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Would preferential access measures be sufficient to overcome current barriers to CDM projects in Least Developed Countries?

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Abstract: Financial support for Clean Development Mechanism (CDM) projects in underrepresented host countries was agreed on at the Copenhagen conference. The EU rules include special import quotas for Certified Emission Reductions (CERs) from Least Developed Countries (LDCs). This paper discusses whether these measures can contribute to overcoming barriers to CDM development in LDCs, how Programmes of Activities (PoAs) are performing, and how CDM projects and PoAs contribute to sustainable development in LDCs. CER supply and demand scenarios for 2013-2020 show that preferential access measures for LDCs would not have an important impact on CDM in these countries if the barriers for project implementation are not overcome. The specific CDM projects and PoAs found in LDCs yield potentially high sustainable development benefits. Through a comparison between the climate regime and the Lomé Convention, a preferential access agreement in agricultural trade, we conclude that not just preferential access is important, but also reduced access costs and the removal of underlying barriers. Increased incentives for added-value products characterise the Lomé success stories. For the climate regime, this could be translated into additional financial incentives for CDM projects with added value. As LDCs host a high share of them, PoAs could constitute an opportunity here.

Keywords: Kyoto Protocol, Clean Development Mechanism, Least Developed Countries, carbon market, preferential access, sustainable development benefits

1. Introduction

Through the Clean Development Mechanism (CDM), greenhouse gas emission reduction credits from projects in developing countries can be acquired by industrialised countries to comply with their Kyoto Protocol emission reduction targets. By October 2010 (UNEP Risoe Centre, 2010), the CDM had mobilised over 5500 projects, out of which 2400 had been registered with the CDM Executive Board (EB) and have the potential to generate Certified Emission Reductions (CERs). About 2.8 billion CERs are expected from these projects by 2012.

The CDM project portfolio is very unevenly distributed across host countries. China, India and Brazil account for about 72% of projects and 76% of expected CERs. Least Developed Countries (LDCs) host just 61 CDM projects in the pipeline (1.1%), of which only 19 projects are registered.

This uneven distribution of the CDM has been repeatedly criticised, as it directly affects both countries' expectations of receiving CDM-related financial flows, and the realisation of the second goal of this mechanism, which is to contribute to sustainable development (SD) in its host countries. Already in 2001, the Conference of the Parties (COP) to the United Framework Convention on Climate Change (UNFCCC) called for the EB to report "to the COP/MOP on the regional and subregional distribution of CDM project activities with a view to identifying systematic or systemic barriers to their equitable distribution" (UNFCCC, 2001: 28). The COP/MOP (the Conference of the Parties acting as the Meeting of the Parties to the Kyoto Protocol) confirmed this at its first meeting in 2005, asking the EB also to suggest options to address these barriers, and to broaden participation in the CDM (UNFCCC, 2005: 98). The Copenhagen conference in 2009 decided that simplified procedures for demonstrating the additionality of very small projects would be introduced, payment of registration fees would be postponed and upfront financing for CDM project validation and registration would be provided for projects in hitherto underrepresented countries (UNFCCC, 2009). Analysts are also discussing other ways of differentiating countries in the CDM. Proposed means include: differentiated eligibility of CDM host countries, discounting of emission reduction credits from different host countries, introducing a cap to the amount of emission credits that can be issued from projects in each country, and a more directed allocation of demand towards particular host countries (Bakker et al., 2009; Castro and Michaelowa, 2010). Also, some buyers like the EU envisage special import quotas for CERs from LDCs or Small Island Developing States (SIDSs), as discussed in section 4.2.

The issue of the sustainable development contribution of CDM projects has been widely discussed in the literature, through literature reviews (e.g. Olsen, 2007), case studies of individual projects (Borges da Cunha, 2007, Cole, 2007; Lenzen et al., 2007; Rudolph, 2007; Sirohi, 2007), systematic analyses of several CDM projects (Sutter and Parreño, 2007; Olsen and Fenhann, 2008), and attempts at creating objective tools to measure SD benefits (Sutter, 2003; SouthSouthNorth, 2004; Olsen and Fenhann, 2008; Lenzen et al., 2007). As host countries' expectations of generating financial flows and SD benefits depend on their attractiveness for CER buyers, this discussion remains relevant.

The following questions thus arise: Could preferential access measures such as the ones described above really improve the participation of LDCs in the CDM? Could such improved participation generate sustainable development benefits in LDCs? Can new modalities of CDM projects, such as the Programmes of Activities (PoAs)[1], which aim to target more distributed emission sources, provide a contribution?

In this paper, we first discuss the current and potential supply of the CDM in LDCs, and present an overview of the barriers limiting CDM development in poor countries. In section 3, we describe the proposals in the international climate negotiations and in the EU climate and energy package to promote CER supply from LDCs and underrepresented CDM host countries. Section 4 develops possible CER supply and demand scenarios for the period 2013-2020. For estimating the supply, we use an extrapolation of the figures provided by the UNEP

Risoe Center CDM Pipeline on the current CER supply, corrected for the project approval and credit issuance rates, and assuming different post-2012 regulatory scenarios. For the demand, we project the baseline emissions of developed countries until 2020 and assume a range of likely emission reduction targets and of supplementarity in the use of CDM credits. In section 5 we assess the impact of preferential access policies on CER supply from LDCs, and the potential sustainable development benefits from CDM projects and PoAs in LDCs. In section 6 we draw a comparison between a preferential access agreement in the agricultural trade system and the climate regime, before concluding in section 7.

2. The CDM in LDCs

2.1. Current and potential supply of CDM projects from LDCs

In terms of volume of credits, LDCs are expected to generate just around 0.5% of all CERs projected by 2012. The foreseeable short-term CER supply from LDCs, including projects that are in the pipeline and project ideas mentioned in country-specific studies or CDM promotion websites (Chea, 2006; Uprety, 2006; Waste Concern, 2006; Yemen's Ministry of Water and Environment, 2008), amounts to about 115 million CERs over the whole lifetime of the projects. This supply is dwarfed by the potential in China, India and other advanced developing countries, which reaches about 7 billion CERs by 2020.

However, a recent World Bank study on the abatement potential in the energy sector in Sub-Saharan Africa (De Gouvello et al., 2008) estimated a potential of about 4 billion CERs from Sub-Saharan LDCs over a project lifetime of 10-21 years. The study used the existing CDM methodologies to identify technologies that could both promote GHG emission reductions and support energy supply in the region. It made a bottom-up inventory of over 3200 potentially feasible clean energy projects applying 22 technologies in 44 countries in SSA. Comparing this theoretical potential with the real number of CDM projects from these countries gives an idea of the scale of the barriers for implementation the LDCs face.

There is a new CDM approach that could provide an inroad for small-scale, decentralised projects with potentially high SD benefits: the Programmes of Activities (PoAs). When in June 2007 the CDM Executive Board agreed on rules for PoAs, it was hoped that they would significantly reduce transaction costs and mobilise the diffusion of small technologies, where the exact number and location of projects would not be known ex ante. However, for over two years, PoAs did not really move forward. The main reasons were regulatory barriers, such as the liability of the validator for any part of the PoA that might be found faulty even years after its registration, the limitation to one baseline methodology and the debundling rules for application of small-scale methodologies. The liability requirement in particular led validators to refuse to validate PoAs. After a long regulatory tug of war, the EB removed most of the barriers in May 2009. Moreover, validators now shift the liability to the PoA developer through a private law contract. Nevertheless, even after the May decision, PoAs only moved slowly – until December 2009, when submissions actually exploded. As of October 2010, 58 PoAs have been submitted for validation, and 5 have been registered.

The distribution of PoAs among host countries differs considerably from standard CDM projects. The large players are underrepresented, whereas countries that have set up good CDM institutions such as Bangladesh, Indonesia, Vietnam and Yemen have PoAs. LDCs have a share of 12% of projects compared to about 1% in the normal CDM pipeline.

2.2. Barriers

What are the reasons for the marginal involvement of LDCs in the CDM? Mitigation potential, institutional CDM capacity and the general investment climate have been used as predictors of attractiveness of host countries for CDM projects, with the finding that about 74% of LDCs are very unattractive, 24% have limited attractiveness, and only 1% are attractive for non-sink CDM projects (Jung, 2005). Furthermore, familiarity between investing country and host country (operationalised as past bilateral trade, bilateral aid and colonial relationship) was found by Dolšak and Bowerman Crandall (2007) to be an even more important factor in explaining CDM location decisions.

More specific barriers for CDM implementation in LDCs, especially in SSA, have been thoroughly discussed within the Nairobi Framework. This initiative was launched at COP/MOP2 in Nairobi (2006) with the aim of helping these countries to improve their level of participation in the CDM (see Muyungi (2006), Agyemang-Bonsu (2007), Ellis and Kamel (2007), Kinkead (2007), UNEP (2007), and the World Bank (2007)).

One of the barriers most frequently mentioned is the limited institutional and technical capacity to develop and implement CDM projects. In the public sector, it is not only the DNAs that need to be established and have a minimum budget, but also the institutional framework for the sectors involved in the project (e.g. energy) is crucial. In the private sector, the presence of trained national CDM consultants is essential for coping with the complex CDM rules at affordable costs. The limited access to financing is an equally important barrier. On the one hand, domestic financial institutions lack capacity and awareness of the CDM as an investment option. On the other, the unattractive investment climate in these countries discourages foreign investors. Indeed, the CDM mainly functions as an additional revenue source for companies that already have financing. Annex I countries and companies are investing in CDM projects only in countries where they are already present (e.g. through subsidiary electricity companies), where they see a market for their products, and where stability is guaranteed (Lütken and Michaelowa, 2008).

There are few possibilities to develop large CDM projects in LDCs, as the energy demand and industry are still small in these countries[2]. In Africa, the largest emission reduction potential lies in sectors that are not significant in the CDM at present (forestry, agriculture, reducing the use of non-renewable biomass), and the low grid emission factors make grid-connected renewable energy and energy efficiency projects less viable. However, while many observers assumed that small projects were not viable through the CDM due to the high transaction costs (Michaelowa and Jotzo, 2005), nowadays there is a noteworthy amount of very small

CDM projects in the pipeline (see Figure 1) and Programmes of Activities are starting to take off, which suggests that the transaction-cost barrier can be overcome.

Another important barrier is the availability of data for baselines and monitoring: gathering this information is too costly for just one or two projects, so nobody makes this effort. Finally, the lack of infrastructure (roads, large equipment but also laboratories for calibrating measurement devices) is another limiting factor for the CDM in LDCs.

Figure 1 approximately here

It is however possible to overcome these barriers, as the case of Honduras shows. Honduras is not a LDC, but a small and poor country, with an unstable political regime and unattractive investment climate. Corruption and crime are high, access to finance difficult. Despite substantial CDM capacity building and financial support for establishing a functional DNA, staff replacement after changes of government has led to losses in institutional capabilities. As most of its electricity is produced from fossil sources, Honduras has some mitigation potential from renewable energy. Additionally, Honduras was an early mover in the privatisation of the electricity sector in Central America, and financial incentives for renewable energy are in place. However, its electricity system is highly inefficient, and prices can only be sustained due to subsidies (Keller, 2008; Lokey, 2008; Figueres, 2002). Nevertheless, Honduras hosts 32 CDM projects, 16 of which are registered (UNEP Risoe Centre, 2010). Honduras has apparently benefited from the leadership of a strong group of entrepreneurs in the renewable sector, who initiated all the CDM projects and created an association that allowed them to pool and share their experience. There is also a local CDM consultancy and a couple of international ones with a presence in the country (Keller, 2008; Lokey, 2008). This domestic leadership, coupled with the early support from international donors, may be the key for the success of Honduras in the CDM.

3. Preferential access measures in the climate regime

3.1. In the international climate negotiations

As mentioned in the introduction, several measures to improve the regional distribution of CDM projects have been discussed in the international climate negotiations. However, the negotiations at COP 15 in Copenhagen proved a roller-coaster ride for LDC interests. The initial text proposed a subsidy for PDD development and validation in LDCs with less than 10 registered projects. A second text version referred to “less developed” countries. But the final text did not limit it to any group of countries, so now even rich Middle Eastern oil-exporting countries qualify. Moreover, the initially foreseen grant mutated into a loan repaid upon the first issuance of CERs, and the total volume of the fund is capped at the interest accruing on the surplus of the EB, which will limit it to 1-2 million $ per year. On a positive note, the COP decision also states that grid emission factor calculations in LDCs should be more flexible[3] and that suppressed demand will be taken into account in baselines[2] (UNFCCC, 2009). But overall, incentives for projects in LDCs remain limited.

3.2. In the EU climate and energy package

In the European Climate and Energy Package for 2013-2020, the EU has committed itself to reducing its overall emissions to at least 20% below 1990 levels by 2020, and to 30% below 1990 if a new global climate change agreement with comparable efforts by other developed countries is reached. It imposes new limits on the amount of CERs from CDM projects and ERUs from JI projects that will be allowed to be imported into the EU between 2008 and 2020, both for the EU Emissions Trading System (EU ETS) and for the sectors not covered in it (non-trading sectors). Assuming that the EU ETS credit imports would be distributed linearly along all years in the period 2008-2020, Table 1 summarises the potential CDM/JI credit demand from the EU for the period 2013-2020, with and without international agreement.

Table 1 approximately here

The package includes a provision with high relevance for LDCs. For the non-trading sectors, the limit for credit imports under the 20% reduction scenario has been generally set at 3% of their emissions in 2005. Twelve countries[4] are allowed to import up to 4% of their 2005 emissions. The extra 1% granted to these countries – around 80 million CERs - can be imported only from LDCs or Small Island Developing States (SIDSs).

There are some additional conditions for the acceptance of CERs or ERUs in the European system. While the restrictions on approved project types sought by the Commission (on the basis of a consideration of "high quality projects") were not approved, forestry credits will still be banned from the EU ETS, but are accepted for the non-trading sectors. Additionally, if no new climate agreement is reached, only the following CERs or ERUs will be accepted:

- Credits issued during 2008-2012
- Credits from projects registered before 2013, but issued later
- CERs from projects registered after 2012 in LDCs
- Credits from projects in countries where a bilateral agreement has been reached with this aim.

In the case that a new international climate agreement is reached, only credits from countries that have ratified this agreement will be accepted from 2013.

Further qualitative criteria restricting the acceptance of credits in the EU system from 2013 onwards are still possible. The qualitative criteria discussed so far include accepting only renewable energy and energy efficiency projects, or only “high quality” projects. While it has been speculated that “high quality” could mean credits that are not based on reductions of industrial gases (this is even more likely now after the recent debates on industrial gas projects, see endnote 5), or credits that are based on projects with a clear sustainable development component, and/or credits with stronger additionality substantiation, this term was never clearly defined officially.

Since the Copenhagen Accord did not yield any new legally binding emission reduction targets for industrialised countries after 2012, so far, the EU climate package is currently the only legally-defined market for CDM projects after 2012. This is why this single policy is, currently, so important for the future of the CDM.

Some questions remain as to the extent to which these measures can boost CDM development in LDCs: Are other Annex I countries going to match this EU initiative, and to what extent? Will the financial and technical barriers for CDM development in LDCs be overcome through these measures? And even if they are, will LDCs be able to match this demand with an adequate supply?

In the following section, in order to try to answer these questions, we present a few possible post-2012 climate policy and carbon demand scenarios, which will be matched with our estimations of carbon credit supply from CDM projects.

4. Post-2012 climate policy and market demand-supply scenarios

In order to assess the effect of possible preferential access for LDCs and other policy scenarios for the future CDM, we create carbon credit demand and supply scenarios with and without an international agreement for the period 2013-2020.

4.1. Demand scenarios

For the demand scenario with no international agreement, we take the announced 20% reduction for the EU, and the greenhouse gas reduction targets announced by other Annex I governments till mid-2009, which are not contingent on an international agreement. For the scenario with an international agreement, we take the 30% target for the EU and tighter targets for other Annex I governments, which we expect could be agreed during the coming negotiations. We build three demand scenarios, as described in Table 2.

Table 2 approximately here

To project the baseline emissions we use figures from the EU climate package described above; European Environmental Agency (EEA) projections for non-EU European countries (EEA, 2005); energy-related CO_2 emissions from the Energy Information Administration (EIA) of the US Department of Energy and extrapolations of UNFCCC inventories for forestry and non-CO_2 emissions for the USA, Canada and Russia (EIA, 2008a; EIA, 2008b; UNFCCC, 2008); projections from the Australian Government (2008) for Australia; and extrapolations of UNFCCC emissions inventories for the years 2000-2005 for other countries (UNFCCC, 2008).

In the EU-27 case, we assume that CERs are required to be supplementary to domestic emissions reductions, as this group has already announced that only 50% of the effort may be covered by emissions credits. For the other countries, we assume that a range between 50% and 100% of the required reductions could be covered through the CDM. We choose, where available (Australia and other European countries), the low emissions path projections, which also account for some domestic mitigation action.

The resulting demand scenarios are shown in Figures 2-4.

Figures 2-4 approximately here

4.2. Supply scenarios

How will CDM project submission develop in the future? As in the past, the start-up of new project types such as supercritical coal power plants, carbon capture and storage (CCS) and forestry could lead to rapid changes in the composition of the inflow. Moreover, the interpretation of additionality by the EB and changes in baseline methodologies can have sudden and massive impacts. Supply would decrease if a project category is suddenly deemed non-additional as happened with cement blending.

Another key influence is the development of post-2012 negotiations, including present Annex B countries pressing for increased mitigation actions by developing countries, and, as outlined above, possible limitations on the import of CERs on the basis of “quality” considerations.

Due to these manifold influences, it is extremely difficult to forecast future CER volumes. Besides the inflow of new project types and projects of types that are already in the CDM pipeline, the key parameters influencing supply are the delay of project implementation, non-validation rate of submitted projects, the rejection rate of validated projects and the performance rate of registered projects. We therefore derive our supply scenarios based on the projected 2020 CERs from UNEP Risoe Centre’s CDM Pipeline as of end of 2008 (UNEP Risoe Centre, 2009), modified in order to account for these parameters. None of the following estimations include the potential supply from Programmes of Activities, since so far there are just five PoAs registered, making projections very uncertain. It should be noted that the resulting projections are based only on extrapolation of the observed amount of projects that have been submitted for validation and registration, accounting for observed trends of submissions and approval rates over time. No economic modelling or equilibrium analysis has been used in deriving the scenarios. Thus, the only way in which we make the demand influence our supply estimations is when we assume some policy-related restrictions to the acceptability of CDM projects.

We use the following formulae to project CER supply volumes:

(1): CERs projected up to 2020 from CDM projects registered until 2012:

$$CER_{sum\,2020} = ((CER_{subm} + \sum_{2008}^{2012} CER_{\inf l,y}) p_{valid} * (1 - p_{rej}) + CER_{reg}) * p_{perf}$$

Where:

CER_{subm} = CER volume by 2020 listed in PDDs of projects submitted up to 2008

$CER_{infl,y}$ = CER volume by 2020 listed in PDDs of projects to be submitted in each year between 2008 and 2012

p_{valid} = probability of validation of projects submitted until 2012

p_{rej} = probability of rejection of validated projects by the CDM EB

CER_{reg} = CER volume by 2020 listed in PDDs of currently registered projects

p_{perf} = CER issuance rate in % of CER_{reg}

We do not include possible delays in this formula because, for projects with a 10-year crediting period starting before 2010, any delay will not change overall CER volumes. Delay only matters for renewed projects with 7-year crediting periods.

(2): CERs projected up to 2020 from projects registered between 2013 and 2020:

$$CER_{add\,2020} = ((\sum_{2013}^{2020} CER_{\inf l,y} * d_{delay,y}) p_{valid} * (1 - p_{rej})) * p_{perf}$$

Where:

$CER_{infl,y}$ = CER volume by 2020 listed in PDDs of projects to be submitted in each year between 2013 and 2020

$d_{delay,\,y}$ = percentage of pre-2021 CERs remaining due to delay of project implementation, for each year, calculated according to equation (3)

p_{valid} = probability of validation of projects submitted

p_{rej} = probability of rejection of validated projects by the CDM EB

p_{perf} = CER issuance rate in % of CER_{reg}

The data for CER_{subm}, $CER_{infl,y}$ and CER_{reg}. have been obtained from the UNEP Risoe Pipeline (2009), and result from the projections by the project developers of how many emission reduction credits they expect to obtain until the year 2020. The figures for $CER_{infl,y}$ have been adjusted to account for the shorter crediting period up to 2020 that projects being submitted in the future will have. For the probability of validation of projects we assume, for a business-as-usual case, 70%. Rejection rates have increased over time, from less than 2% in 2005 to 10% in 2007 and early 2008 (UNEP Risoe Centre, 2009). We thus take 10% as input for our business-as-usual projection of CDM supply in 2013-2020. Average CER issuance performance is set at 98% of predicted CER generation as achieved in the past. We use this figure for the CER issuance rate in the business-as-usual case. However, issuance performance varies greatly across project types, so that the median performance is only 82%. We use this median for modelling stricter CDM supply scenarios.

Delays in project development lead to loss of CERs before a certain date (2012 or 2020), even if not all of them lead to an overall loss of CERs if the CDM continues afterwards[6]. The effect of this delay on estimated CER volumes depends on a specific project's remaining crediting period and would thus theoretically have to be summed up case by case. This also applies to those registered projects whose crediting period only starts in the future. Therefore, the impact of delays depends on the shape of the CER inflow over time. Assuming that the crediting period of all projects coming in during a year would on average begin in the middle of this year, the discount of CERs due to delay can be quantified in the following functional form:

(3): Project delay function:

$$d_{delay,year} = \frac{duration_{pre-2021} - delay}{duration_{pre-2021}}$$

Where:

$d_{delay,year}$ = share of pre-2021 CERs in terms of projected CER level for projects submitted during this year remaining due to delay of project implementation

$duration_{pre\text{-}2021}$ = number of months between July of year until end of December 2020

delay = delay of project implementation (months)

We assume, for all projects, that the delay in project implementation averages 6 months.

Using the formulas and parameters described above, we generate seven CER supply scenarios for the period 2013-2020. In a very strict scenario (Scenario A), only the credits generated from projects registered up to 2012 would be accepted in the global carbon market. In a status quo scenario (B), the CDM would continue with the same rules, stringency, range of host countries and project types as today, continuing to increase credit supply beyond 2012. Following a “high quality CERs” demand policy by the EU, Annex I countries could agree to no longer accept credits from industrial gas projects (Scenario C). Annex I countries could agree to only accept CERs from LDCs for projects registered after 2012 (Scenario D). Additional measures to create appropriate incentives that promote CDM development in LDCs, added to the rule depicted in Scenario D, would form an active LDC-promotion scenario (Scenario D2). Stronger pressure by developing countries to accept REDD (reduced emissions from deforestation and degradation) and CCS projects and clarify rules for programmatic CDM could lead to a larger CDM supply (Scenario E). Finally, a stricter “high quality” scenario would allow CERs from post-2012 projects with stricter additionality considerations and again without industrial gas projects (Scenario F).

Table 3 provides an overview of these scenarios, their assumptions and calculations. In all cases, we deduct the CER demand projected for 2008-2012, which we have previously estimated will total 3300 $MtCO_2eq$ (Michaelowa, 2008), from the overall CER supply for 2008-2020. Based on the current geographical distribution of CDM projects, we estimate supply from the following five regions: LDCs, Latin America, Europe and Middle East, Asia-Pacific other, and Africa other. For scenario D2, to account for the extra inflow of CDM projects from LDCs resulting from active CDM promotion in these countries, we take 50% of the theoretical potential estimated by a World Bank Study for LDCs in Sub-Saharan Africa (De Gouvello et al., 2008) and add it to the CERs projected from the CDM pipeline. The results of our projections are shown in Table 4.

Table 3 approximately here

Table 4 approximately here

5. Estimating quantitative impact of scenarios on CER demand from LDCs

5.1. Supply-demand balance

The combination of our CER supply and demand scenarios is shown in Table 5. In this analysis we have disregarded the potential supply from JI projects. We do this because this instrument suffers from delays in host country approval, and because it also constitutes mitigation effort in Annex I countries.

Table 5 approximately here

These figures show that the balance between supply and demand of CERs depends largely on whether there is an international agreement (resulting in larger demand) and on whether the CER contribution to abatement in Annex I countries is capped or not (supplementarity). Without an agreement and with a cap to the use of CERs of 50% of the mitigation effort in all Annex I countries, CER oversupply is very likely. With an agreement, it is very likely that the CDM would not provide sufficient credits to cover the potential demand during 2013-2020, even with 50% supplementarity. The scenario with the financial crisis – which also assumes an international agreement is reached –has similar results to the scenario with agreement.

It should be noted that several of these combinations are unlikely. Under a scenario with no agreement, for example, it is unlikely that the CDM will be significantly enlarged, as Annex I countries will not be willing to finance further projects in developing countries. It is also unlikely that having not reached an agreement on climate change mitigation, all Annex I countries would then agree to only accept high quality CERs. However, some parties or groups (such as the EU) could decide to implement these limitations unilaterally. Thus, while not completely realistic, the combination of scenarios shows an overall picture of the range of possible balances in the future carbon credit market from the most optimistic to the most pessimistic possibilities.

Figure 5 illustrates how the supply would be spread across regions and shows that under most scenarios, LDCs remain unimportant in the market.

Figure 5 approximately here

We expected that the scenarios without industrial gases, with strict rules, or with CERs only from LDCs after 2012 would have an impact on supply from LDCs. However, industrial gases are decreasing in the CDM pipeline, falling from close to half in 2004-2005 to just 4% of the new CER supply in 2008. Our projections for 2013-2020 reflect these trends and the fact that the current CDM rules do not allow new installations with industrial gas emissions to host CDM projects. Only if this rule is relaxed, the supply of CERs from industrial gas reduction projects would very likely increase again (see endnote 5). The scenario with strict rules is similar. Finally, the scenario with preferential access and incentives that promote CDM development in LDCs after 2012 does show some improvement for these countries, but the supply from all other countries up to 2012 is still much larger. We should also remember that this supply from LDCs will only materialise if the existing barriers for CDM project implementation in these countries are overcome, as seen when comparing scenarios D and D2. The promotion of PoAs with high sustainability impacts could provide an opportunity for this. This promotion could be done through the provision of technical support for coordination entities that set up such programmes, and through the financing of their upfront costs (PDD development, methodology development, registration and validation, and coordination of first participating project activities).

5.2. Potential sustainable development benefits from CDM projects and PoAs in LDCs

If we apply Olsen and Fenhann's (2008) SD taxonomy to the CDM project types most frequently seen in LDCs, we see that these projects potentially have relatively high SD contributions: four of the five most frequent project types have on average 3 to 3.5 clearly identified SD benefits per project; with only biomass energy projects having less than 3 SD benefits per project[7]. While the benefits from hydro and biomass projects are distributed in the social and economic areas, those from reforestation stem mostly from the environmental area, and those from biogas and landfill gas projects come mostly from both environmental and social improvements (see Figure 6).

Figure 6 approximately here

The project types used in PoAs are mainly very small, dispersed technologies, as foreseen by the regulators. Agricultural waste and household energy efficiency projects (compact fluorescent lamps and stoves) dominate, followed by solar water heaters and photovoltaics which according to Olsen and Fenhann 2008) are among the CDM project types with the highest SD benefit potential (see Figure 7). Most PoAs (88%) are small-scale. Most technologies are likely to have substantial social benefits.

Figure 7 approximately here

Generally, PoAs have a high “leverage”, i.e. if they are successful, they can expand quickly without any further delays in the CDM project cycle. For example, an Indian PoA aims at distributing 400 million compact fluorescent lamps (CFLs). However, drawing on our knowledge of CFL projects, we estimate the total volume of lamps distributed by the end of 2012 by the three PoAs in the pipeline at 90 million. For stove PoAs, the total volume could reach 3.5 million stoves by that time. 1.7 million domestic biogas plants and 1350 swine farm digesters could become operational before 2013, which would be in the same order of magnitude as the most successful development assistance projects covering these technologies.

While PoAs still have to show that they actually generate the large reductions they foresee, they could allow LDCs to harness an eventual preferential access to the CDM market. A clear indicator is that some private sector companies like JP Morgan and C Quest Capital are entering the PoA market in countries that would never be appealing for such companies in a "normal" business context. Thus, eventually, the development target of the CDM and the aim to generate cheap CERs could be reconciled.

6. Discussion of preferential access options

In the world trade system, there is a case that could be used to illustrate the effect of preferential access options for a specific group of countries. The Lomé Convention, first signed in 1975 and renewed three times afterwards, is a trade and aid agreement between the European Community (EC) and 71 so-called ACP (African, Caribbean and Pacific) countries. It establishes the basis for trade and development cooperation between these two groups of countries, motivated both by Europe's interest in guaranteeing the supply of raw materials, and by their wish to support ACP countries' sustained development. The Lomé agreements set preferential access quotas for agreed agricultural products that could then enter the EC market free of duty. While these agreements are no longer in place due to their incompatibility with World Trade Organisation (WTO) rules, they are still an interesting case study for illustrating the limitations of preferential access policies.

According to Cosgrove (1994), ACP exports to Europe accounted for 3.4% of total EC imports in 1975, when the first Lomé Convention was signed. Due to the large growth in EC trade, ACP exports declined to 1.5% of EC imports in 1992. While ACP exports to the EC did grow, they could not keep pace with the growth in the European market. Cosgrove concludes that the Lomé Convention did not provide sufficient support to enable ACP countries to keep their market share, and that it therefore failed in its goals.

The preferences generated by Lomé for ACP exports were highly dependent on the barriers that the EC placed for trade in general. For agricultural products, the general rule is that the more processed the product is, the more barriers it faces. Thus, ACP countries would have benefited most from adding value to their raw materials and exporting them to Europe in processed form. Trade also depends on the current prices of commodities. During the 1980s and 90s, the prices of agricultural products mainly fell, which also had a negative impact on ACP trade. Finally, the increase in trade from the preferred country group also depends on the elasticity of demand for the product. The elasticity of demand for most ACP products in Europe is low, meaning that a lower price for them (offered by ACP countries) has little effect on their export volume (Cosgrove, 1994).

Some non-traditional products have been identified as benefiting from the Lomé Convention, among them canned tuna, leather and leather products, fresh flowers, some vegetables, textiles and garments. Many of these products were subject to levies from the European common agricultural policy (CAP), and thus profited from a comparative advantage under Lomé. In Mauritius, the strong specialization in sugar exports to the EC enabled the accumulation of funds that were used to shift the economy towards the textile industry, tourism and financial services (Laaksonen et al., 2007). Despite these successes, the main barriers inhibiting ACP export performance could not be overcome by a trade agreement: climatic conditions (droughts and desertification), crop and livestock diseases, lack of infrastructure leading to high transportation and communication costs, oil price increases, and AIDS continued to restrict the development and integration of ACP countries in the world market (Cosgrove, 1994).

The Lomé experience provides lessons for the climate regime. Through Lomé, not just access to a market was secured, but that access came with fewer costs (no tariffs or levies). In the climate regime, CDM projects from LDC countries benefit from a zero registration fee. However, registration is only a small fraction of CDM transaction costs, whose bulk encompasses PDD development, methodology development (if needed) and validation. Providing upfront financing for PDD development and validation in countries with little CDM development has been agreed on, but funds are limited. If similar financing, for example, for the coordination of PoAs with high SD benefits could be provided, not only could the CDM potential of LDCs be realised, but also a better contribution to local development could be made. It would be important, however, to keep these incentives targeted specifically at LDCs.

In the EU climate package, some degree of preferential access for CDM projects from LDCs has been secured, but no provisions are yet in place for further supporting the implementation of these projects. As seen in the Lomé experience, the underlying causes of poor countries' lack of competitiveness need to be addressed.

Furthermore, in Lomé, success was observed for special types of products with added value. A parallel could be made here to CDM project types with added value (sustainable development benefits or stricter additionality, for example), but only if this added value is transformed into some kind of financial incentive that supports these projects. This kind of differentiation between project types is not yet in place in the climate regime. PoAs could constitute an opportunity in this context. These programmes seem to have a stronger focus on small-scale projects with higher SD benefits than individual CDM projects, and so far represent a higher share in LDCs. Thus, special quotas or special treatment for PoAs could be an opportunity to introduce such a differentiation, without explicitly differentiating between project types or host countries.

A further issue is the source of financing for such preferences. In the Lomé conventions, the EU was a relatively homogeneous group of countries that could agree on securing financing for the trade and aid components of the agreements. In the climate regime, while the Copenhagen Accord led to a generic pledge by industrialised countries to finance mitigation and adaptation in developing countries, the modalities for this finance are still unclear (see Roberts et al., 2010 for a discussion on open questions about the finance promise, and WRI, 2010 for a summary of the financial pledges with comments on whether they are new and additional).

The discussion of compatibility with the international trade regime is a final lesson that can be learned from the Lomé experience. While it is not clear whether the CERs deriving from CDM projects can be considered as "goods" or "services" that are regulated under the WTO, analysts suggests that, in this case, preferential treatment towards CERs from specific origin could be deemed non-WTO conform. Thus, authors discussing the interface between the

Kyoto Protocol and the WTO suggest that caution should be taken to avoid potential disputes between both regimes – for instance through clear definition of the nature of emission reduction credits (for detailed discussions see Kim, 2000; Wiser, 2000; and, more recently, Howse and Eliason, 2009).

7. Conclusions

The current and potential supply of CDM projects from Least Developed Countries is low as many barriers prevent their participation in the carbon market. However, the case of Honduras shows that with limited international financial sources, local entrepreneurship and leadership can bring successes in the CDM when coupled with external aid to set up appropriate institutions. LDCs have a much higher share in CDM Programmes of Activities (PoAs) than in individual CDM projects. According to a taxonomy of SD contributions from CDM projects that includes social, environmental, economic and other benefits, the project types dominating in LDCs and especially the PoAs yield potentially high SD benefits.

Both in the international climate negotiations and by the EU, options have been proposed for fostering CDM development in LDCs. While the financial incentives agreed internationally are available for all countries hosting less than 10 CDM projects, preferential access to part of the European carbon market is granted to CERs from LDCs through the new EU climate and energy package.

By projecting possible CER supply and demand scenarios for the period 2013-2020, we find that the supply-demand balance largely depends on the level of ambition of Annex I countries' targets and on the degree of supplementarity on the use of CERs for meeting them. A restriction on the supply of CERs from CDM projects registered after 2012 to just LDCs would not have an important impact if the existing barriers for project implementation in these countries are not overcome and the current trends in project submission from these countries are maintained. Other likely limitations in CER supply on the basis of project quality would have an even smaller effect on CDM project distribution across host countries. Given the little abatement potential available in LDCs this is not surprising, and raises questions on the appropriateness of offsetts for fostering mitigation in less developed countries. Perhaps other approaches, such as Nationally Appropriate Mitigation Actions, which would be financed through international cooperation, are more promising.

Drawing a comparison between preferential access agreements in the agricultural trade system (Lomé Conventions) and the climate regime, we find further evidence that not just preferential access is important, but also reduced access costs. The current registration fee exemption for LDCs represents only a small fraction of CDM transaction costs and is probably not enough. The now agreed loan for PDD development and validation of CDM projects will be applicable to all countries with less than 10 CDM projects, diluting the benefit for LDCs. An opportunity could arise if similar financing could be provided for PoAs, which have a much higher share in LDCs. Furthermore, the limited impact of the Lomé agreements on ACP trade was partly due to the fact that the underlying causes of lack of competitiveness were not addressed. In the climate regime, if CDM implementation barriers are not directly addressed, the CDM might remain a dream for poor countries. Increased incentives for products with added value led to the few success stories in the Lomé framework. For the climate regime, this could be translated into added financial incentives for CDM projects with added value – however this may be interpreted. Again, PoAs could constitute an opportunity here, as they so far seem to focus on project types with higher SD benefits. Finally, financing was identified as a critical issue for undertaking these measures: if financial incentives for special projects or specific regions are to be created, clear rules for their provision and distribution will need to be reached and enforced.

8. Notes

1: Programmes of Activities are a modality of CDM projects, which allows for bundling similar activities taking place in different locations into one single project. Their aim is to simplify access to the CDM to emission reduction activities that are dispersed in nature and can begin in different points in time, such as the distribution of efficient cooking stoves, or the installation of micro hydro power stations.

2. Poverty or lack of infrastructure reduces the demand for energy services in poor countries: energy use would be higher if people could afford it or the infrastructure was in place. Depending on whether this suppressed demand is taken into account or not, baselines for CDM projects may change significantly (for a discussion of the issue see Winkler and Thorne, 2002).

3: Grid emission factors are used in the CDM to estimate the GHG emissions from the production of electricity in each land or region, in order to calculate how much abatement a project in the electricity sector generates. The calculation of grid emission factors requires data from all installations producing electricity in the respective land or region, which poses a barrier especially in LDCs.

4: Austria, Belgium, Cyprus, Denmark, Finland, Ireland, Italy, Luxembourg, Portugal, Slovenia, Spain, Sweden.

5: These projects reduce the emission of gases with very high global warming potential from industrial facilities – notably the emissions of HFC-23 from the production of refrigerants. Despite the clear additionality of these projects (in the absence of related legislation, there is no incentive other than the CDM revenue to implement the projects), they have been criticised because the CDM revenue largely exceeds the cost of reducing the emissions and can even exceed the value of the refrigerant production (Wara, 2006). The CDM may thus provide the perverse incentive of increasing production in order to receive more revenues. In the last few months, new criticism has arisen due to apparent flaws in the baseline methodology for these projects, which would allow such perverse incentives to subsist (CDM Methodologies Panel, 2010; Schneider et al., 2010).

6: If a project suffers a delay in its registration when its operations have already started, it will lose the CERs for the emission reductions achieved before the date of registration. As project developers can change the start date of a project's crediting period once after registration by simple communication to the CDM Executive Board, a delay of implementation for an already registered project does not lead to an overall loss of CERs during the crediting period, but to a loss compared to the quantity estimated to accrue by a specific date.

7: As a comparison, among the projects analysed by Olsen and Fenhann (2008), N_2O projects have the least SD benefits (one benefit/project on average), and energy distribution projects have the most (5.5 benefits/project), followed by energy efficiency in households (4 benefits/project).

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Tables:

Table 1: Potential credit demand from the EU for the period 2013-2020

Source	20% reduction (Mt CO_2eq)	30% reduction (with international agreement) (Mt CO_2eq)
EU ETS	954	1824
Non-trading sectors	750	1300
TOTAL	**1704**	**3124**

Table 2: Carbon credit demand scenarios 2013-2020: assumed emission reduction targets

Country / Group	Scenario 1: No agreement	Scenario 2: International agreement	Scenario 3: Financial crisis
EU-27	20% below 1990, credit import up to 50% of reduction effort	30% below 1990, credit import up to 50% of reduction effort	Same as in Scenario 2, but baseline emissions during first two years are 3% less than in the base case
US	Back to 1990 emission levels	10% below 1990 levels	
Canada	Back to 1990 emission levels	10% below 1990 levels	
Japan	10% below 1990 levels	20% below 1990 levels	
Australia	5% below 2000 levels	15% below 2000 levels	
Russia	20% below 1990 levels	30% below 1990 levels	
Belarus and Ukraine	20% below 1990 levels	30% below 1990 levels	
Other Annex I	20% below 1990 levels (including Turkey with 5% below 2012 levels)	30% below 1990 levels (including Turkey with 10% below 2012 levels)	

Note: During the Copenhagen meeting and in the Copenhagen Accords, some of these pledges were restructured or strengthened. However, the new pledges are non-binding and most of them are also conditional on, for example, a legally-binding agreement. Thus, the reduction levels we assume here are still realistic.

Table 3: CER supply scenarios 2013-2020: assumptions

Scenario	Description	Values for parameters
A Only CERs up to 2012	Only CERs generated from projects registered up to 2012 are considered for supply up to 2020	p_{valid} = 70% p_{rej} = 10% p_{perf} = 98% $supply = CER_{sum2020} - demand_{2008\text{-}12}$
B CDM same	CDM continues with same rules, same stringency and same countries	p_{valid} = 70% p_{rej} = 10% p_{perf} = 98% $supply = CER_{sum2020} + CER_{add2020} - demand_{2008\text{-}12}$
C No new industrial gases	CDM continues with same stringency and countries after 2012, but without industrial gas projects	p_{valid} = 70% p_{rej} = 10% p_{perf} = 98% $supply = CER_{sum2020} + CER_{add2020\ (w/o\ ind\ gases)} - demand_{2008\text{-}12}$
D After 2012 only LDCs	For projects registered after 2012, only CERs from LDCs are accepted	p_{valid} = 70% p_{rej} = 10% p_{perf} = 98% $supply = CER_{sum2020} + CER_{add2020\ (only\ LDCs)} - demand_{2008\text{-}12}$
D2 After 2012 only LDCs with active promotion	For projects registered after 2012, only CERs from LDCs are accepted. Measures to incentivise this supply are in place	p_{valid} = 70% p_{rej} = 10% p_{perf} = 98% $supply = CER_{sum2020} + CER_{add2020\ (only\ LDCs)} + CER_{LDC\ additional} - demand_{2008\text{-}12}$
E CDM enlarged	CER generation between 2013 and 2020 with 50% higher potential each year	p_{valid} = 70% p_{rej} = 10% p_{perf} = 98% CER_{infl} is multiplied by 150% $supply = CER_{sum2020} + CER_{add2020} - demand_{2008\text{-}12}$
F CDM strict rules	From 2013 onwards stricter additionality, no industrial gases: less validations, more rejections, smaller CER issuance rate	Up to 2012: p_{valid} = 70%, p_{rej} = 10%, p_{perf} = 98% After 2012: p_{valid} = 50%, p_{rej} = 15%, p_{perf} = 82% $supply = CER_{sum2020} + CER_{add2020\ (w/o\ ind\ gases)} - demand_{2008\text{-}12}$

Table 4: Carbon credit supply scenarios 2013-2020:

Projected supply from CDM projects ($MtCO_2eq$)

	A	B	C	D	D2	E	F
Scenario / Region	**Only CERS up to 2012**	**CDM same**	**No new industrial gases**	**Only LDCs after 2012**	**Only LDCs after 2012, with promotion**	**CDM enlarged**	**CDM strict rules**
Africa other	132	171	189	132	132	190	164
Asia-Pacific other	5108	6884	6808	5108	5108	7773	6060
Europe and Middle East	25	35	38	25	25	40	32
Latin America	780	1026	1007	780	780	1150	907
LDCs	55	73	93	73	662	82	76
Total supply 2012-2020 ($MtCO_2eq$)	94	128	118	94	94	145	108

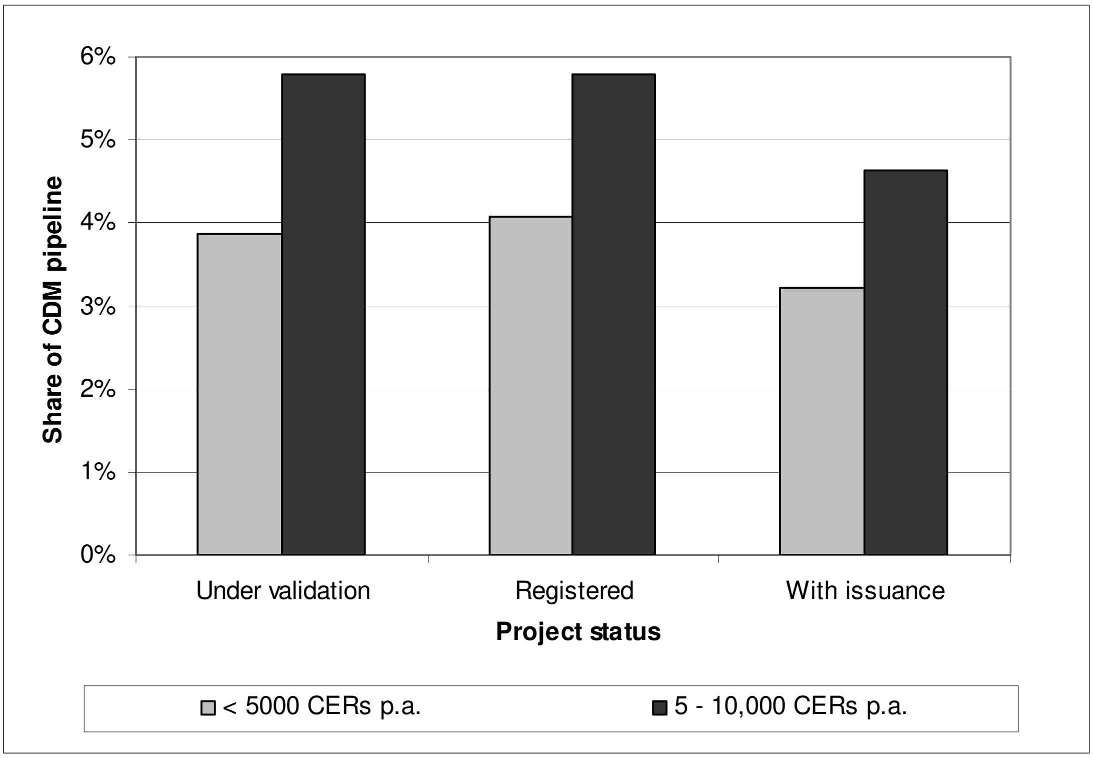
Table 5: CER supply-demand balance for 2013-2020 ($MtCO_2eq$)

Scenario		1 No agreement	2 International agreement	3 Financial crisis
A	Only CERs up to 2012	-2699 – 1107	2461 – 8112	2035 – 7347
B	CDM same	-4822 – -1016	337 – 5989	-89 – 5223
C	No new industrial gases	-4758 – -952	402 – 6053	-24 – 5287
D	Only LDCs after 2012	-2717 – 1089	2443 – 8094	2017 – 7328
D2	Only LDCs after 2012, with promotion	-3306 – 500	1854 – 7505	1428 – 6739
E	CDM enlarged	-5884 – -2078	-725 – 4927	-1150 – 4161
F	CDM strict rules	-3852 – -46	1307 – 6959	881 – 6193

Note: The ranges indicate the different supplementarity assumptions, from 50% supplementarity, to freedom to use the CDM for offsetting as much as desired. Negative figures indicate excessive CER supply.

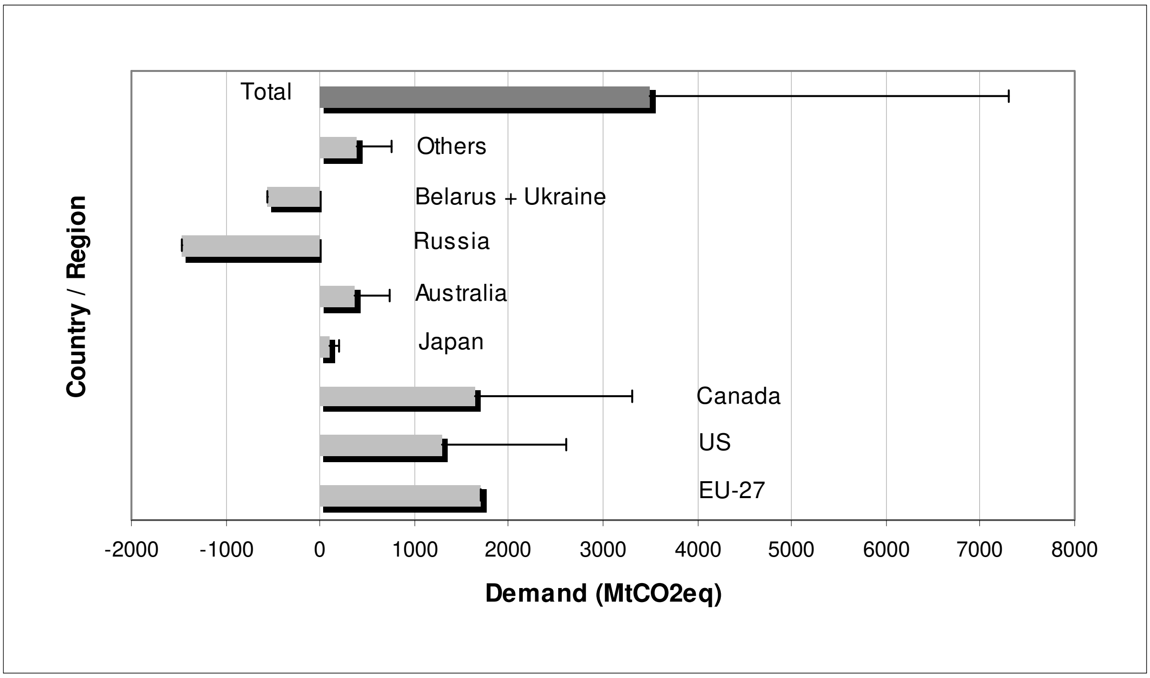
Figures:

Figure 1: Share of very small projects in CDM pipeline (%)



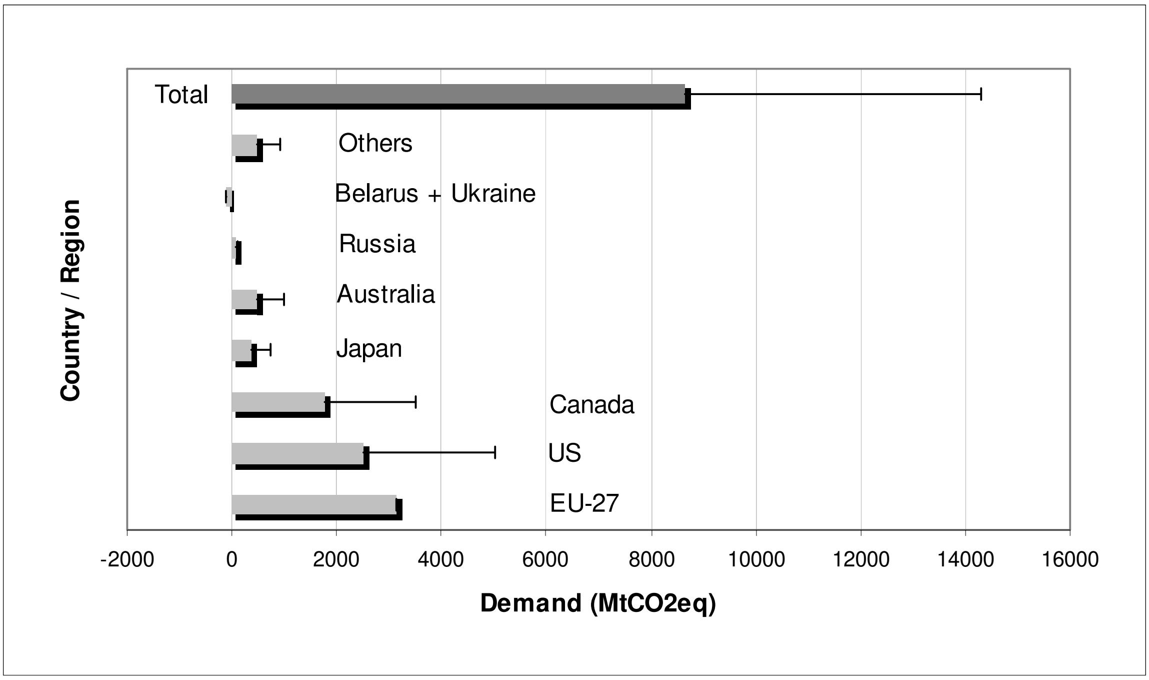
Source: UNEP Risoe Centre, 2010.

Figure 2: Carbon credit demand 2013-2020 for the "no agreement" scenario



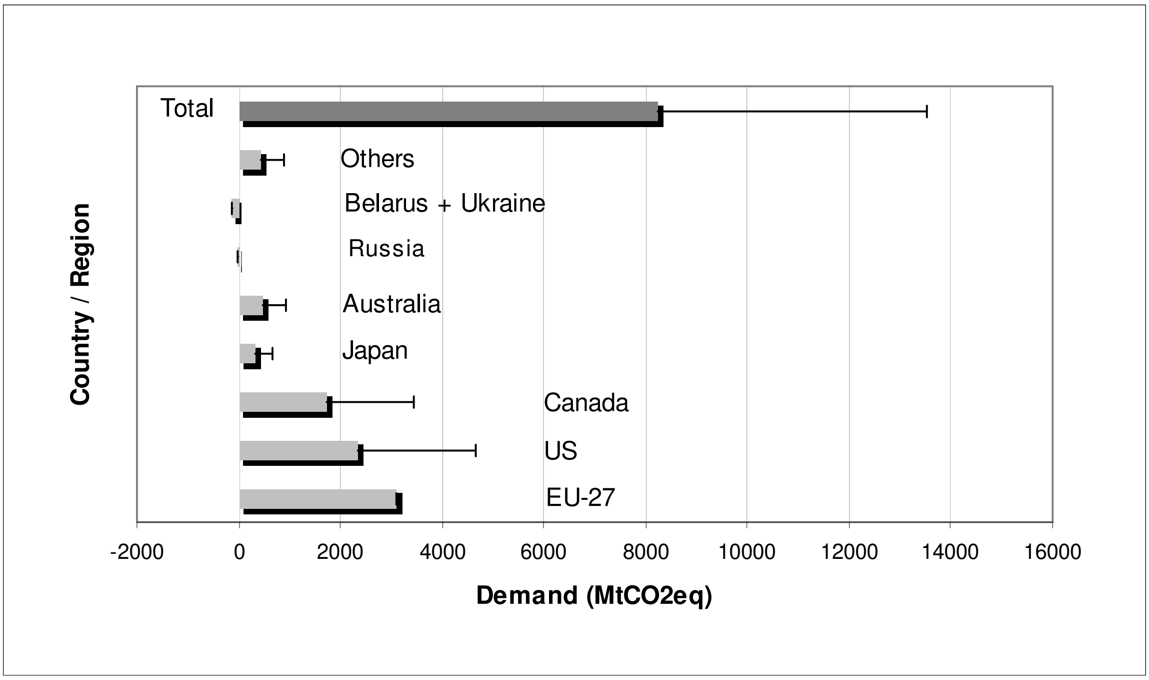
Note: The main bars indicate demand when countries are only allowed to cover up to 50% of their emission reductions through the use of CDM credits; the error bars show demand when there is freedom to use the CDM for offsetting as much as desired.

Figure 3: Carbon credit demand 2013-2020 for the "international agreement" scenario



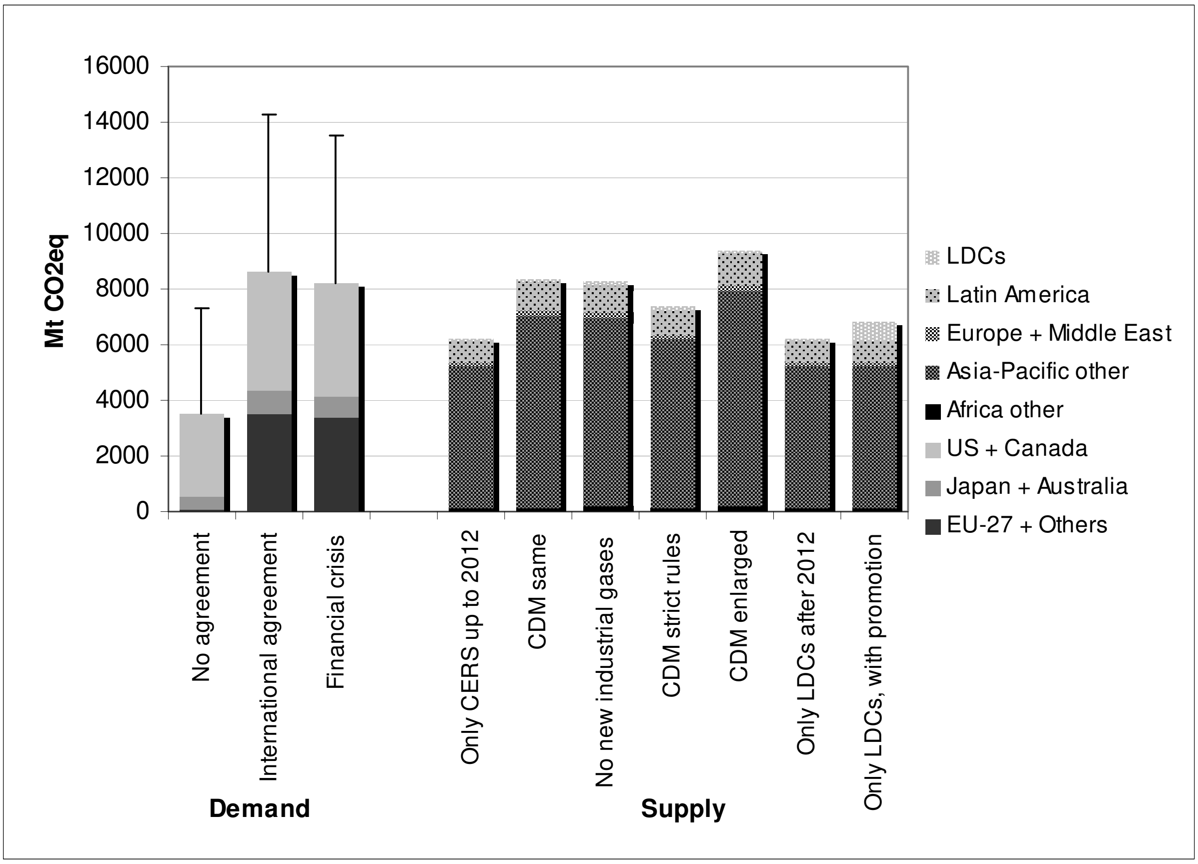
Note: The main bars indicate demand when countries are only allowed to cover up to 50% of their emission reductions through the use of CDM credits; the error bars show demand when there is freedom to use the CDM for offsetting as much as desired.

Figure 4: Carbon credit demand 2013-2020 for the "financial crisis" scenario



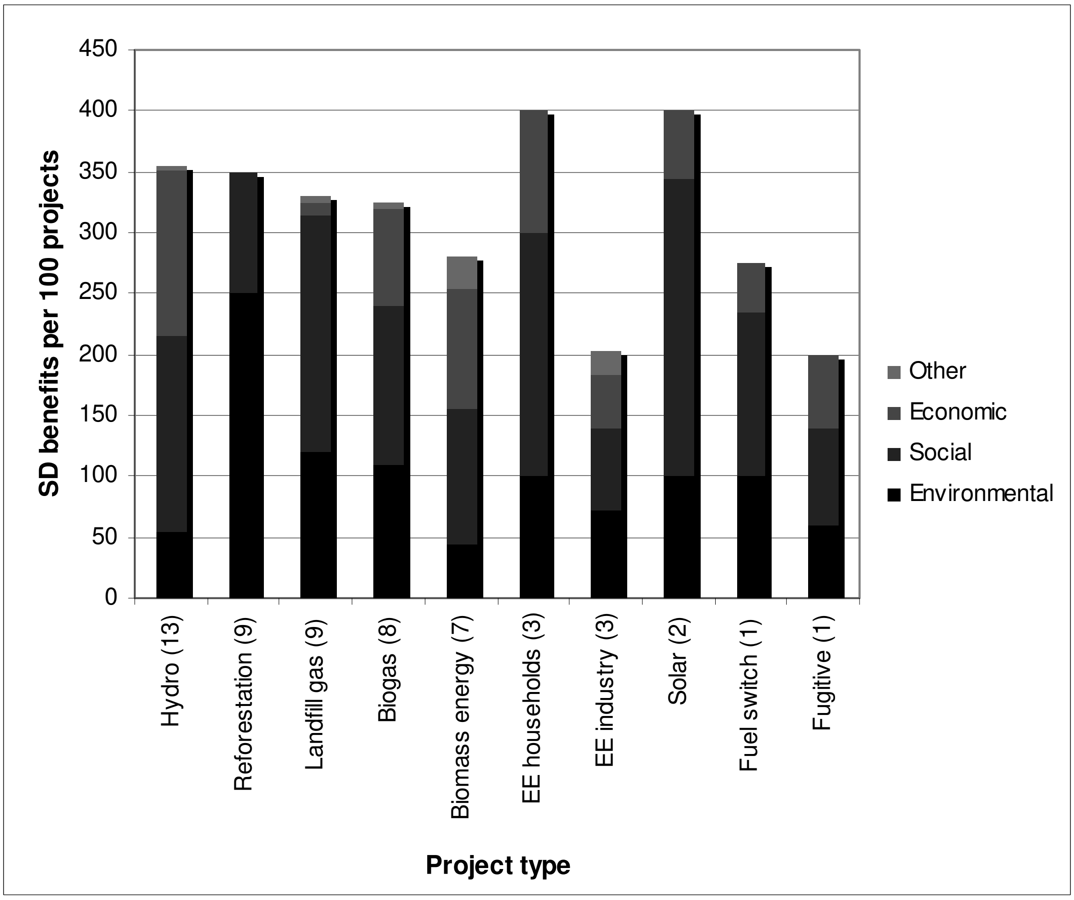
Note: The main bars indicate demand when countries are only allowed to cover up to 50% of their emission reductions through the use of CDM credits; the error bars show demand when there is freedom to use the CDM for offsetting as much as desired.

Figure 5: Supply-demand balance 2013-2020



Note: For the demand, the main columns indicate the situation when countries are only allowed to cover up to 50% of their emission reductions through CDM credits; the error bars show demand when there is freedom to use the CDM for offsetting as much as desired.

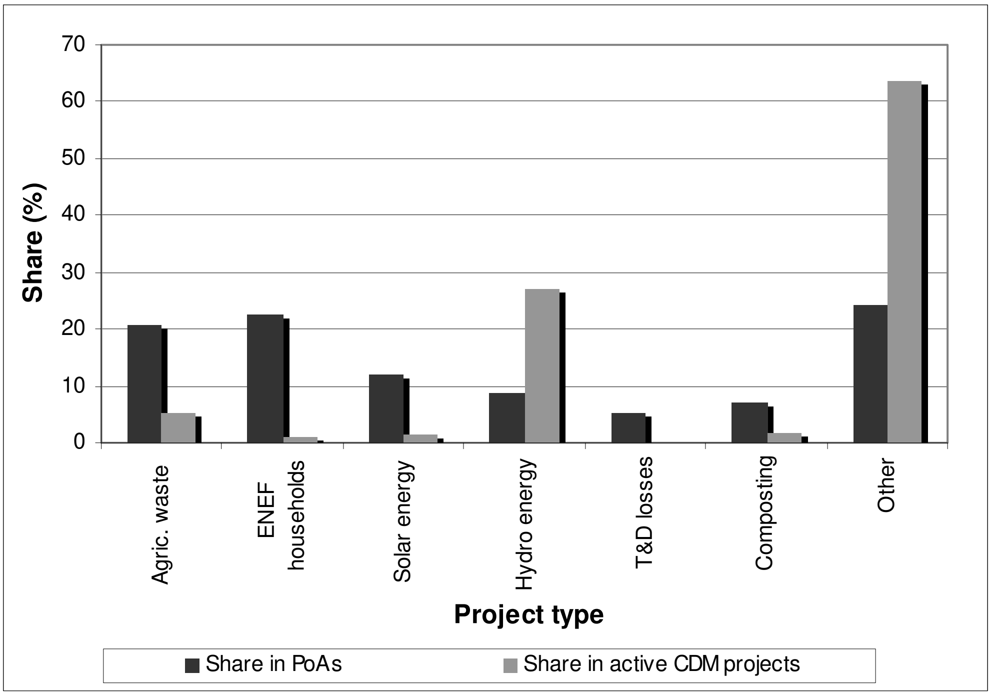
Figure 6: SD profiles of the CDM project types observed in LDCs



Note: Figures in parentheses show the number of such projects in the CDM pipeline of LDCs as of October 2010. Afforestation and energy efficiency of own generation projects are not included, as these project types were not evaluated in Olsen and Fenhann (2008).

Sources: Olsen and Fenhann, 2008; UNEP Risoe Center, 2010.

Figure 7: Project type shares in PoAs and active CDM projects (%)



Note: ENEF = energy efficiency; T&D = transmission and distribution.

Source: UNEP Risoe Center, 2010.