2007

Prospects for Developing Countries

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Meaningful Participation:

The Benefits of Climate Change Policy to Brazil and Prospects for Developing Countries

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May, 2007

Introduction

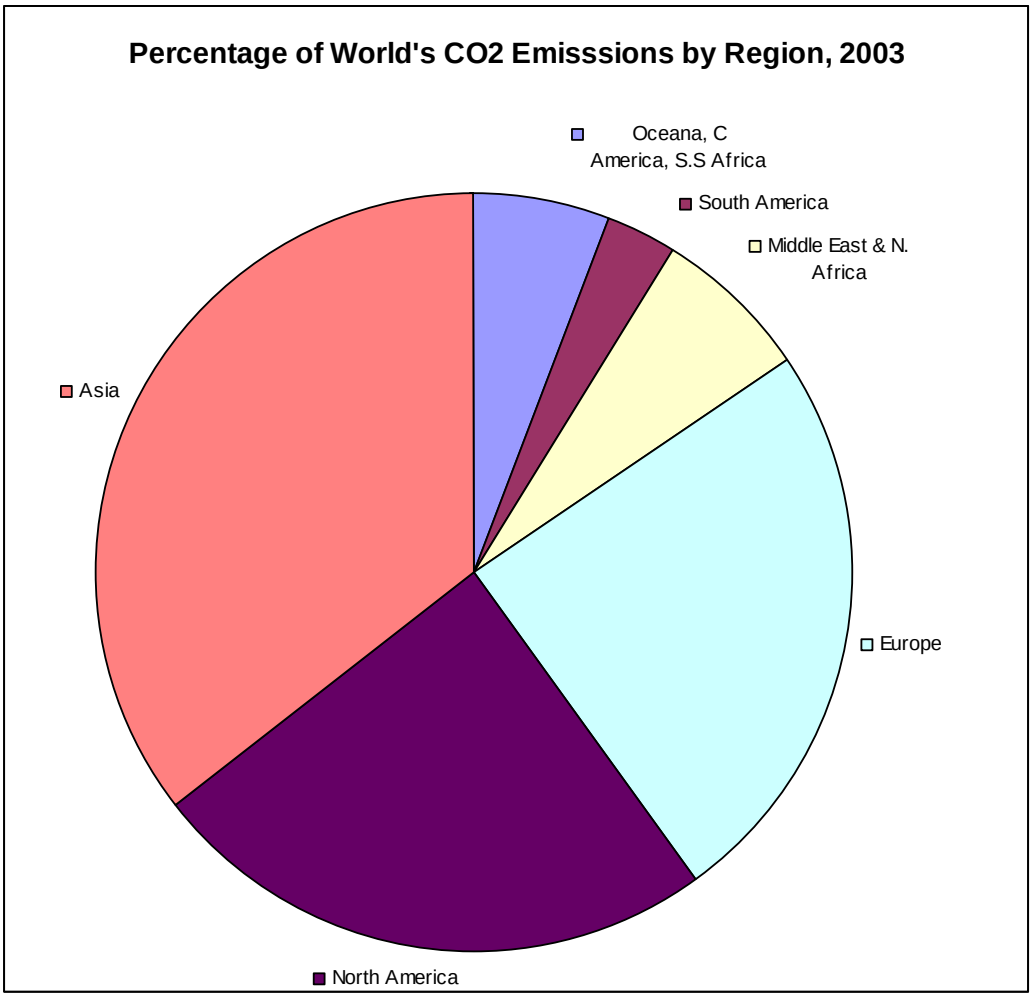
The great debate over the changes in the earth's climate began as a scientific argument, centered on the question of whether human influences were responsible for the alarming rise in average global temperatures. When the scientific community reached a general consensus that humans were indeed responsible (at least in part) for climactic changes, the issue underwent a significant transformation. As policy-makers from countries around the world convened to confront the issue of climate change, the issue changed from a scientific debate to a debate about development, pitting the global South against the global North in the search for policy solutions. After a lengthy negotiation process, the Kyoto Protocol was created to deal with both the scientific aspects as well as the developmental aspects of climate change policy. While developing countries generally shared the sentiment that they were going to suffer from the effects of climate change policy, evidence to the contrary has emerged during the short time since the Kyoto Protocol's entry into force. Defying expectations that developing nations could only lose from climate change policy, Brazil has shown that it is actually quite possible to benefit significantly from these policies. Brazil has been proactive in developing the infrastructure to become involved in climate change negotiations, as well as using policy tools such as the CDM. Its actions have resulted in significant economic, developmental, and environmental benefits. The case of Brazil allows for some insight into how other countries with similar developmental profiles —specifically China and India—stand to benefit from climate change policy, and how these benefits will translate into policy for future climate negotiations.

From Science to Social Inequality- Framing the Climate Debate

The ten years between the drafting of the Kyoto Protocol and its entry into force were filled with contentious debate and heated negotiations. One of the most prevalent controversies was the role of developing countries in climate change mitigation. Developing countries took the position that developed countries had caused the problem of climate change through the process of industrialization, and that they had been able to develop free from any restrictions on greenhouse gas emissions. It was therefore unfair to ask countries that were currently undergoing economic transformation to face restrictions that industrializing countries did not have to deal with in the past. Developed countries, on the other hand, argued that many developing countries had already reached emissions levels of developed countries, and that any mitigation efforts that didn't include countries such as India and China would be ineffective. As Figure 1 shows, both parties were (and still are) responsible for contributing to global CO2 emissions. Developed countries' argument that the developing world would soon surpass the developed world's emissions was certainly not unfounded. In 2003, Asia was clearly responsible for the largest share of emissions, due to the rapid industrialization of India and China. This is not to say that the developed world should be exonerated from responsibility—the United States alone is currently responsible for over 22% of global emissions, which puts North America in second place for its share of global emissions. The graph in Figure 2 breaks down emissions by development categories, as defined in the Kyoto Protocol. Developed countries are referred to as Annex 1 parties by the Kyoto Protocol, while developing countries are categorized as non-Annex 1. More explanation on these categories will be provided later. This graph shows that while developing countries may not have been the

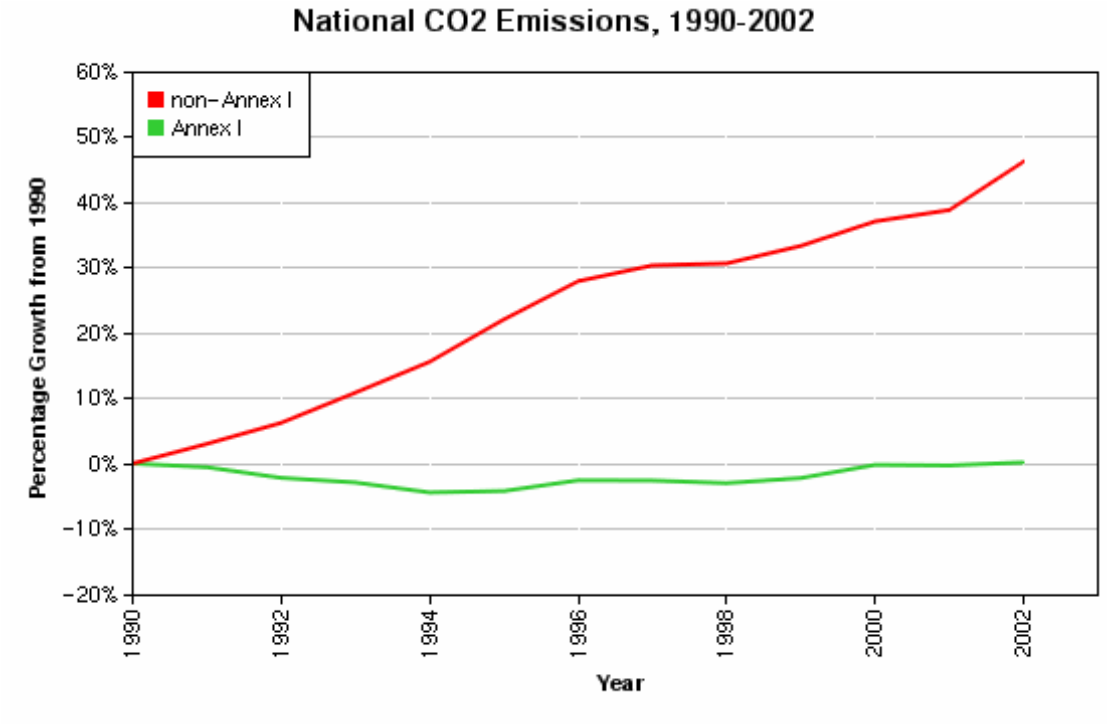
originators of the global warming conundrum, they are certainly emitting a large share of CO2 now. The graph also shows that emissions of non-Annex 1 countries are sharply increasing, while those of Annex 1 countries appear to be leveling out.

Figure 1: Regional Percentages of CO2 Contributions



Source: Climate Analysis Indicators Tool (CAIT) Version 4.0. (Washington, DC: World Resources Institute, 2007).

Figure 2: CO2 Levels for Annex 1 and non-Annex 1 countries since 1990



Source: Climate Analysis Indicators Tool (CAIT) Version 4.0. (Washington, DC: World Resources Institute, 2007).

Despite the empirical evidence that developing countries had already contributed, and were likely to keep contributing to climate change, many representatives of the South remained staunchly opposed to any kind of requirements or restrictions for developing countries. Anil Agarwal of India commented that "industrialized countries are holders of natural debt, borrowing from the assimilative capacity of the environment by releasing waste gases faster than they can be removed naturally," and that "asking developing countries to reduce carbon emissions levels now amounts to asking them to freeze their standards of living at their current stage of development."[1]

Whether or not it was unfair for developing countries to adopt policies to mitigate climate change, warming projections predicted that warming trends would be much worse if they failed to do so. The third IPCCC assessment report predicted that future changes in temperatures due to anthropogenic greenhouse gas emissions would be much greater in scenarios where populations continued to grow and policies and technologies to mitigate emissions were not adopted.[2] The report further suggests that if developing countries industrialize without taking action to mitigate their effects on the climate, the severity of climactic changes due to greenhouse gas emissions could increase dramatically.

The contending positions of the developed and the developing world informed negotiations as countries began the process of creating a cohesive global agreement to address climate change. The resulting protocol reflects both the position of scientists from the developed world who argued for a scientifically-based agreement that would focus purely on emissions reductions, as well as the viewpoint of developing countries that argued for their right to develop in the absence of burdensome restrictions. According to Karen Olsen, the Kyoto Protocol represents a compromise between these two opposing viewpoints; "a strictly political deal mixing principles for burden sharing."[3] In the language of the Kyoto Protocol, this is described as "common but differentiated responsibilities," encompassing the view that all countries have a role to play in combating climate change, but that developing countries would not have to bear as much of the cost of mitigation as the developed world.[4]

Under the Kyoto Protocol, burden-sharing is expressed by dividing countries into different categories by their level of development. Developed countries are defined as

Annex 1 parties, and have set emissions reductions targets. Developing countries are grouped as non-Annex 1 countries, and have no set targets or restrictions. However, they are required to take greenhouse gas inventories and publish national communications about the status of their climate programs.[5] While allocating the bulk of the responsibility to the developed world, the protocol still calls for the participation of developing countries, and specifies mechanisms to assist them with their efforts. In this way, the protocol is a reflection of the debate, and represents a compromise on both sides of the issue. For most participants in negotiations, these compromises were acceptable, but for some key players, they were not.

The exemption of mandatory targets for developing countries led President Bush to withdraw the United States from negotiations in March of 2001, despite the fact that US emissions accounted for more than 36% of global emissions in 1990, the year used as a baseline to set emissions reductions targets. The U.S.'s withdrawal from climate negotiations posed a significant challenge to the rest of the world, which had to make-up for the United State's large share of emissions reductions targets by obtaining ratification from more countries, so that the specifications of the treaty that called for 55 countries, responsible for 55% of global emissions in 1990 to be controlled, could be met.[6] Despite the U.S.'s staunch refusal to participate, the rest of the world pushed forward, and the protocol went into force in February of 2005.

While developing countries were not required to have emissions reductions targets, the Kyoto Protocol did contain important previsions regarding the role of developing nations in climate change mitigation. Most of these previsions remained fairly vague and broadly defined, suggesting that Annex 1 parties should offer assistance to

non-Annex 1 parties through the provision of financial resources to cover costs of mitigation, technology transfer, and assistance with scientific research. Since none of these suggestions call for specific actions on the part of Annex 1 parties, it is unlikely that they will be of any help to developing countries until they are more firmly defined.

Other than these suggestions, there is one other very important piece of the Kyoto Protocol for non-Annex one countries: the Clean Development Mechanism. The Clean Development Mechanism is a flexible mechanism that allows developed countries to implement projects to reduce greenhouse gas emissions and sell those emissions to Annex 1 countries, which are those with mandatory emissions reductions targets. The idea behind the CDM was that it would not only help Annex 1 countries reduce emissions in a cost-effective way, but it would also help contribute to the sustainable development of the host country through technology transfer, investment, and poverty alleviation. In this way, the CDM is a compromise between the two opposing viewpoints of the scientific vs. the developmental perspectives on climate change policy that strives to reconcile these views.

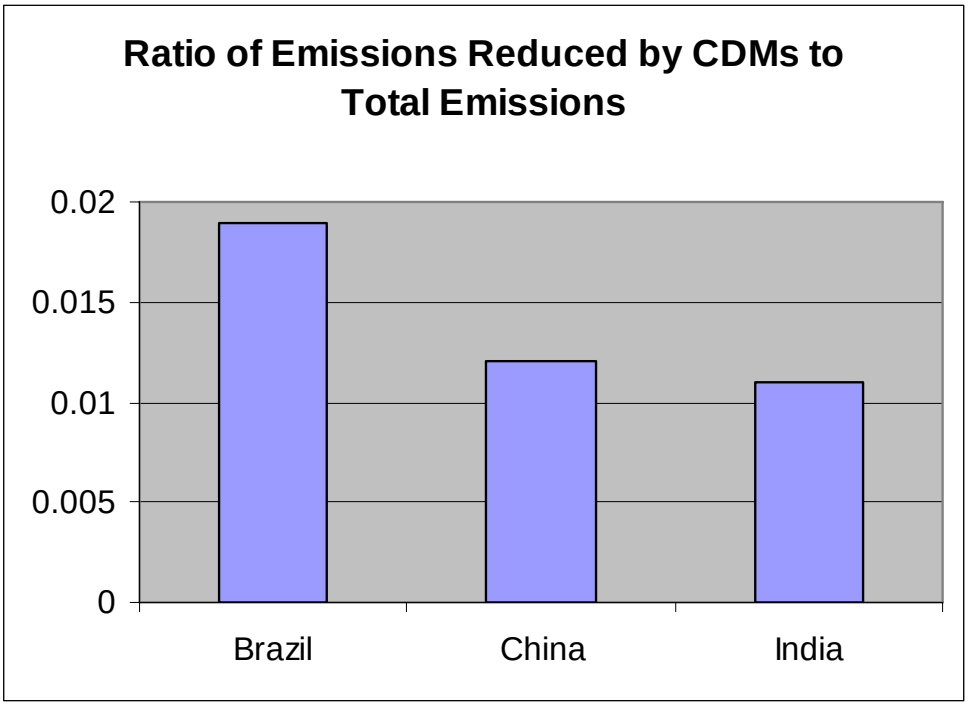
Developing countries were wary from the start about climate change policy, and many thought that the CDM would play a minor role in GHG reductions. As discussed above, there was considerable speculation about fairness and equity. However, two years after Kyoto's entry into force, there is evidence in many countries that rather than hurting economies by imposing new costs and policy burdens, the market-based mechanisms of the Kyoto protocol are creating new opportunities and actually bringing benefits beyond greenhouse gas reductions.

One example of a developing country that is benefiting greatly from climate change policy is Brazil. Brazil has been very involved in climate change negotiations from the start, hosting the Earth Summit in Rio in 1992 and developing the Brazilian Proposal for the Kyoto Protocol that served as a foundation for the development of the Clean Development Mechanism.[7] As of May 2007, Brazil is host to 99 registered CDM projects, which are responsible for 12% of Certified Emissions Reductions (CERs) from CDMs in the first crediting period. Brazil is surpassed by only India in the number of projects that it is hosting.[8] The reductions in emissions due to CDM activity in comparison with total emissions are slightly higher for Brazil than for either China or India (Figure 3.1). While India has many more CDMs than Brazil or China in numbers, the number of CDMs in comparison to population size is much greater for Brazil than it is for either China or India (Figure 3.2). As a function of the size its economy, Brazil has relatively more CDMs than China, while India has the most (Figure 3.3). In addition to its active participation in the CDM, Brazil has also developed its own Futures Market, which is one of only three major futures markets in the world (the other two are the European Trading Scheme and the Chicago Climate Exchange), and has also taken a number of unilateral measures to reduce greenhouse gas emissions independently of the Kyoto Protocol.

The cases in this paper illustrate how Brazil is taking advantage of the opportunities presented by climate change policy and is actually benefiting from these opportunities in the form of economic growth, environmental improvement, technology transfer, and reputation in the international scene. It also examines characteristics of Brazil's environmental regime to determine why Brazil has been so proactive in climate

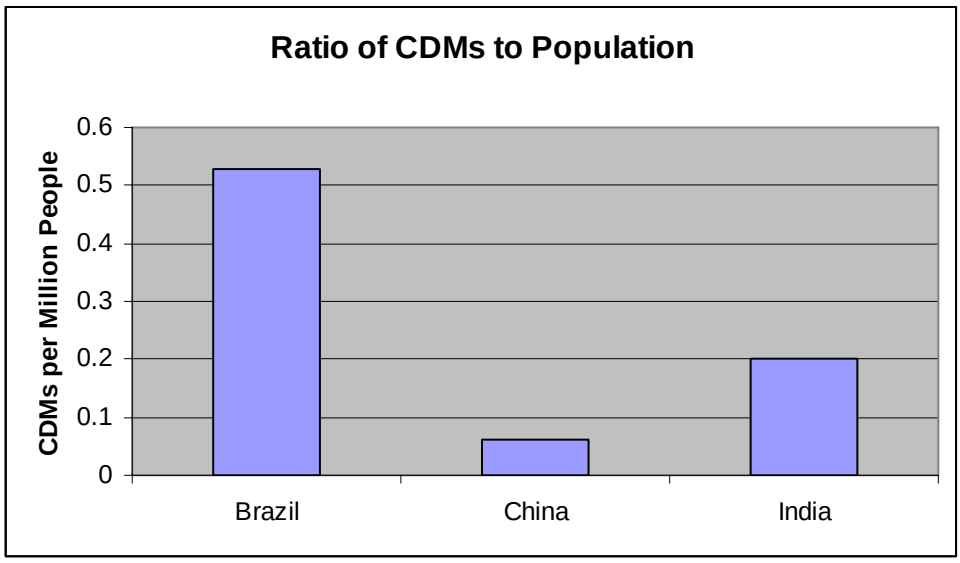
change policy and what factors have allowed Brazil to reap these benefits. Using the framework established for evaluating the benefits of climate change policy to Brazil, I will use Brazil's case to inform a brief analysis of influences of climate change policy on China and India. I will close with a comparison of the three cases, some comments on the implications for other developing countries, and a look into the next round of climate negotiations.

Figure 3.1: CERs/Total Emissions



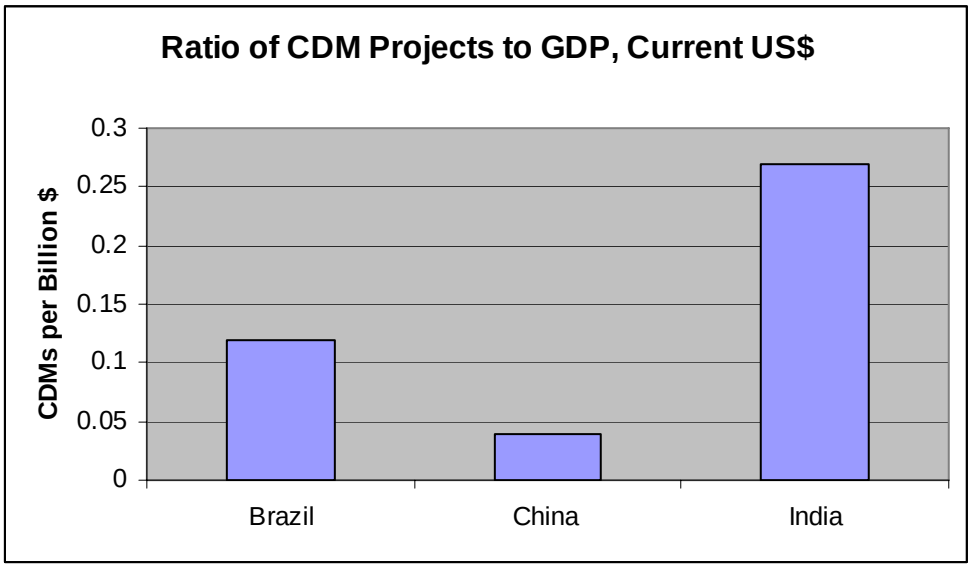
Source: UNFCCC, CDM Statistics. www.unfccc.org

Figure 3.2: CDM Projects/Population



Source: UNFCCC, CDM Statistics. www.unfccc.org

Figure 3.2: CDM Projects/GDP



Source: www.unfccc.org, www.worldfactbook.gov, www.wdi.org

Why Brazil?

Brazil has not always been particularly concerned with the environment. For most of the 20th century, Brazil's focus was on growth and development, and that often went hand in hand with the over-exploitation of natural resources. Driving this mentality was the Developmentalist school of thought, which sought to turn Brazil into a major world power, no matter if that came at the expense of the environment. However, by the mid-1980s, the Developmentalist model was beginning to lose credibility. As Brazil shifted towards a more democratic political system, and "citizens, leaders, and government officials" began to call into question the effectiveness of the Developmentalist model for social and environmental reasons, Brazil began to transition towards a more proactive environmental regime. In the mid 1980s, Brazil experienced an "upsurge of an extensive critique of environmental degradation and the wasteful use of natural resources" from the global community, mostly as a reaction to the growing awareness of deforestation in the Amazon.[9] Concerned that a bad environmental reputation could harm its position in the international arena during this period of increased global integration, Brazil began to give more priority to the environment. In the 1980s, a number of ambitious policies were implemented, including the "Law of the National Environmental Policy" (1981), which aimed "at making socioeconomic development compatible with environmental quality and ecological stability."[10]

Brazil's efforts to transform its environmental regime in response to pressures from the international community during the 1980s demonstrates that even as Developmentalism dwindled, Brazil maintained its ultimate goal of becoming a global leader and gaining respect in the international arena. While it may have been fairly clear by the 1980s that Brazil was not likely to become a great world power due to economic stagnation, rampant poverty, and dramatic social inequality, Brazil continued to seek prominence in areas where it saw the potential for leadership. Brazil's participation in climate change negotiations are an excellent example of this. Beginning in 1992 with the Earth Summit in Rio de Janeiro, Brazil has impressed the international community by its active participation in climate negotiations, as well as its continuous efforts to become a model for other developing countries seeking to capitalize on the opportunities presented by environmental policies.

The Benefits of Climate Change Policy: Definitions

Before enumerating the ways in which Brazil is benefiting from climate change policy, it is important to define what these benefits are.

Economic Benefits are increases in revenues to government, firms, or individuals, and are usually realized from the sale of carbon credits and the generation of employment. Such revenues are generally measured in gross monetary terms, and do not necessarily account for distributional effects. While income generation is usually a good thing, the reader should keep in mind that economic benefits may not necessarily be redistributed in ways that promote sustainable development.

Environmental Benefits are defined as improvements in environmental quality that are additional to the global benefits of reduced greenhouse gas emissions. Such benefits have a greater impact on the community in which greenhouse gas mitigation techniques take place. These benefits include improved air and water quality, improved sanitation, improved habitat for native species, increased vegetation, and increased area of lands for conservation or sustainable activities.

Social Benefits are those that directly improve people's lives, especially in reference to the people in the communities hosting projects to mitigate greenhouse gases. These benefits include increased employment, education, health care facilities, access to electricity, and sanitation.

Developmental Benefits refer to benefits that increase a country's ability to achieve greater levels of development (in the conventional sense). These benefits include technology transfer, foreign investment, and reputation in the international arena, which encourages investment and enhances a country's role in international negotiations.

Most of the measures that are described in this paper do not contributed every type of benefit listed here, but some projects come fairly close. As will be discussed below, projects implemented under the Clean Development Mechanism are currently contributing the most benefits to Brazil, but the carbon market and national policy initiatives are also playing a role in this.

The Clean Development Mechanism and its Implementation in Brazil

The most important prevision in the Kyoto Protocol for Brazil is the Clean Development Mechanism. Brazil was proactive in developing the infrastructure necessary

to attract CDMs early, before the protocol even entered into force. In order to participate in the CDM, the UN requires that a country establish an infrastructure for estimating greenhouse gases, verifying and monitoring projects, and making this information available to the public. The requirements for eligibility, which are listed in Table 1, set up the constitutional infrastructure to validate and monitor CDM projects.

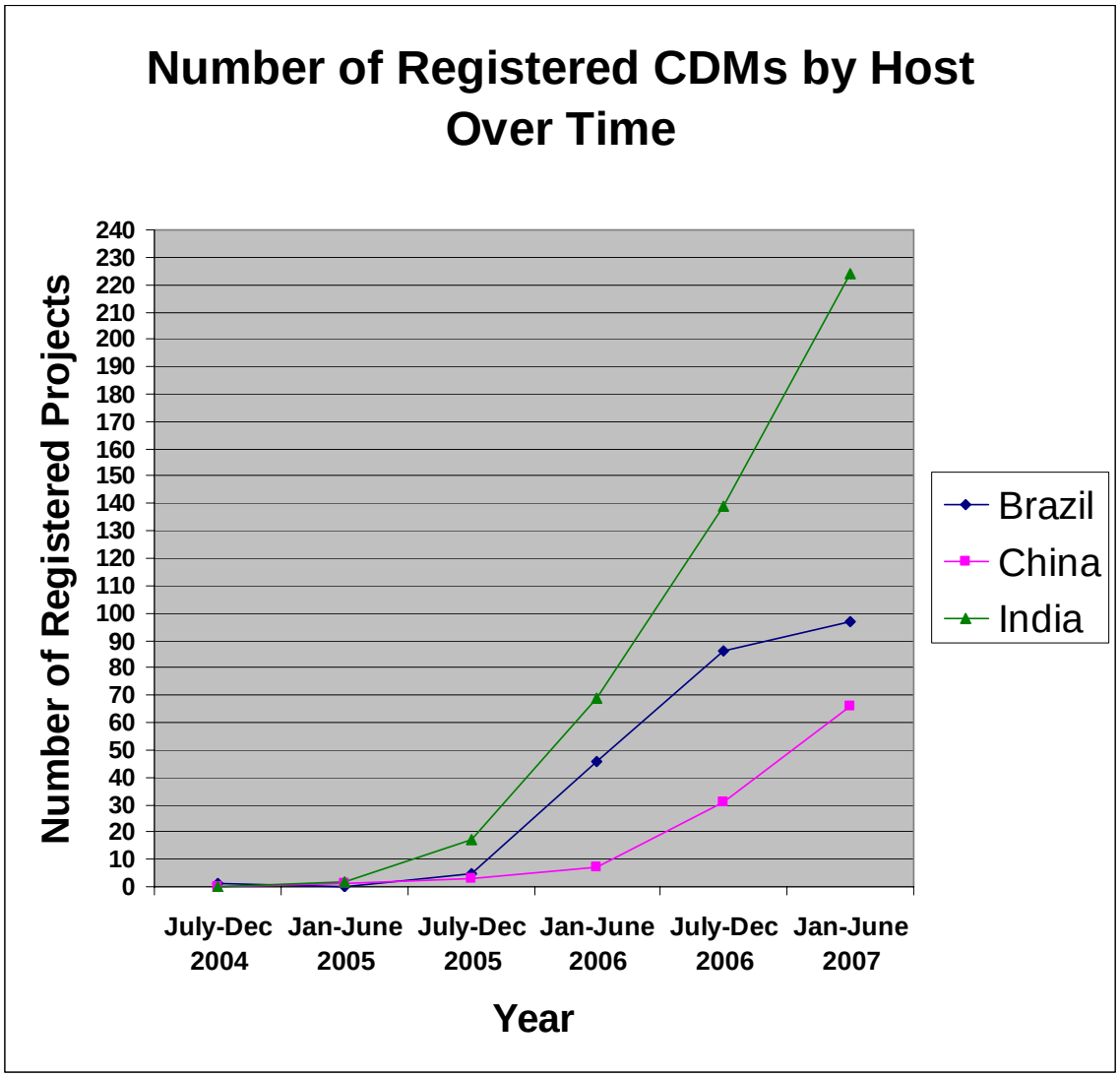
Table 1: CDM Eligibility Requirements

Requirement	**Function**
Designated National Authority (DNA)	Validates CDM projects, verifies and certifies emissions reductions, publishes information about national CDM activity, and submitts an annual activity report of CDM activity to the Executive Board
GHG Accounting System	Estimates anthropogenic greenhouse gas emissions and removals by sinks (such as forests and large bodies of water, which sequester CO2).
National Registry of Greenhouse Gases	Accounts for the emissions and reductions in GHGs, and makes this information publicly available
Comprehensive GHG Inventory	Establishes a baseline for emissions of all GHGs, which is to be submitted to the Executive board of the UNFCC.

Source: UNFCCC, http://unfccc.int/resource/docs/2005/cmp1/eng/08a01.pdf#page=6

By becoming involved early, Brazil was able to attract numerous projects very quickly, so that it could begin reaping the benefits of these projects before other countries came on board. The NovaGerar landfill project, which will be described in more detail later, was registered before the Kyoto Protocol even entered into force. While Brazil was quickly surpassed by India in terms of the numbers of CDMs it hosted, it helped to jump-start the CDM process, and it continues to be a proactive participant. (See Figure 5).

Figure 4: Registered CDM Projects in Brazil, China and India from 2004-2007



Source: UNFCCC, CDM Project Activity, www.unfccc.org

Figure 5: Emissions Reductions by Host Country

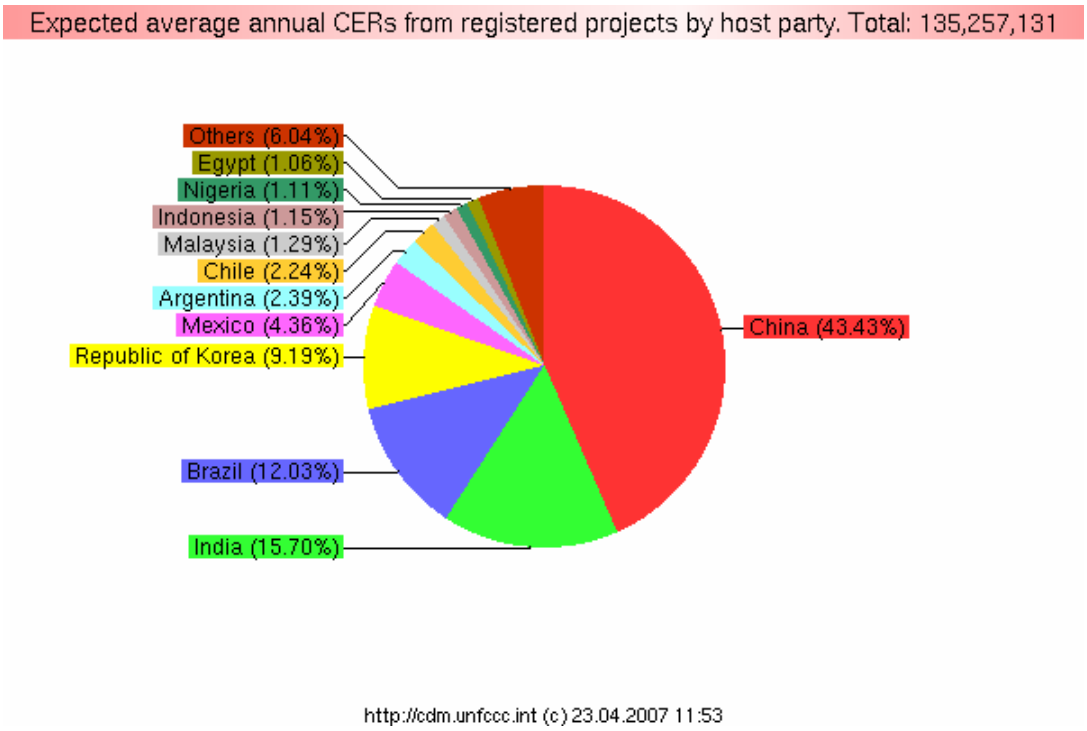
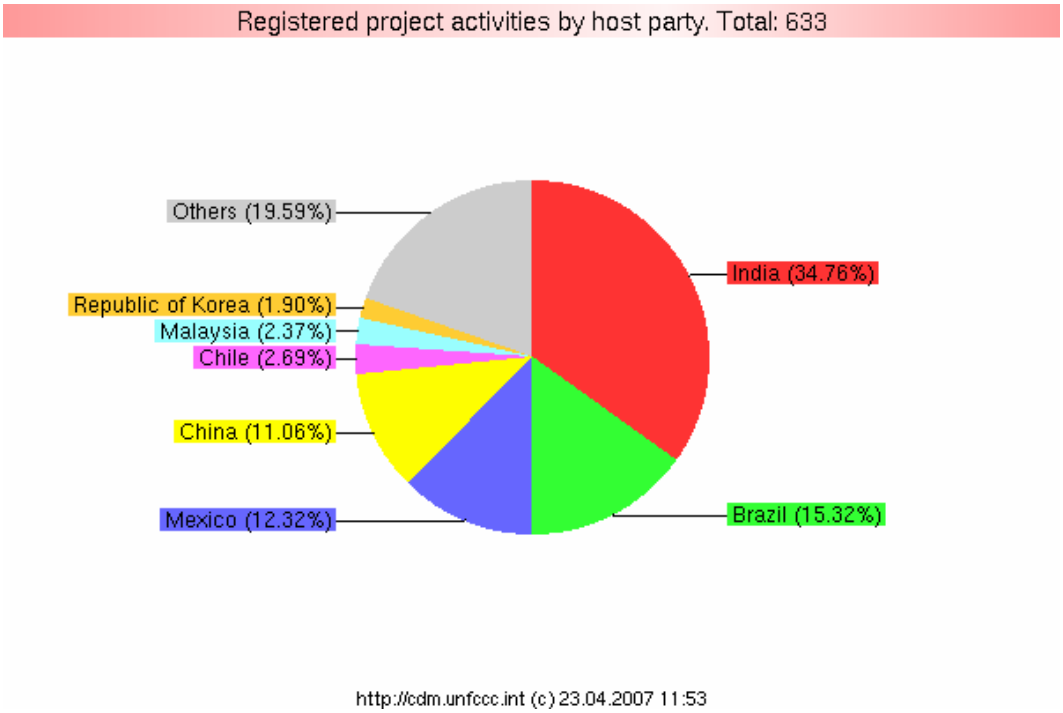


Figure 6: Number of CDM Projects by Host Country

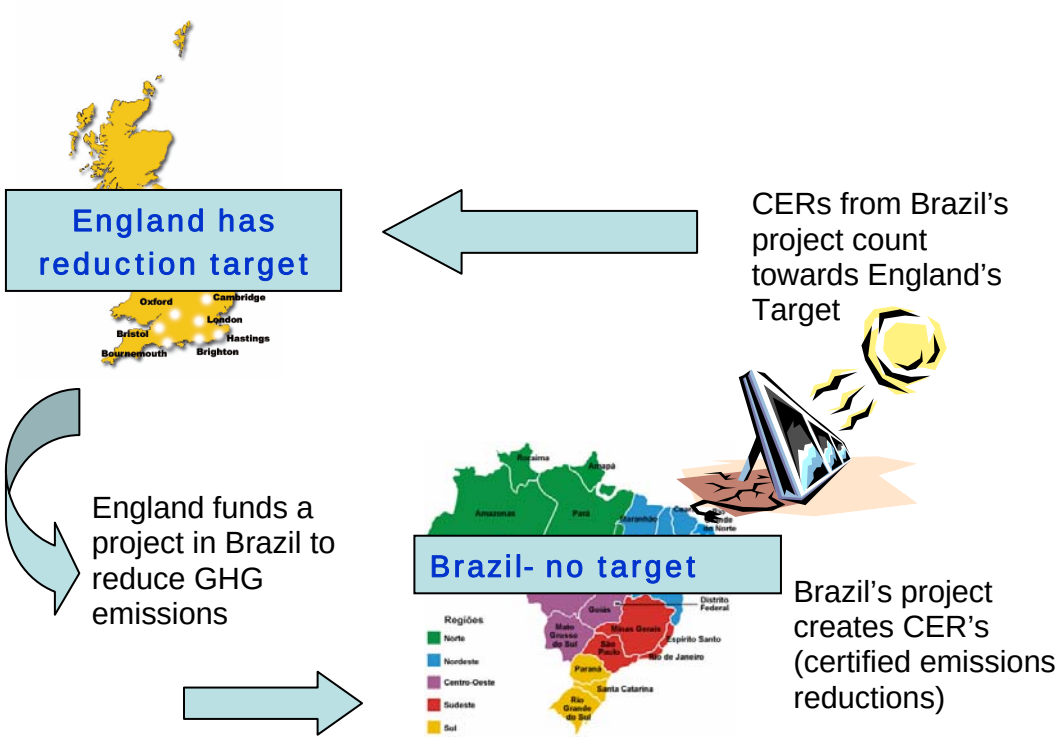


Source: UNFCCC, CDM Statistics, www.unfccc.org

The basic premise of the CDM is that non-Annex 1 countries, which are those countries that do not have mandatory reduction targets under Kyoto and include all of the developing countries and least developed countries, can host projects that reduce greenhouse gas emissions, such as replacing a coal plant with a wind-powered plant, which earns certified emissions reductions (CERs). The CERs are then sold and credited to an Annex 1 country to use towards meeting its national target. See Figure 7 for a graphical representation of idea behind the CDM process. To earn certified emissions reductions, a project must go through all of the project cycle stages, which include the proposal of the project, monitoring plan, and methodology, as well as validation and approval by the Designated National Authority (DNA), which each country must have appointed before they can participate in the CDM. Once all of these steps have been

completed, the proposal is submitted to the Executive Board, which is the international authority that approves the final project and issues the CERs to the appropriate entities.[11]

Figure 6: How the CDM works



The purpose of the CDM is two-fold. First, it aims to help Annex 1 countries reach their targets cost-effectively. Greenhouse gases mix in the atmosphere, so it does not matter where they are reduced; a reduction in China has the same global effect as a reduction in Great Britain. For many industrialized countries, it would be prohibitively expensive to make all of their required reductions domestically. This is because many of these countries already have environmental regulations that ensure that they operate fairly efficiently. If Britain, for example, already has a very low-impact energy grid, it would be very difficult to generate many reductions from energy projects. However, simple

efficiency measures in China, for example, would generate an enormous amount of emissions reductions, since the energy grid in China is highly inefficient and based mostly on heavily polluting coal plants. In this case, it makes much more sense for Britain to fund a project in China to improve efficiency in coal plants, or replace a coal plant with a cleaner technology, than to take domestic measures to make these reductions.

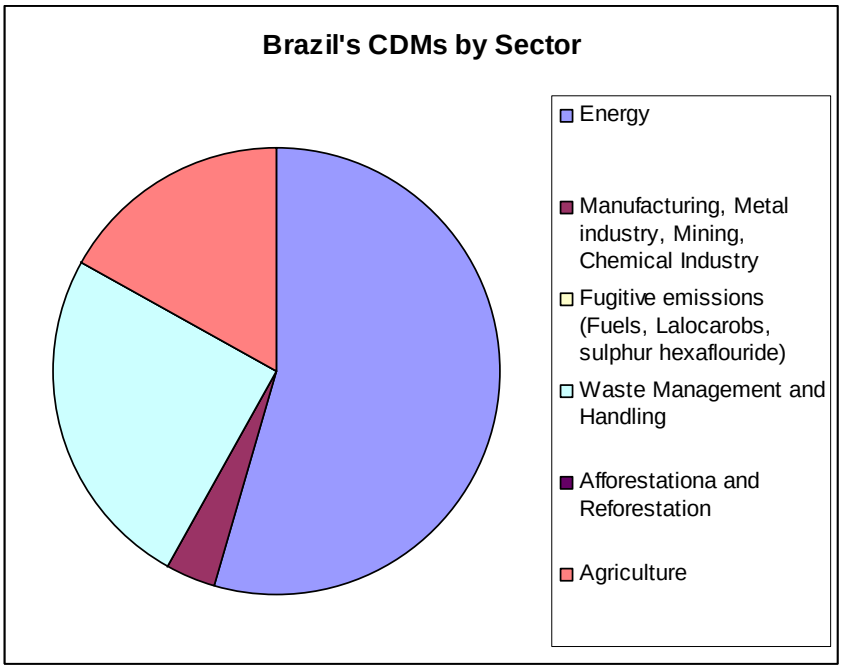
The second aim of the CDM is to contribute to the sustainable development of the country that is host to the project. While the wording in the Kyoto Protocol is fairly vague on what "sustainable development" should mean, it is generally interpreted to include technology transfer, socio-economic gains, and environmental benefits beyond greenhouse gas reductions. It is this second purpose that makes CDMs attractive to developing countries. Developing countries generally do not place climate change mitigation high on their lists of priorities in terms of what problems need to be solved and where scarce funds should be allocated, which makes sense when developing countries face much more urgent problems such as reducing hunger, providing access to clean water, providing better health care, and providing education. This part of the CDM strives make it more feasible for developing countries to participate in climate change policy by offering developmental benefits for those who host CDM projects.

The following cases will show how CDMs in Brazil are working in practice. I will use several different examples from the three sectors that make up the majority of the CDM market in Brazil: Energy, Waste-Management, and Agriculture. For each project, I will provide a brief overview, followed by an analysis of the benefits and drawbacks of the project, as well as a discussion of the potential for the project's future. Because most CDM projects are very newly implemented, there is limited information available for

many of the projects outside of the project design documents submitted to the UNFCCC. I have tried to include as much analysis from outside sources as possible, but for some projects, no data was available apart from the information provided by the project developers. As projects become better established, there will be an increasing pool of literature on individual projects and their effects in their host communities, but as of now, such information is fairly scarce.

Brazil's CDMs are mostly concentrated in the energy sector, which includes renewable and non-renewable energy projects (See Figure 8). It also has a large proportion of waste management projects, as well as a number of agricultural projects. The rest of the projects are in manufacturing, metal production, mining and chemical industries. To date, there are no afforestation or reforestation projects. Afforestation and reforestation projects are still very rare in all countries, mostly because the carbon accounting is very difficult, and these types of projects are also more expensive for the amount of reductions they produce. It will be interesting to see what benefits come from each type of project, but an evaluation of which type of project is the "best" in terms of the benefits it brings is beyond the scope of this paper, and would probably be inclusive anyway due to the short time-scale (most projects are only a year or two old) and limited information available on each project. There are other factors that could be analyzed as well, such as the project partners, the scale, and characteristics of host communities. While these factors will be mentioned as they are relevant to the following cases, I will not provide a detailed analysis of them because the main point of these cases is to illustrate how the CDM in general is bringing benefits to Brazil.

Figure 8: Brazil's CDM Project Profile



Source: UNFCCC, CDM Project Activity, May 2007. www.unfccc.org

The Energy Sector

Although Brazil's energy mix is already more heavily dependent on renewable energy sources than most developing countries, there are still many opportunities to further increase the share of renewable energy. Brazil's sugarcane and wood-processing industries have offered an enormous source of biomass, and Brazil also has a well-established infrastructure for hydro-electric projects, which has facilitated the implementation of several hydro projects.

Biomass

Biomass projects (projects using sugar cane, commonly called bagasse, or wood residues) are the most prevalent type of energy project in Brazil. These projects are relatively simple and easily replicable, leading to an expansive proliferation of projects throughout Brazil. Currently, there are over twenty projects that use either wood residue or sugarcane waste to produce energy.

One such project is at the Usinas Itamarati sugar mill. Located in the state of Mato Grosso, Usinas Itamariti is one of Brazil's largest sugar mills, processing 6,574,350 tonnes of sugarcane every year. Much of this sugar is sold for general consumption, but some of it is also used to make electricity. Using direct combustion technology, biomass is oxidized with excess air, yielding hot flue gases that produce steam in boilers. The steam is then used to produce electricity in a "Rankine cycle engine." This electricity is sold to the grid, replacing electricity that would have been produced from fossil fuels. This project is estimated to reduce 7,990 tonnes of CO2eq over its crediting period by exporting 14,800 MWh to 31,800 MWh of electricity every year.[12]

The main benefits from this project come in the form of revenues generated from the sale of energy to the grid. However, the project developers also note that the project generates local employment. While it only employs seven workers to operate the plant, 3,861 people work for the Usinas Itamarati complex and can potentially benefit from higher wages due to the increased income from this project. The project developers also cite "lower expenditures" due to not having to import electricity from the grid, which will keep more money in region to "provide the population better services."[13] In addition, the project sponser, the Usinas Itamarati Company, is "working with local communities on

environmental education projects, reforestation, regular water quality assessment, support for environmental parks…and support for community agriculture." [14]

A similar project, which uses wood residues to generate electricity, is the Imbituva Biomass Project, located in the state of Paraná. This project envisions using piles of wood waste, which emit methane through decomposition, to produce energy which will be exported to the grid to displace energy produced from fossil fuels. This project is similar to the Usinas Itamarati plant in that it produces electricity from agricultural (or forestry) residues, but this project has the added benefit of eliminating the environmental problem of sawdust piles, which often reach heights of 10 meters. The project will create over 60 jobs, and will implement steam turbine technology from Germany. This technology is not available from any Brazilian company, thus representing some degree of technology transfer. Another difference in this project is that it is a joint venture between a Brazilian company and an English company, which could possibly lead to a greater source of funding and technology transfer.

As we can see from these examples, renewable energy production has a large amount of potential for expansion in Brazil because of the wide-spread availability of biomass fuels from the wood and sugar industries. While both projects envision some job creation and involvement in the community, the benefits of these projects seem to be mostly economic. The first example provides almost no additional environmental benefits other than the reduction of GHG emissions, and job creation is fairly limited. Because the project is funded privately by a Brazilian company, it is unlikely that there will be any technology transfer. The second case offers more environmental benefits, in the form of eliminating wood-waste piles, as well as job generation and technology transfer. It is

unclear that the increased benefits are a result of the fact that the project is receiving funding from a foreign company, but it is definitely a possibility worth noting. While these projects may not create as many additional benefits to the environment and the community as some of the other projects we will look at, the benefits that they do bring make these communities better off than they would have been in the absence of the projects.

Hydro-Power

Hydro-power is another example of a renewable energy CDM project. Brazil has traditionally been heavily dependent on hydro-power, so it has a well-developed infrastructure surrounding hydro-power production. An example of a hydro-power CDM project is Jaguari Energética, which is located in Rio Grande do Sul. The plant incorporates an old dam that had been abandoned after its construction in 1969. The plant provides power to the surrounding town that replaces electricity production from fossil fuels. The small, localized nature of the project provides better reliability and quality of electricity, as well as creating income from the sale of power to the grid. There is additional income from royalties paid to the surrounding communities from the power company for the water rights.

Aside from the economic benefits however, hydro-power projects seem to have a limited effect on sustainable development. This hydro project, for example, used technology and infrastructure that already existed, and it did not claim any employment generation or additional social benefits beyond the generation of income. It is also important to note that other hydro projects could potentially have a *negative* effect on the environment if they have to build a new dam or interrupt water ecosystems. Of all the

projects that are described in this paper, this hydro project is the least interesting in terms of the benefits that it provides to Brazil. However, the net benefit of this project is still positive as in the case of the biomass projects, because the project increases Brazil's share of renewable energy, as well as generating a new source of income for surrounding communities.

Waste Management: Greening Garbage

One of the best examples of a CDM project fulfilling its two objectives is the Nova Gerar landfill in the state of Rio de Janeiro in Brazil. This project, which deals with waste management and power generation in the city of Nova Iguaçu, addresses both social and environmental problems within Brazil, while working within the framework of the international efforts to mitigate greenhouse gases.

Municipal garbage disposal in Brazil is a formidable problem in many areas. The national sanitation report of 2000 reported that 30.5% of all waste collected in Brazil is disposed of in open dumps. The garbage situation is worst around the large metropolitan areas in Brazil; the city of Rio de Janeiro generates over 14 tons of solid waste per day, which totals a staggering 5,110 tons per year, creating enormous disposal challenges.[15] By using innovative technology and by obtaining funding from a variety of international sources, the NovaGerar project addresses these challenges of waste disposal in one of Rio's neighboring municipalities.

The project is run jointly by EcoSecurities, an international environmental finance company and S.A. Paulista, a Brazilian civil engineering and construction firm, with additional funding from the World Bank Netherlands Clean Development Facility, and

the International Bank for Reconstruction and Development, which purchases CERs for the Netherlands government. The objective of the project is to shut down and rehabilitate the Lixão de Marambaia, which was an open dump that ceased operation in 2002, and open a new landfill, called the Aterro Sanitario de Adrianopolis. The new landfill possesses technology that uses methane gas from decomposing garbage to generate electricity to fuel operations at the landfill and export to the grid. All waste gas that is not converted to electricity is flared.

The emissions reductions that are claimed by Nova Gerar come from two sources. First, methane from decomposing garbage that would otherwise simply be emitted into the atmosphere is now burned as electricity, which replaces the use of fossil fuels that would otherwise be used for this purpose. Second, waste methane gas is flared, which converts the methane gas to CO2. Although CO2 is still emitted, there is a net reduction in greenhouse gas emissions because CO2 is a much less potent greenhouse gas than methane. The total emissions reductions produced by combustion and flaring are estimated to be 14.072 million tones of CO2 equivalent over 21 years.[16]

While this number represents a significant contribution towards reducing greenhouse gas emissions, Nova Gerar's benefits extend beyond greenhouse gas mitigation. As Adriana Felipeto, the coordinator of the NovaGerar project, expressed in an interview about the project "Capturing this philosophy [of reducing greenhouse gas emissions] and creating a planet of sustainable development was the objective of this project." The old open dump site at Marambaia has been restored and converted to a public park, where 10 thousand native species of the Atlantic Forest have been planted. The people who formerly made their livings from the dump are now employed at the new

landfill or at the recycling cooperative, and the city has offered assistance in offering adult literacy courses, professional courses, and environmental education workshops.[17] In addition, Ecosecurites and S.A Paulista have agreed to donate part of the energy generated from the methane combustion to nearby schools and hospitals.[18]

NovaGerar exemplifies how the clean development mechanism has benefited a community in Brazil, while at the same time assisting the Netherlands to reach its reduction target cost-effectively. The project provides all four types of benefits were defined previously: economic, environmental, social, and developmental. The project gains income from the sale of CERs to the Netherands, the community surrounding the NovaGerar landfill projects benefits from cleaner air and water, safer living conditions, employment at the new landfills, and reduced dependence on fossil fuels because of an increased in renewable energy in the grid. In addition, the technology used at NovaGerar, which was developed in the UK, can serve as a model for the adaptation of such technologies at other landfill sites in Brazil and contribute to the sustainable development of the country as a whole.

Another innovative project that uses garbage to reduce greenhouse gas is the Usina Verde Pilot project at the Federal University of Rio de Janeiro (UFRJ). Though the carbon credits generated by this project are being sold only to the voluntary market (not to be counted under the CDM), the methodology of the project has been approved by the UN for CDMs, so if this project is scaled-up it will be eligible for CDM status.

The Usina Verde project is run by the private company of the same name and it revolves around incinerating urban waste to create electricity and ash that can be used to make inexpensive bricks and other building materials. The incinerators, which can handle

up to 150 tons of waste per day, burn the waste and then mix the resulting alkaline ash with water to form a "dense mist." The poisonous acid gases that are released during incineration are passed through this mist, resulting in a chemical reaction that creates salts and other waste products. The salts and waste products are then used to make bricks. In addition to creating building materials, the incinerators also produce a little more than 2 megawatts of electricity per day. The technology used for this project was developed by the Usina Verde Company and scientists from UFRJ. Henrique Saraiva, the CEO of Usina Verde claims that his company's technology will be more efficient that incinerators that are already used in other places around the world, and is optimistic about expanding the scale of operations for these incinerators.[19]

The benefits of this project are more difficult to evaluate than the Nova Gerar project for several reasons. Because the project has not been registered as a CDM yet, it is difficult to determine how many carbon credits will be generated by this project, and what the socio-economic impacts of the project will be. For now we can at least speculate on the benefits and costs of this project.

Because the project will generate carbon credits from the production of renewable electricity and the avoidance of methane gas produced from urban garbage in landfills, it is fairly certain that there will be economic benefits from this project. Undoubtedly, there will also be some employment effects, as jobs will be generated by the need to operate the incinerators and make bricks from the waste products. The environmental benefits, however, are much less certain. Temistocles Marcelos, the head of the Brazilian Forum of NGOs and Social Movements for the Environment, commented that the project "cannot be considered clean or sustainable" because the incinerators create "persistent organic

pollutants," such as dioxins, furans and heavy metals.[20] While this is a valid concern, the dioxins that are produced are well within international safety limits, and technologies exist to further reduce such emissions.[21] In addition, the project will be eliminating other harmful substances, such as the methane gas and other substances produced by garbage in urban landfills, and it will replace the burning of some fossil fuels for energy production. The developmental benefits of this project are also uncertain. On one hand, the technology was developed by a private firm in Brazil, so there was no actual technology transfer. On the other hand, the development of this technology was driven by the desire to capitalize on the carbon market and the sale of carbon credits from GHG-reducing technologies. In addition, the project has the potential to be replicated in many other locales, indicating that it could set a new precedent for garbage treatment in Brazil.

In sum, it is difficult to determine the net benefits of this project because it is just getting off the ground, but I offer it as an example of an innovative application of GHG-reducing technology and as a comparison to another similar project (Nova Gerar) that addresses climate change mitigation through the treatment of garbage.

Agriculture: Mitigation from Manure

While it is not typically the first type of renewable energy that comes to mind when thinking of ways to reduce greenhouse gas emissions, pig manure in Brazil has been one responsible for some of the largest reductions in greenhouse gases. The waste created by swine farms, which is usually stored in open-air cess pools, emits staggering amounts of methane gas, which is far more potent than CO2. Confined Animal Feeding Operations (CAFOs) create other serious environmental problems as well, such as odor

and water and land contamination from seepage. Because of the importance of the swine industry to Brazil, it is imperative to create better management systems for porcine waste. The average hog produces 5.9 kilograms (almost 13 pounds) of waste everyday, which, when multiplied by the large number of hogs in Brazil, results in a substantial environmental challenge.[22] The emissions from swine farms can be reduced by installing a biodigestor, which avoids methane emissions by flaring the gas, so that it is emitted as CO2 rather than methane. This process significantly reduces greenhouse gas emissions by reducing their potency by nearly 21 times. The methane gas can also be used to produce electricity, which can be used to power the farm facilities, or sold to the grid.[23] In 2006, Sadia, a large Brazilian meat firm which is responsible for the operations of thousands of swine farms, signed a contract with the European Carbon Fund for the sale of carbon credits from its biodigester project. The biodigester project encompasses 3,500 small swine farmers in the states of Santa Catarina and Paraná and envisions reducing emissions by 2.7 million tons of CO2 over ten years.[24]

The example of Sadia is just one of a whole series of animal waste mitigation (AWMS) projects that have been emerging in multiple states in Brazil. In 2006, 11 projects were registered to control the operations of various swine farms in over 10 states. One such project, which controls swine operations in Mato Grosso, Minas Gerais and Goiás, cites the potential to reduce 5.1 tonnes of CO2eq every year by mitigating emissions from the 11.6 million tonnes of hog waste produced annually in these three states. The biodigesters in this project will use methane from the animal waste to produce biogas that can be used for “localized energy,” rather than being emitted directly into the atmosphere, thus expanding access to energy and replacing some energy in the grid with

this renewable form. These projects will bring the benefits of technology transfer from the use of biodigesters, which can serve as a model for other waste management systems. In addition, there are very large implications for human health. The project will reduce Volatile Organic Compound emissions, as well as reduce offensive odors and contamination from seepage. The wide adaptation of these projects seems to indicate that they are easily replicable and attractive options for reducing greenhouse gases. They also create an abundance of added benefits by addressing a serious environmental problem for an industry that is very important to Brazil's economy, as well as expanding renewable energy use and reducing the health impacts that are caused by CAFOs.

As evidenced by the examples above, CDM projects are generally having a positive effect across multiple sectors of the Brazilian economy, as well as generating social and environmental benefits at the community level. While some projects seem to have more potential to contribute to sustainable development than others, it seems fair to say that CDMs are beneficial to Brazil, and that they will continue to provide these benefits as CDM market evolves and develops.

The next section of this paper deals with another very important way in which Brazil is participating in climate change policy, which is through the development of its own carbon trading platform. The development of this trading platform is similar to the participation in the CDM in that it is also a market-based mechanism that is specified under the Kyoto Protocol, but it is also quite different from the CDM in that Brazil is the only developing country to host such a market.

Brazil's Carbon Trading Scheme

The Brazilian trading scheme is the third of its type in the world, the first being the European Trading Scheme, and the second being the Chicago Climate Exchange. Brazil's development of its own scheme not only demonstrates its commitment to participating in global efforts to combat climate change, it also demarcates Brazil as global leader in participating in market-based solutions to the climate change problem. In addition, the carbon market has the potential to generate economic gains for Brazil worth $3 billion a year, according to estimates from the Federal University of Rio De Janeiro.[25]

The Brazilian carbon market was created by the Brazilian Mercantile and Futures Exchange and the Brazilian Ministry of Development, Industry and Foreign trade, and is usually referred to as the BM&F. It is an internet-based trading system that serves as an alternative to the European and Chicago trading schemes. Companies register greenhouse-gas reducing projects on-line and the BM&F analyze them to ensure quality and then put them forth for trading. Because of the fact that the market is still so young, the BM&F enjoys the advantage of being able to sell carbon credits for much cheaper than the price offered by the European Trading Scheme.[26] This advantage will help the new market attract business early on, so that it can develop to become competitive with the ETS and Chicago Trading systems.

Antonio Vives, manager of the International Development Banks' Sustainable Development Department, explained in a seminar about the new trading scheme that "Brazil has the opportunity of becoming the trading market of reference for Latin America in carbon emissions…" Vives emphasized that the carbon market is illustrative of a new type of development for Brazil, which is not "assistant type development," but

rather "legitimate development in the sense that it allows us to obtain resources to carry out projects that can undoubtedly contribute to the well-being of quality of life improvement of our communities."[27] In addition to income for Brazil, the new carbon credit market has another advantage: it provides incentives for the development of new methods to combat pollution. As Augusta Jucá, an environmental analyst for the United Nations Development Program (PNUD) noted, "The demand for credits forces a demand for more projects that reduce emissions, which, in turn, bring about the development of better technologies."[28]

The most obvious benefits of the carbon market in Brazil are the economic benefits, which are generated from the acquisitions and sales of carbon credits. Environmental and social benefits do not stem directly from the trading scheme, but are indirectly generated from the increased implementation of GHG-reducing projects driven by the increased demand for carbon credits caused by the trading scheme. The developmental benefits come mostly in the form of increased status, credibility, and reputation in the international arena for Brazil. The implementation of this trading scheme positions Brazil as a leader in Latin America, and demonstrates its capability and commitment to participate in global efforts to reduce greenhouse gas emissions.

We have now analyzed two market-based mechanisms that Brazil is using to participate in climate change mitigation. It is important to note that Brazil is also implementing measures to reducing greenhouse gas emissions independently of the Kyoto Protocol. Brazil's efforts to become a leader in combating climate change have extended beyond the typical market-based projects envisioned by the Kyoto Protocol to encompass a variety of unilateral actions that aim to reduce greenhouse gases in ways

that provide additional benefits for the environment, society, and Brazil's position in the international community.

Unilateral Actions

In the 1990s, Brazil's environmental policies were heavily influenced by its international commitments. The importance of Brazil's reputation as an environmental leader has been a driver of environmental policy since it hosted the Rio Summit in 1992. As we have already discussed, Brazil had been trying to solidify its efforts to promote more sustainable environmental practices through national legislation throughout the 1980s as a response to growing pressure from the scientific community as well as civil society.[29] With the growing prevalence of international environmental treaties such as the Montreal Protocol, Brazil took the opportunity to become actively involved in this arena in order enhance domestic environmental practices, as well as improve its reputation and position in the negotiations of international treaties. These two factors motivated Brazil to host the Earth Summit in Rio in 1992, placing Brazil at the forefront of international environmental negotiations. As a host to this "grand environmental summit," [30] it was expected that Brazil would lead by example in adopting laws and policies in concordance with the international environmental agreements that were ratified at the convention. Brazil's demonstrated ability to keep these commitments, according to Drummond and Barros-Platiau, has been applauded by "most environmental organizations, national and international,"[31] as well as giving Brazil more credibility as a member of international negotiations. One of the most important aspects of this is that Brazil has adopted several policies dealing with air pollutions and emissions control independently of any

international legislation. Brazil's energy mix traditionally has been among the cleanest in the world, so Brazil (unlike China or India), faced very little pressure in climate negotiations. Brazil's unilateral actions to reduce emissions, which demonstrate its desire to maintain its salient position in the international community as well as solidify domestic environmental policies, are an important factor in analyzing the ways in which Brazil is benefiting from climate change policy.

According to a recent report by the Center for Clean Air Policy (CCAP), a U.S. based think tank, the unilateral actions of developing countries such as Brazil have significant potential in reducing greenhouse gas emissions levels, while at the same time addressing other environmental and developmental problems. If all of these unilateral actions are implemented successfully, the report estimates that Brazil could achieve a 14% reduction in emissions levels from business-as-usual scenarios in 2020, which amounts to a total reduction of 73 MMTCO2 in 2020. The Brazilian initiatives enumerated in the report are listed in the table below.

Table 2: Brazil's Unilateral Policy Actions	
Program for Incentive of Alternative Electric Energy Sources	Aims to set the goal of producing 10% of all electricity from renewable sources by 2022
National Program of Fuel Alcohol	Lays the groundwork for the majority of new vehicles produced to be "flex fuel" vehicles, meaning that they can run on either ethanol or gasoline. Flex fuel vehicles accounted for 50% of sales in 2005. The goal of the program is for 100% of vehicles to be flex fuel by 2020, and for ethanol to account for 70% of fuel use
The Program to Promote Efficient Use of Non-renewable Resources	Offers free testing and inspection for trucks that transport fuel which has reduced diesel fuel use by 15%. The improvement in efficiency of these trucks has resulted in

	annual reductions of 38,000 metric tons of CO2
The Brazilian Stove and Heater Compulsory Labeling Program	Requires companies to label all stoves and heaters for energy efficiency. Because of this program, new Brazilian-made stoves use an average of 13% less liquefied petroleum gas than the older models, resulting in an annual reduction of 300,000 tons of imported LPG
Source: Center for Clean Air Policy. *Greenhouse Gas Mitigation in Brazil, China and India: Scenarios and Opportunities through 2025, Conclusions and Recommendations. November,* 2006. pp 13-14	

It is important to note that these policies all deal with energy. The fact that Brazil already has a "clean" energy mix[32] suggests that Brazil has implemented these actions (at least in part) in order to demonstrate its commitment to participate in the global effort to combat climate change to other international actors, and thus enhance its reputation.

A very different, yet equally interesting example of unilateral action presents itself in the cultural arena, demonstrating a creative way in which Brazil is incorporating environmental awareness into areas where it hasn't been present in the past. The image of Brazil that is most exported to the rest of the world centers around one very important holiday: Carnaval. Characterized by fireworks, parades of people dressed in fantastic costumes, samba music, and extravagant dancing, Carnaval is the most important holiday of the year. While Carnaval is celebrated everywhere in Brazil, Salvador da Bahia is by far Brazil's capital of festivities for this holiday. Each February, the city is flooded with people from all over Brazil, as well as tourists from around the world who flock to Salvador to enjoy the 5-day party. In 2006, in concordance with efforts to push Brazil's image as a leader in environmental initiatives, ten Trios Electricos (large trucks that carry music bands during the parades) were powered by bio-diesel instead of regular gasoline,

reducing greenhouse gas emissions of each vehicle by 78%-100% and reducing particulate emissions by nearly half. Ivete Sangalo, Salvador's most popular singer, began this trend in 2005 by performing atop the sole Trio Electrico powered by bio-diesel. The rise over the last two years in the use of bio-diesel during Carnaval represents a growing awareness of climate change and environmental issues, in arenas where such awareness hasn't been present in the past. The vice-president of the Association of Music Producers in Bahia, Vera Lacerda commented, "The initiative of the state is brilliant, exemplary, and futuristic. Salvador is providing an example for other cities to preserve and care for the environment."[33] In 2007, further measures were taken to reduce Carnaval's impact on the environment, such as air-quality monitoring, greenhouse gas inventories, and carbon-offsetting for Trios Electricos, hotels, and bars.[34] These initiatives are not only beneficial for the environment; they also help to improve Brazil's image for tourists and foreign interests.

Is Brazil a Beneficiary of Climate Change Policy?

Between CDM projects, the carbon market, and other independent environmental initiatives, it is clear that Brazil stands to benefit significantly from opportunities created by climate change policy. According the UNFCCC, CDMs in Brazil are expected to produce 16,271,186 certified emissions reductions annually, composing 12% of all reductions from CDMs world-wide.[35] The World Bank estimates that the sale of carbon credits in Brazil will generate approximately $1.3 billion dollars,[36] and as mentioned above, the Brazilian carbon-trading scheme is estimated to bring in $3 billion a year.[37]

In addition to these economic benefits, the push to reduce greenhouse gases promotes technology transfer and innovation, which drives development and generates new jobs. Consider the example of the Nova Gerar landfill. Driven by a developed country's need to meet its reduction target under the Kyoto Protocol, state-of-the-art technology that was already widely used in developed countries was brought to a community in Brazil. The host community benefits from the environmental and economic aspects of the project, and Brazil benefits from having this new technology, which it can now use for other landfill projects, and may make such technology standard for all landfills at some point in the future.

While it is too soon to tell whether these benefits will be distributed in such a way as to promote sustainable development in the long run, it is clear that Brazil's participation in climate change mitigation efforts will at least bring about new forms of income and technological advancement, as well as position Brazil as a leader in the international arena of climate change negotiations. The question remains as to whether other developing countries will be able to reap the same benefits presented by climate change policy as Brazil, or whether Brazil's situation is case-specific. In the following section, I will compare the prospects for future participation of other developing countries that are considered to be the most similar to Brazil.

Prospects for other Developing Countries

Despite the fact that the United States cited the lack of participation by developing countries as one of the main reasons to abstain from climate change negotiations, it would seem that many developing countries are indeed active participants

in international efforts to address climate change. According to the CCAP, many developing countries are already discussing "concrete policy steps to reduce greenhouse gas emissions…often motivated by concerns about energy security, air quality, and economic development." The CCAP has been proactive in tracking and assisting developing countries with efforts to implement climate change policy and identify "win-win solutions" for greenhouse gas mitigation via its "Developing Country Project," which has worked with in-country teams in Brazil, China, India and Mexico since 2005.[38] The CCAP's most recent report, *Greenhouse Gas Mitigation in Brazil, China and India: Scenarios and Opportunities through 2025* aims to "shatter the myth" that developing countries are not doing anything to combat climate change. It demonstrates the various strategies that developing countries are implementing to reduce greenhouse gases in cost-effective and developmentally beneficial ways. As we have already seen in Brazil, although these three countries are taking advantage of the clean development mechanism, many projects are being carried out independently of this mechanism, demonstrating the capability and desire of developing countries to contribute to the protection of the climate even in the absence of the assistance provided by the CDM.[39] The study found that the efforts of these three countries will potentially have a major impact on global efforts to mitigate greenhouse gases; the reductions due to unilateral actions and potential future reductions for these three countries by 2020 would be "equivalent to nearly eliminating all the carbon emitted by cars, trucks, buses, and trains in the United states in the year 2004."[40]

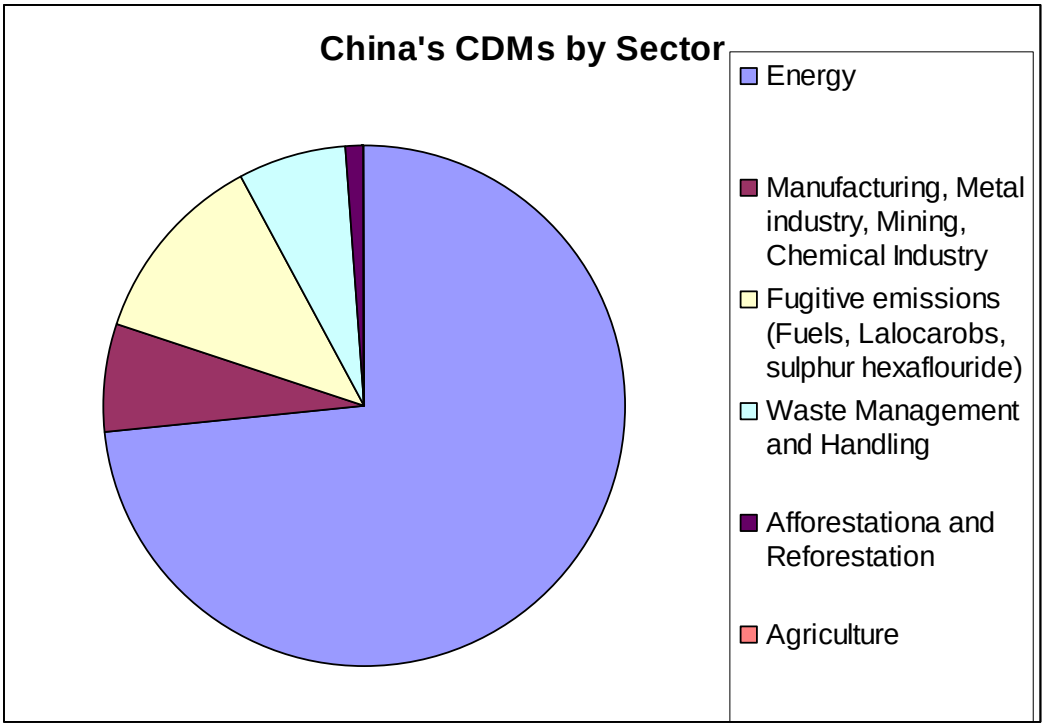
China

China has been widely heralded as the worst threat to the earth's climate, and its poor environmental track record has led many to speculate about whether China is serious about mitigating climate change and addressing environmental problems. The worries over China's contribution to climate change are certainly legitimate: China's rapid industrialization has increased emissions exponentially, and now China is predicted to surpass the United States in greenhouse gas emissions during this year or the next.[41] Every year, China builds enough coal plants to light all of Britain, and as access to electricity expands, this number could increase.[42] China's transition to an industrialized economy presents daunting environmental challenges, which are usually treated as secondary to economic concerns by the Chinese government. Thus, many might find it surprising that recent national policies have incorporated both climate change policy and environmental concerns as key strategies to China's development. In addition, China has already reduced more emissions through the CDM than India, Brazil, Korea, Mexico, and Argentina combined (refer to Figure 5).

For China, the CDM offers the opportunity to prioritize the environment by receiving funding from outside sources, and thus it has plenty of potential to positively impact China. China is currently host to 81 registered CDM projects. These projects are expected to reduce 58,747,503 tons of CO2 every year, which accounts for 43% of all reductions generated by CDMs world-wide.[43] According the World-Watch Institute, most of the CDM projects in China "are conducted bilaterally with an industrialized country partner via the broker market." However, several of the projects have been "undertaken solely by Chinese enterprises, which allows China to

retain and trade all the carbon credits itself."[44] This means that China receives more of the direct economic gains from projects by eliminating middle-men and brokers. A country guide for CDMs in China, which evaluates the potential for CDM projects in various sectors, estimates that the total GHG reduction potential of CDMs in China is about 777 million tonnes of CO2 equivalent, most of which would come from the energy-efficiency sector, but would also include renewable energy sources, coal-bed methane, fuel conversions, and new technologies for power generation (see Figure 9).[45] Statistically speaking, it is clear that China has basically taken over the carbon market by capturing 61% of all sales of U.N carbon credits sold in 2006, and receiving $3 billion of the total $4.8 billion in transfers from developed countries to developing countries that occurred through the CDM in 2006.[46] Nearly half of the projects deal with the construction of wind power infrastructure, but China's portfolio of projects also covers renewable energy, energy efficiency, waste handling and disposal, methane recovery, and reduction of trifloumethane emissions.[47]

Figure 9: China's CDM Project Profile



Source: UNFCCC. CDM Project Activity, May 2007. www.unfccc.org

One such wind project, in Houxinqinqui, an impoverished area of Northern China, demonstrates some of the benefits of renewable energy projects. The wind turbines in this project generate nearly 24 megawatts of electricity, which replace electricity that would otherwise be produced through the combustion of coal. The global benefits of this project are clear: the wind farm reduces emissions by 35,119 tons of CO2 per year. At $8 per emission credit, the economic benefits to the community amount to $281,000. In addition, local peasants in the area now receive free electricity, which has allowed some of them to invest in new farm equipment and send their children to school.[48] Such projects offer the potential for a more sustainable energy model that has less deleterious environmental effects, as well as providing the extra benefits of

increased energy access, reduced pollution-related health problems, and revenue generation for poor communities.

Projects dealing with clean energy also bring other benefits besides electricity and revenue. A recent case study from Shanxi, China noted that "measures primarily intended to reduce GHG s often have other benefits" which include "reduced damage to human health…reduced corrosion rates of materials…and [reduced] crop losses that are brought about by surface ozone and regional haze."[49] Because China uses coal intensively as its main source of power, a majority of GHG mitigation projects revolve around technologies that improve the efficiency and cleanliness of coal. Such projects, which include coal washing, briquetting, improved boiler management, boiler replacement, modified boiler design, and cogeneration of heat and electricity, aim at reducing CO2 emissions of coal. At the same time, these measures also serve to reduce particulate emissions and sulfur dioxide, thus reducing the health problems caused by these emissions, as well as reducing other environmental impacts such as corrosion of buildings and harm to vegetation due to acid rain from SO2 emissions.[50]

In addition to China's participation in the Clean Development mechanisms, the Center for Clean Air Policy reports that China has begun to reduce greenhouse gas emissions via unilateral actions, and is expected to cut emissions by seven percent below projected levels through 2020 as a result of these recent policies.[51]

While business-as-usual scenarios for China predict and ominous doubling of greenhouse gas emissions across the electricity, cement, iron, pulp, and transport sectors, China's unilateral actions taken since 2000 will slow that trend significantly. These actions, which are listed below, have been implemented independently of the Clean

Development Mechanism, which show that China has recognized the importance of environmental standards, as well as the potential benefits of participating in climate-mitigation strategies. In particular, China is very interested in increasing energy independence by reducing its reliance on fossil fuels, increasing the efficiency of its power network, and improving the quality of air and water, which are seriously threatened by severe pollution problems.[52] The specific actions cited by the report are listed in Table 3.

Table 3: China's Unilateral Policy Actions

Renewable Energy Law and the Tenth Five-Year Plan	Reduces electricity-sector emissions by five percent below business-as-usual levels by 2020. This is equivalent to shutting down 20 coal-fired power plants
Medium and Long Term Energy Conservation Plans	Reduces cement-sector emissions by about 15 percent below business as usual levels by 2020 and reduce iron and steel-sector emissions by nine percent below business-as-usual levels by 2020. These reductions are equivalent to shutting down half of the shaft kiln cement facilities that existed in China in 2000, and shutting down about 425 existing iron and steel facilities.
Fuel Efficiency Standards for Passenger Cars, SUVs, and Multi-Purpose Vans	Reduce transportation sector emissions by 5 percent below business-as-usual scenarios by 2020

Source: Center for Clean Air Policy. *Greenhouse Gas Mitigation in Brazil, China and India: Scenarios and Opportunities through 2025, China Fact Sheet.* November, 2006

As is the case in Brazil in regards to unilateral actions taken independently of the Kyoto Protocol, China has demonstrated that it is beginning to include the environment in its development plans. This shift indicates a changing attitude for

China that may not be a direct effect of the Kyoto Protocol, but reflects a response to the growing global pressure for environmental responsibility.

Benefits to China

China has shown an enormous potential for participating in climate change mitigation, both through participation in the Kyoto Protocol via the CDM, as well as with its own national policies. As we have already discussed, China is benefiting enormously from the CDM, as well as from the implementation of domestic policies that reduce greenhouse gas emissions and improve energy efficiency. Still, many raise questions about China's motives. Is China only participating in the CDM because it can benefit economically, or is it actually concerned about the importance of addressing climate change? While it is nearly impossible to determine China's true motivation for its actions, a brief look at China's national policy regarding the environment offers some insight into its attitudes towards participation in environmental efforts.

After China became one of the first 10 nations to ratify the UNFCC, it developed a number of national policies that incorporated the goals of environmental protection and climate mitigation as key strategies in China's development.[1] The most recent of

[1] The Chinese "National Assessment Report on Climate Change," which was released on December 26, 2006, stated that "China will adopt a responsible attitude toward the world's environment and implement a national strategy for sustainable development."[1] This strategy, known as Agenda 21, laid out "concrete steps… towards sustainable development and mounting a response to climate change in the next century," with a focus on "sustainable energy development." While giving primacy to socio-economic concerns such as alleviating policy, Agenda 21 stated that "it will be necessary to conserve natural resources and to improve the environment, so that the country will see long-term, stable development." As a follow-up to Agenda 21, the Ninth Five-year plan and the 2010 Long-Term Program for National Economic and Social Development of the People's Republic of China, in which "sustainable development was set as an important guideline" for China were approved in March of 1996 at the Fourth Session of the Eighth National People's Congress and in 2001, the outline of the Tenth Five-Year Plan for National Economic and Social Development of the People's Republic of China which "put forward specific objectives in various areas and in different phases, while formulating the implementation of specific key plans for ecological construction, restoration, and environmental protection," which correspond the objectives and guidelines of the Kyoto Protocol and the clean development mechanism. See CDM Country Guide for China p 102

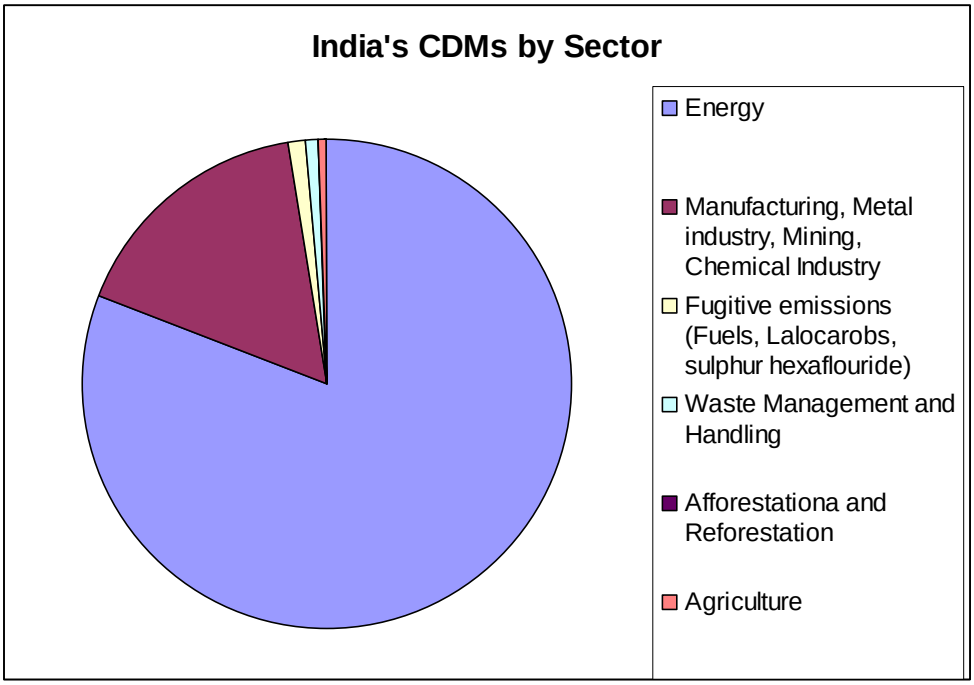
these strategies, which was developed in 2002 by the Sixteenth National Congress of the Communist Party of China, was an "an ambitious blueprint" for the next 20 years of China's development. While defining development primarily by economic growth, "enhancing social equality and environmental protection" were also included as key components of sustainable development. In addition to legislation dealing with sustainable development, special laws have been developed that relate specifically to the CDM and the protection of foreign investments in China.[53] Such legal protection for foreign investors is crucial to China's participation in climate change policy, as we will explore later. China's inclusion of the environment in its national policy does not guarantee that China will immediately commit to implementing strong environmental regulations and dramatically changing its treatment of the environment. However, it does imply a shift towards a vision of more sustainable development and a willingness to begin to put the environment somewhat higher on its list of priorities for development and growth.

China is not only benefiting from the massive inflows of foreign investment in CDM projects, but the influences of climate change policy can also be seen in China's national policies, which aim to bring environmental concerns into the arena of developmental planning. Whether these plans for sustainable development actually lead to the implementation of environmentally-friendly policies has yet to be seen, but the very appearance of such policies and legislation does seem to indicate a positive change in the Chinese position towards participation in the climate regime, as well as the potential for China to benefit from climate change policy in many of the same ways that we have seen in Brazil.

India

The other country which is usually considered to be in the same category as Brazil and China in terms of the size of its economy, population, and developmental status, is India. India is host to 231 registered CDM projects which account for 35% of all registered projects. India is by far the world's leader in the number of CDM projects that it is hosting, and only China exceeds it in the number of expected emissions reductions that these projects will generate. The CERs expected from India's CDM projects are estimated to total 20,786,687 tons of CO2e per year, which amounts to 15% of all CERs generated from CDM projects.[54] According to some estimates, India is eventually expected to capture 20-30% of the CDM market, which could generate about $300 million annually.[55] As in the case with China and Brazil, the vast majority of projects are being implemented in the energy sector (see Figure 10), with very few projects in agriculture, waste management, or forestry. In addition to CDM activity, the Center for Clean Air Policy has identified several unilateral national policies that will contribute to GHG reductions in several sectors of the economy.

Figure 10: India's CDM Projects by Sector



Source: UNFCCC, CDM Project Activity, May 2007. www.unfccc.org

CDM s in India

Like China and Brazil, India has developed an infrastructure that has enabled it to attract CDM projects. India's "preeminent position" in the CDM market can be attributed to "a good technical base" and a "pro-active national CDM authority,"[56] which is composed of secretaries from ministries such as finance, non-conventional energy sources and power, with the Ministry of Environment and Forests serving as the head ministry for CDM issues in India. India's efforts to become involved in the CDM early can be seen in the rapid proliferation of projects in the months surrounding Kyoto's entry into force; 80 projects were approved by India's CDM authority in the eighteen months between November of 2004 and June of 2005. It is estimated that CDM projects in India could result in potential reductions of 417 million tons of CO2eq through 2012.[57]

India's commitment to implement policies that will encourage sustainable development as well as mitigate environmental problems is visible in the make-up of its government. Currently, it is the only country in the world with a designated ministry for renewable energy (The Ministry for Non-Conventional Energy Sources) as well as an exclusive public sector financial sector (The Indian Renewable Energy Development Agency) that designs guidelines to promote the increase in renewable energy use.[2] In addition, the government has enacted several other policies independently of the CDM which will help to slow the rising emissions trends in India and contribute more sustainable industrial development. These policies include the National Steel Policy 2005, which will retrofit inefficient plants and encourage the building of more efficient new facilities and the Indian Integrated Transport Policy 2002. This will promote a sustainable transport system with increased emphasis on energy efficiency and environmental conservation, including improved fuel economy for rail shares for passengers and freight.[58]

Benefits to India

India has clearly benefited financially from the surge of foreign investment from CDM projects, and has also benefited from the adoption of climate conscious government initiatives. As with China, there is some speculation about the positive sustainable development spillovers that these projects will have. A critic of the CDM

[2] The Ministry for Non-conventional Energy Sources (MNES) prepared a set of guidelines for "Promotional and Fiscal Incentives by State Governments ofor Power Generation from Non-Conventional Energy Sources" in 1993 and 1996, which included preferential tariffs, as well as tax and duty exemptions to promote renewable energy. See Joseph B. Gonsalves. An Assessment of Projects on The Clean Development Mechanism (CDM) in India. United Nations Conference on Trade and Development. October 19, 2006 p 60

notes that none of India's registered CDM projects deals with afforestation, agriculture, or rural development. The majority of the projects are energy-efficiency projects from industries, which have the least potential for social and environmental co-benefits as they pertain mostly to installing new technologies in industrial facilities. In addition, according to this critic, education and awareness surrounding the CDM continues to be poor.[59] Whether this factor hinders the implementation of CDMs is unclear, and it is a problem that will probably solve itself as the carbon market develops and India continues to be an active participant. There are also concerns that smaller, poorer communities are being left out of the CDM because they are unable to attract large-scale investors. Environmental Secretary Prodipto Ghosh comments that India is currently investigating a process to "bundle" smaller projects so that it will be easier for companies to invest in such small-scale initiatives. "Once that is done," says Ghosh, "we will move to raising skills and awareness amongst those in this sector."[60] Hopefully, these initiatives will help to increase the equity of project distribution so that the benefits of CDM projects reach a wider number of people. Again, just as is the Chinese case, only time will tell whether the benefits to India from climate change policy will contribute to the long-term sustainable development of the country, but there are signs of positive trends in this area.

Cross-Country Comparisons

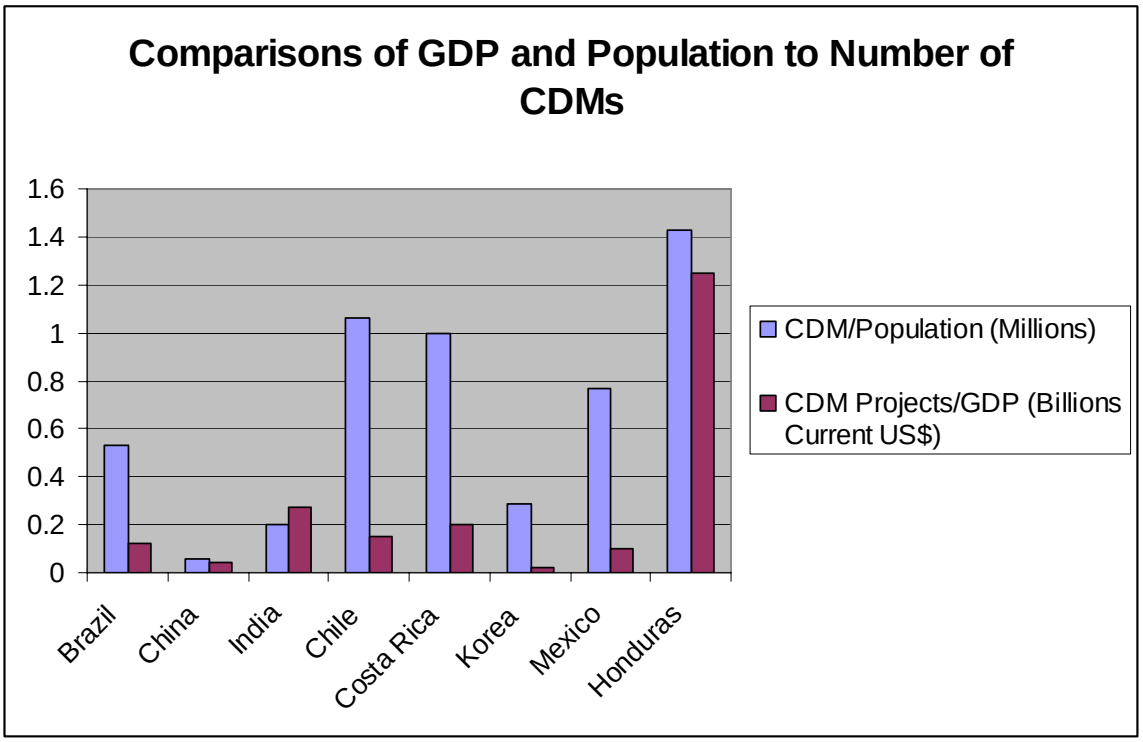
This paper has looked at the cases of Brazil, China, and India as examples of developing countries that are actively participating in climate change policy, and are

benefiting from this participation. By examining these three cases, several salient features can be distinguished that may offer some insight into how and why developing countries are benefiting from climate change policy.

Brazil, India, and China are obviously very different countries, but they all share some similar characteristics that relate to participation in environmental efforts. These characteristics include size, institutional capacity, and attractiveness to foreign investors.

The most obvious trait that these countries share is that they are all large, both in terms of population as well GDP. However, this characteristic may not be as important as it seems. While size can be beneficial to capitalize on economies of scale, many countries that are much smaller than Brazil, India, and China have done quite well in attracting CDM projects. If viewed as a ratio rather than gross values, as shown in Figure 11, smaller countries such as Honduras, Chile, Costa Rica, and Korea are also attracting relatively high numbers of CDM projects. While generating conclusive data on the relationship of the size of a country and its ability to attract CDMs would require more extensive analysis, it seems that these relationships suggest that size is not the most important factor, and that institutions have more of a role to play in determining the ability of countries to attract CDMs.

Figure 10: Size and CDM Relationships in Selected Developing Countries

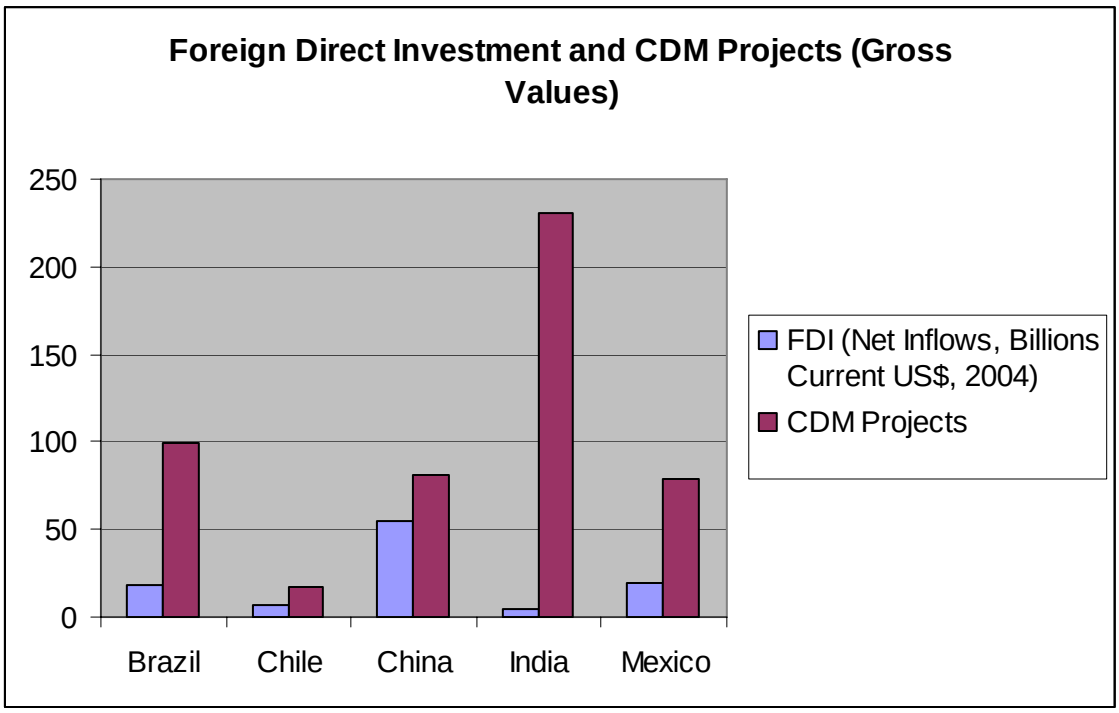


Source: www.wdi.org, www.unfccc.org

More important than size are the national policies and institutional characteristics of Brazil, India, and China that contribute to their ability to benefit from climate change policy. All three countries already receive large amounts of foreign direct investment because of relatively stable political and economic environments, large pools of skilled and semi-skilled workers, and institutional capacity.[61] Levels of foreign direct investment seem to correspond with number of CDM projects in many cases: Brazil, China, and Mexico all have very high levels of FDI as well as high numbers of CDMs. India, however, has a relatively low level of FDI, yet obviously has the highest number CDM projects (See Figure 12). While it seems like there is a general trend towards CDMs going to countries with the most FDI, there are also

other factors at play. The most important of these factors has to with institutional capacity.

Figure 11: FDI and the CDM



Source: www.wdi.org, www.unfccc.org

Brazil, as we have seen, has defined the environment as an area in which it can excel in the international arena, and thus has made it a priority to include the environment in both its domestic policies as well as its international commitments. Brazil began creating an infrastructure for the CDM early, which not only made it attractive for initial project developers, but also allowed Brazil to have more control in what types of projects it wanted to host and how it wanted to define sustainable development. In an analysis of the CDM in Peru and Pakistan, Jeswani and Solis

found that "Countries which have engaged in the establishment of institutions early have had the benefit of attracting CDM investments due to the knowledge and experiences gained in the process."[62] Thus, Brazil has hosted projects in a broad variety of sectors, and has reaped substantial benefits extending beyond the generation of CERs. China and India are similar in this respect. Both have included environmental concerns in their national policies and both have created special ministries and subsidiary bodies to deal with environment and climate-related issues. By establishing strong, proactive designated authorities (DNAs) early and creating other institutions to deal specifically with CDMs, they have created an environment that is conducive to high levels of foreign investment, while still being able to control the terms on which this investment occurs. China, for example, has prioritized projects that bring about high levels of technology transfer, while India has gone so far as to develop its own set of criteria for project eligibility based on sustainable development indicators.[63] The ability to set up specific laws, policies, institutions and ministries to deal with climate change is likely the most important factor in determining whether a country can benefit from climate change policies. As Jeswani and Solis comment:

> The Capacity of the host country's DNA is perhaps one of the biggest factors in its effective CDM market participation. A well established, trained and experienced DNA will have the ability to minimize transaction time, thus cutting down on transaction costs. These conditions will effectively attract the project developers and project investors as the perceived risks are lower in comparison to countries where these conditions do not exist. In addition, a capable DNA will effectively evaluate project proposal criteria based on the established national priorities and sustainable development criteria.[64]

Likewise, Jeswani and Solis found that countries such as Pakistan "which showed a great passivity towards the Kyoto Protocol" and did not create a DNA until after Kyoto went into force, have not been able to attract much CDM activity because of weak institutional support and lack of knowledge on the issue.[65] Most non-Annex 1 countries have a DNA of some kind, but countries with less institutional capacity are unable to "risk large investments in institutional infrastructure" and thus are less attractive to foreign investors because the environment for investments is more uncertain. The observation that institutions are more important than size in determining CDM capacity would help to explain the high ratio of CDMs to population and GDP in a small country such as Costa Rica, which set up a DNA before the methods of the CDM had even been approved and defined its own criteria for sustainable development.[66]

From these preliminary observations, we can see that while size may have some initial impact on the CDM market because of the benefits of economies of scale, the most important factors in determining whether countries can benefit from climate change policy have to do with institutional capacity to attract and protect foreign investment, as well as the inclusion of the environment in the priorities of national policy.

Prospects for the Future

The fact that institutional capacity is so important in determining the benefits of climate change policy bodes well for some smaller countries such as Costa Rica and Chile that have strong institutions and relatively high levels of investment to begin with, but it bodes poorly for the vast majority of the countries that are grouped in the

"least developed category," which include most sub-Saharan African countries and poor Latin American and Asian countries. Of the $4.8 billion in transfers from developed to developing countries via the CDM in 2006, $3 billion of that went to China, while less than $150 million went to all of the countries in Africa combined. Kai-Uwe Schmidt, the secretary of the CDM executive board said that the UNFCCC was "acutely aware of regional imbalances in global warming projects and hoped to address them," but that these projects require "considerable investment," which is difficult to come by in many African countries.[67]

This issue was brought to the table at the 12th Conference of the Parties (COP 12) that took place in Nairobi, Kenya, in November 2006. UN Secretary General Kofi Annan announced that a coalition of international organizations including the UNFCC, UNDP, UNEP, World Bank, and African Development Bank, were planning to address the problem of the under-representation of African countries and the general geographic inequity of CDM distributions. However, he provided no insights about the funding or mechanisms that would be used in order to achieve this goal.[68] Until a clear framework of how this initiative is going to be implemented, it seems that very little will be done to enhance the inclusion of less developed countries in the CDM.

Other results of the recent COP 12 were equally inconclusive. Despite the recent gains that I have discussed in this paper made by developing countries, and the demonstrated capacity for large developing countries to participate in climate-mitigation efforts, there have been no indications that any large developing country is ready to take on its own mandatory targets. For this to happen, a whole new round of

negotiations regarding the transfer of CDM projects, specific targets, funding, and mechanisms would have to take place. Since these issues are just beginning to be settled and adapted to by the current climate regime, an entire new round of negotiations is simply not realistic for the near future. Still, it is possible that the increased participation of such countries and the resulting international attention to climate change issues could encourage the United States to re-enter negotiations in the next round. Such a development would be a further boon to developing countries, as it would greatly expand the market for carbon credits, as well as drive new innovation and investment in clean technology.

The carbon market has become a hot topic within the past couple of years as it continues to evolve, develop, and take form in the context of a quickly globalizing world. While this paper has offered some insights into the benefits of climate change policies to developing countries, it is not clear that the current climate change regime will generate benefits for everyone, nor is it clear that it will have any real impact on reducing global warming trends. It is much too early to draw any conclusions in regards to these two questions, and they will be better left to be debated at the next round of Kyoto negotiations in 2012. As with most environmental policies that incorporate market mechanisms, there are both positive and negative aspects of the carbon market. Following that logic, the participation in such market mechanisms creates winners and losers. As we have seen, the winners in this round of Kyoto negotiations appear to be developing countries with sturdy institutions and high levels of foreign investment that have developed a strong infrastructure for the CDM and other climate-related policies. The losers are those that cannot risk huge investments

in creating new institutions for the CDM, or that cannot attract foreign investors because of unstable, risky economic and political environments.

It turns out that the initial argument of developing countries that they stood to lose from climate change policy and that limiting greenhouse gas emissions would hinder their right to develop was somewhat unfounded. While many equity concerns remain, and will have to be further addressed in future meetings, many countries are benefiting from the opportunities created by climate change policy. In turn, the developed world is benefiting from the participation of these countries as it strives to address this global environmental challenge.

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