

Rent extraction with a type-by-type scheme: An instrument to incorporate sustainable development into the CDM

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Received 29 November 2007; accepted 11 February 2008

Available online 25 March 2008

Abstract

Although the CDM is supposed to assist developing countries in achieving sustainable development, sustainable development is not incorporated into the market aspect of the CDM. By participating in the CDM, developing countries may end up losing all cheap emissions reduction possibilities, while obtaining little sustainability benefits. This paper proposes rent extraction with a type-by-type scheme as an instrument to incorporate sustainable development into the CDM. The rent extraction with a type-by-type scheme makes it possible for the CDM host country government to discourage the low-cost projects that have little sustainability benefits, and to extract more rent from the projects that are developed. The main challenge of implementing this instrument is the uncertainty of the opportunity cost, but the host country government can adjust the scheme for the uncertainty to achieve its goal. Therefore, the type-by-type scheme will better assist the host country in achieving sustainable development than a single-rate scheme.

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Keywords: CDM; Resource rent; Type-by-type scheme

1. Introduction

The Clean Development Mechanism (CDM) was proposed in the Kyoto Protocol to facilitate developed countries to achieve their greenhouse gas emissions reduction targets at lower costs, and also to assist developing countries in achieving sustainable development. However, since sustainable development is not incorporated into the market aspect of the CDM, private-sector investors in a properly functioning CDM market would pursue emission reduction only (Ellis et al., 2007). Then it could happen that after the most lucrative low-cost CDM projects are chosen by private-sector investors, developing countries are left with only high-cost options (Muller, 2007; Rose et al., 1999; Karp and Liu, 2001).

Some, but not all, CDM projects generate sustainability benefits for the CDM host countries. The sustainability benefits include obtaining advanced technology and financial resources, alleviating poverty through income

and employment generation, and reducing the emissions of local pollutants. These benefits are not the primary objective for private-sector investors to develop CDM projects, thus they are external benefits of the CDM. Generally lower-cost CDM projects (e.g. PFC and HFC destruction, landfill gas and N₂O capture) have little sustainability benefits, whereas higher-cost projects (e.g. energy efficiency improvement, development and utilization of new and renewable energy, and methane recovery and utilization) generate large sustainability benefits. The practice of the CDM has demonstrated that CDM investors are most interested in the low-cost CDM projects that have little sustainability benefits. For example, China's current Certified Emission Reduction (CER) supply is mainly from the HFC projects, which have costs as low as €0.5/tCO₂e (Cosbey et al., 2005). As of January 2007, among the 37 Chinese CDM projects approved through registration at the CDM Executive Board, the CER production from the HFC projects accounts for 93% of the total CER production (CDM Market Brief, 2007). As of May 2007, among the 2022 projects approved by the Chinese Designated National Authority, the CERs issued

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from HFCs, PFCs and N₂O projects account for 69% of the total CER production (China CDM, 2007). Although HFCs, PFCs and N₂O are very harmful greenhouse gases, the CDM projects in these categories do not generate any sustainability benefits for the host country. Then by participating in the CDM, developing countries may end up obtaining little sustainability benefits, while losing all cheap emission reduction possibilities (Muller, 2007; Liu, 2007).

Therefore, an instrument is needed in the CDM host country to incorporate sustainable development into the CDM. The instrument should have two functions. One function is to discourage the development of the low-cost projects that have no sustainability benefits and encourage the high-cost projects that may generate large sustainability benefits. The other function is to effectively extract resource rent from the low-cost CDM projects once they are developed, so developing countries would at least get some revenue, which can be used for supporting sustainable development, while they lose cheap emission reduction possibilities. In this paper, I propose a policy instrument, rent extraction with a type-by-type scheme, and will show that this instrument has both functions needed to incorporate sustainable development into the CDM.

The CDM projects may generate considerable resource rent if the CER price is high and costs of CER production are low. In a competitive market, low-cost CDM projects generate high resource rent, whereas high-cost projects generate low resource rent. Muller (2007) has a full discussion about the importance of extracting resource rent from CDM projects. He argues that rent extraction can be seen as a way to internalize potential external costs imposed by CDM activities, can be used to address the equity and distributional issues by taking a deliberate decision on who will capture the rent, can compensate for resource use and can assist developing countries in achieving sustainable development. Rent extraction can basically take four different forms: auction, profit tax, revenue tax or fixed fees. An auction can be difficult to implement in practice because future developments of CDM projects are uncertain and all payments must be done in advance. A profit tax is theoretically ideal but it may make CDM projects relatively less attractive. Revenue tax and fixed fees are economically suboptimal but simpler, so they could be valuable alternatives to profit tax. One can argue for rent extraction and give ideas on how the revenues can be used, but one may keep a realistic attitude on the government's ability to truly support sustainable development. Due to the potential of policy failure, institutional setting of rent extraction needs to be carefully designed.

In the present study, I extend Muller's study by studying the optimal scheme for extracting rent from the CDM. I will show that rent extraction with a type-by-type scheme makes it possible for the CDM host country government to discourage the low-cost projects that have little sustainability benefits, and to extract more rent from the low-cost

projects that are developed. I will discuss the main challenge of implementing this instrument. Since the scheme will be designed based on the estimated value of the opportunity cost, a deviation of the true value from the estimated one will result in either ineffective extraction of the resource rent or distortion of the market. However, the government can adjust the scheme for the uncertainty to achieve its goal. Therefore, the type-by-type scheme will better assist the host country in achieving sustainable development than a single-rate scheme.

The rest of this paper is structured as follows. Section 2 estimates the CDM resource rent for the major CDM host countries and regions. Section 3 proposes and analyzes rent extraction with a type-by-type scheme. Section 4 concludes the paper.

2. Estimation of the CDM rent

The CDM allows industrialized countries to invest in emission abatement projects in developing countries and receive credits for the abatement achieved (CER). Although CDM projects may generate benefits for global and local environments and are supposed to assist the host country in achieving sustainable development, what private-sector investors care most, if not solely, is the profit from the transfer of CERs. Consequently, the investment in CDM projects is primarily a profit-maximization activity rather than an environmental protection action or an aid for development. Hence, in this paper, I apply a profit maximization model. In the model, the decision maker is the CDM developers, the choice variable is the quantity of CERs and the objective is to maximize profits.

The real price of CERs is determined by the demand and supply of CERs in the international CDM market. Since the EU "Linking Directive" allows the import of CDM and JI credits into the EU allowance market, the real CER price is actually somehow determined by the aggregate demand and aggregate supply of carbon credits in the world. In this paper, I assume that there is an equilibrium real price of CERs in the international market. Then the CDM developers are all price takers of the equilibrium real price, which implies that the demand curve facing the CDM developers in a host country is a horizontal line that is determined by the real equilibrium price.

The optimal quantity of CERs is the solution to the private optimization problem:

$$\underset{Q}{\text{Max}} PQ - TC, \quad \text{subject to } P = P^*,$$

where P^* is the equilibrium price of CERs, Q is the quantity of CERs and TC is the total economic cost. The first-order condition of the optimization problem implies that the optimal quantity of CER production is determined by $P^* = MC$. Since the marginal economic cost has captured the opportunity cost, the producer surplus does not include the return on investment. Then all of the

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