

The Case of the Waigaoquiao Coal Plant: Moving Towards a More Efficient and  
Equitable Clean Development Mechanism

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On February 16<sup>th</sup>, 2005, every developed country in the world (except the United States) signed the Kyoto Protocol, which commits these countries to reducing greenhouse gas emissions<sup>1</sup>. Since developed countries have historically produced most of the world's emissions, this agreement commits these countries to reducing emissions as a way to mitigate climate change. The Kyoto Protocol also established the Clean Development Mechanism (CDM) as a global emissions trading scheme. Under the CDM, energy projects in the developing world that reduce carbon emissions (through renewable energy, clean technology, etc.) are approved and sold as credits to developed nations, who finance the projects<sup>2</sup>. These credits are called Certified Emissions Reductions (CERs), and one CER represents one ton of CO<sub>2</sub><sup>3</sup>. The avoided carbon emissions from these CDM projects serve as carbon offsets to help developed countries meet their compliance requirements under the Kyoto Protocol<sup>4</sup>.

The Clean Development Mechanism is the first global attempt at an emissions trading market to address the “tragedy of the commons” that we see in the Earth's atmosphere<sup>5</sup>. While it is fundamentally a good idea, the CDM has developed many problems and inefficiencies in its decade of existence. In this paper, I will analyze the Clean Development Mechanism in terms of efficiency and equity, and suggest ways to improve this policy. First, I will discuss general criticisms of the Clean Development

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<sup>1</sup> Wara, Michael. "Measuring the Clean Development Mechanism's Performance and Potential." *UCLA Law Review* 55, no. 6 (2008):

<sup>2</sup> Wara, Michael. "Measuring the Clean Development Mechanism's Performance and Potential," 1761-1762

<sup>3</sup> "Clean Development Mechanism (CDM) ." UNFCCC.

<sup>4</sup> Wara, Michael. "Measuring the Clean Development Mechanism's Performance and Potential," 1761-1762

<sup>5</sup> Wara, Michael. "Measuring the Clean Development Mechanism's Performance and Potential," 1762

Mechanism, and then I will cover efficiency and equity issues in a case study of a CDM project in China. Next, I will introduce my policy recommendations, and explain the overall significance of the CDM in the context of global climate policy.

### **Criticisms of the Clean Development Mechanism**

The Clean Development Mechanism was originally intended to lower the costs of meeting Kyoto emissions targets for developed countries, since in the short run, buying offsets is much more attainable, both politically and economically, than changing infrastructure to low-carbon and renewable technologies<sup>6</sup>. This is because the marginal cost of building new low-carbon or renewable energy infrastructure in developing countries tends to be less than the marginal cost of changing or “prematurely retiring” existing capital in developed countries<sup>7</sup>. While this concept is very appealing, there are several recurring problems with the CDM.

One problem is that the Clean Development Mechanism has chronically high transaction costs, which deters many potential transactions. I interviewed Michael Wara, Associate Professor of Law and Justin M. Roach, Jr. Faculty Scholar at Stanford University, and he commented on the long review process, scrupulous protocol, and third party verification involved in registering a project for the CDM. This long process, along with the added complexity of completing a trade between two different nations, creates many of the high transaction costs<sup>8</sup>.

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<sup>6</sup> Kopp, Raymond, Michael Toman, and Marina Cazorla. "International Emissions Trading and the Clean Development Mechanism," 5

<sup>7</sup> Wara, Michael. "Measuring the Clean Development Mechanism's Performance and Potential," 1763

<sup>8</sup> Wara, Michael. Telephone interview by author.

The next problem has to do with accuracy in calculating baseline emissions, which are the level of emissions if the project was not implemented. The number of CERs that a particular project receives, and therefore can sell to developed countries, is determined by subtracting the project's emissions from the baseline emissions. Some project developers don't accurately report baseline emissions and overestimate them in order to get more CERs and therefore more revenue<sup>9</sup>. This results in massive over-crediting of projects in the CDM system<sup>10</sup>.

Another problem is that although the CDM has a goal of creating sustainable development benefits in developing countries, most projects do not achieve this. There is an important distinction between the benefits that come from reducing emissions and the benefits that come from increased sustainability (improvements to the local community, cultural changes, a better local environment, etc). CERs only monetize the emissions reductions, and not the sustainability benefits, so the larger sustainability goals of the CDM are not represented in the CERs. "Sustainable development" is also defined very differently across various countries, so it is hard to monitor the positive impacts of each project<sup>11</sup>. In fact, there have been CDM projects that have had *negative* impacts on the environment and local communities, and I will explore that further in the equity section of my paper.

The last main problem is associated with making sure that projects actually offset emissions. The following graph explains what *should* happen under the Clean Development Mechanism:

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<sup>9</sup> "Intro to the CDM." Carbon Market Watch.

<sup>10</sup> Wara, Michael. Telephone interview by author.

<sup>11</sup> "Intro to the CDM." Carbon Market Watch.

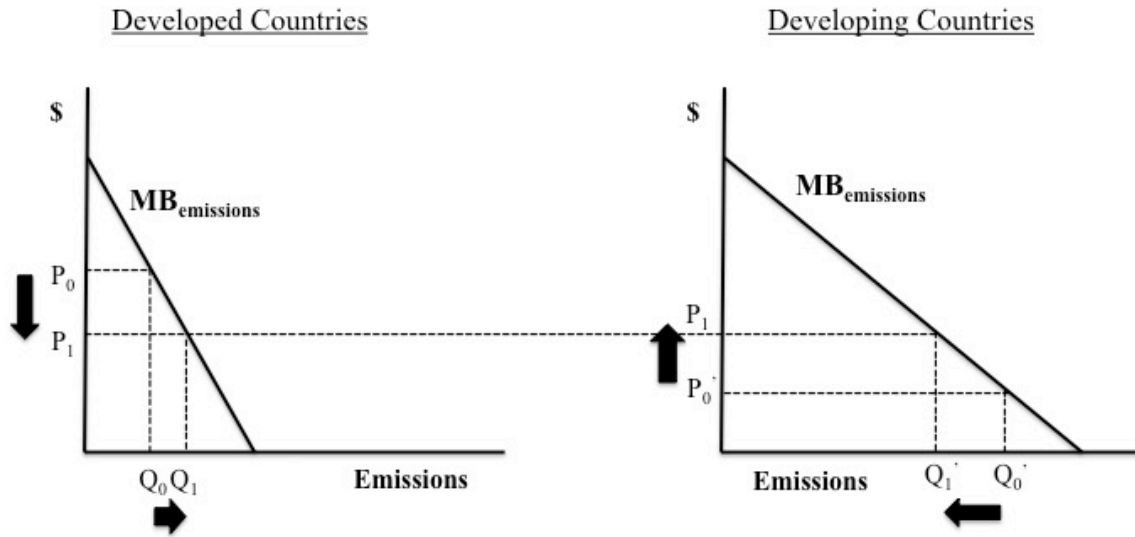


Figure 1. The graph on the left depicts the emissions market in developed countries, in which there is a higher marginal benefit of emissions, or marginal cost of abatement, than in the emissions market in developing countries, which is depicted in the graph on the right. For every increase in emissions in developed countries from  $Q_0$  to  $Q_1$ , there should ideally be an analogous *decrease* in emissions in developing countries from  $Q_0'$  to  $Q_1'$ . Disregarding transaction costs for now, the price of emissions should be equal worldwide at  $P_1$ . In developed countries, this represents a decrease in price from  $P_0$  to  $P_1$ , which allows CERs to be cheaper.

Many of the projects that are approved under the CDM are not “additional”, that is, they would have happened with or without funding from the CDM system. These non-additional projects do *not* decrease emissions, and so they do not represent actual emissions reductions for the developed countries that finance them, which represents a loss in efficiency. As articulated in the Kyoto Protocol, when a project would have happened anyway, it cannot technically be counted as an offset, cannot be registered

under the CDM, and cannot help developed countries meet their compliance requirements<sup>12</sup>. Despite this policy, there have been many non-additional projects that have been registered. One such project is the Waigaoqiao coal-fired power plant in Shanghai, China.

### **Case Study: Waigaoqiao Coal-Fired Power Plant, Shanghai, China**

In July 2011, the U.N. approved the registration of the Waigaoqiao coal plant under the Clean Development Mechanism. The project was the construction of a 2,000 MW ultra-supercritical coal plant, using a “clean coal” technology that allowed the plant to reach up to 43% efficiency<sup>13</sup>. The registration of this project was part of a deal of five coal plants in India and China that were approved for the CDM and were promised a total of 68.2 million CERs (which is equal to \$919 million) among the five power plants over a 10-year period. The deal was immediately criticized under the premise that these power plants were not additional and did not need CDM revenue to be built<sup>14</sup>. In addition, these projects were estimated to emit nearly ten times the CO<sub>2</sub> emissions that they claimed to offset<sup>15</sup>. I will use the Waigaoqiao plant as a case study for an efficiency and equity analysis in the following paragraphs.

First, the problem of non-additionality contributes to a loss of efficiency in the emissions trading market. There are several reasons why this particular clean coal plant may not have been considered as additional: (1) This project was believed to already have

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<sup>12</sup> "Clean Development Mechanism (CDM)"

<sup>13</sup> Kollmuss, Anja, and Steve Herz. "Why Coal Projects in the CDM Undermine Climate Goals." Carbon Market Watch.

<sup>14</sup> Fogarty, David. "Carbon Credits for India Coal Power Plant Stoke Criticism." Reuters.

<sup>15</sup> Kollmuss and Herz

been financed, and so the project did not need CDM revenue to be implemented; (2) Cost estimates for the project might have been inaccurate; (3) China already has several government mandates for clean coal technologies for environmental and health reasons (and these technologies are often cheaper or more cost-effective than dirtier technologies); and (4) the alternatives to this project may not have been fully investigated<sup>16</sup>. It is hard to tell from this particular Project Design Document<sup>17</sup> and the Validation Report<sup>18</sup> released by the operator, Shenergy Company Ltd., whether the project was actually additional or not. But if it was *not* additional, it created a problematic efficiency loss in the emissions market, along with many other CDM projects in China that are continually challenged on their additionality.

Next, I'd like to address an equity issue posed by the Waigaoquiao coal plant project. While coal plants can be made cleaner using scrubbers and other technologies, they still produce many greenhouse gas emissions, toxins, and waste that contribute to environmental degradation, human health impacts, and environmental justice issues. Coal plants are lasting infrastructure, so when a coal project is built, the environment and surrounding community feel the impacts for decades<sup>19</sup>. It is also important to keep in mind the political and cultural patterns of the developing nations in which these projects occur. In the case of the Waigaoquiao coal plant, many other countries conduct Environmental Impact Assessments on potential CDM projects, but this is much less

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<sup>16</sup> Kollmuss and Herz

<sup>17</sup> "Project Design Document Form."

<sup>18</sup> "Validation of the Shanghai Waigaoquiao Coal-Fired Power Project Using a Less GHG Intensive Technology."

<sup>19</sup> Kollmuss and Herz

common in China<sup>20</sup>. This could be contributing to a reduced sense of transparency about environmental issues in China, and could contribute to costs to communities located near coal power plants.

This is an equity issue in that local communities often have disproportionately high costs compared to the firm building the project, the rest of the developing country, the developed nation(s) financing the coal plant, and the world. In this case study, the firm (Shenergy Company) gets CDM revenue, and the developed nation(s) have the benefit of being able to emit more due to their purchase of this project's CERs. And while the rest of the developing country and the world benefits from better air quality and less global environmental damage associated with lower greenhouse gas emissions, the local community that lives next to the power plant has the unique costs of toxic wastes, poor air quality, and even noise and light pollution.

There is an argument that clean coal technologies are better for the environment and for people than more carbon-intensive coal technologies, and that almost any other energy project would have some sort of disproportionate impact on the local population. However, the local environmental burdens brought on by clean coal plants are higher than those brought on by many other types of energy facilities, namely renewable energy sources, and so there is a greater equity issue in the case of clean coal plants.

This brings up another efficiency problem in this case study. Since coal plants create huge burdens on local communities as compared to many other types of energy facilities, it makes sense that the price of CERs for coal should account for this difference

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<sup>20</sup> Wara, Michael. Telephone interview by author.



and be priced higher than equivalent CERs for a wind project, for example. However, it is not easy to tell whether CERs always account fully for this difference.

A recent study by Paul Epstein<sup>21</sup> of the environmental and human health impacts of coal in the U.S. estimates that since these impacts are not fully accounted for, we are underestimating the true price of coal by a factor of 2 or 3<sup>22</sup>. Let us assume for a moment that CERs for the Waigaoquiao coal plant *do not* fully account for all the costs associated with coal production. I argue that the marginal cost of this coal plant is higher in reality than the marginal cost that is encompassed in the price of a CER, which creates an externality and market failure. This externality is shown in the following graph:

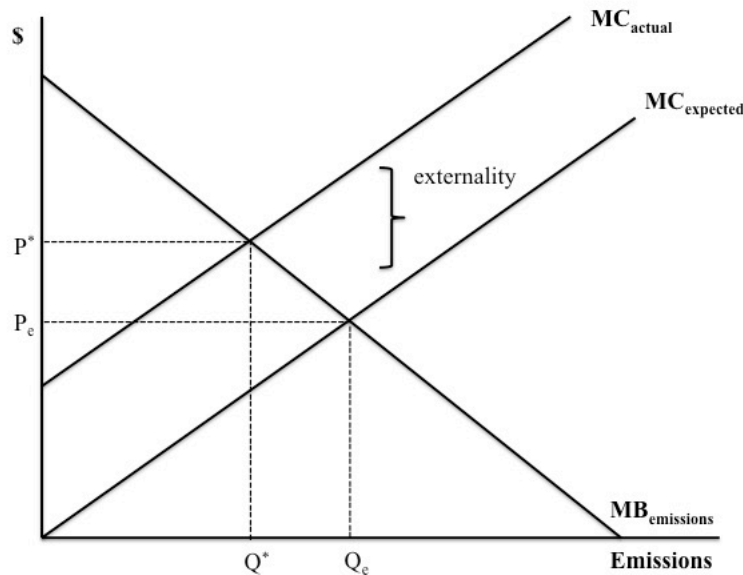


Figure 2. In this graph, the true marginal cost is higher than the expected marginal cost because of the many external costs of a coal power plant that are not encapsulated in the price of a CER. This creates an externality, as shown by the area in brackets. The

<sup>21</sup> Epstein, Paul R. "Full Cost Accounting For The Life Cycle Of Coal." *Annals of the New York Academy of Sciences*: 73-98.

<sup>22</sup> Kolmuss and Herz

efficient amount of emissions ( $Q^*$ ) is less than the current emissions ( $Q_e$ ), and the efficient price of emissions ( $P^*$ ) is higher than the current price ( $P_e$ ). The price of CERs for this coal plant is currently underestimated, and to encompass the true costs of these projects, the price must be increased.

Overall, this case study highlighted some examples of efficiency and equity issues that we see in some CDM projects. This project was believed to be non-additional due to the existing financial and governmental framework surrounding the building of the Waigaoquiao power plant, which creates an efficiency loss. The project also brought up equity concerns in distributional impacts and high costs to local communities. This highlighted the need for CERs to fully account for all the environmental and health impacts of the energy project. In the remainder of the paper, I will introduce my policy recommendations for improving the Clean Development Mechanism's efficiency and equity issues that I have outlined, and I will then discuss the overall significance of the CDM in the context of global climate policy.

### **Policy Recommendations**

In my earlier section on criticisms of the CDM, I mentioned four main problems: (1) high transaction costs; (2) inaccuracy in baseline reporting; (3) ineffective sustainable development outcomes; and (4) non-additionality issues. My first policy recommendation focuses on clean coal projects in China, since this is the type of CDM project that I am most familiar with through my exploration of the Waigaoquiao case study, and my other two policy recommendations address issues that are apparent in many areas of the CDM:

- (1) *Ban all Chinese coal power plant projects from being registered as CDM projects.* Through my analysis, I have come to realize that the equity issues and disproportionate impacts on local communities are simply too high, and this undermines the potential for China to improve their own environment and the health of their population. The Chinese government is also actively facilitating expansion of clean coal technology through mandates, which increases the risk that a given coal power plant project will be non-additional.
- (2) *Intensify the registration and approval process for new CDM projects.* It is clear that even with a seemingly rigorous registration process, non-additional projects and inaccurate baseline reporting are slipping through the cracks. Intensifying each step of this newly streamlined process to include rigorous verification and analysis will help ensure additionality and accuracy. The challenge is to do this without increasing transaction costs, as they are already very high and this is often a barrier to participation in the CDM.
- (3) *Encourage the Chinese government to improve their sustainable development guidelines.* It is hard to know whether the CDM is even making a positive impact on China's sustainable development without having clearly established goals and processes for monitoring improvement. China and the world could benefit from a clear definition of China's sustainable development goals.

### **The Clean Development Mechanism in the Context of Global Climate Policy**

This paper has explored some chronic problems with the Clean Development Mechanism, both in general and in the specific case of the Waigaoqiao coal plant. My

policy recommendations are meant to be a starting place to imagine a better future for the Clean Development Mechanism, with a broader impact on how we go about tackling climate change on a united global front. Right now, the CDM is not doing very well - with such high transaction costs, demand for CERs is falling, while developing nations are generally eager to participate and are maintaining a fairly constant supply of CERs<sup>23</sup>.

With COP 21 coming up in Paris this November, there is even the possibility that the Clean Development Mechanism will become obsolete, along with the Kyoto Protocol. There is hope that COP 21 will produce a new global climate agreement to essentially replace the Kyoto Protocol, and it is based on Intentional Nationally Determined Contributions (INDCs) submitted by each country. This means that the dichotomy of developed versus developing nations that the Kyoto Protocol and the Clean Development Mechanism were based on is about to end, and now every nation in the world has a responsibility to reduce their greenhouse gas emissions and play a role in mitigating climate change. There is also an initiative called the Green Climate Fund, in which developed countries help developing countries finance energy improvements and meet their INDC targets.

In my opinion, the creation of an emissions trading market through the Clean Development Mechanism has been a good first step in tackling climate change on a global scale. However, there are lots of issues with the CDM, and the purchase of CERs to offset emissions could be delaying important infrastructure changes. To keep global warming below 2 °C, we must make huge emissions reductions by retiring coal plants, halting expansion of oil extraction, implementing energy efficiency measures, and

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<sup>23</sup> Wara, Michael. Telephone interview by author.

expanding renewable energy resources, not only in developed countries but worldwide. With the policy recommendations I have made, the Clean Development Mechanism can be improved and kept as a side method to encourage renewable energy development and provide carbon offsets. But going forward, the focus must be on working together as an international community to improve energy infrastructure and move towards a cleaner global economy.

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