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CDM AND JI IN VIEW OF THE SUSTAINABILITY DEBATE

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ABSTRACT
Clean Development Mechanism (CDM), Joint Implementation (JI) and emissions trading are the three flexible instruments incorporated in the Kyoto Protocol. This paper presents a critical assessment of the sustainability of energy-related technology innovation and transfer in the context of CDM and JI. The rebound effect is discussed by comparing intended and unintended project and process outcomes. Attention is given to the role of nations and key actors like multinationals in achieving sustainability goals of the protocol.

1. SOVEREIGNTY AND GOVERNANCE

The Treaty of Westphalia of 1648 established the principles of territorial states that still dominate international relations today. However, political and economic realities at the start of the 21st century are very different from those 350 years ago:

- Nation states are not restricted to Europe anymore but are distributed around the world;
- Many of the present around 180 “sovereign nation states” are weak and powerless. Yet, nation states are parties to international conventions;
- The annual turnover of many multinationals is often larger than the Gross Domestic Products of most nations.

Moreover, what seemed impossible in 1648, it is now very likely that anthropogenic actions are adversely influencing the global climate (IPCC, 2001). The world’s nations have responded by adopting and entering into force the UN Framework Convention on Climate Change.

The Kyoto Protocol is a direct outcome of the Framework Convention. It is based upon four decades of scientific endeavours since the 1957 International Geophysical Year. Having acknowledged that producers and consumers are increasingly connected in global networks with corresponding environmental consequences like global change, the Kyoto Protocol also underlines the globalization trends in socio-economics and in culture.

Although the actions of producers and consumers directly influence the world environment, they themselves do not conclude international treaties. Nations do, although they in turn are often not the real environmental actors.

The institutional differences between nations as parties to international treaties and powerful key actors like multinationals, pose genuine challenges especially in realizing the aims and goals of global environmental treaties like the Kyoto Protocol. Reasoning along similar lines, Bierman (Bierman, 2000) proposes to establish a new international organization that would essentially deal with environmental problems.

2. SUSTAINABILITY

The Brundtland report defined sustainable development as development that meets the needs of the present generations without compromising the ability of future generations to meet their needs (WCED, 1987) – a seemingly simple definition with immense implications. It emphasizes the ecological, socio-cultural and economic dimensions of the sustainability debate. It underlines that human actions should be such as to prevent any degree of permanent damage through its consumption of resources. It also indicates the need to create social institutions and instruments to deal equitably with large world population increases. The concept of sustainable development stresses the interdependence between economic growth and environmental quality.

The Brundtland definition is not universally accepted. The very concept of economic growth is challenged by Daly (Daly, 1996). Others, whiles subscribing the Brundtland definition argue that sustainable development underlines the need for a significant redistribution of wealth, power and economic resources from North to South (Welford, 2000).

Article 12 of the Kyoto Protocol, in defining CDM indicated as its purpose to help developing countries to achieve sustainable development and so contribute to the ultimate objective of the convention and to 'assist Annex I parties in achieving compliance' with their specific commitments (Grubb et al, 1999). However, there is no guidance yet on how this is to be achieved (Jackson et al, 2001).

3. NON-RENEWABLE ENERGY SOURCES

Present world energy use is anything but sustainable. Over 90% of the energy is still produced from non-renewable and predominantly carbon-based fossil resources. These resources are still relatively large and inexpensive, often owing to government subsidies. Technological infrastructure and supply and demand chains for fossil fuels are firmly established throughout the world. The associated economic and political interests surrounding fossil fuels are overwhelming. This makes it different for any treaty to reduce and mitigate the environmental consequences of carbon-based emissions.

Yet in the use of fossil fuels three encouraging trends are predominant (Schoot Uiterkamp, 2000). First energy generation is becoming more efficient. For example, present state- of- the- art combined-cycle gas turbines now produce electricity with over 55% efficiency, a substantial improvement from the 35-40% typical of classical steam power plants. Secondly energy generation is becoming cleaner especially as a result of implementing environmental controls such as flue gas treatment and desulphurization technology. Thirdly, there is a clear trend toward "decarbonisation"

(Grübler, 1998), implying a decrease in the specific amount of CO_2 emitted per unit of energy used. For example, a shift from coal to natural gas for power generation means moving from a source of 94 kg of CO_2 per GJ thermal energy to a source of 56 kg of CO_2 per GJ. Assuming that the overall energy use is not increasing in parallel, such a shift fits very well in "post-Kyoto" policies aimed at reducing CO_2 emissions. It should be added that the shift from coal to natural gas has its shadow sides as well. Natural gas is a fine potential source of hydrogen and an equally fine source of organic chemicals. The more natural gas is used directly for power or heat generation, the less will be available for future hydrogen production and chemical manufacturing.

4. RENEWABLE ENERGY SOURCES

The EU aims to increase its share of energy from renewable sources such as solar, wind, hydropower and biomass from 4% in 1991 to 8% in 2005. Initiating and maintaining renewable systems, has its own direct and indirect environmental impacts and socio-economic consequences (cf Kopolo, 2001). Generally these systems have to be built using energy from fossil sources. Storage systems are needed to maintain energy supply during nighttime, calm or drought. Finally renewable energy sources such as biomass plantations often need substantial space, a strictly finite resource. Assuming that their biomass is appropriately used in energy generation, biomass plantations are carbon cycling intensifiers. Speeding up of carbon cycling turns biomass into a renewable energy source. After all one way mobilization of carbon from fossil sources is prevented by replacing it by carbon from biomass plantations Carbon dioxide originating from the latter sources can be reused over and over and can help generate energy simultaneously. This is not the case with carbon(dioxide) fixed in so-called sink projects. Sink projects are essentially temporary carbon storage facilities. There are other adverse impacts of sink projects (Grubb et al, 1999). Positive impacts are possible as well given sufficient institutional and technical capacity to implement guidelines, effective community participation and transfer and local adaptation of technology (Watson, 2000). The development of renewable energy technology is only part of the process of moving towards a sustainable future. That process also requires social and institutional changes including, presumably, new attitudes and expectations concerning consumption and affluence (Elliott, 2000).

5. ENERGY EFFICIENCY AND REBOUND EFFECT

Energy efficiency is the ratio of the output of conversion process or of a system to its energy input. Countries often expanded their economics while simultaneously improving energy efficiency. The overall result is that the final energy use of these countries remained about the same although the energy intensity of their economic decreased. Results were different for various economic sectors. In The Netherlands, energy use of the manufacturing industry strongly declined between 1973 and 1988, but energy use in freight transportation, travel and households increased during that period (Wilting et al, 1998). One commonly observes that energy efficiency and other technological improvements in apparatus and products in an economic sector are offset by volume growth resulting from behavioural, social or demographic factors. This phenomenon is called the rebound effect.

Binswanger (2001) presents a thorough analysis of this effect. He observes that especially technological change of a time-saving nature (for example shifting to faster modes of transport) can have a large influence on energy use as many time-saving devices require an increase in energy consumption. In other words a rebound effect with respect to time. Sustainability concepts based on the idea of resource or energy improvements to technological progress tend to ignore the rebound effects with respect to energy or time. Carbon taxes and other ecological tax reforms that would substantially increase the price of energy relative to income, would be an important step in actually reducing energy consumption on the demand side, for example in the household sector. Similarly a combination of carbon taxes and/or a policy of investment credits and R&D directed towards scale-adaptable and appropriate technologies can lower the barrier to the widespread adoption and transfer of climate-friendly technologies (Azar, 1999). In turn a proper set of taxes can offset possible rebound effect in countries receiving the energy-efficient technologies.

6. TECHNOLOGY TRANSFER AND CAPACITY DEVELOPMENT

Technology transfer is a process involving the trade and investment in technology, the selection (e.g. new or second-hand) adoption, adaptation and dissemination of industrial technology, and last but not least capacity development (see below) as science and technology are strongly related (Song, 1997). Since from now on basic industries will largely expand in developing countries, transfer of environmentally sound low carbon technologies takes on an extra importance (Worrell et al, 2001). Traditionally technology transfer is seen as a private transaction between two enterprises. However, technology transfer and innovation are interactive processes involving many partners and stakeholders. A successful outcome of these processes requires capacity development in the receiving countries. Capacity development is the process by which individuals, organizations, institutions and societies develop the ability (individually and collectively) to perform functions, solve problems and set and achieve objectives (Hildebrand, 1994; Begg & Parkinson, 2001). From a national capacity- needs perspective, developing countries should develop abilities in climate science and assessment, negotiations and implementation but above all in managing technological change (Sagar, 2000).

Especially large and rapidly developing countries like China and India consider energy supply as a limiting factor in economic growth. Therefore they often refused to accept emission goals interfering with economic growth. Ipsen et al (2001) show that the potential conflicts embodied in that position can be resolved by addressing the supply conditions of the jointly implemented projects. Fundamental to this supply is the realization of the countries' own developmental goals. Creating and developing an institutional capacity for a national environmental policy is an important precondition for cooperation. Taking the obligations for domestic emission standards seriously, implicitly defines a baseline for global emissions too.

While India and China are globally important participants in the climate change debate, such cannot be said yet for most African countries. Africa's low level of emissions (4% of present global greenhouse gas emissions) is considered a real barrier to African participation in the CDM except for possible sink projects. Therefore the concept of "emissions avoidance" was proposed by African countries to expand the scope of CDM. (Sokona et al, 2000). Whatever way of implementation is chosen, here too capacity development remains a crucial factor in creating the right conditions for participation of African countries in the Kyoto mechanisms.

7. CONCLUSIONS

- Achieving the aims and goals of the Kyoto Protocol poses specific challenges given the institutional differences between nations as protocol parties and powerful key actors like multinationals.
- Many well-intended improvements in energy efficiency are offset by various rebound effects. This may occur in implementing sustainability objectives of JI and CDM projects.
- Technology transfer and capacity development need to go hand in hand, since both are crucial prerequisites in assuring sustainable outcomes of JI and CDM projects.

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