

# Management and Impacts of Climate Change Programme GICC

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A - Introduction: Scientific background and objectives

In Kyoto, the industrialized countries listed in Appendix 1 of the Climate Convention made quantitative commitments towards the reduction of their greenhouse gas emissions. In order to fulfill these commitments, the signatory states were to make domestic provisions - binding measures or incentives – aimed at those responsible for the emissions. The developing countries refused to set emission reduction targets for themselves, since they perceived such commitments as constraints on their future development, for they saw industrialized countries as those historically responsible for the climatic situation. However, according to forecasts by experts, the emissions of these countries as a whole will reach within a few decades a level equivalent to that of Appendix 1 countries. Controlling the emissions of developing countries has today become a vital necessity if the objectives of the Climate Convention are to be reached. This issue has led to the incorporation of a 'Clean Development Mechanism' (CDM) in the Kyoto Protocol in order to help developing countries to keep the future increase of their emissions under control.

It is also important to recall, however, that the CDM only emerged late in the course of the Kyoto Conference, as developing countries resisted the principle of plain flexibility mechanisms with no guarantee that they would come in addition to development aid. It is thus clear that a project eligible to be a CDM must also be a development project. The question of the relationship between environment and development was therefore present from the beginning.

Two aspects of the debate were worth further scrutiny:

To what degree can technology-oriented incentives, aimed at steering the decisions of investors towards cleaner and often more expensive technologies, trigger some sort of development-boosting ripple effect? Are not these objectives somewhat contradictory, with the contradiction fuelling the sceptical positions of some of the largest developing countries that are stakeholders in international negotiations? The scientific and political international debate had until then remained at a standstill because of the sharply divided positions on environmental integrity and on the cost of CDM-related transactions. The first attempts at integrating the 'development' dimension kept to a restrictive approach, in accordance with the 'sustainable development criteria' whereby host countries would be able to select certain project proposals and filter out others. Given such static conceptions, development is often only dealt with through secondary benefits (ancillary benefits) such as 'medical consequences of the reduction of air pollution' and never as the main contribution of a project to the host country, i.e. its output in terms of goods or wealth. It was thus a matter of expressing this issue in a formal microeconomic axiomatic framework in order to relocate the political debate in a sound scientific framework, and of creating the appropriate tools to measure the contributory effects.

When the CDM claims to be an instrument for the reduction of emissions in developing countries and when most technological decisions take place at times of increasing production capacities of goods and services – and hence of emissions -, how can we set criteria to define a reference situation in order to measure such reductions, at a time when funding constraints sometimes thwart all hopes for endogenous investments and the consequent additional emissions ? The best answer was to abandon the too partial approaches limited to the elaboration of purely ecological indicators ('benchmarking' approaches based on the development of simplified technical coefficients of emission per product unit) to study the finer mechanisms of investment decision-taking and find less restrictive categories to use in the analyses. It then became necessary to turn to the analysis of real sectoral cases in order to examine closely the workings of private decision and public regulation, as well as their response to the introduction of an additional environmental revenue.

In order to deal with this second aspect, we chose to study two of the main sectors influencing the level of the developing countries' contribution to the increase in atmospheric CO<sub>2</sub>: the power sector, the main emitting sector (part 1)<sup>1</sup>, and the forestry sector, the main sector for the sequestration of the CO<sub>2</sub> emitted in the atmosphere (part 2).

*1 Two separate reports were also prepared to facilitate the dissemination of the findings.*

## B – Project summary

In a preliminary phase, we showed, within a formal microeconomic axiomatic framework, that the Clean Development Mechanism does have a leverage effect on development. This was achieved by constructing a microeconomic representation of the linkage between the microeconomic level of the decision - regarding a single industrial investment - and the rise in the general flow of investments and income induced by CDM projects as a whole in the national economy. The incremental rise in investment flow and income obviously depends on the value of the CDM-certified emission reduction credits and even more on the assumption that the discount rate of investors from the North is lower than that of their counterparts from the South (lower access cost to capital) and that the transferred clean technologies are more productive than benchmark 'local' technologies. Assuming that access to capital is one of the constraints weighing down the development of the host country, the CDM makes it possible to increase both the volume of achieved investment opportunities (internal rate of return greater than the investor's discount rate) and the general flow of investments (the increase in direct foreign investments in the sector most responsive to the CDM signal induces the local investment capacity to turn to other sectors).

We modeled the theoretical impact of carbon revenue (with fixed international carbon price) and potential national sectoral policies and measures on the internal rate of return on the basis of empirical sectoral analyses. Several methods can be used thereafter to calculate the leverage effect: (i) the ratio of the value of the carbon credits injected through feasible CDM projects (internal rate of return greater or equal to the discount rate of the investors) to the increase in direct foreign investments, and (ii) the ratio of the same carbon revenue to the increase in income generated by the additional CDM investments. We then carried out a detailed quantification exercise with a MARKAL simulation of the Indian power-generation sector in close collaboration with our Indian partner (the Indian Institute of Management of Amhedabad). This involved: (i) analysing projection scenarios of electricity demand and realistic sectoral policies, (ii) parameterizing the incidence of carbon revenue and anticipated national policies and measures in the MARKAL technological database, (iii) running the MARKAL optimization program, and (iv) computing and analysing the different leverage

effects on the Indian economy generated by the CDM through its taking up investment opportunities in the power-generation sector. Depending on the set of hypotheses tested, this quantification highlighted a 1.7 to 8.7 leverage effect on income (mean value over the entire range of tested options: 5.2). Although this procedure can be used for the main sectors of activity with a positive greenhouse gas emission balance, it is not applicable to the forestry sector. Forestry occupies a place of its own in climate negotiations, and the forestry sector of developing countries is characterized by a number of specificities, which the debate on 'flexibility mechanisms' has not always fully taken into account. Some activities reduce greenhouse gas emissions, others result in carbon fixation, while others yet do both simultaneously. Working on a typology of these various activities shows that they cannot be reduced to a unique category of carbon sinks, and that substitute activities (regarding energy or materials) must be evaluated taking into account the sustainability of the management of the tapped resources – an aspect not envisaged in the current configuration of the CDM. An additional problem is that of the non-permanent nature of carbon sequestration in forest plantations, since these can be accidentally destroyed.

Forest activities undertaken under the CDM risk being reduced to precious little by the set of regulations 'controlling' the recourse to carbon sinks. The exclusion of conservation activities is justified by difficulties in determining credible reference scenarios and in quantifying the virtual credits that could be generated. As regards the other activities, the will to avoid including carbon fixation that does not directly result from a precisely identified human intervention was the argument justifying the exclusion of forest management activities and of introducing improved and less damaging forestry techniques that contribute to the reduction of greenhouse gas emissions and to the maintenance of the sequestering capacities of the forests. The same approach was adopted to differentiate 'plant cover restoration' activities, which concern degraded forests, from 'afforestation and reforestation' activities. In the end only the latter were accepted as eligible for the CDM. Such choices are clearly marked by the scientific and media debates on the long-term carbon balance of forests, the possible saturation of the 'terrestrial sink' or even the transformation of this 'sink' into 'source'. The problem is that such a narrowing down of eligible activities, although reassuring to the guardians of environmental integrity and facilitating the measurement of carbon stocks, deprives developing countries of the levers that could be used to finance the most relevant activities in their particular situation, which is one of degraded natural forest resources. In the negotiations, the reflection on the accounting of carbon sinks in the CDM followed the same line. To solve the question of the possible non-permanent nature of these sinks, special carbon credits specific to the forest sinks of the CDM are expected to be introduced, although their value in relation to credits generated through emission reductions cannot be forecasted – in the case of temporary credits. The sensitivity of classical financial indicators (internal rate of return) to two different carbon fixation accounting methods was underlined during tests conducted on eucalyptus plantations in Congo. Given the pessimistic expectations regarding the potential price of credits linked to emission reductions in the wake of the American decisions, and the vast quantities of Russian 'hot air', the value of 'temporary credits' – or related forms – designed for the forest-based carbon sinks of the CDM is likely to be rather limited. In such conditions, the leverage effect expected from the CDM for the sustainable development of the forestry sector is likely to be very weak, the 'carbon revenue' being too low to encourage investment decisions not already scheduled through other economic pathways.

Additionality is the next problem. In several tropical regions, the general trend is towards the gradual replacement of natural forests – degraded by intensive use – with artificial plantations of fast growing trees. In many cases, the plantations proposed under CDM

activities are not additional, i.e. they would probably come into existence even without the support of the mechanism. The methods employed to work out the reference scenarios and assess the additionality of the proposed activities thus become a central issue. We showed that several options were possible, but also that, on the one hand, the information discrepancy between the proponent businesses and the evaluators and, on the other, the high cost of the transaction, required using technical and financial generic references (benchmarks) coupled to an analysis of the specific 'obstacles' to the considered activities, carried out in a well-defined institutional and geographical context. The high transaction costs of setting up and monitoring CDM activities – in comparison to the carbon revenue that could be expected in return – may moreover thwart the leverage effect in the case of small-scale projects, such as village plantations or certain types of agroforestry projects, which will be unable to attract private 'carbon' investments. The only way to give their chance to such activities is to use a combination of instruments, including official development assistance, through specific financial procedures such as capital investment funds, while at the same time lowering the various types of other obstacles hindering their development. The policies and measures that influence economic practices and decisions in the forestry sector are here critically important.