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Overstraining International Climate Finance: When Conflicts of Objectives Threaten Its Success

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Summary

Expectations concerning international climate finance have increased considerably. In particular, provisions for international transfer schemes are an important element in the Paris Agreement. Yet, climate finance is not only seen as a tool to efficiently combat global warming, but also to solve development problems in the recipient countries. Thereby, conflicts between distributive and allocative objectives arise, which threaten overall performance of such transfer schemes. Given the severity of the climate change problem, we raise concerns whether the world can afford climate transfer schemes that do not focus on prevention of (and adaptation to) climate change, but are considered as a vehicle of rent-seeking by many agents. In line with the famous Tinbergen rule we argue that other sustainability problems and issues of global fairness should not be primarily addressed by climate finance but should be mainly tackled by other means. Future designs of international transfer schemes within the framework of the Paris Agreement are to be based on experience gained from existing mechanisms. Therefore, we con-sider different existing schemes using a graphical technique first proposed by David Pearce and describe the conflicts between allocative and distributional goals that arise.

Keywords: Ancillary Benefits, CDM, Climate Finance, Co-benefits, Global Environment Facility, Incremental Cost, International Transfers, Paris Agreement, Premium Prices

JEL Classification: H41, H87, Q54, Q56

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Overstraining International Climate Finance: When Conflicts of Objectives Threaten Its Success

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Abstract

Expectations concerning international climate finance have increased considerably. In particular, provisions for international transfer schemes are an important element in the Paris Agreement. Yet, climate finance is not only seen as a tool to efficiently combat global warming, but also to solve development problems in the recipient countries. Thereby, conflicts between distributive and allocative objectives arise, which threaten overall performance of such transfer schemes. Given the severity of the climate change problem, we raise concerns whether the world can afford climate transfer schemes that do not focus on prevention of (and adaptation to) climate change, but are considered as a vehicle of rent-seeking by many agents. In line with the famous Tinbergen rule we argue that other sustainability problems and issues of global fairness should not be primarily addressed by climate finance but should be mainly tackled by other means.

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I. Introduction

Recent efforts in the industrialized world to raise climate protection, like the Green Deal of the European Union or the German $60 billion Climate Package, raised some concern about the efficiency of climate policy on the global scale. As long as there are cheaper climate-change mitigation options in developing countries, it tends to be counterproductive to spend money for reinforced abatement in industrialized countries: critics argue that a dollar spent on greenhouse gas abatement in developing countries will bring about more of the urgently needed climate protection than spending this dollar in the industrialized world. As the problem of global warming is threatening life on earth, a waste of resources should be prevented and thus international cooperative approaches aiming at using transfers to steer abatement activities to places where abatement is cheapest should get particular weight. This is an efficiency (of climate change mitigation) argument in favour of international climate transfers and thus of global 'climate finance'.

Yet, beyond the efficiency goal, there are arguments that tarnish the picture. On the one hand, there is some ethical concern that developed countries will consider climate transfers as a modern form of indulgence trading. On the other hand, there is a concern that developing countries may want to misuse such transfers as an instrument for rent-seeking, i.e. for increasing the amount of development aid flowing to them.

One aspect that complicates a fair assessment of climate transfers is the occurrence of 'other benefits' than those obtained from slowed global warming. As slowing or combatting global warming is the primary objective of climate change mitigation, the associated benefits are called primary benefits (see e.g. Buchholz et al. 2020). All 'other benefits' arising from a climate change mitigation measure (like the reducing of the burning of fossil fuels) are called ancillary benefits or co-benefits.[1] While the primary effects are globally public, the ancillary effects are regularly private from the point of view of a mitigation project's host country.[2] Therefore, the recipient of climate transfers hosting mitigation projects will enjoy these additional benefits, through which thus a redistribution from developed to developing countries

[1] Recently, Sovacool et al. (2020) catalogued 128 prospective co-benefits alone to four European low carbon transitions.

[2] An example of a policy with clear "national" ancillary effects is carbon farming in Australia as investigated by Kragt et al. (2016).

is effected. Frequently, the local benefits are subsumed under "sustainable development benefits" and some link between climate policy objectives and the sustainable development goals (SDGs) is derived. In other words, the transfer-induced export of climate protection improves the prospects to attain SDGs in developing countries. Thus, we have a SDG argument, which tilts the balance in favour of climate transfers in favour of the developing countries and thus reinforces a potential rent-seeking motive. The positive distributional effect for developing countries tends to be important as co-benefits, e.g. in the shape of air-quality benefits, are assessed to be of significant size (see e.g. West et al. 2013). In their survey of studies considering air-quality-related ancillary benefits, Nemet et al. (2010) find that a range of studies assessed them even to be of a similar order of magnitude to greenhouse gas abatement cost estimates. Bain et al. (2016) also confirm in their analysis of different types of ancillary effects that these benefits could motivate action on climate change.

Yet, as different climate policies generate divergent levels of primary and ancillary benefits, developing countries prefer those with a high degree of "ancillary" sustainable development benefits and transfer-paying developed countries those with a high climate protection impact. Hence, a conflict of interest arises. Moreover, efficiency in global climate protection could be impaired, if – for distributional reasons – those activities are preferred that bring about high co-benefit levels but at the same time lower climate protection levels.

It is in this area of tension, the international community has to make decisions about the role climate transfers have to play in international climate cooperation. In the Paris Agreement, Article 6 already addresses such international cooperative approaches like the successor of the clean development mechanism (CDM), but details of their design are very controversially discussed. The important task now is to implement provisions for climate transfers in a way that respects both the efficiency and distributional concerns outlined above. In order to evaluate schemes in this regard, further (sub-)criteria like transaction costs and public acceptance have to be taken into account, as they in turn affect allocative and distributive outcomes.

In §37 of Decision 1/CP.21 adopted by the Conference of the Parties in Paris 2015 it is set out that future designs of cooperative mechanisms and climate transfer schemes should be based on experience gained from existing mechanisms. In this paper, we will follow this line and assess different transfer mechanisms focussing on the question how they have dealt with co-benefits and their advantages for developing countries in the past: 1) the Trust Fund of the

Global Environment Facility (GEF) and 2) the CDM (including a premium market). The analysis describes weaknesses and strengths of these systems and explores how the individual schemes have handled trade-offs between different policy objectives and conflicts of interest between donors and recipients. In particular, we explore how these mechanisms deal with jointly generated ancillary effects of mitigation projects.

In our analysis of international transfer schemes, we employ a graphical method that has been proposed by Pearce (2007) in order to investigate GEF transfers and basically rests on the Coasean model.

In our study we use the terms ancillary benefits and co-benefits interchangeably, despite the concern to call the 'other benefits' *ancillary* and the climate-change mitigation benefits *primary*. Some researchers argue that there should not be a ranking of benefits as they are equally important. This lead to the predominant use of the term co-benefits in the more recent scientific literature. Yet, a climate policy instrument should serve climate change mitigation while 'other benefits' or local sustainable development are a plus and their generation is not the key intention of this policy instrument. Nevertheless, they have to be taken into account in order to evaluate a project's overall advantageousness, e.g. by offsetting the project's marginal cost and marginal local co-benefits (see e.g. Ekins 1996). In line with the famous Tinbergen Rule, which says that for an effective policy at least *n* independent policy instruments are required to successfully reach *n* independent policy targets, the question therefore arises whether primary and ancillary benefits can and should be meaningfully addressed by the same instrument. To deal with this question will be a central objective of this paper.

The paper is organised as follows: In Section 2, we consider how the GEF Trust Fund has handled different benefit components in its system of disbursing funds towards the developing world and we assess how the different features of the GEF have influenced (e.g. via transaction costs) efficiency and distribution. Then, in Section 3, we turn to the CDM scheme where we in particular explore the effects that a 'premium system', which requires a minimum level of local sustainability co-benefits. These effects are then contrasted with those identified for the GEF schemes before. In Section 4, we compare the discussed schemes w.r.t. the various evaluation criteria that are of importance for allocation and distribution. Emphasizing the strengths and weaknesses of the schemes may improve the design of new schemes and support decision-making under Article 6 of the Paris Agreement. Section 5 concludes.

II. The Global Environment Facility and Co-Benefits

The Global Environment Facility (GEF) was established as an international financial mechanism to tackle global environmental problems in 1992. Initially it concentrated on the four focal areas climate change, biodiversity, ozone depletion and international waters. The World Bank, the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP) were chosen as the implementing agencies during the Facility's early years. As Kaul and Conceição (2006: 39) point out, *"[t]he Global Environment Facility is a precursor of today's emerging carbon markets*" because it "*facilitates trade between countries in the inputs to*" global public good provision.

In the context of climate change, Article 4 of the UN Framework Convention on Climate Change (UNFCCC) was of particular importance for the GEF. In this Article it is stated that the developed country Parties and other Parties included in Annex II shall provide financial resources, "*needed by the developing countries to meet the agreed full incremental costs*" of – amongst other things – climate change mitigation undertaken by developing countries. In line with the provisions of Article 4, the GEF's available funds are provided by developed countries and the Facility channels these funds towards developing countries in order to support projects and measures reducing greenhouse gas emissions. In this regard, financing "incremental cost" means covering the extra expense incurred by incremental activities of developing countries benefiting the global environment. Incremental activities are those actions of developing countries that would not have occurred without the support of the GEF. Put it differently, in order to identify incremental activity one distinguishes between two policy scenarios, i.e. between the "business-as-usual" (see GEF 2007) climate policy scenario without assistance by the GEF in a developing country and the scenario where the Facility's support modified the climate protection efforts in this country. Thus, the activities above and beyond the "business-as-usual" (or baseline) are "incremental".

Meanwhile, the GEF is not only entrusted with the operation of the Financial Mechanism of the Convention, but it also administers the "Least Developed Countries Fund", the "Special Climate Change Fund" and provides secretariat services to the "Adaptation Fund" (see IISD 2019). Furthermore, it also serves as part of the financial mechanism of the Paris Agreement as was agreed at the COP 21 in Paris in 2015. The Paris Agreement requested the GEF to support the establishment of the Capacity-building Initiative for Transparency, for example, which

seeks to strengthen the institutional and technical capacities of non-Annex I countries to meet the transparency requirements defined in Article 13 of the Paris Agreement.

Although the implementation of the GEF Trust Fund (i.e. the Fund that was established on the eve of the 1992 Rio Earth Summit) was initially driven with global-benefit-orientation, the GEF accepted already in its pilot phase (June 1991 to mid-1994) "*that the local/global benefits distinction would be blurred in many cases*" (Pearce 1995: 143). A key principle of the GEF is to aim at cost-effectiveness. Thus, the money of the GEF Trust Fund is to be disbursed in a way that for given funds secures a maximum of global benefits.

In the early years of the GEF Trust Fund there was an intense discussion not only about the correct determination of the "business-as-usual" (or baseline), but also about the level of transfers when supported projects are jointly producing global and local benefits. For such cases, which tend to be the rule and not the exception, two polar financing concepts were discussed, i.e. the financing of net incremental cost (NIC) and of gross incremental cost (GIC). The NIC and GIC stand for the lower and upper bounds of the agreed full incremental cost that are to be reimbursed (see, e.g. Heintz and Tol 1996: 2-3 and Pearce 1995: 168-170).

While the GIC concept does not offset the costs of incremental activities with the domestic co-benefits or ancillary benefits of these GEF-supported activities in developing countries, the NIC concept nets out domestic benefits in the shape of ancillary benefits as well of direct economic benefits, e.g. derived by the host country from saved energy expenses. Thus, the international NIC-based compensations are lower than those associated with the GIC concept and the principle of cost-effectiveness pursued by the GEF suggests the application of the NIC concept.[3] In line with this, King (2006) argues that consideration of domestic as well as global benefits "*is important because international compensation for incremental cost should be provided net of the domestic benefits*."

In Figure 1 below, the transfers of both the NIC and the GIC concepts are illustrated for a stylized situation where the transfers should bring the considered developing countries' GHG abatement to a globally efficient level, where marginal abatement costs equal global marginal abatement benefits. In this figure a_i* stands for the "business-as-usual" abatement level of

[3] Cervigni (1998: 228) points out: "*The standard argument in favour of net incremental cost is its cost-effectiveness: more conservation can be achieved for any dollar spent when international resources are used to pay only the net cost of incremental conservation measures*."

country i, which is assumed to represent the abatement level that a "rational" country would choose voluntarily, i.e. where the marginal mitigation benefits MB_i enjoyed by country i are equal to the marginal net abatement cost MAC-MCB for this country. The net marginal abatement costs are assumed to comprise the gross marginal abatement costs MAC minus the domestic marginal co-benefits MCB that are regularly "private" from the developing country's point of view. The abatement level a* is the globally optimal abatement level in country i, towards which the GEF transfer scheme intends to raise the abatement in country i.

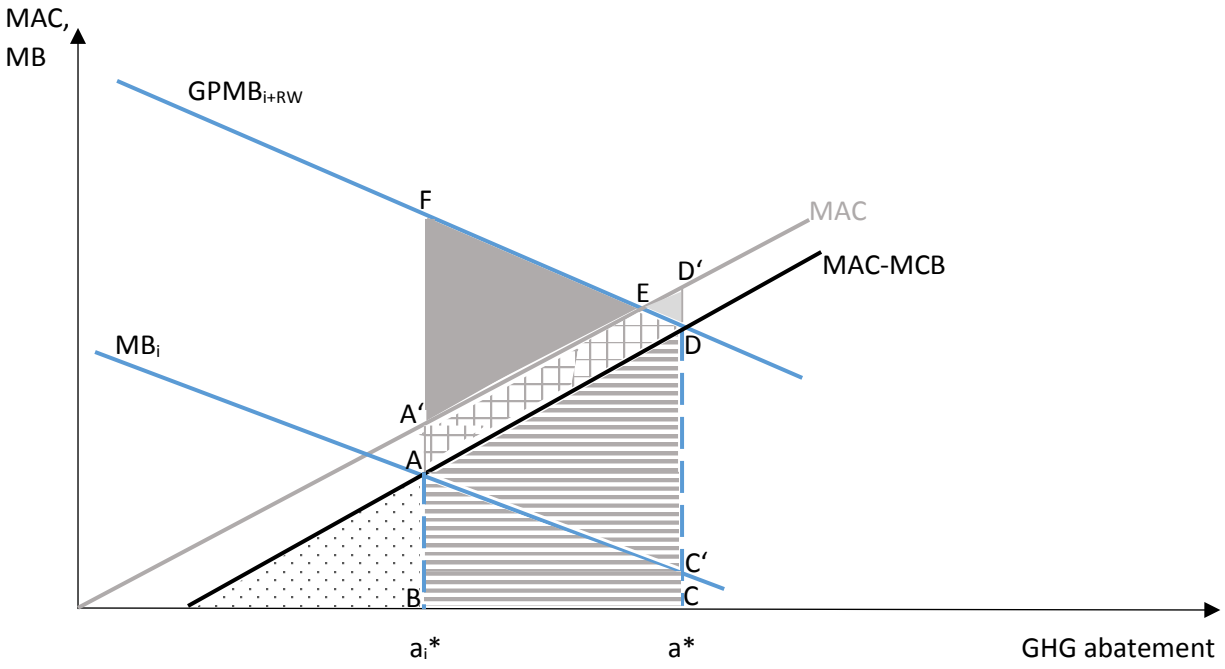

Figure 1: Illustration of GIC and NIC Schemes

The dotted triangle depicts the domestic net costs of attaining the "business-as-usual" level (or baseline) from the perspective of the developing country.

The area ABCD (dashed area) stands for the net-incremental-cost transfer payments required to attain the optimum a*, i.e. where the global public marginal benefits $GPMB_{i+R}$ of GHG abatement are equal to the net marginal abatement costs for the developing country.

In contrast, the area A'BCD' (comprising the dashed and checkered areas and the small monocromatic light grey triangle) represents the gross-incremental-cost transfer payment to be made when the abatement is raised up to the level a*. The figure clearly shows that the NIC concept is more cost-effective: Given limited funds for climate transfers, the use of the

method reimbursing only the NIC would bring about a higher climate change mitigation level as the funds saved relatively to the gross concept could be spent elsewhere in order to induce additional abatement activity. Under the NIC scheme, the global community would enjoy a net welfare gain of the triangle ADF.

Yet, even if the GEF would pay the GIC, the global community would enjoy a net welfare gain, which is reflected by the area of triangle A'EF minus DD'E (the dark grey triangle minus the small light grey triangle). DD'E comprises GEF payments for abatement that exceed the global community's benefits (from this abatement) as reflected by $GPMB_{i+RW}$, where index RW stands for the 'rest of the world'.

The host country of the mitigation project will receive a payment ABCD from the NIC scheme and a higher payment ABCD + A'ADD' from the GIC scheme. The additional net benefits the host country will receive due to the implementation of a NIC transfer scheme corresponds to the area ABCC'. These are country i's additional primary benefits enjoyed from the increase of the GHG abatement level from a_i* to a*. The respective net benefits in a GIC scheme are ABCC'+ A'ADD', where A'ADD' stands for the rise in ancillary benefits.

However, the NIC concept raised objections because of its one-sided distributional implications. It has been argued that surpluses of incremental actions should be shared between donor and recipient countries of GEF funds, and "*not appropriated fully by the global community through the net incremental cost principle*" (see King 1993: 27). Yet, as explained above also the NIC concept benefits the host country as it raises this country's benefits by an amount reflected by area ABCC'.

Pearce (1995: 169) stresses that project sustainability and maximum cooperation favour the gross-cost concept. Interests of local communities should be carefully taken into account to raise their willingness to cooperate and net gains to local communities must be sustainable as otherwise project gains could be short-lived (see GEF EO 2006: 136). Therefore, not only because of distributional trade-offs it might be considered to be opportune to seek for a compromise, i.e. to apply a sharing rule which is an intermediate between the NIC and the GIC rule. Indeed, as Pearce (2000) states, "*[i]n practice, GEF tends to operate so that only some domestic ancillary benefits are deducted from the 'gross' incremental cost. Local environmental benefits may be computed but not deducted*."

Incremental cost calculations at the GEF came to an end in 2006. As assessments are made mostly at the end of the design of GEF projects and therefore have little impact on their design, it was argued that incrementality could only play an insignificant role as its exact size cannot be determined objectively ex ante. Actually, incrementality is achieved "*through the initial negotiation that takes place between the GEF agents and the recipients in the definition of the baseline and the global environmental benefits that will be produced in the project*" (van den Berg 2007: vii). Another important reason for challenging GEF incremental cost calculations was the view (expressed by key people involved in GEF project design and review) that a clear distinction between local and global environmental benefits is largely artificial or even impossible to be reached (GEF EO 2007: 7). Furthermore, there was much confusion of stakeholders about incremental cost concepts and procedures.

Due to the problems associated with the quantitative assessment of incremental cost, the GEF started to put greater emphasis on qualitative aspects of "incremental reasoning" (GEF IEO 2018), which even though only vaguely specified has meanwhile become the core principle underlying the GEF. This principle "*encapsulates the basic rationale for a project seeking GEF funding*", which is the global environmental objectives and the GEF's contribution to the additional cost of projects required to pursue these objectives (GEF EO 2007: 43). The focus on incremental reasoning tends to significantly reduce transaction costs as incremental cost calculations are skipped. However, Broughton (2009: 69) points out that the abandoning of a "hard" norm in the shape of incremental-cost calculations and the transition to the "softer" way of assessing incrementality, "*may not make the concept easier to understand or to apply within projects for those applicants searching for clarification*".[4] Furthermore, the softer norm may find less acceptance in countries paying international transfers as there may be more room for manoeuvre by developing countries during the negotiations (that take place between the GEF agents and the recipients of funds) aiming at appropriating additional rents at the expense of the donors. Yet, much depends on the bargaining power of involved agents as can be observed from the CDM example addressed in the next section.

Finally, it is worth mentioning that incremental reasoning does not only play a role for the GEF Trust Fund, but e.g. the Green Climate Fund also refers to it in its requirements for funding

[4] This holds the more as incremental reasoning was not defined by the GEF when it was introduced as the core principle. According to GEF EO (2007), *"[p]rocedurally, it implies logical argumentation and case-based reasoning, which has implications when ascertaining the basic rationale for GEF projects*."

proposals (GCF 2019: 9). Yet, it is also argued by the GCF (2018: 5) that quantitative approaches allow a more precise and accurate assessment of incremental costs.

III. The Clean Development Mechanism, Premiums and Co-Benefits

Another international mechanism in the context of climate finance is the "Clean Development Mechanism" (CDM). This mechanism under the Kyoto Protocol was designed with the dual aim of assisting developing countries in achieving sustainable development (SD) and of helping developed countries in achieving compliance with their Kyoto commitments. The CDM allows governments or private entities of developed countries (having ratified the Protocol) to implement emission reduction projects in developing countries and to receive credit in the shape of "certified emission reductions" (CERs). These CERs can be counted against the developed countries' national reduction targets. Hence, both involved countries should benefit from the mechanism: while the transfer payer will receive CERs, the transfer receiving developing country will obtain national sustainable development benefits.

SD benefits are regularly – and yet quite broadly – classified into the three categories 'environmental', 'social' and 'economic'. Likewise, in the context of the CDM under the Kyoto Protocol, there is a lack of a clear definition of SD and an absence of the requirement to monitor SD impacts.[5] In the Marrakesh Accords it was affirmed in 2001 (UNFCCC 2002) that "*it is the host Party's prerogative to confirm whether a clean development mechanism project activity assists it in achieving sustainable development*". Due to the ambiguity of SD concepts and indicators, developing countries may get a strategic incentive to set rather low sustainable development standards before bargaining starts in order to become a particularly attractive CDM investment location for foreign investors that are primarily interested in earning CERs. This provides other examples for strategically motivated pre-bargaining moves that have been considered in other contexts of international environmental economics (see Buchholz and Konrad 1994 and Beccherle and Tirole 2011).

[5] Local job creation may serve as one indicator for the development impact of CDM projects. Mori-Clement and Bednar-Friedl (2019) investigate such employment effects for projects in Brazil, for example.

In the competition for CDM projects and financing, a 'race to the bottom'-risk is pending (see, e.g. Sutter 2003, Olsen 2007 and Torvanger et al. 2013), which means that developing countries are willing to accept more and more projects with rather low co-benefits as they compete with other countries for international project funds.

Interestingly, in times of a falling demand for CERs after 2011–2012,[6] i.e. when bargaining power on the supply side was decreasing, the 'race to the bottom'-risk tended to be reduced to some extent, as the relatively (to the demand) high supply "*enabled buyers to differentiate between CERs of different characteristics*" (Michaelowa, Espelange and Hoch 2020: 54). Yet, this explanation seems to not fully capture the attenuation of the "race to the bottom"-risk as the high supply could have just exerted a pressure on the price of CERs instead.[7] Possibly the developments on the CERs market were accompanied by investors' rising attention for public concern about sustainable development, and purchasing on the premium market was part of a marketing strategy partly in the sense of "green-washing". It seems that there is still much scope for research in this context.

Sutter and Parreno (2007: 89) are among the first to propose a premium price for CERs from those projects that strongly contribute to sustainable development. They argue that this might raise the share of such projects in the global carbon market. As Sutter (2003: 202) points out, the prerequisite for charging premium prices is a market for premium CERs and explains that such premium CERs could be attractive for purchasers as they might help to prevent reputation losses that may arise from financing unsustainable CDM projects. In order to establish such markets, labels for certain CERs had to be created that indicate a higher level of sustainability co-effects associated with these CERs. Among those labels are the "Gold Standard" that has issued more than 98.4 million carbon credits in 2018 (Willers and Cima 2019). On the Gold Standard and other standards like the Climate, Community & Biodiversity Standard and the Social Carbon Standard see, e.g. Michaelowa et al. (2019) and Michaelowa, Espelage and Hoch (2020).

However, GHG emission reductions by projects with a higher sustainable development component clearly tend to be more expensive than reductions by those with low local co-benefits

[6] On the development of international carbon markets in the recent two decades see Michaelowa, Shishlov and Brescia (2019).

[7] Indeed, the price for CERs declined sharply in the period 2011-2012, see e.g. World Bank (2019: 59).

also due to now necessary project evaluation and labelling. Especially if small projects are concerned, the transaction costs for receiving a label may become prohibitively high. As Robinson et al. (2016: 134) stress, mechanisms like the Gold Standard need to carefully balance transparency, accountability and transaction costs. Transaction costs usurp at least a portion of the welfare gains that the private offsetting standards intend to bring about. Due to their higher cost (relatively to those of projects established for the regular markets), GHG abatement activities for a premium market tend not to be cost-effective from a climate-change-mitigation point of view.

Furthermore, Olsen et al. (2019: 247) stress, "*sustainability labels have never developed beyond a small niche in the compliance market and attract only a small share of the carbon finance available*". Hence, the voluntary nature of the premium scheme seems to be no appropriate blueprint for future schemes under the Paris Agreement. Instead, some liability would be required in order to raise the market penetration of projects with higher co-benefits.

If a future scheme stipulates minimum sustainability standards for CDM projects that are beyond those presently employed so that projects with low co-benefit levels could definitely be banned, then the marginal abatement cost curve obviously tends to rise. The effects of a shift towards more sustainable projects on the outcome of a CDM transfer scheme is illustrated in Figure 2, which resembles Figure 1 to some extent. Yet, in Figure 2, the measures to accomplish the GHG abatement are different to that in Figure 1 as they involve higher local co-benefits. In order to keep the elaborations concerning the CDM comparable to those concerning the GEF scheme, we suppose in our stylized depiction that the considered host country is only compensated for the project costs and the other agents (investors, CERs buyer) are from the rest of the world. The increase of marginal abatement costs of projects yielding higher local sustainability benefits is reflected by a constant marginal cost mark-up MCM. The MAC curve reflects the marginal abatement costs for the mitigation activities conducted if no minimum standards were established and we assume that this is the same MAC curve that applies in the GEF scheme (Figure 1). MAC + MCM represents the marginal abatement costs in a system where a (higher) minimum sustainable-development standard is required. Due to the cost mark-up, the purchasers are required to pay a higher CER price while presently buyers do this voluntarily on premium markets.

Postulating that it still pays for investors to generate abatement up to level a*, the global community would enjoy a welfare gain that is reflected by the area of the dark grey triangle minus the light grey triangle. This global community's welfare gain is smaller than the one that would occur under the GIC and NIC schemes as mitigation costs rose.

The international transfers are represented by the area A''BCD'' (area below the line depicting MAC + MCM in the range between a_i* and a*), for which holds that A''BCD'' > A'BCD' > ABCD. Therefore, CDM transfers via the premium market that are required to attain a* are higher than those associated with the GEF schemes. Consequently, Figure 2 illustrates the fact that the premium CDM is less cost-effective from a climate-protection point of view.

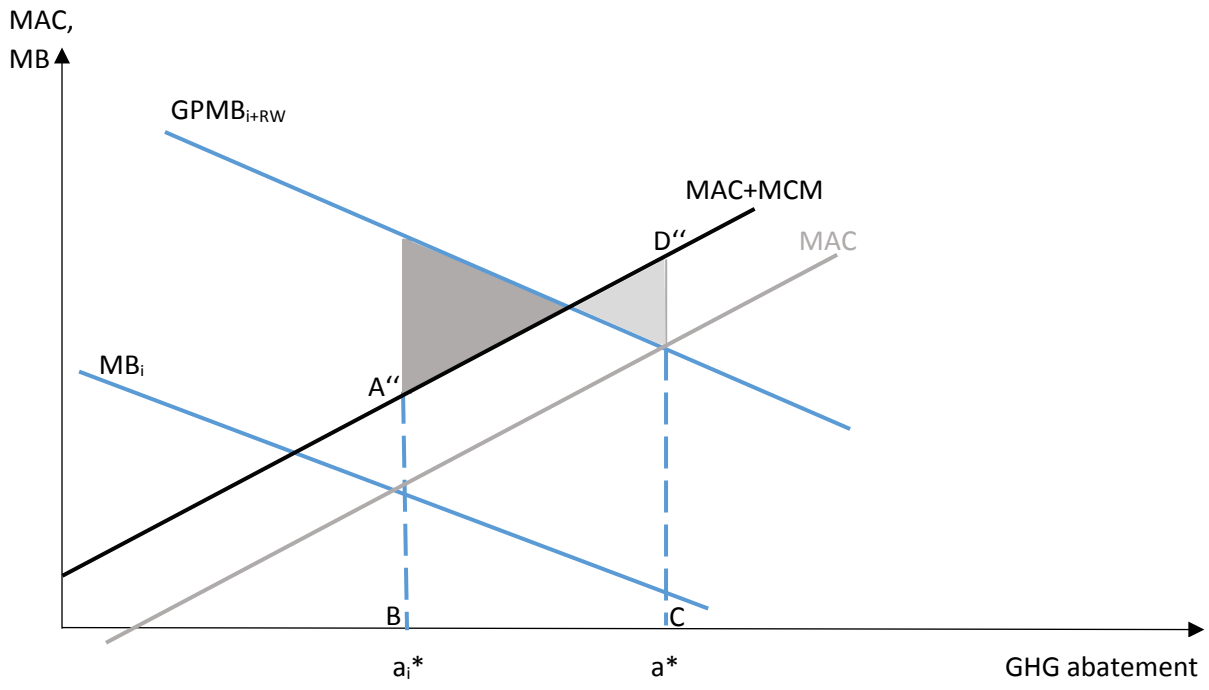

Figure 2: Illustration of the CDM When a Minimum Level of Local Co-Effects is Required

If marginal costs of projects further rise (beyond the MCM depicted in Figure 2) due to higher SD requirements, the marginal abatement cost curve MAC + MCM would shift further upwards. Cost-effectiveness regarding GHG mitigation of transfers further declines. As also the co-benefit levels become higher, the change to 'more sustainable' projects may cause a downward shift of the net marginal abatement cost curve which reflects (MAC + MCM) - MCB.

Figure 3 captures the situation where MCM equals the *increase* in MCB, so that a* is on the same level as a* in Figure 1. Yet, it also indicates via arrows the effects of the introduction of

the premium standard for the case where both marginal abatement cost and MCB increase, but the *increase* of MCB becomes stronger than the rise in marginal abatement cost as reflected by MCM.

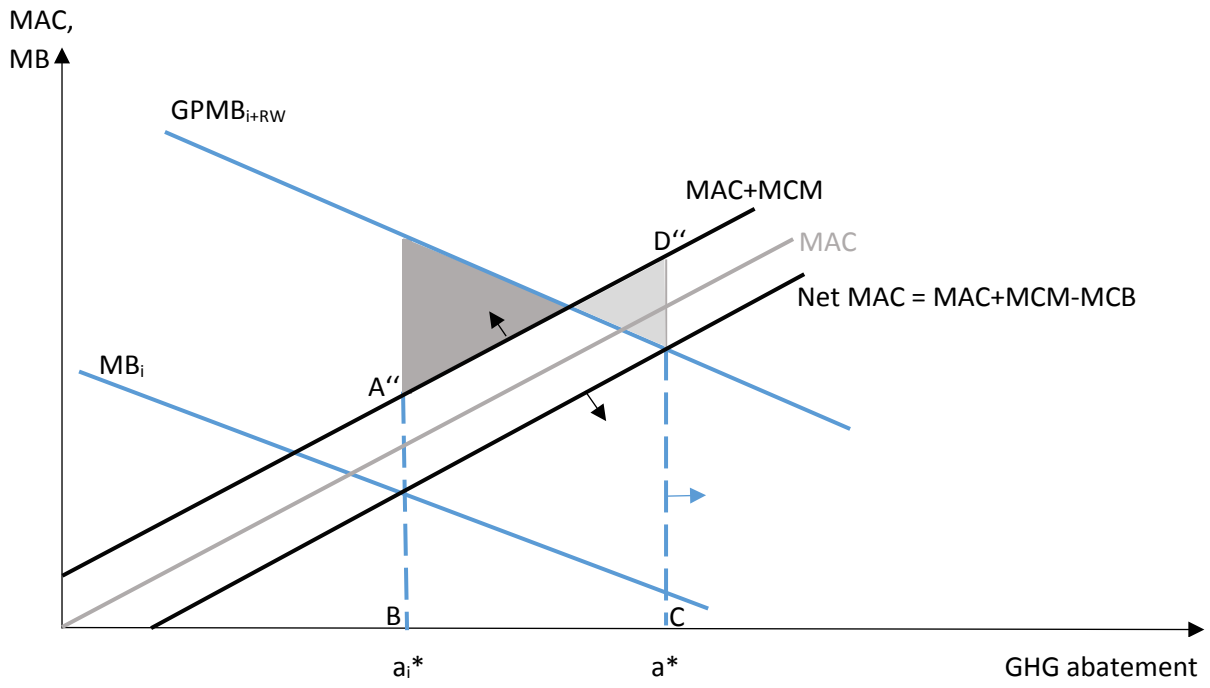

Figure 3: Taking into Account of the Premium-like Scheme's Effects on Co-benefits and Marginal Abatement Costs

While marginal net domestic abatement costs MAC + MCM – MCB decrease for the developing country, the level of received transfer payments for each unit of abatement increases as the MAC + MCM curve moves upwards. The efficient abatement level would increase beyond a*. While the dark grey triangle shrinks, the light grey triangle tends to increase, reducing the global community's welfare gain despite a higher efficient GHG abatement level a*.

Consequently, the level of transfer payments per unit of GHG abatement increases while net MAC decrease. The abatement level pursued by the developing country, which is characterized by an equality of net MAC and GPMB$_{i+RW}$, would rise beyond a*. The dark grey triangle shrinks, the light grey triangle increases, which implies a reduction of the global community's welfare gain despite the higher abatement level (now beyond a*). The developing country will gain due to higher local SD effects and higher mitigation enjoyed.

In the case where the increase in MCB is weaker than the rise in marginal abatement cost, i.e. the premium MCM is rather high, both marginal cost curve MAC + MCM as well as net marginal cost curve MAC + MCM – MCB will shift upwards. The net MAC curve would even be located above MAC, i.e. the curve reflecting the marginal abatement costs for the mitigation activities conducted if no premium market would have been established. Consequently, if an international agreement would stipulate a minimum SD requirement, this may even reduce the willingness of developing countries to supply mitigation, as a* tends to decrease. Global climate protection and welfare would decrease.

Despite the poor cost-effectiveness in abating GHGs and the niche character of sustainability labels inducing price premiums under the CDM, premium prices are now indeed getting new prominence in the context of the Paris Agreement. New proposals for improving (local) sustainability effects of internationally supported climate change mitigation projects are the subject of the discussion in the following section.

IV. Cooperative Approaches in Accordance with Article 6 of the Paris Agreement

Article 6 of the Paris Agreement establishes international cooperative approaches for climate protection and the support of sustainable development is one of its major characteristics. As Articles 6.2-6.3 set out, Parties can cooperate directly with one another on a voluntary basis. This renders possible the implementation of emission reduction measures in one country and the transfer of associated emission reduction "credits" to another country so that the reductions can be counted towards the latter country's Nationally Determined Contribution (NDC). Furthermore, it allows to link emissions-trading schemes of two or more countries. Articles 6.4-6.7 establish mechanisms to contribute to mitigation of greenhouse gas emissions and to support sustainable development. The activity cycle of those mechanisms may share similarities with the activity cycle of the CDM (see Michaelowa, Espelage and Müller 2019). In Articles 6.8-6.9 the importance of non-market approaches is recognized, but it still has to be specified how these approaches are to be executed and as is stated on a UNFCCC (2020) website, the non-market approaches mechanism can presently "be anything and everything, provided it's not market-based".

The consideration of co-effects as displayed in the subsequent sections will help inform decision makers about the individual concepts' merits and weaknesses in the context of considering local sustainability effects. As outlined in the introduction, efficiency in protecting the climate and the attainment of distributional objectives may be two conflicting goals. The *efficiency argument* is represented by the sub-criteria cost-effectiveness of mitigation activities and (low) transaction cost of the transfer scheme.

The *distributional argument* refers to the conflicts between "rewards to developing countries" (RDC) and "public acceptance in industrialized countries" (PAIC). High RDC would imply that ethical concerns are well addressed as the poorer countries are not exploited via the transfer scheme. Yet, this may imply higher transfer levels for combating global warming and therefore conflicts with cost-effectiveness (and hence the efficiency goal) and with PAIC as the distributional advantages in developing countries would be at the expense of the donors.

However, the cake for all could be expanded by caring for efficiency (i.e. high cost-effectiveness of mitigation projects and low transaction costs of the transfer scheme) and thus for benefits for the global community. This tends to mitigate also the distributional conflicts (albeit a potential loss of co-benefits in developing countries, but a gain in global climate protection).

To keep the evaluation of schemes simple, we distinguish between three ratings only, where the medium rank is **o** and the schemes deviating upwards all get a **+** and those deviating downwards a **-**. Some of the tentative evaluation depends on the distribution of bargaining power between donors and recipients and specific regulatory provisions and thus more than one evaluation could apply, e.g. **o/-**.

As can be observed from Table 1, the picture is rather mixed. Depending on the weighting of distributional and efficiency arguments, different schemes may serve as models for future schemes within the Paris framework.

Table 1: Tentative Evaluation of Mechanisms for Different Criteria

	Cost-effectiveness (mitigation)	Rewards to developing (host) countries	Public acceptance in developed countries (hard norm)	Transaction costs
GEF-NIC	+	-	+	-
GEF-GIC	o	o	o	+
GEF-IR	+/o	+/o	o /-	+/o
CDM	+/o	o/-	+	o
CDM-P (qualitative norms)	-	+	-	o /-
CDM-P (quantitative norms)	-	+	-	-

For instance, Olsen, Arens and Mersmann (2018: 393) warn in their discussion of lessons learnt from the CDM that concerning the voluntary mechanisms "*there is a great risk of repeating the 'race to the bottom' known from the CDM, where the prerogative for host countries to approve SD has resulted in weak national SD criteria*." This warning reflects a major concern about adverse distributional effects. A higher weight on distributional aspects tends – as Table 1 indicates – to have a negative influence on efficiency of climate change mitigation. Yet, one has to note that at the same time other studies suggest that positive allocative effects may be triggered, too – e.g. via the enhancement of perceived fairness,[8] which spurs the willingness of developing countries to participate actively in climate policy (see e.g. Rübbelke 2011 and Pittel and Rübbelke 2013).

Like in the case of the CDM, several scientists highlight the distributional role private offsetting standards (like the "Gold Standard") may play in future international climate policy and some explicitly suggest applying premium prices in order to overcome the problem of the race to

[8] There are several studies addressing international climate finance and its influence on (perceived) fairness or justice, e.g. Pickering, Jotzo and Wood (2015), Pickering, Betzold and Skovgard (2017) and Colenbrander, Dodman and Mitlin (2018).

the bottom. The positive view concerning the prospects of private offsetting standards is encouraged by empirical findings that many buyers of CERs are willing to pay a price premium; however, according to Parnphumeesup and Kerr (2015), charity groups and governments tend to be more willing to pay a premium than private sector buyers. Purchasers at premium prices do this by either because of altruistic motives or – as outlined in an earlier section of this paper – because of higher quality of their investments, i.e. a higher level of project sustainability.

Hultman, Lou and Hutton (2019) point out that it may become important to encourage more purchasers to act on the premium market in the future. Blum and Lövbrand (2019) discuss the role of carbon markets and private offsetting standards in the Paris climate regime and express the view that private standard setters fill "*perceived legitimacy gaps*" of public governance mechanisms. Olsen et al. (2019) endorse a qualitative approach to assess, label and rank the expected SD benefits of projects. By labelling based on qualitative data, transaction costs could be reduced relatively to a quantitative approach. Olsen et al. (2019) suggest to link the Paris Agreement and the 2030 Agenda for Sustainable Development Goals (SDGs) in the future by using the SDG global indicator framework in evaluating sustainable development aspects of mitigation activities. There is already a Gold Standard called "Gold Standard for the Global Goals" that quantifies and verifies impacts of climate initiatives toward multiple SDGs.[9]

This link between SDGs and climate protection could provide new opportunities for industrialized countries. The updated National Sustainable Development Strategy of Germany (The Federal Government 2018: 8) sets out the importance of the 2030 Agenda for SDGs for alleviating international movements of refugees and migrants, for example. European countries may strongly benefit from sustainable development in Northern Africa, for example, but to a lesser extent from such a development in Central America. Thus, some components of sustainable development are not exclusively private for the hosts of climate change mitigation projects, but spillovers spread transcontinentally or even globally.[10] These effects resemble the effects of impure public goods (see e.g. Ihori 1992).

However, consistently thought out, the consideration of SDGs in the pricing of GHG emission reduction credits or certificates would have to be also applied in the context of the EU ETS,

[9] See https://www.goldstandard.org/articles/gold-standard-global-goals.
[10] A distinction between direct and final or ultimate impact (van den Berg 2011: 413) seems to be relevant in this context.

raising the transaction costs and reducing the attractiveness of the economic instrument of emission permit trading.

V. Conclusions

The discussion of the treatment of co-benefits in climate finance has undergone considerable changes in the past decades: Applying tools (like minimum SD standards or premium systems) to raise local sustainable development effects of climate protection projects in developing countries would not have been seriously taken into consideration in the early years of the GEF. In the early and mid 1990s, the discussion instead was mainly about global benefits and attaining efficiency in greenhouse gas abatement and, hence there was – for cost-effectiveness reasons – some preference for reducing the transfers at least by a part of the domestic co-benefits in the host country of the climate protection project. A double-rewarding of the host countries would have been clearly declined as this is even less cost-effective from a pure climate-protection perspective than the gross-incremental-cost method.

Application of a premium-price mechanism as meanwhile frequently proposed will, however, reward the host countries twice: domestic sustainability co-benefits are enjoyed and additionally a premium is received (for these enjoyed co-benefits). Purchasers have to some extent been willing in the past to buy at such higher prices for several reasons (e.g. for improving their reputation as firms or countries), and there are no concerns as long as this is accomplished on a *voluntary* basis.

In contrast, establishing an *obligatory* labelling system and with it making premium prices a prerequisite for activities under Article 6.4 of the Paris Agreement will raise the costs of such desired activities. Such higher-cost burdens for cooperative approaches are not new: historically a 2%-share of proceeds from the sale of CERs is already channelled towards the Adaptation Fund. Higher cost and thus higher prices of certificates, on the one hand, reduce the functionality of mechanisms under Article 6 of the Paris Agreements as potential purchasers of certificates, who are interested in reducing climate-policy related costs only (and not in sustainable development elsewhere) will lower their demand on the certificate market.

One may in general distinguish two polar views: On the one hand, opposition against premium prices will be raised by a first group taking the stand that climate policy should primarily combat global warming threatening life on our whole planet. On the other hand, the double-rewarding of hosts of projects tends to reduce the opposition of a second group considering cooperative approaches under Article 6 as a kind of indulgence trade and exhibit some morally motivated "joy of giving" towards the developing countries. Although respecting the needs of developing countries, there is a big risk that the objectives of international climate policy are not clear enough anymore and the transfer mechanisms of climate policy become ineffective in combatting the main threat which thus – to some degree - may come out of sight.

The first group, for which efficiency of climate protection is the main concern, may also insist on hard norms in order to make sure that not too much funding is diverted from effective climate protection. The second group, for which distributional motives are of high importance, has a preference for softer norms instead. The members of this group also point out that applying hard norms (e.g. via quantification of co-benefits) involves high transaction cost and thus impairs efficiency, too, since some to the premium may be consumed and consultancies may benefit instead. Softer norms may also have the advantage to save time and thus to accelerate the pace at which abatement projects can be launched in developing countries. Moreover, softer norms for accepting projects seem to be attractive also for purely pragmatic reasons, as some co-benefits are hard or virtually impossible to quantify in a reasonable way, like e.g. those benefits associated with gender aspects. Yet, just this creates much scope for rent-seeking activities that should be avoided from the perspective of the first group.One way to address the deep conflict between the two groups is to avoid the overburdening of policies with the expectation to become overarching cures for multiple problems. In this vein Peterson and Skovgaard (2019: 72) argue that "*climate finance and development aid are defined by different objectives and should be treated therefore as distinct entities*", which means following the Tinbergen Rule stated in the Introduction. Hence, the promotion of local sustainable development of developing countries should be reserved to development aid.

References

Bain, P. G., Milfont, T. L., Kashima, Y., Bilewicz, M., Doron, G., Garðarsdóttir, R. B., ... & Corral-Verdugo, V. (2016). Co-benefits of addressing climate change can motivate action around the world. *Nature Climate Change*, 6(2), 154.

Beccherle, J. and Tirole, J. (2011). Regional initiatives and the cost of delaying binding climate change agreements. *Journal of Public Economics*, 95(11-12), 1339-1348.

Blum, M. and Lövbrand, E. (2019). The return of carbon offsetting? The discursive legitimation of new market arrangements in the Paris climate regime. Earth System Governance, 2, 100028.

Broughton, E. (2009). The Global Environment Facility: Managing the Transition. Ifri, Health and Environment Reports, No. 3, Paris.

Buchholz, W. and Konrad, K. (1994). Global environmental problems and the strategic choice of technology. *Journal of Economics*, 60(3), 299-321.

Buchholz, W., Markandya, A., Rübbelke, D. and Vögele, S. (2020). Ancillary Benefits of Climate Policy – New Theoretical Developments and Empirical Findings, Springer, Cham.

Cervigni, R. (1998). Incremental cost in the convention on biological diversity. *Environmental and Resource Economics*, 11(2), 217-241.

Colenbrander, S., Dodman, D. and Mitlin, D. (2018). Using climate finance to advance climate justice: the politics and practice of channelling resources to the local level. *Climate Policy*, 18(7), 902-915.

Ekins, P. (1996). How large a carbon tax is justified by the secondary benefits of CO_2 abatement?. *Resource and Energy Economics*, 18(2), 161-187.

GCF (2018). Incremental and full cost calculation methodology. GCF/B.21/03, Incheon.

GCF (2019). Review of the initial investment framework: Matters related to incremental and full cost calculation methodology and policies on co-financing and concessionality, GCF/B.23/19, Incheon.

GEF (2007). Operational Guidelines for the Application of the Incremental Cost Principle, GEF Policy Paper, Washington D.C.

GEF EO (2006). The Role of Local Benefits in Global Environmental Programs, Evaluation Report No. 30, Washington D.C.

GEF EO (2007). Evaluation of Incremental Cost Assessment, Evaluation Report No. 34, Washington D.C.

GEF IEO (2018). An Evaluative Approach to Assessing GEF's Additionality, GEF/ME/C.55/inf. 01, Washington D.C.

Heintz, R. J. and Tol, R. S. J. (1996) Secondary benefits of climate control policies: implications for the global environmental facility; CSERGE Working Paper GEC 96-17, University of East Anglia, Norwich.

Hultman, N. E., Lou, J. and Hutton, S. (2019). A review of community co-benefits of the Clean Development Mechanism (CDM). *Environmental Research Letters*, 15(5), 053002.

Ihori, T. (1992). Impure public goods and transfers in a three-agent model. *Journal of Public Economics*, 48(3), 385-401.

IISD (2019). GEF Bulletin. International Institute for Sustainable Development, Vol. 192, No. 23, https://enb.iisd.org/download/pdf/sd/enbplus192num23e.pdf.

Kaul, I. and Conceição, P. (2006). The Changes Under Way: Financing Global Challenges through International Cooperation Behind And Beyond Borders. In: I. Kaul and P. Conceição (eds.), The New Public Finance – Responding To Global Challenges, Oxford University Press, New York and Oxford, 28-70.

King, K. (1993). The Incremental Costs of Global Environmental Benefits, Working Paper No. 5, Global Environment Facility, Washington.

King, K. (2006). Compensating Countries for the Provision of Global Public Services: The Tool of Incremental Costs. In: I. Kaul and P. Conceição (eds.), The New Public Finance – Responding To Global Challenges, Oxford University Press, New York and Oxford, 371-388.

Kragt, M. E., Gibson, F. L., Maseyk, F. and Wilson, K. A. (2016). Public willingness to pay for carbon farming and its co-benefits. *Ecological Economics*, 126, 125-131.

Michaelowa, A., Espelage, A. and Müller, B. (2019). Negotiating cooperation under Article 6 of the Paris Agreement, Perspectives, Freiburg.

Michaelowa, A., Shishlov, I. and Brescia, D. (2019). Evolution of international carbon markets: lessons for the Paris Agreement. *Wiley Interdisciplinary Reviews: Climate Change*.

Michaelowa, A., Shishlov, I., Hoch, S., Bofill, P. and Espelage, A. (2019). Overview and comparison of existing carbon crediting schemes, Perspectives, Freiburg.

Michaelowa, A., Espelage, A. and Hoch, S. (2020). Co-benefits under the market mechanisms of the Paris agreement. In: W. Buchholz, A. Markandya, D. Rübbelke and S. Vögele (eds.), Ancillary Benefits of Climate Policy, Springer, Cham, 51-67.

Mori-Clement, Y. and Bednar-Friedl, B. (2019). Do clean development mechanism projects generate local employment? Testing for sectoral effects across Brazilian municipalities. *Ecological Economics*, 157, 47-60.

Nemet, G. F., Holloway, T. and Meier, P. (2010). Implications of incorporating air-quality co-benefits into climate change policymaking. *Environmental Research Letters*, 5(1), 014007.

Olsen, K. H. (2007). The clean development mechanism's contribution to sustainable development: a review of the literature. *Climatic Change*, 84(1), 59-73.

Olsen, K. H., Arens, C. and Mersmann, F. (2018). Learning from CDM SD tool experience for Article 6.4 of the Paris Agreement. *Climate Policy*, 18(4), 383-395.

Olsen, K. H., Bakhtiari, F., Duggal, V. K. and Fenhann, J. V. (2019). Sustainability labelling as a tool for reporting the sustainable development impacts of climate actions relevant to Article 6 of the Paris Agreement. *International Environmental Agreements: Politics, Law and Economics*, 19(2), 225-251.

Parnphumeesup, P. and Kerr, S. A. (2015). Willingness to pay for gold standard carbon credits. *Energy Sources, Part B: Economics, Planning, and Policy*, 10(4), 412-417.

Pearce, D. (1995). Blueprint 4: Capturing Global Environmental Value, Earthscan, London.

Pearce, D. (2000). Policy framework for the ancillary benefits of climate change policies. Ancillary benefits and costs of greenhouse gas mitigation. OECD, Paris, 517-560.

Pearce, D. (2007). Do we really care about biodiversity?. *Environmental and Resource Economics*, 37(1), 313-333.

Peterson, L. and Skovgaard, J. (2019). Bureaucratic politics and the allocation of climate finance. *World Development*, 117, 72-97.

Pickering, J., Betzold, C. and Skovgaard, J. (2017). Special issue: managing fragmentation and complexity in the emerging system of international climate finance. *International Environmental Agreements: Politics, Law and Economics*, 17, 1–16.

Pickering, J., Jotzo, F. and Wood, P. J. (2015). Sharing the global climate finance effort fairly with limited coordination. *Global Environmental Politics*, 15(4), 39-62.

Pittel, K. and Rübbelke, D. (2013). International climate finance and its influence on fairness and policy. *World Economy*, 36(4), 419-436.

Robinson, C. J., Renwick, A. R., May, T., Gerrard, E., Foley, R., Battaglia, M., Possingham, H., Griggs, D. and Walker, D. (2016). Indigenous benefits and carbon offset schemes: An Australian case study. *Environmental Science & Policy*, 56, 129-134.

Rübbelke, D. (2011). International support of climate change policies in developing countries: Strategic, moral and fairness aspects. *Ecological Economics*, 70(8), 1470-1480.

Sovacool, B. K., Martiskainen, M., Hook, A. and Baker, L. (2020). Beyond cost and carbon: The multidimensional co-benefits of low carbon transitions in Europe. *Ecological Economics*, 169, 106529.

Sutter, C. (2003). Sustainability Check Up for CDM Projects: How to assess the sustainability of international projects under the Kyoto Protocol. ETH Zurich.

Sutter, C. and Parreño, J. C. (2007). Does the current Clean Development Mechanism (CDM) deliver its sustainable development claim? An analysis of officially registered CDM projects. *Climatic Change*, 84(1), 75-90.

The Federal Government (2018). Deutsche Nachhaltigkeitsstrategie, Aktualisierung 2018, Berlin.

Torvanger, A., Shrivastava, M. K., Pandey, N. and Tørnblad, S. H. (2013). A two-track CDM: improved incentives for sustainable development and offset production. *Climate Policy*, 13(4), 471-489.

UNFCCC (2002). Report of the conference of the parties on its seventh session, held at Marrakesh from 29 October to 10 November 2001, FCCC/CP/2001/13/Add.2, Decision 17/CP.7, https://undocs.org/FCCC/CP/2001/13/Add.2

UNFCCC (2020). What are Market and Non-Market Mechanisms? https://unfccc.int/topics/what-are-market-and-non-market-mechanisms, accessed on 02.06.2020

Van den Berg, R. (2007). Foreword. In: Global Environment Facility Evaluation Office, Evaluation of Incremental Cost Assessment, Evaluation Report No. 34, Washington.

Van den Berg, R. (2011). Evaluation in the context of global public goods. *Evaluation*, 17(4), 405-415.

West, J. J., Smith, S. J., Silva, R. A., Naik, V., Zhang, Y., Adelman, Z., Fry, M. M., Anenberg, S., Horowitz, L.W. and Lamarque, J. F. (2013). Co-benefits of mitigating global greenhouse gas emissions for future air quality and human health. *Nature Climate Change*, 3(10), 885-889.

Willers, C. and Cima, E. (2019). Gold Standard – Market Report 2018, https://www.goldstandard.org/sites/default/files/market_report_2018.pdf

World Bank (2019). State and Trends of Carbon Pricing 2019, Washington D.C.

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