

SUSTAINABLE DEVELOPMENT EVALUATION FROM CLIMATE CHANGE MITIGATION OPTIONS - THE CASE OF RENEWABLE ENERGIES¹

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Presentation Overview

There are principles laid down by the UN Framework Convention on Climate Change (UNFCCC) on the pursuit of the ultimate objective of stabilizing greenhouse gas concentrations. The UNFCCC imposes three conditions on the goal of stabilization namely that it should take place within a time-frame sufficient to "allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner" (Art. 2). It also specifies several principles to guide this process: equity, common but differentiated responsibilities, precaution, cost-effective measures, right to sustainable development, and support for an open international economic system (Art. 3).

The Third IPCC assessment report advances this process by including recent analyses of climate change that place policy evaluations in the context of sustainable development. This expansion of scope is consistent both with the evolution of the literature on climate change and importance accorded by the UNFCCC to sustainable development - including the recognition that "Parties have a right to, and should promote sustainable development" (Art. 3.4).

In the 1970s and 1980s, many development assistance agencies attempted to promote small-scale renewable-energy technologies like biogas, cooking stoves, wind turbines, and solar heaters in developing countries. From 1980 to 2000, official development assistance for renewable energy totaled about \$3 billion, most of which went for geothermal, wind and small hydro technologies. At the same time many developing countries were busy with their own renewable energy programs. Large-scale initiatives by developing country governments included ethanol use for transport in Brazil, household biogas for lighting and cooking in China and India, grid-connected wind power in India, and small hydropower in Nepal.

The 1992 UN Conference on Environment and Development (the Rio "Earth Summit"), along with the resulting UN Framework on Climate Change, breathed new political life into donor assistance for renewables (7, 10, 18, 34-37). Linked to the Earth Summit in the 1990s were new forms of multilateral assistance for renewable energy, including about \$600 million in grant assistance by the Global Environment Facility, \$2 billion in loans from the World Bank, and new initiatives by the UN Development Programme. Many of these projects have been designed to promote sustainable technology diffusion and

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markets by removing key barriers related to skills, financing, institutional and business models, and policies. This means that presently there is enough experiences already performed using the climate change mitigation option dealing with the use of renewable energy (more than 100,000 MW of installed power from which more than 40,000 in developing countries), and we are in conditions to examine the contribution of these programmes and projects on sustainable development, as required by the UNFCCC

One particular study (Martinot et. al, 2002) analysed sustainable development impacts of these programmes in rural areas of developing countries and concluded that not only many of them failed in achieving their short-term targets, but more than that, even the ones that were technologically and economically successful were, in general, not able to push economic development, and consequently did not collaborated for sustainable development. Many reasons are presented and it is recognized that several mistakes were practiced in the past and as time evolves the possibility of success is improving. A major conclusion of such survey is that (a) social benefits and quality of life, rather than income and economic benefits, have driven markets for renewable energy in rural areas; (b) experience with “productive uses” of renewable energy is still in its infancy and deserves much greater attention from donors, development agencies, and governments; (c) economic benefits from renewables are more likely in rural areas that are already undergoing development and can incorporate the additional energy dimension into existing development activities for water, health, education, agriculture, and entrepreneurship; and (d) published studies of income generation and economic benefits from renewable energy are still limited and call for further research.

Considering the shortage of information as pointed in statement d) and the conclusion on statement b) above, we are presenting one experience that has achieved considerable climate change mitigation and has impacted rural area promoting sustainable development. This is the use of alcohol as a fuel in the transportation sector, replacing oil derivative, in Brazil.

Brazil's policies mandate the blending of ethanol with all gasoline sold in the country, and also require that all gas stations sell pure ethanol. This last requirement made it commercially viable for the automotive industry to produce ethanol-only cars, as early as 1980. In the scale-up phase of the program, the share of ethanol-only cars as a share of total car sales rose steadily from 27% in 1980 to 96% in 1985. However, by 1989 the sales share had declined to 51%, triggered by a temporary ethanol shortage. Ethanol use continued to decline in the 1990s, and by 2000 sales had declined to around 10,000 ethanol only vehicles—compared to more than 800,000 in 1987. These declines were due in part to political uncertainties, lack of attention from policy-makers, ethanol producers, and automobile manufacturers to the program, declining oil prices, which made ethanol less competitive, and lack of confidence in supply. More recently, a significant price difference with gasoline that, even mainly produced from local oil, has been quoted at the international price and the large devaluation of the national currency, made ethanol, which is essentially dependent on goods and services quoted in national currency, more competitive. Sales of neat ethanol cars increased again, achieving 53,000 units in 2002. Motivated by the demand retake auto manufacturers concluded that it could be an option

to develop flexfuel engines able to use either pure ethanol, pure gasoline, or any blend of them. These cars launched in 2003 are showing wide interest, mainly due its resilience to price fluctuation of oil or agricultural products. Nevertheless, independent of the neat ethanol demand, the alcohol program is an important commercial activity since there is a guaranteed and continuously crescent market for ethanol blended in gasoline.

The ProAlcool program demonstrated cost reductions and economies of scale in ethanol production technologies, achieving factors of two or three improvement in ethanol yield from a given acreage of sugar cane. It also brought about policy changes in sugar cane pricing (from being based on weight to being based on sucrose, or energy, content) that changed the composition of the sugar cane crop and made ethanol production even more effective.

From the global environmental perspective the program is a success, replacing 7 MtC/yr, due its excellent energy balance, requiring very small amount of fossil fuel in its production. From the development perspective national and sectorial positive impacts are noticed through: a) hard currency savings from replacement of oil importation; b) improvement in air quality in large cities; c) through the large number of direct and indirect employments in rural areas created at very low value of investment - complying with the UNFCCC condition on sustainable development. Avoidance of oil importation reduced deficit in the country balance, saving hard currency expenditures directly and indirectly through interest payment on accumulated debt on amount above US\$ 100 billion in the period 1975-2000. Most job positions were well adapted to the low cultural level of the significant share of the region inhabitants. Job creation has been possible, since car owners compose a well established and reasonable rich demand market. Thus, as opposed to most of the renewable energy projects, mainly the ones using biomass, ProAlcool was not designed to provide energy to the poor living in rural areas, but was designed for the poor living in the county-side to produce and sell energy to the better-off part of the population living in cities and used to pay for gasoline at the international level. This characteristic is very important to note and to explore even further, Historically, rural population survived selling their products (essentially food and fodder) to the city inhabitant, which has money to pay for them. The establishment of a new opportunity for rural people to explore and make money selling a new product – energy- to the car owners is a remarkable source of rural development. Employment generation brings financial resources to the region and may be a source of revenue as large as the food and fodder market. This is particularly important for countries and regions where there are land, water, and low-cost manpower availability, which guarantee that food production, is not threatened, fulfilling another condition imposed by UNFCCC. Selling a new product to the ones that can afford to pay is important since quite often agricultural activities are constrained more by the lack of demand than by shortage of inputs.

The possibility that this experience be repeated in other developing countries with success is increasing due the concern with climate change and better understanding of more effective policies for sustainable development. Large scale production of ethanol to replace gasoline in national markets is being retake, after a few failures outside of Brazil, in the 80's. India, Thailand, Colombia are examples of developing countries preparing for

such effort. Regarding the international market large opportunities exist triggered by the climate change compromises, like the Kyoto Protocol. Large scale production to fulfill liquid fuel demand of developed country can be performed by some tens of tropical developing countries, and this can make a real contribution for the sustainable development of these regions, while increases the supply options for fuels at world level, limiting oil derivatives prices and reducing importers' vulnerability to market prices manipulation and to physical risks caused by excessive centralization of supply. Finally one must not forget that many renewable energy efforts are directed at improving energy for the poor. Most renewable energy markets first succeed because the richer segments of society are able to afford the benefits or have the means to generate income from increased access to energy. Thus some argue that purely market orientations are going to leave behind large segments of the poor. Effective policy approaches for reaching the poorest may combine private sector involvement with targeted public subsidies linked to development goals and strategies for increasing incomes.

A review of the sustainability aspect of renewables has the merit to trigger similar evaluation for the several other climate change mitigation options, including the one dealing with carbon capture and storage CCS. Such technology is being analysed in a IPCC Special Report and should be submitted to an evaluation about its positive contribution to sustainable development.