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A Comparative Examination of International Carbon Trading Mechanisms

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Introduction

Climate Change: a Global Threat and a Global Responsibility

Since the Industrial Revolution, increased emissions, deforestation, and other environmental degradations resulting from human activity have caused carbon dioxide and other pollutants to accumulate in the atmosphere. This accumulation has changed the composition of the atmosphere altering the earth's carbon cycle. The accumulated carbon and other pollutants, collectively known as greenhouse gasses, trap infrared radiation (heat energy) causing the planet to warm up in a phenomena known as global warming. Over the past 50 years the average global temperature has increased at the fastest rate in recorded history, making 2014 and 2015 the hottest years on the historical record[1]. Research and climate modelling by the Hadley Center and numerous other research centers definitively indicates that the global rise in average temperature is the direct result of human activity not natural climate cycles. If no action to counter this trend is taken, the concentration of greenhouse gasses could become double that of pre-industrial levels, and temperatures could rise by as much as 5°C by 2050[2]. In addition to an increase in global temperature, climate change could also affect regional precipitation variability, sea levels and increase the frequency of extreme weather events. These climatic impacts pose serious threats food production, access to water, human and ecological health, and economic development

[1] Gillis, Justin. "2015 Likely to Be Hottest Year Ever Recorded." The New York Times. October 21, 2015.
[2] Stern, Nicholas. "The Stern Review on the Economic Effects of Climate Change." *Population and Development Review* 32, no. 4 (December 01, 2006)., vi

Global warming is an international issue with broad effects but, it is important to note that the effects of global warming will not be experienced equally by all nations. Developing countries will suffer the most from climate change even though, historically, these countries have contributed the least to carbon emissions. Already located in the warmest regions of the earth where rainfall is the most variable, developing countries' weather patterns will be the most profoundly impacted by global warming. This is particularly harmful to developing countries because developing economies are the least diversified and the most heavily reliant on the climate-sensitive industries namely, agriculture, fishing, and tourism[3]. In a report prepared for the Pew Center on Global Climate Change, Ian Burton of the University of Toronto estimated that between 1984 and 2003 the costs of global warming in developing countries were three times higher than in higher income countries[4]. Compounding the problem, these most vulnerable countries also possess the least means of adapting to the effects of global warming. Developing countries tend to lack the institutions, the funds, and the technology to properly implement mitigation and adaptation programs or adjust their economies to face the worst effects of climate change.

Given the unfair cost burden climate change places on developing countries, it is reasonable that much of the burden of mitigation rests on the shoulders of developed countries. The "polluter pays" principle of responsibility and social justice insists that developed countries must account for their historical roles as the greatest polluters. This does not mean, however, that all climate change mitigation actions must take place within

[3] Stern, vii
[4] Burton, 3

developed countries. Due to rapid economic growth, a lack of clean, fuel-efficient technology, and increased venturing into carbon intensive industries, developed countries' levels of greenhouse gas emissions are increasing rapidly. The *World Energy Outlook* projects that by 2030 developing countries will account for over three-quarters of the projected increase in greenhouse emissions[5]. It is therefore imperative that emission reductions take place across all quarters of the globe. Developed countries have the opportunity to offer financing options to lower income nations to support mitigation efforts. Fortunately, the lower mitigation costs in developing countries tend to be less than in developed countries that have already adopted the easiest, most cost-effective mitigation measures. Significant reductions in greenhouse gas emissions can be achieved relatively inexpensively by targeting the cheapest, most easily implementable options first.

Carbon Trading: an Integral Part of the Climate Change Solution

Having established the urgent necessity of coordinated global action against climate change, the pertinent question facing the international community is: what mitigation measures should be adopted and how? Many different approaches for climate change mitigation exist but, one of the most interesting potential methods is carbon trading, through either cap and trade schemes or offsetting programs. In general, a cap and trade scenario works by setting a "cap" on the level of emissions an actor is allowed to emit, and issue pollution permits to each actor allowing them to pollute only certain amount. The actor can either 1) pollute less than their allotted amount of emissions, in

[5] Stern, 176

which case they can sell their emissions credits to other actors or 2) be unable to meet the emissions requirements and have to purchase emissions credits from a source polluting below the allotted quota. Offsetting programs allow actors to purchase emissions credits by financing emission reduction projects in areas outside of the capped zone, often in developing countries. In either system, firms can make their own decisions on how much pollution is worth to them. A firm with high costs of abatement might choose to continue polluting but purchase emission credits from another firm or finance an emissions reduction project in another country. As long as the emission credits purchased truly reflect an accurate account of verified emission reductions, then the total number of global emissions goes down and the emission cap is met at less cost. With emission prices determined by market forces, rather than artificially selected (like in the case of a carbon tax), the resulting carbon market equilibrium should represent the socially optimum level of pollution.

While the theory behind carbon trading is sound, actually implementing trading programs and developing the necessary infrastructure is extremely challenging. Since the theory behind property rights-based emission trading was first articulated in the 1960s, numerous emission trading systems have been developed on international, national, and local levels. This paper will examine some of the more prominent emission trading mechanisms and evaluate their effectiveness based on a range of criteria.

Evaluation Criteria

On the surface carbon trading schemes seem like the perfect solution to the global climate change problem. Actors are free to make their own decisions about how to

pursue emission abatement and are therefore free to choose the option that makes the most financial sense for their firms. The multitude of carbon trading programs, however, present firms with numerous avenues to pursue emission reductions. Each program has a different way of approaching carbon trading and emission credits and it is difficult to determine which program presents the most efficient pathway toward total emission reduction. It is imperative that programs be objectively evaluated and compared in order to determine which program presents the best, most efficient methods of reducing greenhouse gas emissions. In theory the most efficient carbon trading system would be the one that achieves the most greenhouse gas emissions reductions at the least cost. A benefit cost analysis could be run to determine the quantitative value of the emission reductions achieved by the program less the program costs and the program with the greatest benefit to cost ratio would stand on top. This simple concept is complicated, however, by the diverse nature of costs and benefits that accumulate as a result of each trading mechanism. In order to achieve a comprehensive evaluation of each trading mechanism, this thesis will assess each program on the basis of the following criteria:

1. Environmental costs and benefits

   Judging carbon trading mechanisms by their environmental benefits seems obvious given their missions of achieving a certain amount of emission reductions. A clear method of judging carbon trading mechanisms is determining the amount of confirmed emission reductions resulting from the program, assigning a quantitative value to the reduced emissions, and comparing that value to the associated costs. Less obvious criteria for evaluation are the positive and negative externalities that occur as a result of these programs. For example, one type of project eligible for

emission credits in several of the carbon trading mechanisms is financing the creation of a carbon sink by planting trees in an area affected by deforestation. If the project well researched and properly executed, numerous side benefits can accrue to the forest ecosystem. The newly planted forest could, in addition to absorbing carbon dioxide, provide a habitat to animals whose homes were endangered by deforestation and land use. It is possible, however, for poorly thought-out projects to cause environmental harm. For example, if reforestation is carried out using non-native trees, then the reforestation attempt could disrupt the native ecosystem launching a chain reaction of unintended consequences.

2. Economic costs and benefits

   Again, the economic costs of mitigation are very much a part of the public conscience when it comes to thinking about carbon trading mechanisms**.** One of the most important economic aspects of a carbon trading system to analyze is, whether the price of a carbon unit in that particular system is an accurate reflection of the social cost of a unit of carbon emission. Achieving equilibrium pricing is critical to the success of a trading program because if prices are too low, then firms will be too able to substitute emission reductions for carbon credits. A key idea behind carbon trading as a system is that the flexibility in where emissions are cut results in lowers abatement costs on the whole than command and control systems. However, carbon trading systems can result in unintended economic externalities that must be taken into account when performing a benefit-cost analysis of carbon trading systems.

3. Social

   There is always going to be some degree of tradeoff between abatement and the consumption/ production of other normal goods. When implementing emission reduction programs, the key is to know what tradeoffs you are willing to make. In many cases, the people making the sacrifices for emissions reductions are the ones who are least responsible for past emissions and the ones who will suffer the most from the adoption of abatement measures. A key feature to examine in any emissions reductions program is therefore what negative social impacts the program has on what portion of the population. Program developers must keep in mind the issues of fairness and equality in deciding who should bear the costs of abatement programs.

4. Institutional

   While the criteria discussed above can be evaluated in a quantitative cost- benefit way, carbon trading systems must also be judged by in a qualitatively to ensure certain institutional variables are met. These institutional factors ensure that the carbon trading programs run smoothly and achieve the quantifiable results measured by the discussed criteria. The main institutional factors that will be examined in this paper are transparency, accountability, and the ability of the program to respond to changes or challenges.

European Union Emissions Trading Scheme[6]

Description

The European Union Emissions Trading Scheme is an emissions trading system implemented by the European Union to comply with its Kyoto mandated emissions targets. Composed of 25 participating countries and affecting some 12,000 firms, the EU ETS is the largest program of its kind implemented to date. Enacted in 2005, the EU ETS is currently entering its third phase. Phase I lasted from 2005 to 2007 and was considered a trial phase. Lacking reliable data on industry emissions, the EU in Phase I allowed Member States to allocate emissions credits based on firms' own estimates of historical emissions. Emission data collected from Phase I was then used to implement stricter emission targets, enact higher penalties for noncompliance, and allow state auctioning of emission credits during Phase II (2008-2013). Currently in Phase III (2013-2020), the EU ETS operates under improved rules and a stricter emissions cap to ensure Kyoto compliance.

Operationally, EU Member States achieve Kyoto compliance by a combination of two programs- the EU ETS and the Effort Sharing Decision (ESD). The EU ETS sets a hard cap on emissions, but only applies to certain industries and covers only 45 percent of total EU greenhouse gas emissions[7]. Firms in affected industries are assigned a certain number of one ton EU carbon allowances (EUAs) based on their industry, size, and historical emissions. The firm can then either pollute above or below that allowance. If a

6 Because the EU ETS does not adopt sustainable development as a stated program goal and the countries directly participating in the EU ETS mechanism are not as vulnerable as developing countries, the social impacts of the EU ETS will not be examined at length in this chapter

7 "The EU Emissions Trading System (EU ETS)." European Commission

firm polluted above the allowance, it can either buy emissions credits or pay a steep penalty. If a firm polluted below its target, it could sell its left-over emissions credits on the free market. Emissions permits are held in one of the EU ETS registries. Firms can open an account by applying on the relevant Member State website that keeps track of the number of permits assigned to each Member State, the allocation of permits to registered firms, and the transfer of credits between firms. The Community Independent Transaction Log records and authorizes all transactions that take place between EU ETS accounts[8]. To achieve the remaining emissions reductions necessary to meet Kyoto targets, Member States use ESD to decide how to divide emission allocations amongst other industries. Industries regulated by ESD can achieve compliance using the same emission credits trading mechanisms as industries regulated by the ETS. These mechanisms include purchasing emissions credits from the EU ETS market, international project credits from other Kyoto mechanisms and, carbon sink credits from the Land Use Land Use Changes and Forestry (LULUCF) division. Under each phase of the EU ETS, Member States' emissions caps are lowered making emission credits more expensive and increasing the costs of pollution. In this way, the EU decreases its emissions over time to achieve Kyoto compliance while maintaining flexibility in how emission reductions are achieved.

Assessing the Environmental Impact

Designed as a "learn by doing" pilot without a specific reduction commitment, phase I (2005- 2007) of the EU ETS achieved, depending on the metric, a decrease in carbon

[8] Macken

emissions of 120 million to 300 million metric tons. This amounts to an overall decrease of 2 to 5 percent below business as usual standards[9]. While this seems small, it is important to keep in mind the original goal of phase I was not to realize a certain level of emissions reductions, but to put a price on carbon and establish the institutional basis for a successful carbon trading system[10]. Building on the foundations laid out in the phase I period, phase II (2005-2012) succeeded in reducing carbon emissions by 11.5 percent during the phase[11]. This means that the EU has met its treaty obligation for its first commitment period (2008-2012) of an 8 percent reduction below 1990 levels. With these reductions already in place, the program is currently on track to meet its 2020 emissions targets of a 20 percent reduction compared to 1990 levels. Current estimates project emissions to be 24 percent lower in 2020 than they were in 1990. Looking beyond 2020, however, the EU is not projected to reach its 2030 emissions target of 40 percent below 1990 levels. Taking into account only the current measures implemented, the EU total GHG emissions are estimated to be only 27 percent below 1990 levels in 2030[12]. This does not necessarily mean that the EU cannot implement new measures (with already in the pipeline) to bridge the gap.

The chief related issues that must be addressed moving forward are the structural imbalance between supply and demand for allowances and the consistently low carbon spot price. Establishing the right EUA price is of critical importance to long term success of the EU ETS. The price of the EUAs should be high enough that firms are incentivized

[9] Brown, vi
[10] Whether Phase I actually accomplished these goals will be discussed in a later section
[11] European Commission. "Climate Action Progress Report "
[12] Brown, 5

to reduce their carbon emissions to avoid the costs of purchasing EUAs, but not so high that it is in the best interests of the firms to relocate to a country/ region without restrictions on carbon emissions. The primary determining factor of the price of EUAs is the relationship between the supply of allowances (based on the size of the current cap and the amount of allowances left over from the previous periods) and the demand for carbon emissions. Simplistically, the greater the demand relative to the supply of allowances, the higher the spot price of carbon. The situation facing the EU is one of a high supply of allowances relative to demand and a resulting low carbon price. This state of affairs began in phase I, when a lack of data on the historical emissions of firms and the tendency for Member States to bargain and exaggerate to ensure their industries received more free allocations caused an over-allocation of emissions credits by four percent[13]. The over-allocation of emissions led to a carbon spot price of almost zero in 2007 and a stagnating carbon market.

Fortunately, the structure of the EU ETS system allows for some degree of self-correction between periods. One method of ensuring a fresh start between periods, was the rule that surplus EUAs from phase I could not be transferred to the second phase of the scheme (within phases, firms were allowed to let surplus credits from one year to be used in subsequent years). This meant that at the beginning of phase II, firms were subject to a new emissions cap determined by the emissions data from phase I, that was 6.5 percent[14] lower than in 2005. Member States in this phase were also required to develop National Allocation Plans (NAPs) laying out, in greater detail than in phase I, the

[13] Brown, ix
[14] "The EU Emissions Trading System (EU ETS)." - European Commission

amount of allowances the state intended to issue to emitting sectors. These plans then needed to be approved by the European Commission increasing the regulatory supervision and accountability of Member States and encouraging a more reasonable distribution of EUAs to industries. Despite these measures, phase II did not see the development of an efficient carbon market because of the global financial crisis of 2008. In the wake of the crisis, EU market activity slowed and emissions dropped on average 10.48 percent in member countries between 2008 and 2009[15]. This drop pushed total emissions below the allotted cap so that, once again, the demand for emissions credits fell below supply. Table 1 details the exact over allocation of allowances (in metric tons) that occurred between 2008 and 2011.

Table 1: Total Supply- Demand

in Mt	2008	2009	2010	2011	Total
Supply (issued allowances and international credits)	2076	2105	2204	2336	8720
Demand (reported emissions)	2100	1860	1919	1886	7765
Total Surplus of Allowances	-24	244	285	450	955

Source: European Commission Community Independent Transaction Log (CITL), published on May 2, 2012

Overall, the Research Institute of Applied Economics in Barcelona estimates that only between 21 to 23 percent of the abatement seen in the wake of the financial crisis

[15] Bel, 9

was a result of policy actions by the EU ETS[16]. The rest of the 11.5 percent total emissions abatement in phase II can be attributed to other factors. These factors include the leftover allowances sold at the end of phase II, the early auctioning of 120 million of phase 3 allowances in the 4th quarter of 2012, the inflow of credits from other trading schemes, and, most notably, the economic slowdown from the financial crisis. It is tempting to question the importance of locating the exact cause of emissions reductions. As long as emissions are going down, does it matter whether the EU ETS is the cause? The answer is yes. The same economic and social conditions cannot be relied upon to occur again and to have the same emissions reducing outcomes in the future. Given that it is the explicit goal of the EU ETS to promote emissions abatement "in a cost-effective and economically efficient manner"[17], a sacrifice in the form of a reduced economic growth would not be worth the ensuing emissions reductions. The repeated over allocation of emissions permits in phase II casts into doubt whether the EU can achieve similar reductions while still growing economically and reflects poorly on the ability of the European Commission to accurately judge the appropriate supply of carbon credits. If the Commission continues this pattern of over allocation, the EU will almost certainly fail to overcome its projected shortfall of the 40 percent reduction target in 2030.

Moving into the third stage of the EU ETS, the Commission submitted a report to the European Parliament identifying the need to "tackle the structural supply-demand imbalances"[18] that led to the projected continuance of an oversupply of 2 million emissions credits for a decade following the end of phase II. In order to address this

[16] Bel, 15
[17] European Comission. "The State of the European Carbon Market"
[18] European Comission. *DECISION OF THE EUROPEAN PARLIAMENT*, 2

disparity, the Commission implemented several measures to reduce the supply of allowances in phase III and to create greater flexibility to dealing with external shocks to the carbon market. The first of these measures to be put into action was the postponement of the auction of 900 million allowances (400 million in 2014, 300 million in 2015, and 200 million in 2016) until 2019[19]. This "back-loading" of emissions credits avoids increased in the EUA surplus that continued until 2013 giving the demand and supply relationship time to become more balanced, the price of carbon to increase, and for carbon market activity to take off. The "back-loading" of allowances is also expected to act as a precursor for the establishment of Market Stability Reserve (MSR) as a more long term solution. The Reserve will begin operating in January of 2019 and is designed to automatically adjust the annual volume of emissions credits being auctioned if the number of allowances in circulation exceeds the boundaries of a predefined range. The MSR could either 1) add allowances to reserve from future auction volumes in response to a market surplus of allowances greater than 833 million allowances or 2) take away allowances from the reserve and add them to the auction market to prevent a deficit of allowances if the total surplus is below 400 million allowances[20]. 100 million allowances per year are set to be released from the MSR to ensure predictability and stability in the carbon market. With the MSR mechanism, the EU ETS has a flexible means of directly addressing supply and demand imbalances. This ability to add or take away allowances from the market alleviates some of the burden of accurately divining supply and demand on a given year- a skill that EU ETS planners clearly did not possess in phases I or II. Finally, phase III also takes the step of applying a linear reduction factor to decrease the

[19] "Structural Reform of the European Carbon Market." European Commission.
[20] European Commission. "Proposal for a DECISION OF THE EUROPEAN PARLIAMENT", 5

emissions cap on an annual basis to rectify the over-supply of EUAs. While previous phase applied the same cap for the entire phase, in phase III, the cap is set to decrease by 1.74 percent, or by number of general mt allowances 38,264,246 each year. Taking the linear reduction factor into account, emissions from fixed installations in 2020 are set to be 21 percent lower than in 2005[21]. In order to achieve the EU ETS's longer term goal of 40 percent emissions reductions in 2030, the reduction factor is set to increase even further in phase IV to 2.2 percent reduction each year. This is estimated to push emissions reductions from fixed installations to 43 percent below 2005 levels overcoming the projected shortfall of 13 percent. Between the "back-loading" measure, the establishment of the MSR, and the application of the linear reduction factor to the allowance cap, the EU ETS managed to achieve a balance between supply and demand in 2014 when demand slightly exceeded supply[22] for the first time since 2008.

Reducing the size of the allowance surplus is not the only measure implemented by the EU ETS in phase III to strengthen its environmental impact. The program is currently in the process of moving from mostly free allocation of allowances to auctioning as a default method. In phase II only four percent of distributed allowances were auctioned, while the year 2013 of phase III saw the share of auctioned allowances at just over 40 percent[23]. This share is set to increase throughout phase III. The ratio of auctioned to freely allocated allowances depends on the member state and the industry. A greater proportion of allowances are freely allocated to eight developing states that have only joined the EU since 2004 (Bulgaria, Cyprus, Czech Republic, Estonia, Hungary,

[21] "Allowances and Caps." European Commission
[22] *The EU Emissions Trading System Factsheet*,6
[23]"Auctioning." European Commission

Lithuania, Poland and Romania). These states have committed to implementing national plans to modernize and diversify their energy sectors and reduce reliance on more carbon heavy fuels such as coal. Free allocation to firms in these countries is conditional on the firms using the cost savings from free allocation to invest in the mandated improvements[24]. On an industry basis, the EU ETS is focused on transitioning gradually to primarily auctioned EUAs. In the power sector, all emissions credits are currently allocated to plants via auctioning, with the exception of plants in the eight transitioning member states discussed above. Firms in the manufacturing sector received 80 percent of allowances for free in 2013 but, this portion is set to decrease to 30 percent in 2020[25]. In the aviation sector, only recently included in the EU ETS directive, 15 percent of allowances are set to be auctioned. For other sectors included in the EU ETS directive, the number of allowances auctioned is set to increase from an average of 40 percent to over half by the end of phase III. The transition from free allocation to auctioning of allowances fulfills the polluter pays principle of justice and ensures that the social cost of carbon is integrated into firms' business and financial decisions. Auctioning also serves the practical purpose of creating an additional source of revenue for member states. In 2014, this revenue amounted to €3.2 billion[26]. The EU ETS directive mandates that at least 50 percent of this revenue be reinvested in environmental or energy saving measures. Many member states exceed this minimum requirement so that 87 percent (€3 billion) of auctioning revenue was directed for these purposes in 2014[27]. Most of this

[24] "Auctioning." European Commission
[25] "Auctioning." European Commission
[26] "Auctioning." European Commission
[27] European Commission. "Climate Action Progress Report, 13

investment was directed at energy efficiency measures, climate research, sustainable infrastructure improvements, and research in clean technology.

Although many consider the EU ETS a failure due to the over allocations of emissions credits in phases I and II, the scheme has actually succeeded in reducing total emissions by 23 percent below business-as-usual standards in 2014[28]. With the new measures implemented for phase III, the amount of emissions reductions is set to increase each year. This will ultimately serve to balance the EUA market.

Economic Impact

The main economic issue facing the EU from its emissions trading scheme is the risk of carbon leakage. The term carbon leakage describes the potential phenomenon of firms transferring production to other countries to avoid the prohibitive costs of being subject to restrictive climate policies. This would be damaging to the economies of the EU member states that lose businesses to less regulated countries and damaging to the environmental goals of the EU ETS as firms simply relocate their emissions. Carbon leakage has the potential to actually increase global emissions as firms make the energy intensive moves to countries with laxer environmental policies where they might establish production facilities that are less environmentally friendly than the originals. With the move from free allocation to auctioned allowances in phase III, carbon leakage becomes especially concerning as firms now face higher emissions costs than in previous phases. The EU ETS is aware of the risk of carbon leakage, especially in carbon intensive industries, and has created a list of at-risk firms and industries eligible to

[28] Jong, 2

receive special treatment. Firms on this list will receive all, or a portion (depending on their level of risk), of their allotted allowances via free allocation rather than having to purchase their allowances at auction. This ensures that at-risk firms do not have to pay prohibitive costs for their emissions while still holding them to the cap. If a firm on the list exceeds the amount of emissions it is allocated, it does have to purchase additional EUAs at auction. This list of eligible firms is updated every five years to reflect firms' changing exposure to the leakage risk factors of firm costs of emission reduction and level of exposure to trade outside the EU. Trade intensity outside the EU is an important factor to consider because a firm could lose competitive advantage if it faces costs that other firms that it is competing against do not because they are not subject to the restrictions of the EU ETS. A firm or sector is eligible to be on the list if it faces at least a five percent increase in production costs (direct or indirect) from implementing the EU ETS directive and its trade intensity outside the EU is greater than ten percent. Alternatively, a firm or sector is eligible if its additional costs are over a 30 percent increase or its non-EU trade intensity is above 30 percent[29]. Some firms with multiple product lines or divisions are eligible for the carbon leakage free allocation exemption for some portions of its business but not others. In these cases, firms only receive a portion of their emissions credits via free allocation depending on the percentage of their business affected. To date, the EU ETS seems to have been extremely successful at preventing carbon leakage and preventing a loss of regional competitiveness. The London School of Economics estimates the impact of the EU ETS on EU global competitiveness to be "extremely limited" and even more ambitious policies (such as

[29] "Carbon Leakage." European Commission

increased auctioning or a higher carbon price) would cause exports to fall by only 0.5 percent and imports to rise by an extremely limited 0.07 percent[30]. As more and more countries adopt increasingly stringent environmental policies, the risk of carbon leakage continues to fall. Knowing this, the question now facing the EU is whether the measure taken to counteract the threat of carbon leakage can now be scaled back to maximize the environmental impact of the EU ETS. Currently, over 150 sectors representing 97 percent of industrial emissions in the EU are at least partially eligible for free allocation[31]. At this point, free allocation acts as a kind of subsidy to heavy emitters saving them from having to pay the increasing EUA price that lower emission firms are subject to. The question of how to address free allocation is an issue that will be addressed in phase IV (2021-2030).

Transparency

Transparency is of key importance to implementing a system like the EU ETS because firms must make long-term business decisions based on the regulations imposed on the carbon market. If firms are not aware of potential regulatory decisions by the European Committee or the carbon allowance market is unpredictable, then firms cannot effectively incorporate the cost of carbon into their investment decisions, and emission reductions will not be achieved in a cost effective manner. To ensure transparency, the EU ETS is diligent about providing notice on technical changes in the EU ETS and publishing status reports on various features of the program. A key issue regarding transparency is the 2013 change in reporting rules that no longer requires the EU

[30] "The Carbon Leakage Myth Buster.", 3
[31] "The Carbon Leakage Myth Buster.", 3

Commission to report what type of credits firms use to meet their abatement obligations. Instead, only the aggregate number of carbon credits is released[32]. This is concerning because a large portion of the carbon credits firms can use (132.8 million in 2013) comes from international offset programs such as the Clean Development Mechanism (CDM). These programs do not necessarily have the same regulatory standards as the EU ETS and can have drastic, unintended impacts on the lives of locals in the offset area. Without the requirement to report the source of carbon offset credits, it is impossible for watchdog agencies to ensure firms are achieving their carbon reductions in an ethical and socially just way.

Accountability

The EU ETS was developed in response to the EU signing of the Kyoto Protocol and is a significant, but not the only, instrument the EU uses to achieve Kyoto compliance. As a single part of the EU's overall climate policy, no formal Kyoto mechanisms exist to hold the EU ETS accountable for emission reductions. Nevertheless, the EU ETS is subject to indirect enforcement through the Kyoto Protocol's enforcement of Annex I countries treaty obligations. The Enforcement Committee exists to monitor whether Annex I countries achieving the required emissions reductions and mandating punishments for noncompliant countries. Consequences for non-compliance consist of a requirement that the Annex I entity make up for the difference in its emissions reductions deficit and an additional 30 percent reduction added

[32] Filzmose

on to the next commitment period[33]. Unfortunately, while the Enforcement Committee can mandate these additional reductions, the Kyoto Protocol has no teeth to enforce punishments or fees on non-compliant countries. Without a means of enforcing punishment, no effective mechanism exists to hold the EU or the EU ETS as a whole accountable for mandated emission reductions.

However, the EU ETS does have a system in place to enforce regulations on its Member States. Directive 2003/87/EC lays out three avenues the EU ETS can use to address Member State reduction deficiencies. The most important is the ability of the EU ETS to implement a fine on non-compliant firms. Article 16 of that Directive gives Member States the ability and the obligation to levy a fine on firms who do not surrender enough emissions credits by April 30 to cover the preceding year. In addition to having to surrender the necessary amount of emissions credits to account for the deficit, firms are also required to pay a €100 fine on each one ton carbon credit not initially released[34]. Firms that are non-compliant are also placed on a list that is published each year ensuring relying on social pressure to present another effective instrument for inducing compliance.

Responsiveness

The division of the EU ETS into phases both limits and enhances its ability to respond to problems and changes in the market. It is limiting because it is difficult to make changes in the program within a phase because the rules for that phase and the market cap are set ahead of time. However, at the end of each phase it is mandatory that

[33] "An Introduction to the Kyoto Protocol Compliance Mechanism."
[34] Dechezleprêtre, 5

the EU ETS program be reviewed by the European Commission and regulatory changes be enacted with each new phase. Phase III marks the beginning of a new ability to respond to changes in market forces within phases with the creation of the Market Stability Reserve which will become operational in January 2019. As discussed in the previous section, the MRS neutralizes the negative effects of the pervasive allowance surplus giving the EU ETS the ability to respond to future shocks in the allowance market.

Final Remarks

Despite an initially fraught start to emissions trading in the EU ETS, the long term prospects for the program are promising. As the EU continues to meet is Kyoto mandated emissions reductions, the demand for EUAs will continue to grow as the supply shrinks. While the move to increased auctioning could move to cover a greater proportion of industries and firms without having to be concerned with carbon leakage, this combined with the increase in flexibility from the MRS should help the EU ETS respond to future shocks in the carbon market.

The Clean Development Mechanism

Description

Like the EU ETS, the Clean Development Mechanism (CDM) is an instrument under the Kyoto Protocol designed to help participant countries achieve their abatement requirements. Unlike the EU ETS, however, CDM projects are implemented in non-Annex I countries that are not subject to a cap on their emissions levels. The CDM consists of carbon abatement projects hosted in developing countries that sell one carbon ton unit certified emission reductions (CERs) to developed, Annex I countries. The CDM was designed to take advantage of the lower cost of reducing emissions in developing countries. Unlike Annex I countries that, for the most part, have already taken action to address the cheapest forms of mitigation, developing countries are still in the infancy of adapting their industry and infrastructure to be more environmentally friendly. This provides an opportunity for both developing and developed countries to implement low cost carbon abatement programs in developing countries. Developing countries can experience the benefits of localized pollution abatement and improvements in production processes, while industrialized countries can purchase the lower cost emissions reductions to achieve their Kyoto compliance goals. Developing countries also have an advantage for cheap carbon abatement because of their geographical tendency to have a higher percentage of land suitable for afforestation. This makes these countries ideal for carbon capture and storage CDM projects where land is set aside to grow trees for the creation of a carbon sink. As the planted trees grow and absorb carbon dioxide from the atmosphere during photosynthesis, they contribute carbon abatement. The amount of carbon being absorbed by the carbon sink trees can be calculated and then sold

on the carbon credit market. In addition to cost-effective carbon abatement in Annex I countries, the other expressed goal of the CDM is to promote sustainable development within CDM host countries. Sustainable development lacks a precise definition but the Rio +20 conference in 2012 established three "mutually reinforcing dimensions" that ought to be promoted in the host countries by CDM projects: economic development, social development, and environmental protection[35]. Examples of sustainable co-benefits include new investment in production processes, the transfer of climate-friendly technologies, a greater knowledge of environmentally friendly production processes, and the creation of jobs and increased economic activity.

The CDM program operates under a project-based system in which an emissions reductions or carbon offset project receives funding only if the project managers can prove the "additionality" of the project. In this context, additionality means that the emissions reducing project would not have occurred if funding wasn't available through CDM. Having additionality as a requirement promotes cost-effective emissions abatement ensuring Annex I countries do not waste money financing improvements that would have occurred anyway. Funding is provided by the issuing of CER credits that are sold to firms and private actors in Annex-1 countries with the EU, under the EU ETS, compromising 73 percent of the demand for CDM CERs[36]. Approval for a CDM project is achieved through a multi-tier bureaucratic process that checks to confirm the project fulfills the additionality requirement. The first step for project approval is assessment by

[35] United Nations Framework Convention on Climate Change. "Benefits of the Clean Development Mechansim 2012." The Clean Development Mechanism, 2012., 13

[36] Pulver, Simone, Leticia Guimarães, Ranjit Deshmukh, and Jennifer Kane. "Carbon Market Risks and Rewards: Firm Perceptions of CDM Investment Decisions in Brazil and India." Energy Policy 40 (January 2012): 90-102.

a designated operational entity (DOE). The DOE is an auditor accredited by the CDM Executive Board and connected to the firm that verifies project proposals checking for feasibility, additionality, and code compliance. After approval by the DOE, the project is passed along to the host country's Designated National Authority (DNA). The DNA determines if CDM project meets the requirements for additionality and checks to see if the project promotes sustainable development. With no official system for measuring sustainable development, DNAs must utilize their own best judgment to determine if a project fulfills the approval criteria for a CDM project. After approval by the DNA, the project then moves on to the final step of being evaluated by the international body, the CDM Executive Board, which judges projects to ensure the voluntary participation of every party involved and the achievement of measurable, additional emissions abatement.

Environmental Impact

From the beginning of its operation in 2002, the CDM has issued over 1.6 billion CERs[37] from almost 8,000 projects[38] from host countries around the world. These CER credits are purchased by firms in Annex I countries to offset their own emissions so that they do not exceed their emissions limits. With the reductions in emissions from CDM projects being turned over for use as allowances in industrialized countries, the CDM is not actually designed to result in a net reduction in emissions on its own. Instead, the CDM is designed as a tool that firms operating under cap and trade or voluntary systems can use to achieve their target emissions levels cost effectively. This overall emissions neutrality means that the additionality component of CDM requirements is especially

[37] "Issuance Certified Emission Reduction (CERs)." UNFCC. April 26, 2016.
[38] "CDM Projects by Host Region." UNEP DTU CDM/JI Pipeline Analysis and Database. April 2016.

important to ensure that CERs are an accurate reflection of the social cost of carbon. If a CDM project is non-additional, then the Annex I firm purchasing the CERs is paying for abatement that would have occurred anyway and wasting its money. Unfortunately, the methods for determining and verifying project additionality are problematic, leading to non-additional or questionable additionality in approximately 40 percent of registered CDM projects[39]. The process for determining additionality, codified in the 2001 Marrakesh Accords, is a project specific "bottom-up" approach in which project developers are responsible for developing the methodologies for determining additionality. This approach was thought best because it allowed flexibility across industries and types of projects and passed the costs of additionality assessment onto the project developer. By making project developers bear the cost of additionality assessment, however, the Accords created a system where project developers are not incentivized to apply rigorous standards or undergo time-intensive data collection processes. The current bottom-up system has resulted in a situation where only ten percent of CDM projects demonstrated utilization of the recommended (but not required) standardized assessment mechanisms outlined in the Marrakesh Accords[40]. The most common tool for determining additionality and the simplest is to utilize a barrier analysis. Using barrier analysis, firms set out to prove that they face "realistic and credible" barriers that prevent the project from being implemented without CER credit revenue[41]. Of the projects using barrier analysis to prove additionality, 38 percent do not provide

[39] Du Monceau, Tanguy, and Arnaud Brohé. "Briefing Paper "Baseline Setting and Additionality Testing within the Clean Development Mechanism (CDM)"." AEA: A World Leading Energy and Climate Change Consultancy ED56638, no. 1 (December 2011)., 6

[40] Ruthner, Lena, Mark Johnson, Bipasha Chatterjee, Michael Lazarus, and Nariko Fujiwara. "Study on the Integrity of the Clean Development Mechanism (CDM)." Encyclopedia of Environment and Society ED56684, no. 1 (October 11, 2011)., 33

[41] Ruthner, 7

evidence in their validation reports that the DOE has verified the presence of credible barriers to the project activity[42]. Furthermore, 71 percent of small-scale projects and 39 percent of large-scale projects using the barrier analysis do not explain how CER revenue would help overcome those barriers[43]. Another commonly utilized assessment mechanism is a standard investment analysis using NPV, IRR, or unit cost of service methods to demonstrate that the CDM project would financially unattractive without the revenue from CER credits. Currently the use of investment analysis by project coordinators is a fraught endeavor. A study by the Institute for Applied Ecology found that only 45 percent of registered projects provided sufficient data and justifications of assumptions for the results of the investment analysis to be replicable[44]. Finally, another standard method of demonstrating project additionality is applying a "common practice analysis" to demonstrate that elements of the project are not common practice within the region or country. The key weakness of common practice analysis is the lack of a clear definition of common practice. The CDM Executive Board itself has issued contradictory statements on the parameters of what constitutes common practice. In methodology AM0011 common practice is defined as project activities occurring in less than five percent of similar cases, while in methodologies AM0041 and AM0044 common practice is more loosely defined as a process used in less than 33 percent of firms with similar activates[45]. Common practice methodology is also problematic because of the flexibility of what constitutes comparable practices or technology. Project

[42] Schneider, Lambert. "Is the CDM Fulfilling Its Environmental and Sustainable Development Objec-Tives? An Evaluation of the CDM and Options for Improvement." Öko-Institut, December 5, 2007., 33
[43] du Moncea ,7
[44] Schneide, 36
[45] Schneide, 38

developers manipulate the approval process by narrowly defining their project technology to the degree that sufficiently few firms could be considered comparable or by broadly defining the list of comparable firms/ projects so that the percentage of similar projects is very small.

Part of reason for the pervasiveness of shoddy additionality justifications is the CDM's perverse incentive structure that makes the DNA responsible for verifying additionality. The DNA benefits from maximizing the number of approved CDM projects because of the prestige value of hosting CDM projects and the economic benefit of an inflow of CER revenue. It is also far easier to give project proposals a cursory review before approval than undergoing an exhaustive evaluation. With host country DNAs not fulfilling their regulatory duties and no mandatory evaluation standards, the CDM Executive Board is hard pressed to determine which additionality determining methods are valid.

Another key issue in determining the environmental impact of the CDM is the setting of a CDM project baseline level of emissions. The baseline describes the amount of GHG emissions a firm would normally emit under a business as usual setting without the CDM project. By subtracting the firm's level of emissions with the project from this baseline scenario, the firm's level of emissions abatement is calculated and this amount is converted into CER credits. It is imperative that the baseline be accurate to ensure that the number of CERs being sold is an accurate reflection of total emissions reductions. If the baseline is estimated as too high then the CER credits sold will allow firms in Annex I countries to emit more than the emissions reductions CDM project actually produced and net global emissions could actually increase. The Marrakesh Accords establish three

ways of calculating a firm's baseline level of emissions. A firm can utilize current and historical emissions to project emissions levels, use emissions from the next economically attractive option after CDM, or use data from similar projects. When setting a baseline using comparable project data, the firm is obliged to restrict its comparison to projects undertaken in the past five years that performed in the top 20 percent in the project category[46]. Each of these three methodologies is problematic and changing from one methodology to another can yield substantially different baseline estimates. In the case of using historical emissions data, the Marrakesh Accords do not specify an appropriate time period from which historical data can be drawn. This subjective method allows the firm to choose a historical time frame with the highest emissions to ensure a high baseline. The historical levels of high emission could be due to outdated, inefficient technology or from a period of unusually high demand that no longer has any bearing on the present reality. The next method of comparing emissions from the next economically attractive course of action is better in that it focuses on the emissions from recently added plants and takes into account expected trends. This method, however, is difficult to employ because of the numerous next best options from which to choose. Typically used by new firms without a long history of emissions, the last option of choosing a comparable firm is problematic because it gives the CDM project developer substantial leeway to pick inappropriately high emitting firms. The definition and scope of what category the CDM project falls in or what constitutes comparable firms is largely up to the company's discretion. This leaves room for the company to manipulate the project definition so that the list of comparable firms is

[46] Paulsson, Emma. "A Review of the CDM Literature: From Fine-tuning to Critical Scrutiny?" Springer Link. January 4, 2009.

broader than it is in reality. The emissions levels of the top 20 percent of comparable projects in this scenario are likely to be higher than they should be giving the company a higher baseline than is appropriate[47]. Each of these three baseline assessment mechanisms gives project developers substantial room to manipulate the CDM project baseline to be artificially high. To compound the problem, the option to pick any of the three mechanisms maximizes the chance that project developers can choose the baseline that produces the highest possible amount of CER credits.

Ultimately, the problem inherent with trying to establish an accurate baseline is that emissions baselines are counterfactual, using data from the past and present to try and make predictions about the future. At the time the baseline is estimated, it is impossible for the project developer to anticipate, with certainty, developments in clean technology, changes in emissions demand from economic downturns (like in the case of the EU ETS), the availability of substitutes products, or changes in regulation. All of these could impact the business-as-usual scenario of the firm if it had not implemented the CDM project. While the baseline for the CDM project is chosen at the beginning of the project lifespan, it can have profound effects of the number of CER credits generated for a long period of time. Under the Marrakesh Accords, project developers can choose between a seven year crediting period which can be renewed twice for a total of 21 years, or a single ten year period. With the seven-year renewable time period the baseline must be renewed after each seven year period[48]. While many projects have lifespans significantly longer than these periods, seven to ten years with an over allocation of CERs is a significant time period given the urgency of reducing global emissions. The

[47] Paulsson
[48] "Operational Lifetime." CDM Rulebook

CDM Executive Board does recognize the problems inherent in the counterfactual baseline and has incorporated language in the CDM Marrakesh rules specifying that baselines should take "into account relevant national and/or sectoral policies and circumstances"[49]. This means that firms are required to take into account the technology and regulatory atmosphere when forecasting their business-as-usual emissions and calculating their baseline. Given the interest national governments and DNAs have in ensuring CER revenue, however, this requirement runs the risk of creating a perverse incentive structure. Host countries might be incentivized to neglect clean technology or increase environmental regulation in order to not lose investment revenue from CER sales. To ensure this is not the case, the Executive Board created the E+/E- tool. In this context, E+ refers to a policy that privileges emissions-intensive technologies while E- references policies that favor the adoption of less emission-intensive technologies[50]. To ensure that host countries are not incentivized to adopt policies favorable to increased emissions, the CDM Executive Board rules that such policies can only be accounted for in the baseline calculation if they were in place prior to the adoption of the Kyoto Protocol in 1997. In contrast, E- policies can only be excluded in establishing a baseline scenario if they have been implemented since the adoption of the Marrakesh Accords in 2001. Given the amount of time that has passed since the implementation of the Marrakesh Accords, the E- rule needs to be updated to reduce the risk of over-crediting and double counting of emissions reductions. While the threat of perverse policy

[49] Du Monceau, Tanguy, Arnaud Brohé, and Noriko Fujiwara. "Political Lock-in in the Context of the CDM." EU Bookshop. 2011., 7
[50] "THE APPLICATION OF E+/E- POLICIES IN THE ASSESSMENT OF ADDITIONALITY." UNFCCC/CCNUCC EB-52 (June 01, 1999): 128-29., 1

incentives is real and destructive, the more immediate problem is the perverse incentive of firms to exaggerate their baseline emissions.

Economic Impact

Integral to the functioning of the CDM as a project based mechanism is the achievement of an equilibrium carbon price for CER credits. CER prices ought to be low enough to offer firms in Annex I countries a way to cost-effectively offset their emissions but high enough to sufficiently fund carbon abatement projects in the developing world. Achieving the ideal equilibrium price involves a complex interplay of supply and demand. The supply of CER credits comes from CDM certified emissions reductions in developing countries. The demand for CERs originates from Annex I countries operating under mandatory or voluntary emissions caps that seek to take advantage of the lower costs of abatement in developing countries. Because of the different costs of abatement, it is cheaper for industrialized countries operating under a cap to buy emission reduction credits through the CDM than from firms within the industrialized country. The most cost-effective way therefore for firms in Annex I countries to meet their emissions reductions requirements is to maximize the proportion of CER abatement credits compared to more expensive Annex I emissions credits such as EUAs. The problem currently facing the CDM mechanism is an oversupply of allowances relative to demand. The cause of this shortfall in demand is new regulations in Annex I cap and trade systems the limit the number of CER credits firms can use for emissions abatement. Historically, the EU under the EU ETS has been the largest source of CER demand purchasing 66.4 million CERs before 2014[51]. At the beginning of the third phase of the EU ETS,

[51]"CERs and ERUs Market as from 2013." EU ETS- A Legal Point of View., 2014

however, the EU Commission implemented new rules restricting the amount of CERs firms can exchanges for EUAs. Part of motivation for these restrictions stems from the EU ETS's own troubles with regulating supply and demand within the system, while another part of the Commission's incentive derives from the problems with verifying that CERs represent real, additional emissions reductions discussed in the previous section. EU regulations up to 2020 specify that stationary installations may utilize international credits up to the higher of two limits: the international credit entitlement specified in the national allocation plan or 11 percent of the total freely allocated allowances. For installations who are new participants in the EU ETS, the Commission mandates that international credits may represent a maximum of 4.5 percent of their total verified emissions in phase 3. Finally, aircraft operators may use international credits up to 1.5 percent of their total verified emissions in phase 3[52]. The EU Member States also agreed at the 2011 Durban COP that after 2012 the only new project CER credits that would be accepted into the EU ETS would need to originate from Least Developed Counties (LDCs) even though the current largest producers of CERs, China (80 percent) and India (five percent), do not qualify for this label[53]. Compounded with the repeal of Australia's Carbon Pollution Reduction Scheme (CPRS) and the eight percent limit[54] on offset credits in the California Cap and Trade Program, the CDM is currently facing a large shortfall in demand for CERs. This imbalance between supply and demand has caused the market CER price to decline dramatically from €20 per ton of carbon abatement in

[52]"Climate Change Committee Approves Proposed Regulation on International Credit Entitlements for 2013-..." European Commission. November 2, 2016.
[53] "CERs and ERUs Market as from 2013."
[54] "CERs and ERUs Market as from 2013."

2008 to only €0.40 in 2013[55]. With the restrictions on Annex I CER demand and the subsequent drop in CER prices, the CDM is currently in crisis and in need of substantial reform if there is to continue to be a Kyoto mechanism for emissions reductions in developing countries.

Social Impact

Examining the social impact of the CDM is especially important given the location of projects in developing countries where the populations are the most vulnerable and the least enfranchised. The CDM is supposed to be an instrument to promote sustainable development and sponsor regional co-benefits. CDM projects, however, can produce varied social side effects depending on the level of stringency of the DNA. The Marrakech Accords place the responsibility for defining whether a project contributes to sustainable development in the hands of the host country. With no international standard for verifying sustainable development, each DNA must come up with its own criteria for evaluating project documentation. Most DNAs utilize checklists and multi-criteria methods to evaluate project design documents (PDDs). This method is problematic for several reasons. Firstly, PDDs are written by the project developer whose incentives are to obtain approval for the project, not provide sustainable co-benefits. At no time is the DNA or the DOE required to follow up to implementation of co-benefits so the sustainable development claims of the PDD could be very different than reality. This method is also an inefficient means of judging sustainable development because it is not holistic. Host countries are only required to verify the documentation for

[55] "The Marrakesh Accords and the Marrakesh Declaration." UNFCC, 2001.

positive co-benefits of the project, not investigate the negative side effects of a CDM project on local communities. With these weak institutional criteria, it is not surprising that no project has ever been rejected as a result of not meeting sustainable development criteria[56].

The type of project is an important factor in determining the social impacts of CDM project. Representing 26 percent (i.e 2,228 projects) of all CDM projects registered and 27 percent of CER credits issued in 2011, hydropower projects are the most common type of CDM project[57]. Lauded by national governments as sources of clean, cheap energy and drivers of economic growth, hydropower projects, financed by CDM and development agencies, have become increasingly popular in recent years. Unfortunately, the ramifications of building a hydropower dam can be extremely harmful to local communities. According to the United Nations Environmental Programme (UNEP) CDM Database, 41 percent of hydroelectric CDM projects have the potential to have negative social impacts on local communities[58]. With 188 CDM dam projects registered by 2011, India has one of the highest concentrations of CDM projects in the world. The majority of these projects occur in poor, rural regions in the North[59]. In many of the registered CDM projects in these areas, project developers do not obtain the prerequisite "prior and informed consent" from project shareholders leaving affected villages no voice in the decision making process that led to the destruction of their homes. For example, the Lepcha people were excluded from the decision making process that placed dams along their sacred Teesta River the North Sikkim district. The

[56] Du Moncea, "Briefing Paper "Sustainable Development and Social Equity", 10
[57] UNEP DTU CDM/JI Pipeline Analysis and Database
[58] Ruthner, 44
[59] Yumnam, Jiten, and Imphal Manipur. "Dams and CDM in India." *Carbon Market Watch*, 2013., 6

blasting and tunneling for the dam caused water sources in the hills to dry up and led to severe landslides that destroyed several houses near the dam site[60]. The Environmental Impact Assessment (EIA) submitted for the Teesta dam project did not take into account the damaging impacts on the Lepcha people or the ecological, seismic, or reduced flow impacts from the blasting. With the Indian DNA not holding CDM hydroelectric projects accountable for their social impacts, the Lepcha people are left without direct access to an institutional means of changing their situation. Hydroelectric CDM projects are not designed to align incentives so the DNA will stringently test for equitable sustainable development. One reason for this is the general profitability of hydroelectric projects. With large upfront costs, hydroelectric projects typically rely on barrier analysis to prove that the costs of construction would be prohibitive without funding from CERs. Despite high investment costs, many of these installations would prove profitable in time (indicated by a net positive NPV), thus failing a strict test for additionality. Hydroelectric projects therefore allow the developing country to profit twice-- first from CER sales and then from the sale of energy generated at the plant. Incentives to protect against the negative impacts of hydroelectric projects are also not scale aligned in that the impacts of the CDM project tend to be localized while the interests of the DNA are broad encompassing the entire country. Only a small segment of the population usually isolated and not powerful, is directly affected by the dam project while the benefits are diffuse. To the developing country's administration the prestige and spread out benefits outweigh the isolated costs to the people at the dam site.

[60] Yumnam, Jiten. "Mega Dams and CDM Fraud in Sikkim." Carbon Market Watch. March 27, 2013.

Another type of CDM project liable to cause negative social impacts is the creation of carbon sinks. Although forestry projects represent only a 0.8 percent of CDM projects, the severe problems they impose on local populations makes them an important aspect to consider when evaluating the effectiveness of CDM projects[61]. Like hydroelectric projects, carbon sinks tend to be land intensive making them vulnerable to land grabbing and the abuse of customary user/ ownership rights. This problem is particularly prevalent in African nations where CDM is a relatively recent tool lacking the institutional infrastructure and the firmly established land use rights to protect local peoples. African countries also constitute the majority of the list of LDCs that will continue to be allowed to sell CERs to the EU ETS post-2012. The long term viability of CDM projects and the relative abundance of unclaimed forestry land make African countries especially vulnerable to project developers seeking to make a profit at the cost of the local population. The Norwegian company Green Resources is one example of a carbon offsetting, plantation forestry firm whose projects have a detrimental impact on the local population. Operating in Mozambique, Sudan, Tanzania, and Uganda, the company owns 45,000 hectares of standing forest making them the largest carbon forestry company operating in Africa[62]. The company currently holds two 50-year licenses in Uganda for the Bukaleba Forest Reserve (5,780 ha) and the Kuchung Forest Reserve (2,099 ha). Both sites necessitated a series of evictions and bans on forestry agriculture to qualify as CDM projects. Ugandan national land laws acknowledge indigenous peoples access and user rights to their customary lands but grants priority to protecting corporate land licenses. In the case of the Bukaleba and Kuchung lands owned

[61] UNEP DTU CDM/JI Pipeline Analysis and Database
[62] "African Forestry- Carbon Offsets." Green Resources.

by Green Resources, the company claimed CER verification was dependent on preventing encroachment on the licensed land. In 2004, the Ugandan government chose to uphold Green Resource's plantation borders and began evicting locals and destroying crops the locals had planted among the tree saplings[63]. A 2011 expansion of Green Resource's planting area expanded the eviction area exacerbating the locals' problems. Forcing locals off of their ancestral lands has impacts beyond the immediate impacts on the villagers themselves. In the case of Green Resources, some villagers were inspired to fight back burning down sections of the planted trees in protest. For others that move, there is potential for increased conflict in other regions as displaced groups are forced to move into other land being used by other groups. This increases the chances of intergroup conflict as displaced populations are forced to incur on other groups' land.

Transparency

The CDM suffers from unique transparency issues due to its structure as a project based system operating at local and international levels. The CDM Executive Board mandates the organization of meetings with accredited observers, the publication of all decision making documents and forms, the publication of the reasons for a project rejection, and the existence of an appeal process for revised projects that were originally rejected at any stage of the process[64]. This process gives buyers and project developers access to the decision making process of the CDM Board but, fails to incorporate project stakeholders. Members of the local communities affected by CDM projects do not have

[63] Walukamba, Aldon. "Farmers Barred From Cultivating In Forest Reserve." Uganda Radio Network. May 17, 2012.

[64] Nyaoro, Jackie, and Bipasha Chatterjee. "Briefing Paper "Governance of the Clean Development Mechanism (CDM)." *AEA: A World Leading Energy and Climate Change Consultancy* ED56638, no. 1 (December 2011).,14

the same access to resources or information as other participants in the CDM process. This lack of access is particularly damaging because local communities are the most likely to be negatively impacted by a CDM project. The Executive Board requires that project developers consult with local stakeholders regarding "requests for registration issuance, deviations, revision of monitoring plans, new methodologies proposals, revisions of an approved methodology, and clarification on an approved methodology or an approved tool"[65]. Although these consultations are a mandatory part of the project registration process, this does not mean they are actually carried out. Again, responsibility for stakeholder consultation lies with the project developer and verification of the consultation is provided in the PDDs written by the developer. It is easy for project developers to misreport consultation in order to obtain project approval. When this occurs, there are limited channels for affected communities to communicate their concerns. Because of the limited access of the poor, rural communities most likely to be affected by CDM projects, it is necessary for there to be higher standards of transparency for stakeholder consultation. Publishing reports and rulings online is an insufficient measure when affected communities are likely not to have internet access. Instead, stakeholders must be kept informed via in-person consultations and information must be communicated in a format local communities can understand rather than formal, technical reports.

Accountability

For the CDM, the question of accountability encompasses two dimensions of responsibility- 1) a responsibility to the buyers of CERs to ensure the credits being

[65] Nyaoro, 14

purchased are reflections of additional, real, and verified emissions reductions and 2) a responsibility to the local stakeholders of CDM projects to ensure that the impacts of CDM projects are included in the cost benefit analysis of a CDM project. On both dimensions of accountability, the CDM falls short. As discussed in the environmental impact section above, the institutional mechanisms and incentive structures to ensure project additionality simply do not exist in the CDM architecture. The primary responsibility for verifying the additionality of a project lies with the host country DNA, who has little incentive to turn down projects that bring in significant revenue and prestige. The methods for determining additionality are flexible and give the project developer significant ability to manipulate project data to receive the most amount of CERs possible. With these limitations, buyers in Annex countries cannot be certain that the CERs they are purchasing reflect true emissions reductions and that they are not funding projects that would have occurred without their assistance. The same institutional weaknesses that make it difficult to verify additionality also make it easy for project developers to get away with projects that negatively impact the local populations. DNAs are only required to consult project documents to verify sustainable development not to investigate the actual situation at the project site. The project documents are written by the project developer who can simply list the positive impacts the project may or may not have without accounting for the costs to local communities. Projects that tend to generate the most CERs also tend to have the least sustainable co-benefits[66]. Because project developers only generate revenue from emissions reductions, not from sustainable

[66] Du Monceau, Tanguy, and Arnaud Brohé. "Briefing Paper "Sustainable Development and Social Equity", 12

development, there is no incentive structure in place to ensure local communities benefit from CDM projects.

Responsiveness

Like the issue of transparency, responsiveness of the CDM depends largely on host countries' effectiveness at consulting with local shareholders. Given the problematic protocols for initial shareholder consultation, it is especially important that the host country's DNA or the Executive Board be able to respond to concerns or complaints by local communities. Unfortunately, the same issues that make initial consultation unlikely to occur, make responding to the problems that arise from CDM projects difficult. Because the project developer only reports on the positive actions it is taking for sustainable development, the negative impacts often go unrecognized (unless an NGO becomes involved) and unresolved.

Final Remarks

Although the CDM plays a valuable role in the global carbon market, the mechanism had proven to be deeply flawed. Placing control over project design and verification in the hands of interested parties creates a perverse incentive structure for CDM project developers and DNAs. This incentive structure, combined with a lack of necessary oversite, motivates CDM project developers to exaggerate the amount of emission reductions achieved and ignore the negative social externalities caused by their projects. With the supply of emissions reductions in developing countries unreliable, purchasers in Annex I countries cannot be certain the CER credits they purchase to offset their own emissions actually cover the entire emissions amount. With the demand for CER credits drying up and subsequent reduction in project, it is not even certain that the

CDM will be able to continue to operate. Given detrimental problems that are fundamental to the architecture of the CDM, it is worth exploring alternative approaches to valuing carbon in the developing world. One promising proposal currently being debated is, instead of counting emissions reductions based on a baseline specific to a particular firm, CERs could be calculated by comparing firm emissions to industry standards. Firms with an emission's intensity less than the industry average would receive credits based on how far below the average emissions per production unit the firm's emissions fell. While this intensity-based crediting system raises some of the same question about comparable industries and projections of future industry activity as the CDM's current format, this system would prevent firms from manipulating their emissions baselines to the same extent and would not punish firms who had been historically low emitters.

REDD and REDD+[67]

Description

The UNFCC's program Reducing Emissions from Deforestation and Forest Degradation (REDD) was conceived amidst growing concern over the role of forestry initiatives in carbon abatement programs. Between 1990 and 2000 deforestation proceeded with a net loss of 8.3 million hectares forestry land per year. After the turn of the century, this rate improved but proceeded apace with an average net loss of 6.2 million hectares per year up to 2010[68]. The majority of this forest loss occurs in tropical forests in developing countries creating devastating impacts on biodiversity and the livelihood of forest-dependent communities. This degradation is also responsible for approximately 10 percent of total global carbon emissions[69]. These concerns led the Coalition for Rainforest Nations fronted by Papua New Guinea to propose REDD as a mechanism incentivize forest preservation in 2005. The idea of including deforestation initiatives was debated during the Kyoto Protocol talks, but ultimately not implemented due to concerns over carbon leakage from deforestation simply shifting from one area to another and difficulties in accurately measuring and verifying carbon emission reductions. Although these challenges remained a concern support for deforestation initiatives remained strong in developing countries and the REDD proposal was taken up

67 Because of the lack of date characterizing the REDD+ mechanism, the discussion in this chapter focuses on the known institutional factors influencing the different REDD+ impacts. With this discussion making up the bulk of the chapter, a separate discussion of institutions factors (transparency, accountability, and responsiveness) is impractical and any claims made about these factors would be unable to be supported. For these reasons, this chapter excludes a discussion on institution variables.

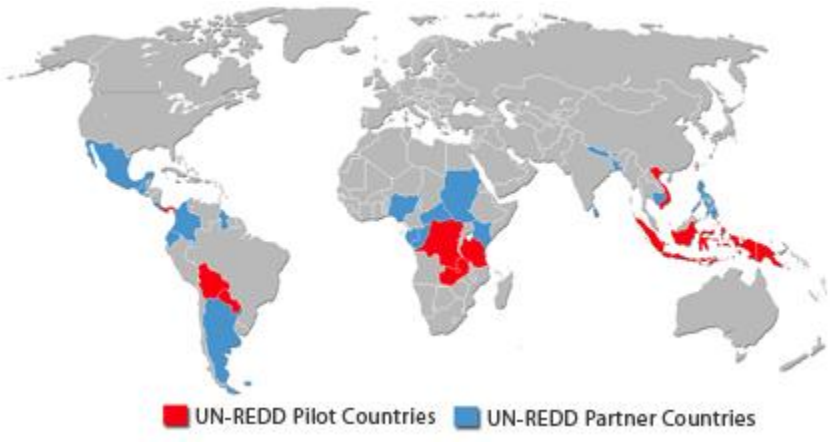
68 Adams, Emily E. "World Forest Area Still on the Decline." Eco-Economy Indicators. August 31, 2012. Accessed April 25, 2016.

69 "What Is REDD+?" The REDD Desk. April 6, 2016.

in 2007 by the Conference of the Parties to the UNFCCC in Bali (COP-13)[70]. In its original form, REDD was an interagency program, of the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP), designed encourage developing country to tackle reducing emissions from deforestation and forest degradation. In 2010, as part of the Cancun Agreements at COP-16[71],[72], REDD's mandate was expanded to include the aims of the conservation of forest carbon stocks, sustainable management of forest, and the enhancement of forest carbon stocks. The addition of these directives created the REDD- plus (REDD+) mechanism within the UN-REDD program. By expanding the REDD program's prerogative, the conference participants hoped to prevent REDD from developing into a mechanism that rewarded only historically high emitters/ deforesters. If only reducing emissions from deforestation was rewarded, then countries with historically low emissions or deforestation would not be incentivized to preserve their low rates. Promoting conservation and sustainable forest management also has the potential to provide significant co-benefits to local communities if they are properly compensated for adopting sustainable practices. While rewarding good practices is an essential part of any climate mitigation mechanism, figuring out how to reward conservation in REDD+ is a challenging process that is bound to present problems is calculating emissions reductions.

[70] "What Is REDD+?"
[71] "REDD: An Introduction." REDDMonitor. April 07, 2009.
[72] This is the same year that the CDM grew to include carbon sink projects reflecting the growing emphasis on forest preservation as a part of climate change mitigation

REDD+ projects cover more than 28.7 million hectares of forested land in developed countries around the world. Geographically, 53 percent of projects are located in Latin America, 26 percent in Asia, and 21 percent in Africa. Although Latin America



Source: UN-REDD Programme

leads in the number of projects, Asian REDD+ projects cover the greatest area. 37 percent of project land is in Asia, 33 percent in Africa, and 30 percent in Latin America[73]. The map below shows the countries participating in REDD+ programs.

The mechanisms for funding the REDD+ program were decided in 2011at the COP-17 in Durban, South Africa. REDD+ activity can be funded by either voluntary funds or from private sources that treat REDD+ as a source carbon offset credits. Voluntary funding could originate from a national or international level with both the governments of developed countries and international development funds pledging to provide financing for REDD+. To date, donor country contributions amount to $215.2 million of which 91 percent is directed to supporting UN-REDD partner countries at the

[73] Nhantumbo, Isilda, and Marisa Camargo. "REDD+ for Profit or for Good?" *IIED Natural Resource Issues*, 2015., 35

national and regional levels[74]. This support takes the form of promoting "REDD+ readiness" developing the institutions to ensure "good governance, stakeholder engagement, safeguards and multiple benefits, and monitoring, reporting and verification"[75]. The first phase of a developing country's REDD+ program is devoted to this capacity building supported by public grants. By the end of the first phase, participating countries must provide a national emissions reference level or a forest reference level, a robust and transparent plan for forest monitoring, and a system of safeguards to prevent negative externalities[76]. Only in the second phase of a national REDD+ strategy are the strategies developed the first phase implemented and projects begin. These projects can be funded by either private sources or public grants. By allowing dual sources of funding the REDD+ program grants project flexibility to pursue efficient emissions reductions and sustainable co-benefits. Projects sourced by private sector agents are more likely to focus on generating revenue from emissions while projects funded by non-profits or government agencies are more likely to support local communities. Currently with most participating countries in phase two of REDD+, the private sector and NGOs lead in REDD+ implementation funding 35 percent and 36 percent of projects respectively. Eight percent of projects are led by public actors while 11 percent are funded by partnerships between sectors[77]. Most participating countries have yet to enter phase three. A country moves on from phase two only after five years

[74] "REDD FAQs." UN REDD Programme.
[75] "REDD FAQs."
[76] "Report of the Conference of the Parties on Its Sixteenth Session Addendum Part Two: Action Taken by the Conference of the Parties." *Framework Convention on Climate Change*, 2010., 5
[77] Nhantumbo, 15

have passed since REDD+ was initially adopted. This phase involved evaluating current REDD+ projects and institutional mechanisms and adapting necessary changes.

Environmental Impact

Assessing the impacts of REDD+ as a mechanism is difficult because the program is still in its infancy. Most countries are still in the midst of phase two of the program and have yet to publish the data needed to assess the impacts of REDD+ projects. While it is difficult to gain a full picture of the impacts of REDD+ as a whole, it is possible to examine the institutional structure of the program and evaluate the results of some of the older projects to draw conclusions about the overall environmental impacts. Many of the environmental issues facing the EU ETS and the CDM also apply to the REDD+ program. One of the greatest of these challenges is ensuring that the emissions reductions achieved by the program are real and measurable. This is particularly challenging for the REDD+ program because it seeks to reward continuance of good behavior. Without a standard of "bad behavior" it is difficult to measure what effects REDD+ funding has on the behavior of forest users. REDD+ revenue could truly incentivize good forestry practices or it could make no difference on the behavior of resource users and simply be viewed as a nice source of additional cash. To ensure that funding goes to projects that provide real emissions reductions, the REDD+ program has strict requirements for participant country's Measurement, Reporting and Verification (MRV) systems that monitor changes in forest carbon stocks and flows and set baselines[78]. This is particularly challenging for a forestry program such as REDD+. Measuring carbon flows involved quantifying the complex interplay between the amount

[78] Angelsen, Arild. "Analyzing REDD+: Challenges and Choices." *Center for International Forestry Research*, 2012., 99

of carbon absorbed by the forest and the emissions produced forestry activities, not simply measuring levels of past emissions like in the case of CDM projects. Forests also cover broad swaths of land while forestry usage and carbon flows vary across areas. To gain an accurate picture of the carbon capacity and flow in a forest area it is therefore necessary to implement community-based monitoring is linked to spatial analyses. This requires substantial bureaucratic cooperation and necessitates the involvement of the forest communities whose carbon impact is being monitored and recorded. The coordination of this data collection can present high transaction costs. In Thailand, the local governments conflict with the central government and donors on what are seen as infringements on their local authority by independent MRV agencies. Past emissions data is scattered across different departments and not being shared between branches. Locals also are not incentivized to provide accurate depictions of land use habits in the fear of inspiring increased regulation[79]. Some success has been found, however, in engaging local communities through a program organized by the World Agroforestry Center (ICRAF) Southeast Asia Program through the Trees in Multi-Use Landscapes in Southeast Asia project called rapid carbon stock appraisal (RaCSA)[80]. The RaCSA program aims to engage local communities in recording forestry activities offering means to improve local livelihoods through funding improved practices. With the right incentive structures in place, it is possible to cooperate with local communities to gain accurate depictions of carbon impacts of forestry activities. Because the responsibility for baseline setting lies in the hands of national governments, who receive dedicated financing from international UNFCC funds instead of private developers, the REDD+

[79] Angelsen, 128
[80] Angelsen, 3

mechanism does not fall prey to the same perverse incentive structure as the CDM. This does not necessarily mean, however, that the REDD+ program's emissions baselines are more accurate. The means for calculating the forestry baseline are significantly more complicated that either the EU ETS or the CDM and involve higher implementation costs. With funding from the UNFCC and expert support from partner institutions such as NASA, Brazil's National Institute for Space Research (INPE) and the US Geological Survey[81], it is possible for the REDD+ program to ensure real, accurate, and measurable emissions reductions from forestry management.

Another problem facing the REDD+ mechanism is the potential for carbon leakage. This can occur if the constriction of forestry and deforestation activities from REDD+ in one area causes the perpetrators of these activities to simply shift their production to other unprotected areas. If these effects are not accounted for in the calculation of emissions reductions credits, then the credits purchased from the forest preservation project are not accurate reflections of real reductions and global emissions can actually increase. Evidence from the Peruvian Amazon corroborates the possibility of this phenomenon. Observed rates of deforestation in and around newly established protected areas showed that while deforestation within the parks decreased, deforestation rates in the surrounding areas actually increased[82]. Of key importance to preventing carbon leakage is extending protection to as much areas of the relevant forest area as possible. The national governments of developing countries have significant power to extend protection from national level REDD+ programs to vast swaths of forest limiting

[81] "REDD FAQs."

[82] Venter, Oscar, and Lian Pin Koh. "Reducing Emissions from Deforestation and Forest Degradation (REDD): Game Changer or Just Another Quick Fix?" *ANNALS OF THE NEW YORK ACADEMY OF SCIENCES*, no. The Year in Ecology and Conservation Biology (2012): 137-50., 143

the amount of carbon leakage that can occur within the country. Brazil experience success with this approach under the Governors' Climate and Forests Taskforce (GCF) REDD+ program. Beginning in 2008, seven out of nine[83] Amazonian states have implemented plans to limit deforestation under the National Plan for the Prevention and Control of Deforestation in the Amazon[84]. The program is financed through a combination of NGO support and the participation of observer states, Catalonia, California, and Illinois, who integrate the emissions reductions from deforestation into their GHG reduction plans[85]. Local politics present a particular challenge when dealing with carbon leakage. In implementing REDD+ deforestation regulations, a district faces a loss of tax revenue and the risk of deterring business investment in the area. Holding out from implementing deforestation regulation allows a district to benefit economically as forestry business moves from regulated areas to unregulated. Shifts of this kind must be included in the calculations for emissions reduction from deforestation initiatives or emissions reductions cannot be counted as real or measurable.

Economic Impacts

Unlike the EU ETS or the CDM, the REDD+ carbon finance mechanism is as yet too untested to determine how the program's emissions credits fit in to the global carbon market equilibrium. Many REDD+ project have yet to begin generating substantial emissions credits and data about the purchase of those credits has yet to be analyze in any significant way. Without examining how the market values of the emissions reductions, it is difficult to judge the economic efficiency of the mechanism. Taking this approach is

[83] The two non-participating state, Amazona and Acre, have both independently passed laws regulating deforestation increasing the effectiveness of the program
[84] Angelsen, 103
[85] GCF Task Force

not necessarily a good measure of the program's economic value. Because of its mission of reducing carbon emissions from forestry activity, the REDD+ mechanism is not designed to achieve emissions reductions at the least cost. There are other, less costly ways to achieve equivalent emissions reductions. Instead, REDD+ developers designed a program that required more initial investment but aimed to achieve real, measurable emissions reductions and sustainable co-benefits.

In total, assuming the achievement of a 50 percent abatement of forest-related emissions by 2020, the Eliasch Review estimated the global costs of REDD+ to be between 17 and 33 billion dollars per year[86]. The opportunity costs of implementing REDD+ depend on the country or region doing the implementing and the types of forestry activates that would have occurred had REDD+ not been adopted. For regions with lucrative economic forestry activates the opportunity cost would be very high. Meanwhile, for some regions protected under REDD+ programs but not being utilized for forestry activities, the opportunity cost would be zero. For Indonesia, regional opportunity costs range from $0.49 per ton of carbon for smallholder farming in Sumatra to $19.6 per ton for the protection of degraded forest land typically used in the production of palm oil[87]. A significant advantage of the REDD+ mechanism is that it allows actors to choose protection policies or projects that have the lowest opportunity cost. For example, the opportunity cost for completely eliminating deforestation in the Brazilian Amazon is estimated to be $1.49 per ton of carbon reduced. The price of decreasing deforestation to only 94 percent of projected levels is projected to be less than half that at

[86] Angelsen, 114
[87] Angelsen, 114

$0.76 per ton of carbon eliminated[88]. At the point where reducing emissions becomes prohibitively expensive, program participants can always chose to cease abatement and instead pursue the profitable alternative activity.

Social Impacts

Like the CDM, the REDD+ mechanism contains the dual missions of reducing carbon emissions and promoting sustainable development in developing countries. It is especially important to pay attention to the social impacts of the REDD+ mechanism given the type of communities likely to be effected by REDD+ regulation. Of the 1.2 billion people characterized as living in extreme poverty, 90 percent rely directly on forest resources for their livelihoods[89]. These people depend on forests as sources of fuel, food, medicines and shelter. These poor, rural populations also tend to have the least voices in national politics and the least access to the means of appealing decision about land use. It is therefore especially important that the institutional mechanisms to protect the rights of local communities be integrated into the REDD+ program. The Forest Carbon Partnership Facility (FCPF) and the REDD+'s Guidelines on Stakeholder Engagement mandate that project developers obtain the free, prior and informed consent (FPIC) of local communities before project implementation[90]. Division of the benefits of REDD+ projects ought to be shared between project developers and local stakeholders as defined by carbon rights agreements. While most project developers do seek to engage local stakeholders, there is no enforceable way of ensuring that the consultations reported in project documents actually take place. In one study only 23 percent of project

[88] Angelsen, 115
[89] Parker, Charlie, Andrew Mitchell, Mandar Trivedi, and Niki Mardas. *The Little REDD+ Book*, 2009., 12 Nhantumbo, 31

documents stated that communities were likely to receive a cash share of the carbon credits, with only 16 percent explaining how these benefits would actually be distributed[91]. What truly matters in ensuring REDD+ programs do not cause negative social externalities, is a strong system granting ownership or user rights to forestry communities. These systems of forestry rights function independently of the REDD+ mechanism and vary from host country to host country.

Final Remarks

Although the exact impacts of the REDD+ mechanism are yet to be known, it seems likely that the emission reduction credits produced by REDD+ projects will be real, measurable, and without extreme negative externalities. The positive incentive structures and increased oversight established in the REDD+ mechanism will help the program avoid the same pitfalls as the CDM. Where the REDD+ mechanism seems likely to fall short is in the amount and the cost of the emissions reductions achieved in the program. The process for accounting for reduced emissions for deforestation is more complicated than other methods and involves higher transaction costs. Thanks to international funding providing an additional source of finance for the program, the higher implementation cost should not impede REDD+ from being widely adopted by developing countries.

[91] Nhantumbo, 45

Conclusion

Ultimately each emissions abatement mechanism is designed to operate under different national circumstances. The CDM and REDD+ mechanisms both are targeted at achieving emission reductions in developing countries without mandatory abatement levels. Because these countries do not have the mandatory incentive structures to fund abatement measures on their own, these systems must rely on outside funding, such as the EU ETS and other mandatory/ voluntary emissions trading systems, to finance abatement projects. The REDD+ program relies on both private finance and international public funding to achieve emissions reductions through forestry initiatives while the CDM funds projects through the incentive of CER revenues. The differences in funding create different incentive structures. With the resource of international funding, REDD+ programs will still profits from projects that provide significant co-benefits and thus can afford to have higher standards for sustainable development than the CDM. To incentive improved sustainable development in the CDM mechanism, greater international scrutiny must be applied to CDM projects to incentivize project developers to avoid negative social externalities. Facing a shortfall in demand from changing standards in the EU ETS, the CDM , and REDD+ to a lesser extent, most find additional sources of funding for abatement projects. Some of this will be provided from more and more countries adopting emissions reduction requirements but, more international funding would also prove useful to improving the program.

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