	12
Total	1040	100	210276	100.0				

Source: Fenhann (2017)

4. Discussion

The results of applying a sustainability labelling approach to analysis of the CDM PoA Pipeline of mitigation activities demonstrates that the benefits to sustainable development can be reported in a structured, simple way based on ex-ante qualitative data available in project design documents (PDDs). Against the background of lessons learned from the CDM, the barriers to assessing sustainable development and ways of transitioning from the Kyoto Protocol regime to the Paris Agreement regime in alignment with the 2030 Agenda, this section discusses the strengths and weaknesses of sustainability labelling as a reporting tool for transparency in promoting sustainable development through Article 6 approaches and provides recommendations in response to its limitations.

4.1 A unitary SDG framework

By building on the CDM SD Tool as a common framework to assess the benefits of sustainable development, sustainability labelling introduces a harmonized tool for the ranking and hence labelling of SD benefits. To overcome the barrier that sustainable development is considered a broad concept without a globally accepted common definition, the CDM SD Tool taxonomy provides a flexible framework with clear-cut criteria and indicators. In an evaluation by the UNFCCC Secretariat, the tool was found to meet its objective while respecting Parties' prerogatives to decide on their own national priorities for SD (UNFCCC, 2014). However, the tool is voluntary to use and has a number of shortcomings when it comes to delivering a comprehensive, robust approach to the sustainability assessment of climate actions. Shortcomings include the lack of safeguards and ensuring compliance with human rights, the non-availability of monitoring and reporting guidance, independent validation and verification not being required, guidelines for stakeholder consultations not being linked to SD assessment, methods for quantifying SD benefits not being available and the lack of an option for certifying SD benefits (Arens et al., 2015). Sustainability labelling is not a solution to all the shortcomings, but it does provide a tool for reporting information about intended SD outcomes in a format that enables results-based finance to identify and reward mitigation actions with the highest contribution to SD benefits. In transitioning from the Kyoto Protocol's flexible mechanisms to the Paris Agreement's cooperative approaches, there is a growing awareness that Article 6 approaches can benefit from alignment with the SDG indicator framework (Dransfeld et al., 2017; Horstmann and Hein, 2017; Olsen and Soezer, 2016). A limitation of the current sustainability labelling tool is that it builds on the CDM SD taxonomy developed before the global SDGs were agreed in 2015. This creates a challenge in being able to align sustainability labelling with the new SDG indicator framework (SDSN, 2015). Already, voluntary sustainability standards such as the Gold Standard for the global goals and other initiatives such as the Initiative for Climate Action Transparency (ICAT) and the Sustainable Development Guidance (Rich and Olsen et al., 2017), have developed tools and approaches to assess the impacts of climate actions towards the SDGs.

4.2 Sustainability labelling enables a price signal

As a reporting tool, sustainability labelling provides information to the Parties and the carbon market whereby the priorities for and benefits of sustainable development can be assessed transparently. The results of applying sustainability ranking are that mitigation actions can be labelled as either 'best', 'high', 'medium', 'low' or 'not acceptable' to qualify for a

sustainability label. The rationale for a price signal is for the market to provide the solution to promoting high-quality SD benefits of mitigation actions. A price incentive to promote mitigation actions with SD benefits is well known from voluntary sustainability labels in carbon markets. In the early days of the CDM, Sutter (2003) hypothesized that CDM sustainability labels could differentiate the market for Certified Emission Reductions (CERs) into normal CERs and premium CERs. Typically, the premium market has been characterised by government buyers and non-profit or private-sector buyers, who believe there is a need for the Gold Standard or similar voluntary sustainability labels to certify that SD benefits are delivered. The market demand for labelled credits has been related directly to evidence suggesting that host countries are failing to ensure the SD benefits of CDM projects in the compliance market (Parnphumeesup and Kerr 2011). However, voluntary sustainability labels have never developed beyond a small niche in the compliance market and attract only a small share of the carbon finance available (Wood 2011). A complementary solution to alleviating the perceived weaknesses in host countries' approvals of the contribution of CDM projects to SD is to introduce voluntary SD assessment such as sustainability labelling at the global level.

4.3 A sustainability reporting tool can reduce complexity and transaction costs

Sustainability labelling provides a simple, qualitative and low-cost reporting tool to distinguish mitigation activities based on their SD profiles. Information on the sustainability ranking of mitigation actions may serve as a starting point to incentivise a 'race to the top' for mitigation actions with the highest grade. The grade is a proxy measure of the potential magnitude of the contribution and can serve to incentivise investments for different types of SD benefits. To ensure that the claimed SD benefits are actually realised, the underlying mitigation activities would have to be monitored, verified and reported (MRV'ed). However, due to the fact that quantifying and measuring SD is difficult and costly, sustainability ranking represents a simpler approach to reporting qualitatively on the expected and achieved SD benefits, provided that reliable ex-post data exist on implementation.

4.4 Limitations of the proposed sustainability labelling tool and recommendations

The current sustainability labelling tool is limited in scope in that it only addresses the need for transparency through sustainability reporting. As such it does not provide a solution to broader issues such as how to ensure environmental integrity, avoid double counting and demonstrate additionality. Due to the lack of available information on implemented CDM

projects, the analysis used data from PDDs, which only provide an ex-ante assessment. Ex-ante benefits are expected benefits, as opposed to benefits actually delivered (ex-post benefits). Therefore, using an ex-post analysis may result in different SD benefits being reported. In other words, the data taken from the PDDs are not verified. Clearly, to enhance the credibility of claims in SD assessments, there is a need also for monitoring and verification of benefits for sustainable development over the activity cycle of mitigation actions.

Another limitation of the current approach is that it uses weights only for the dimension level according to the nested sustainability approach. Due to the lack of implementation data of projects on the ground, the present study does not provide weights for the SD criteria, such as health, jobs etc. However, the tool has the capacity to provide that. Stakeholder consultation can be recommended in future use of the tool in order to estimate and adjust the weights for each criterion. This would enable users to adjust the weights depending on their national or local conditions. It can also provide the flexibility to accommodate bottom-up, nationally determined priorities for sustainable development and avoid the tool being seen as a top-down approach.

5. Conclusion

Research results from applying the CDM SD Tool to the analysis of a sample of 2095 Component Programme Activities (CPAs) from 382 Programmes of Activities (PoAs) that had entered the UNEP DTU CDM Pipeline by January 2017 demonstrates that mitigation activities can be scored and graded according to their contribution to sustainable development based on a proposed sustainability labelling tool. The sustainability labelling tool uses a nested approach to assessing sustainability in order to reflect a view that the economic sphere is nested within the social sphere, which is itself nested within the environmental sphere. The three dimensions are interlinked in the way that, in the long term, economic and social development depend on the carrying capacity of the environment. In practice, the study suggests that stakeholder consultations and/or nationally determined sustainable development priorities are used to determine the importance of SD criteria. In this study, for the sake of simplicity and due to the lack of data, all SD criteria are assumed to be equally important. Based on the total SD score from an analysis of a sample of CPAs, mitigation actions have been graded as 'best', 'high', 'medium', 'low' or ‘not acceptable’ (very low) in qualifying or not qualifying for a sustainability label. The study finds that the types of

mitigation actions with the best grades are *Energy efficiency households, Energy efficiency service, Solar* and *Hydro*, while mitigation actions with the grade 'low' but still acceptable are *Fossil fuel, Fugitive, Coal bed/mine methane* and *Geothermal*.

The sustainability labelling of mitigation actions is relevant to the Paris Agreement Article 6 cooperative approaches as a new reporting tool to promote sustainable development. Specifically, it provides a qualitative approach to assessing, labelling and ranking the expected SD benefits. Learning from experience with the Kyoto Protocol barriers to promoting sustainable development through mitigation actions is known to be strongly related to the diverse interests of the Parties and stakeholder groups. By building on the CDM SD Tool and, in the future, aligning it with the SDG global indicator framework, sustainability labelling offers a simple, qualitative approach to Article 6 reporting and transparency that enables a price signal to be given incentivising a 'race to the top' for mitigation actions with the highest contributions to sustainable development.

6. References

ADB, 2018. Decoding Article 6 of the Paris Agreement.

Alfares, H.K. and Duffuaa, S.O., 2008. Determining aggregate criteria weights from criteria rankings by a group of decision makers. *International Journal of Information Technology & Decision Making*, *7*(04), pp. 769-781.

Arens, C., Mersmann, F., Beuermann, C., Rudolph, F., Olsen, K.H., Bakhtiari, F., Hinostroza, M.L. and Fenhann, J.V., 2015. *Reforming the CDM SD Tool: recommendations for improvement*. German Emissions Trading Authority.

Belton, V. and Stewart, T., 2002. *Multiple criteria decision analysis: an integrated approach*. Springer Science & Business Media.

Dialogue, C.P., 2012. Climate change, carbon markets and the CDM: a call to action, report of the high-level panel on the CDM policy dialogue, September 2012. In *Bonn, Germany: United Nations Framework Convention on Climate Change Secretariat*.

Dransfeld, B., Wehner, S., Bagh, T., Bürgi, P., Puhl, I., Zegg, M., Micahelowa, A. (2017). *SD-Benefits in Future Market Mechanisms under the UNFCCC*. Dessau-Rosslau: G. Umweltbundesamt. Retrieved from Climate Change.

Edwards, W. and Barron, F.H., 1994. SMARTS and SMARTER: Improved simple methods for multiattribute utility measurement. *Organizational Behavior and Human Decision Processes*, *60*(3), pp. 306-325.

Fenhann, J., 2017. UNEP DTU CDM/JI Pipeline. Retrieved January 2017, from UNEP DTU Partnership http://www.cdmpipeline.org/

Greiner, S., Howard, A., 2017. Where to now with the CDM? Deciding on the fate of the CDM activities, credits, rules and institutions. *Carbon Mechanisms Review, pp.* 10-13

Griggs, D., Stafford-Smith, M., Gaffney, O., Rockström, J., Öhman, M.C., Shyamsundar, P., Steffen, W., Glaser, G., Kanie, N. and Noble, I., 2013. Policy: Sustainable development goals for people and planet. *Nature*, *495*(7441), pp.305-307.

Hermwille, L. and Kreibich, N., 2017. Identity crisis? voluntary carbon crediting and the Paris Agreement.

Horstmann, B. and Hein, J., 2017. *Aligning Climate Change Mitigation and Sustainable Development Under the UNFCCC: A Critical Assessment of the Clean Development Mechanism, the Green Climate Fund and REDD*.

Joumard, R. and Nicolas, J.P., 2010. Transport project assessment methodology within the framework of sustainable development. *Ecological Indicators*, 10(2), pp.136-142.

Marcu, A., 2016. *Carbon market provisions in the Paris Agreement (Article 6)*. Centre for European Policy Studies.

Michaelowa, A., and Hoch, S. (2016). Built on experience: how to transition from the CDM to the Sustainable Development Mechanism under the Paris Agreement. *Carbon Mechanisms Review, 2016*(1), 28-31

Olsen, K.H., Arens, C. and Mersmann, F., 2017. Learning from CDM SD tool experience for Article 6.4 of the Paris Agreement. *Climate Policy*, pp.1-13.

Olsen, K.H. and Fenhann, J., 2008. Sustainable development benefits of clean development mechanism projects: a new methodology for sustainability assessment based on text analysis of the project design documents submitted for validation. *Energy Policy*, 36(8), pp.2819-2830.

Olsen, K.H. and Soezer, A., 2016. The best of two worlds: Article 6 mechanisms shall contribute to sustainable development goals (SDGs). *Carbon Mechanisms Review*, 2, pp. 14-16.

Parnphumeesup, P. and Kerr, S.A., 2011. Stakeholder preferences towards the sustainable development of CDM projects: lessons from biomass (rice husk) CDM project in Thailand. *Energy Policy*, 39(6), pp. 3591-3601.

Poveda, C.A. and Young, R., 2015. Potential benefits of developing and implementing environmental and sustainability rating systems: making the case for the need of diversification. *International Journal of Sustainable Built Environment*, 4(1), pp. 1-11.

Rich, D., Olsen,K.H. etal., 2017. *Sustainable Development Guidance Guidance for assessing the environmental, social and economic impacts of policies and actions*. World Resources Institute, UNEP DTU Partnership.

Roberts, R. and Goodwin, P., 2002. Weight approximations in multi-attribute decision models. *Journal of Multi-Criteria Decision Analysis*, *11*(6), pp. 291-303.

Salling, K.B. and Pryn, M.R., 2015. Sustainable transport project evaluation and decision support: indicators and planning criteria for sustainable development. *International Journal of Sustainable Development & World Ecology*, *22*(4), pp. 346-357.

SDSN, 2015. Indicators and a monitoring framework for the Sustainable Development Goals: launching a data revolution for the SDGs. A report by the Leadership Council of the Sustainable Development Solutions Network. Revised working draft (Version 6).

Sutter, C. 2003. *Sustainability Check-Up for CDM projects,* Berlin, Wissenschaftlicher Verlag.

UNFCCC., 2012. *Draft Voluntary Tool for Highlighting Sustainable Development Co-benefits of CDM Project Activities and Programmes of Activities*. Bonn.

UNFCCC., 2014. Information note: evaluation of the use of the voluntary online sustainable development co-benefits tool. Version 01.0. Bonn.

UN 2015. Transforming our world: the 2030 Agenda for Sustainable Development. Resolution adopted by the General Assembly on 25 September 2015. *In:* ASSEMBLY, U. N. G. (ed.).

UNFCCC 2015. Paris Agreement. Paris: UNFCCC.

Verles, M., 2016. Sustainable development: from Kyoto to Paris and beyond. http://www.goldstandard.org/sites/default/files/documents/marion_verles_sd_kyoto_paris_beyond.pdf.

WCED (World Commission on Environment and Development), 1987. *Our Common Future*. Oxford University Press, Oxford.

Wood, R.G., 2011. *Carbon finance and pro-poor co-benefits: the Gold Standard and Climate, Community and Biodiversity Standards* (Vol. 4). IIED.