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Technical Note

Sustainable energy technologies in Israel under the CDM: Needs and prospects

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ABSTRACT

The complexities related to the Clean Development Mechanism (CDM) are considered quite high and only a relatively low percentage of the existing potential has been exploited in the developing world. Israel obtains a significant unexploited potential, especially regarding Renewable Energy Sources (RESs) and Energy Efficiency (ENEF). In order to be able to identify potential CDM projects and to formulate a series of possible investment strategies with a CDM component, it is crucial to establish a clear understanding of the host country's needs and priorities, the suitable sustainable energy technologies, as well as their related potential benefits and barriers. The paper presents results obtained from an elaborated stakeholders' assessment on potential of sustainable energy technologies under the CDM conducted in Israel.

1. Introduction

Climate change has emerged as one of the greatest threats to the planet and the combat against it is becoming one of the top priorities worldwide. On the other hand, world community faces the economic, environmental and social problems suffered by developing and less developed countries (non-Annex I countries). The Clean Development Mechanism (CDM) may contribute to the mitigation of both problems since, according to article 12.1 of the Kyoto Protocol [1], it should make compatible cost efficient abatement of greenhouse gas (GHG) emissions with the improvement in the sustainable development potential of poorer countries by promoting the transfer of, both, financial and technological resources from developed to developing countries. Therefore, a typical CDM project would involve both a transfer of a low-carbon technology to a developing country, which is in accordance with its domestic needs and priorities, and a transfer of Certified Emission Reductions (CERs) to the industrialised country that invests in the CDM project [2,3].

According to the *Marrakech Accords* of 2001, which provide further details on the modalities and procedures for the Kyoto Protocol, it is the prerogative of the host countries to assess whether CDM projects support their sustainable development [4]. Host countries are free to determine criteria for CDM projects' contribution to sustainable development. Consequently, sustainable development under the CDM is considered a country context-specific aspect which could differ across countries. This does not mean that industrialised countries cannot play a role in supporting the contribution of CDM projects to sustainable development. After all, industrialised countries could decide that they only want to participate in projects with a large contribution to local economic development and with low or no negative impacts on the local environment, economy and society.

In this respect, a round of discussions is currently going on concerning the particular sustainable development benefits the CDM should bring to host countries [5]. Indeed, the transfer and implementation of Renewable Energy Sources (RESs) and Energy Efficiency (ENEF) technologies through CDM can assist a developing country to meet its main energy services needs' and priorities as well as to achieve sustainable development. However, in order to assure the sustainability of a CDM project, the identification of the host country's most important energy needs and priorities and the selection of the most appropriate technology alternatives to transfer and implement to the specific host country under CDM are required. In addition, the selection of the suitable CDM project to develop in a host country should also be made on the basis of ensuring the removal of existing implementation barriers [6].

This is due to the fact that, in spite of the numerous benefits a CDM project could deliver, a wide array of barriers prevents its successful implementation in a host country, such as the quite lengthy approval procedures and a huge amount of transaction costs associated with different processes in the CDM life cycle [7,8]. These barriers should be overcome so as to guaranty a sustainable implementation of CDM projects in the host country.

With respect to the above, in order to be able to identify potential CDM projects and to formulate a series of possible investment strategies with a CDM component, it is crucial to

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establish a clear understanding of the host country's needs and priorities, the suitable sustainable energy technologies, as well as their related potential benefits and barriers.

Israel possesses an extensive potential to abate greenhouse gas (GHG) emissions by utilising RES and ENEF technologies. Furthermore, Israel's Energy Plan aims at diversification through an enhanced move towards natural gas, especially after a grand offshore natural gas field discovery [9], which reveals the potential for the substitution of oil in energy generation by natural gas. Indeed, possible CDM project opportunities in Israel can be found in a wide array of categories [10]:

- *Energy*: Use of RES, such as solar energy, geothermal energy, wind turbines, hydroelectric stations, utilisation of waste heat, biomass, *etc*.
- *Transportation*: Establishment of a mass transit system, switch to clean vehicles fuelled by cleaner fuels.
- *Waste*: Collection of methane gas from landfills and wastewater treatment plants, generation of energy from waste, treatment of livestock waste, *etc*.
- *Industrial and public buildings*: Installation of energy-saving lighting, installation of solar collectors for water heating for residences, hotels, medical centres, and, for water heating at high temperature for industrial use, *etc*.
- *Industry*: Increasing production efficiency and saving on fossil fuel combustion transfer to dry production processes in the cement industry, *etc*.
- *Land-use changes*: Primarily reforestation and afforestation projects.

In the above framework, the paper presents results obtained from an elaborated stakeholders' assessment on potential of sustainable energy technologies conducted in Israel under the CDM. The selected Israeli stakeholders from different energy sectors were contacted in the context of EC FP6 "ENTTRANS" project which aims at supporting the host country DNAs in building the capacity to explore which CDM projects would contribute to the countries' sustainable development needs and priorities.

Apart from the introduction, the paper is structured along three sections. The methodological approach followed for Israeli stakeholders' preferences elicitation is introduced in the second section. The third section presents, analyses and discusses the main outcomes resulted from the stakeholders' assessment. Finally, the last section is the conclusions, which summarises the main points that have arisen in this paper.

2. Methodological notes

2.1. Background information

Israel's Designated National Authority (DNA) for the CDM was established in 2004 within the Ministry of Environment, with representatives of several governmental and public bodies: the Ministry of the Environment, Ministry of Transportation, Ministry of Industry and Trade, Ministry of National Infrastructures, Ministry of Finance, Ministry of Agriculture, the Manufacturers Association of Israel, Israel Electric Corporation (IEC), and the environmental NGO Zalul. The DNA has established procedures for the assessment of CDM project proposals and their alignment with national sustainable development criteria. It also serves as 'service platform' to assist project developers during the CDM project cycle.

Up to September 2008, 33 CDM projects in Israel have entered the pipeline of projects that are either under validation, or have been registered (Table 1). All these projects have in the meantime been approved as eligible CDM projects by the Israeli DNA. In total, should these projects perform as planned in their design documents, it is expected that they will generate 15.9 million CERs by the year 2012, which can then be transferred to industrialised countries with quantified commitments. Moreover, most of the projects have a lifetime that goes beyond the year 2012 (the end of the Kyoto Protocol commitment period) and will continue generating emission reductions and thus CERs. In actual practice CDM projects hardly perform according to plan with some projects performing below and others even above expectations. In general, it is expected that projects deliver around 75% of planned CERs, which would imply for the current Israeli projects approximately 11.9 million CERs by 2012 [11].

Table 1
CDM projects pipeline for Israel, *as per September 2008*.

	Registered	Requested Review	At Validation	Correction Requested	Registration Requested	Total
Agriculture			1			1
Biogas	1		3			4
Biomass Energy	1		1			2
ENEF Industry	1					1
ENEF Own Generation			1			1
Fossil Fuel Switch	1		9			10
Landfill Gas	3	1	3			7
N_2O	4					4
PFCs			2			2
Wind	1					1
Total	12	1	20	0	0	33

Source: Ref. [11].

It is also interesting to note that the fossil fuel switch projects mentioned in Table 1 are all in the field of switching from oil or coal to natural gas. However, it should be mentioned that even though natural gas is eligible under the CDM [11], sometimes CDM rules make it difficult for project investors to prove the additionality of such projects.

Two areas with a particularly large CDM potential are the following [12]:

- *Energy*: The rate of growth of electricity consumption in Israel is among the highest in the world, reaching some 6% per annum in the last decade. Based on a 'business as usual' scenario, the IEC anticipates the production of 74 GWh in 2020, which would imply a CO_2 emissions level of nearly 60 Mt CO_2 per year. Emissions from this sector may be reduced by two means: changes and improvements in the electricity production system and use of renewable energy.
- *Waste management*: Israel has made major strides in its waste management over the past decade by closing 77 large waste dumps and replacing them with state-of-the-art central landfills with systems for leachate collection and treatment, leakage prevention and collection of gas emissions. However, the methane captured from the waste decomposition is hardly used anywhere in Israel for heat and electricity generation. However, some 90% of the country's waste is still landfilled in a less controlled way; only a few of the sites extract and utilise methane. Consequently, this sector is a strong contributor to Israel's GHG emissions, also due to the high global warming potential of methane.

2.2. Approach adopted

The proposed approach is build, in a large extent, on the emerging insights from the EC FP6 "ENTTRANS" project, which aims at supporting the host country DNAs in building the capacity to explore which CDM projects would contribute to the countries'