FEMIP

Study on Clean Development Mechanism (CMD): Project Identification in FEMIP Countries

European Investment Bank

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Abbreviations

AFD	Agence Française de Développement
ANER	Agence Nationale pour la Maîtrise de l'Energie (Tunisia)
AZIT	Association of the Tangiers Industrial Zone (Morocco)
BOOT	Built-Own-Operate-Transfer
BU	Bottom - up
CAIP	Cairo Air Improvement Project
CCS	Carbon Capture and Storage
CCU/EEAA	Climate Change Unit of the Egyptian Environmental Affairs Agency
CDER	Centre des Energies Renouvelables
CDG	Caisse de Dépôt et de Gestion
CdM	Ciments du Maroc
CDM	Clean Development Mechanisms
CDM EB	CDM Executive Board
CDM NC	CDM National Council (Morocco)
CDM PS	CDM Permanent Secretariat (Morocco)
CEO	Chief Executive Officer
CERs	Certified Emission Reductions
CIEDE	Tunisian Information Center on Sustainable Energy and Environment
CIOK	Cimenterie Oum El Kelil (Tunisia)
CMPP	Centre Marocain de Production Propre
CPSCL	Caisse des Prêts et de Soutien aux collectivités Locales
CRE	French Commission de Régulation de l'Energie
CSP	Concentrating Solar Power
Danida	Danish International Development Assistance
DNA	Designated National Authority
DNI	Direct Normal Irradiance
DOE	Designated Operational Entity
DSWH	Domestic Solar Water Heaters
EB-CDM	Egyptian Bureau for CDM
EC-CDM	Egyptian Council for CDM
EEAA	Egyptian Environmental Authority Agency
EIB	European Investment Bank
EOR	Enhanced Oil Recovery
EPAP	Egyptian Pollution Abatement Project

EU-ETS	European Union Emission Trading Scheme
FEC	Fonds d' Equipement Communal
FEMIP	Facility for Euro Mediterranean Investment and Partnership
GEF	Global Environment Facility
GHG	Green House Gases
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
HDR	Hot Dry Rock
HRS	Heat Recovery System
IBRD	International Bank for Reconstruction and Development
ICF	Italian Carbon Fund
IEA	International Energy Agency
IEC	Israeli Electricity Corporation
IFI	International Financing Institutions
IPP	Independent Power Producer
JBIC	Japan Bank for International Cooperation
kfW	Kreditanstalt Für Wiederaufbau
KP	Kyoto Protocol
LNG	Liquified Natural Gas
MoU	Memoranda of Understanding
METAP	Mediterranean Environmental Technical Assistance Programme
MSW	Municipal Solid Waste
NCS	Nature Conservation Sector
NGOs	Non Governmental Organisations
NGVs	Natural Gas Vehicles
NREA	New and Renewable Energy Authority (Egypt)
NSS	National Strategy Study (Egypt)
OCP	Office Chérifien des Phosphates (Morocco)
ONAS	Tunisian National Office of Cleansing
ONE	Office National d'Electricité (Morocco)
ONEP	Office National de l'Eau Potable (Morocco)
PANE	Moroccan National Action Plan for the Environment
PDD	Project Design Document
PFC	Perfluorocarbons
PIN	Project Identification Note
PPs	Project Participants
PS	Moroccan Permanent Secretariat
PSA	Production Sharing Agreement
RES	Renewable Energy Sources

SCC	Sindicatum Carbon Capital
SD	Sustainable Development
SIPH	Solar Industrial Processes Heat
SME	Small and Medium Enterprises
STEG	Société Tunisienne de l' Electricité et du Gaz (Tunisia)
SYKE	Finnish Environment Institute
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change
WB	World Bank
WHRS	Waste Heat Recovery Systems

Executive Summary

Scope of the Study

The Study of CDM Project Identification in FEMIP countries aimed to:

- investigate the possibilities for carbon finance and crediting activities in the Mediterranean region, identify priority sectors and make relevant recommendations;
- build a pipeline of concrete CDM projects or project concepts that the EIB could help finance in the years to come;
- promote closer communication between the EIB and local CDM actors.

The study focused mainly in Egypt, Morocco and Tunisia, which were selected as priority countries, in terms of their potential for CDM projects.

The third aim was accomplished through:

- a regional workshop, with participation from the three priority countries; this workshop took place in Cairo on 19 November 2006;
- recommendations for an Early Warning System that would be used by the EIB to identify CDM projects in their conception / design phase as well as technical assistance needs to be covered.

This Executive Study to the Final Report of the study summarises the findings and the recommendations of the study which are presented in detail in the report.

Current Status and Potential for CDM

Political commitment to the Kyoto Protocol in some clear manner on the one hand and institutional acknowledgement of the CDM option on the other hand are both preconditions for a country to be able to host CDM projects. It seems that, among the FEMIP Countries, these preconditions are only met for Egypt, Israel, Jordan, Morocco, Syrian Arab Republic, Tunisia and Cyprus. Of these countries:

- Jordan and the Syrian Arab Republic do not currently host any CDM project activity;
- Egypt has two CDM projects registered and three at validation stage;
- Tunisia has two projects registered;
- Morocco has three projects registered and three at validation stage;
- Cyprus has two projects at validation stage; and
- Israel has two registered projects and seven at validation stage.

CDM potential in the FEMIP region is abundant. More specifically the CDM potential by sector is as follows:

- Industrial & Services Sector:
  - There is considerable potential for fuel switch from coal to natural gas for power generation in oil / gas exporting countries, such as Libya, Algeria and Egypt, as well as in oil dependent countries with access to the natural gas grid, such as Turkey, Morocco and Israel.
  - There is very considerable potential for energy conservation in industry, through energy efficiency interventions and process modernization in most countries of the region. A large part of this potential, however, is locked in small and medium enterprises (SMEs) and concerns medium size investments.
- Energy Sector:
  - Wind Energy Potential: Good prospects, fairly evenly distributed throughout the FEMIP region;
  - Hydroelectric energy potential: Primarily in Turkey; in smaller degree, in Morocco, some parts of Algeria, Tunisia and Egypt.
  - Geothermal energy potential: In Turkey mainly, as well as Algeria, Morocco and Tunisia, to a smaller extent.
  - Solar energy potential: Very extensive and well-distributed.
  - Ocean energy potential. Limited tidal energy potential in the region.
  - Energy efficiency households/service potential. Especially large in densely populated regions.
- Waste Sector / Landfill Management: Good prospects for LFG (Landfill Fuel Gas) projects in the region. Jordan and Israel have a relatively high LFG-CDM potential, while LFG prospects are good in Turkey, Egypt and Algeria.
- Transport Sector: Fuel diversification potential is highly dependent on the country's possibility and need to engage in fuel switch. Thus, in oil exporting countries (Libya, Egypt and Algeria) the biofuel potential seems to be relatively weak, with more promising solutions the large-scale implementation of natural gas vehicles, and introduction of liquified petroleum gas (LPG) as a transport fuel. In more import dependent countries, such as Cyprus, Malta, Israel, Lebanon, Morocco, Tunisia and Turkey, fuel diversification might be of strategic importance and could also include the production as well as the import of biofuels.
- Other Sectors (including agro-forestry sector): Generally limited potential in the region, though there is potential for some important forestation projects of local import.

CDM in Egypt

The Egyptian government is actively involved in tackling the climate change related policies. Moreover, Egyptian policy for the promotion of CDM related activities has been

one of the most active among the FEMIP countries. The institution responsible for all related CDM activities in Egypt is the Egyptian DNA, established in the Egyptian Environmental Affairs Agency.

The most important opportunities for CDM projects in Egypt, are currently in the following sectors, in order of importance: (I) Industrial & Services Sectors, (II) Energy Sector, (III) Waste Sector / Landfill Management, (IV) Transport Sector and finally (V) Other (Agro-forestry sector).

The following International Financing Institutions (IFIs) and bilateral entities are active in Egypt in the CDM context: The World Bank, the Global Environmental Facility (GEF), Kreditanstalt für Wiederaufbau (KfW), the Danish International Development Assistance (DANIDA), the Japan Bank for International Cooperation (JBIC), the Spanish Carbon Fund, the UNDP, the Sindicatum Carbon Capital, Ecosecurities, and the Finnish Environment Institute.

Following are the main advantages and disadvantages related to the development of CDM and CDM projects in Egypt.

Table 1: Main advantages and disadvantages for CDM development in Egypt.

Advantages	Disadvantages
• DNA well organized and staffed with capable and supportive personnel; • State authorities sensitized and interested in promoting CDM; • Significant potential in several sectors is (Energy, Industry, etc.); • Already developed pipeline with about 40 CDM project proposals; • Existence of approved methodologies for most of the proposed projects; • Some CDM projects already registered with UNFCCC EB; • Local agencies, NGOs, organisations, consultants etc. keen to be involved in CDM.	• Local industries / utilities / enterprises etc. are facing difficulties in the development of attractive CDM project proposals (lack of specialized knowledge, limitation of resources - financing, personnel etc.); • Relatively small number of trained and active local consultants in many sectors related to CDM; • High CDM transaction costs; • A significant number of CDM projects are small scale activities, which have limited financing possibilities; • Local banks not involved in CDM financing; • Low prices of electricity and fossil fuels do not promote certain projects.

The following policies / actions are recommended, to further encourage CDM in Egypt:

- Provision of well targeted training to agencies, industries / companies / utilities, aiming to improve their internal capabilities for identifying attractive CDM projects;
- Provision of specialized Technical Assistance for the development of CDM project proposals (PINs, PDDs, etc.), thus helping local enterprises to afford CDM Project

Cycle transaction costs;

- Encouraging the clustering of small scale projects into projects/programmes with a critical mass;
- Supporting the concerned institutions with specialised technical assistance, to enable them to fulfill their mission more efficiently;
- Provision of financing with terms better than BaU commercial practice (e.g. long payback periods, low interest rate, soft loans etc.);
- Preferential transactions for CDM projects, such as exemption form custom duties;
- Continuous adjustment of energy prices to reflect the real market costs, so as to increase the competitiveness of RES and energy efficiency projects.
- Subsidies for the alleviation of poor people, based on a more selective targeting method, rather than on tariffs of energy products.

The most interesting projects under development, as identified by the study experts, are the following:

- Industry & Services Sector
  - Waste Heat Recovery (Abou Zaabal Company for Fertilizers):
  - 22 Brick Kilns Fuels Switching Project
  - Nitrous Oxide Emission Reduction in Nitric Acid Unit
  - Perflurocarbon's Emissions Reduction
- Energy Sector: 200 MW wind farm at Gabel El-Zeit area
- Other (Agro-Forestry Sector): The Greater Cairo Ring Road Afforestation project.

CDM in Morocco

The Moroccan Government declared very early its willingness to pursue sustainable development and the country has been actively involved in climate change and related policies. However, no specific CDM law has been adopted yet. A CDM National Strategy covering the period 2003-2005 has been developed, . That strategy aimed at attracting CDM investments and implementing the institutional and structural framework required to operate the CDM mechanism, as well as developing the national capacities in this field and promoting the Moroccan CDM potential internationally.

The seat of the DNA is at the Ministry of Territorial Planning, Water and Environment.

There is substantial CDM potential in Morocco. Renewable energy sources (wind, solar, hydro, biomass), energy efficiency, rationalization of local transport, waste management and forestation provide different opportunities for saving on GHG. In this framework, the DNA has developed a project portfolio of proposed CDM projects since 2002. This

portfolio contains currently about 60 projects, at different stages of maturity. The sectors' potential in order of importance is: (I) Energy Sector, (II) Industrial & Services Sector, (III) Waste Sector / Landfill Management, (IV) Other (including Agro-Forestry Sector and Carbon sequestration), (V) Transport Sector.

The IFIs and bilateral institutions active in Morocco in the CDM context include the World Bank, the UNDP, KfW, the AFD (Agence Française de Développement), Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), Ecosecurities and the local Caisse de Dépôt et de Gestion.

Following are the main advantages and disadvantages, on the interplay of which the further development of CDM and CDM projects in Morocco will depend.

Table 2: Main advantages and disadvantages for CDM development in Morocco.

Advantages	Disadvantages
• Early start and sensitisation of state authorities; • Good organisation, with competent and supportive DNA; • Local organisations, associations, NGOs etc. exhibit interest in CDM projects; • Trained and active local consultants in many sectors related to CDM; • Substantial potential in several sectors; • Abundance of financing sources for CDM; • Momentum gained through the early registration of three CDM projects; • No electricity subsidies; electricity prices are high enough to promote RES projects.	• Legislation in electricity does not allow full private sector involvement; • Subsidies of butane and other fuels distort market and delay energy efficiency projects; • No concrete strategy in the transport sector; • Lack of concrete energy efficiency / RES policies with incentives and measures; • Uncertainties in the forestry sector; • Unilateral CDM approach by large companies may discourage foreign investors; • Limited access of SMEs to local or foreign financing facilities; • A large part of CDM projects are too small to benefit from IFI funding; • No involvement of local banks in CDM financing.

The adoption of the following policy recommendations could further encourage CDM in Morocco:

- Further progress towards liberalization of the electricity sector;
- Adoption of national strategies in different CDM sectors and implementation of those strategies with specific measures and incentives;
- Further information and awareness campaigns, targeted partly at SMEs but also at

civil society at large;

- Investigation of possible ways to formulate CDM projects by clustering similar interventions in several SMEs;
- Further training and capacity development, encompassing also important CDM fields where there is presently little or no experience (forestation, methane sequestration);
- Provision of risk management facilities for CDM project development;
- Provision of financing through grants and/or credits for technical assistance for CDM development (entire project cycle), possibly coupling it to project financing;
- Making special financing for CDM projects available to medium enterprises – and for medium size projects – through local banks and other small financial institutions;
- Providing funds for CDM financing that are flexible and respond to the projects' particular needs.

The most interesting CDM projects or project ideas, identified by the study experts, are listed below:

- Industry & Services Sector
  - Systems in the OCP Unit of Safi (Maroc Phosphore I & II);
  - Wind farms by the cement industry (several projects);
  - Wind farm 2 X 10 MW – Industrial zone of Tangier Dalia I and Dalia II;
  - Industrial Energy Efficiency in the Sidi Bernoussi Industrial zone;
  - Energy efficiency and process change in olive oil enterprises.
- Energy Sector
  - 60 MW wind farm in Taza by the public electricity utility ONE;
  - 1000 MW wind farms by the ONE;
  - 5-10 MW wind farm for the Tan Tan desalination plant by ONEP;
- Other Sector: Biodiesel Morocco (combined forestation and biodiesel production).

CDM in Tunisia

Tunisia has set itself ambitious CDM-related goals for the future. By 2011, it plans to have projects underway to save altogether 12,7 Mt of CO_2-eq. Additional reductions of 16,9 Mt of CO_2-eq are planned for the period 2012 to 2016. A strategy devised in 2005 to establish the mechanisms for initiating and approving CDM projects at national level is being implemented as of 2006, while, from 2006 to 2011 the Tunisian CDM strategy envisages the development of numerous CDM projects, at a target rate of at least 20 projects a year.

Ministry of Environment and Sustainable Development is the Tunisian DNA. The Ministry has developed since 2003 a portfolio of proposed 47 CDM projects. It has to be noted that about 60% of the most workable Tunisian CDM potential lies in small scale projects.

There are several IFIs and bilateral institutions active in Tunisia in the CDM context. These include the World Bank / IBRD, UNDP, GEF, JBIC, KfW, AFD, Spanish Development Aid, Enerciel, GTZ, the local Agence Nationale pour la Maîtrise de l'Energie and Ecosecurities.

Following are the most important advantages and disadvantages for the development of CDM in Tunisia.

Table 3: Main advantages and disadvantages for CDM development in Tunisia.

Advantages	Disadvantages
• Abundance of financing sources and technical support organizations for CDM; • Abundance of renewable energies especially wind and solar; • Already existing various CDM projects portfolios; • Two projects have already been registered; • No electricity subsidies; electricity prices are high to promote RES projects; • Incentives in the field of energy efficiency, solar thermal and transportation; • Early start and sensitization of state authorities.	• Uncertainties regarding energy regulatory framework for IPP integration; • Low legitimacy and coordination skill of the DNA; • Lack of dialogue or opposition between various stakeholders (STEG and IPP, Min. of Env. and ANME); • A large part of CDM projects are too small to benefit from IFI funding; • Lack of tariff incentives for renewables and cogeneration power plants connected to the grid; • Limited potential for workable CDM projects; • Large part of CDM potential in SMEs, which have other priorities and limited CDM related resources and skills; • Relatively small number of trained and active local consultants in many sectors related to CDM.

The following policies / actions are recommended, to further encourage CDM in Tunisia:

- Improvement of the energy regulatory framework, through the set-up of a really independent regulatory entity, the effective opening-up of the energy market to IPPs and the application of a clear regulatory framework for grid connection procedure;
- Economic and financial measures, such as:
  - Incentive scheme, with a preferential rate for renewable energy systems

connected to the grid;

- Support of non profitable activities such as specific environmental and energy actions in public utilities or SMEs;
- Specific support focused on small size projects (<5 M€), which represent a great CDM potential.

- Technological measures:
  - Continuous and extensive capacity building in CDM issues and feasibility studies;
  - Long term support for project implementation (tools and methods) to enhance the organizational capabilities;
  - Detailed grid assessment for wind projects including reinforcement options and dispatching overhaul opportunities.

The most interesting projects under development, as identified by the study experts, are the following:

- Industrial & Services Sector:
  - 3,8 MW cogeneration power plant in 4 food processing factories of “Mohsen Hachicha” group;
  - 14 MW wind power installation in the cement factory CIOK (Cimenterie Oum El Kelil);
- Energy Sector: 120 MW wind farms in Tunisia;
- Waste Sector / Landfill Management: Electric valorization by anaerobic digestion from sewage sludge of large Tunis area treatment plants.
- Other Sector: Afforestation/Reforestation and integrated development of forest vocation degraded lands.

1. Introduction

The study's objective is to investigate the possibilities for carbon finance and crediting activities in the three selected Mediterranean countries (Egypt, Morocco and Tunisia), identify priority sectors and build a pipeline of concrete Clean Development Mechanism (CDM) projects, which EIB could help work up and finance in the next period. In particular, the project has the following two specific objectives:

- Early Project Identification and EIB Involvement in Project Activities.
- Formulation of an "Early Warning System": This will formulate concrete ideas / proposals on an "early warning" system that the EIB and other bilateral / multilateral financial institutions could adopt to identify CDM projects in Egypt, Morocco and Tunisia and select projects to finance.

The project comprises three tasks:

- Task 1: Analysis of CDM Potential.
- Task 2: Identification of CDM Projects.
- Task 3: Further Development of Communication Channels.

The aim of this final report is to provide the EIB with the findings, conclusions and recommendations of the consultants. This document has been enhanced with the outputs of the workshop implemented in Cairo, on the 19th of November 2006.

The current document is structured in 7 chapters, as follows:

- Chapter 2, following this short introduction, is devoted to the analysis of the general background in the FEMIP countries;
- Chapter 3 is dedicated to the project approach used by the consultants in the country analysis, as well as the description of the ideas underlying the proposed "Early Warning System".
- Chapters 4, 5 and 6 are devoted to the analysis of CDM project development in Egypt, Morocco and Tunisia respectively. The structure for each country study includes as described in the project approach an analysis of the CDM-related policies, a review of the existing CDM projects, a description of CDM potential and projects by sector, a brief discussion of issues related with CDM project financing, the main barriers inhibiting CDM projects in the region, as well as a SWOT analysis
- Chapter 7 comprises the project results, namely the recommendations for each country studied and the implemented dissemination activities. It also includes some general recommendations for the FEMIP countries and specific recommendations addressed to the EIB.

2. FEMIP Countries

In order to be able to identify potential CDM projects and to formulate a series of possible investment strategies with a CDM component for EIB in the FEMIP-region, it is crucial to establish a clear understanding of what the potential effects of CDM-related (procedural) issues such as validation and verification, as well as project development are.

In the following, procedural matters regarding (new) forms of CDM as well as some basic characteristics of the current CDM pipeline are touched upon. In addition some data on the overall commitment, including ratification status of the various FEMIP-countries and their implications for investment and investment potential will be discussed as well as the financing possibilities.

Following the description of CDM-related issues, investment potentials for various RES and other sustainable energy technology options (such as energy efficiency, fuel switch, etc.) based on existing literature will be discussed. This information will be combined with information available on possible project activities within the countries in this region in order to define some possible investment routes. Through this, an overview will be provided of the results of the research that has been carried out within the framework of this project, which will include analysis of some earlier inventories of potential investment (and CDM-) projects/opportunities in the region.

Finally, a broad regional framework will be presented including some 'barrier analysis' (legal, political, environmental and social) with the purpose of defining and/or adapting a number of broad potential investment strategies. Some of such strategies may be implemented at the multi-country level.

The overall objective of the current chapter is to investigate the possibilities for carbon finance and crediting activities in the Mediterranean region.

2.1 Existing and upcoming CDM-related Policies

The CDM is one of the three market-based mechanisms of the Kyoto Protocol that Annex 1 Parties can use in order to cost-effectively realize their emission reduction targets. As such, the CDM mechanism serves as a vehicle for investments in sustainable energy technologies in industrializing/developing countries.

In order to generate CERs, project initiators/investors/developers are expected to go through the following CDM validation and registration procedure. Their prime activity is the development of a PDD, in which a detailed description is given concerning aspects such as additionality assessment, baselines, the project boundary, leakage, monitoring

and barrier analysis.

The steps of the CDM project procedure are described below:

Step 1: Planning a CDM project activity

- CDM project participants (PPs) plan a CDM project activity.
- There are several conditions in order to be registered as a CDM project activity, and PPs should consider those conditions from a planning stage.

Step 2: Preparing the project design document (PDD)

- PPs prepare the project design document (PDD) for a CDM project activity.
- There is a standard format for the PDD, and PPs must fill in all the contents as necessary.

Step 3: Getting approval from each Party involved

- PPs shall get written approvals of voluntary participation from the designated national authority (DNA) of each Party involved, including host Party.
- The written approval from host Party should include confirmation by the host Party that a project activity assists it in achieving sustainable development.
- A Party involved is a Party that provides a written approval.
- The registration of a project can take place without an Annex I Party being involved at the stage of registration.
- The details of approval procedure is up to each Party.

Step 4: Validation

- Validation is the process of independent evaluation of a project activity against the requirements of the CDM on the basis of the PDD.
- Validation is carried out by a designated operational entity (DOE).
- There is a formal procedure for validation.

Step 5: Registration

- Registration is the formal acceptance of a validated project as a CDM project activity.
- Registration is done by the CDM executive board (CDM EB).
- There is a formal procedure for request for registration.
- PPs shall pay registration fee at registration stage.

Step 6: Monitoring a CDM project activity

- PPs collect and archive all relevant date necessary for calculating GHG emission reductions by a CDM project activity, in accordance with the monitoring plan written in the PDD.

Step 7: Verification and certification

- Verification is the periodic independent review and ex post determination of the monitored GHG emission reductions.
- Verification is carried out by a designated operational entity (DOE).
- There is a formal procedure for verification.
- Certification is the written assurance by a DOE that a project activity achieved the reductions in GHG emissions as verified.
- Certification is also done by a DOE.

Step 8: Issuance of CERs

- The EB will issue certified emission reductions (CERs) equal to the verified amount of GHG emission reductions.
- There is a formal procedure for issuance of CERs.
- The issuance of CERs, in accordance with the distribution agreement, shall be effected only when the share of proceeds to cover administrative expenses (SOP-Admin) of the CDM has been received.
- Among issued CERs, 2% of those will be deducted for the share of proceeds to assist developing Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation (SOP-Adaptation).

Step 9: Distribution of CERs

- CERs will be distributed among PPs.
- The decision on the distribution of CERs from a CDM project activity shall exclusively be taken by PPs.

Source: From CDM and JI in Charts, version 6.0. Institute for Global Environmental Stategies (IGES), August 2006.

The above process is more or less a reflection of the transaction costs that are likely to be incurred when engaging in CDM project development. The costs of completing the entire CDM project cycle have a strong fixed element. For instance the costs for PDD, methodology development, validation, verification are mostly fixed; only the EB administration fee is completely variable. Due to this, projects with less than 10,000 CERs per annum have difficulties in recovering these transaction costs. This can be a burden for many small-scale renewable energy & energy efficiency projects, which are generally small and can be replicated widely, and which often have high sustainable development benefits for the local population.

Because CERs are being the required product/commodity for increasing the project revenues for project developers and/or CDM-investors (CER sellers), or for compliance and trading purposes, it is important to consider the various forms of CERs. The way in which CERs are created bilaterally, multilaterally or unilaterally, via programmatic/ sectoral or individual approaches, provides scope for product differentiation and thus price and quality differentiation. It is widely recognized that the various types of CDM projects result in differences in risk profile, and therefore in the quality of the CERs generated.

Bilateral CDM

Many official government tender programmes of Annex 1 parties (for which project developers can submit proposals) assume bilateral CDM in which the host country project developer and the Annex 1 public representative engage in a one-to-one negotiation process, in determining what the terms of delivery and payment of CERs will be and what will happen in case of default. Before that stage, it is fairly common practice that the investor country and host country sign a memorandum of understanding in order

to smoothen the negotiation process. This option provides a high degree of price certainty for the bilateral partners, but does not guarantee delivery of CERs. This inherently leads to a lower CER-price paid by the Annex 1 investor, because the Annex 1 investor takes over some of the risks associated with project implementation, which will lead to an increase in contracting (and thus transaction) costs.

Multilateral CDM

Multilateral funds collect funding from CER investors and invest these in CDM projects around the globe. This 'centralized buying' of CERs has the benefit of lowering transaction costs, as the intermediary (e.g. World Bank Carbon Finance Unit, Netherlands Community Development Fund) could, for instance, possess a specific skill, ability or country context knowledge and experience which allows it to negotiate in a more efficient manner and/or to assess the country/investment risk more accurately. So, this option has the prime advantage of reducing transaction costs, primarily at the buyer side, whereas price and delivery risk are relatively low[1] since the intermediary is most likely to pursue a portfolio strategy, involving both low risk and high risk CDM-projects.

Unilateral CDM

With unilateral CDM the host country project developer/investor attempts to walk through the entire CDM project validation, registration and issuance procedure without the (financial) aid of foreign investors. After issuance of the CERs by the Executive Board, the CERs can be sold on the CDM market or within the EU-ETS via the EU Linking Directive (2004/101/EC) which allows EU-ETS installations to use a.o. CERs for compliance in the first and second phase of the EU-ETS. Hereby price arbitrage between the CDM market and the EU-ETS is possible, which bears the potential for CERs to obtain a certain price premium. The investment risks associated with project development, the project development costs and the CDM related transaction costs have to be born by the project developer and host countries themselves. After issuance of the (essentially risk-free) credits a price can be obtained based on the actual spot (or forward) market price on either the CDM or EU-ETS credits market.

Programmatic CDM[2]

Programmatic CDM involves the aggregation of a number of relatively small emission reduction activities (within a sectoral, regional or project type scope) in developing countries into a larger bundle or programme, which is then prepared and submitted to the CDM Executive Board as a single CDM activity with one set of methodologies for

1 Price and delivery risk are still present; see for example the Durban case, where the initial agreed upon contract price was perceived too low by project initiators. The World Bank Carbon Finance Unit had to renegotiate the contract price and CER delivery quantity.

2 The EB at COP/MOP in Nairobi (Nov. 2006) provided a guidance document on programmatic CDM that can be downloaded: http://cdm.unfccc.int/EB/028/eb28_repan15.pdf.

baseline determination and monitoring of the project performance. Programmatic CDM is most straightforward under a unilateral approach but can also be implemented under a bilateral or multilateral scheme. The rationale behind programmatic CDM is that it reduces CDM-related transaction costs for those smaller projects that have a relatively low GHG abatement component. Monitoring and verification issues could arise as a direct result of the dispersed nature of the project activities. Also the issue of policy additionality arises, since governments usually formulate policies in a comparable 'programmatic' manner.

For all of the FEMIP-countries the country-specific policy situation as well as the market structure (balance between public-private) requires careful screening before one starts engaging in CDM-activities and before one can determine whether or not the right institutional structure, such as host country DNA, etc., is in place to provide for the necessary supportive activities, such as capacity building, promotion of the host country for investors, etc.

As regards the environmental measures and initiatives in the region, reference shouls be made to the Mediterranean Environmental Technical Assistance Programme (METAP), founded in 1990. This programme is an innovative partnership between countries of the Mediterranean region and multilateral donors. It's aimed to strengthen the capacity of Mediterranean countries to address common environmental issues. The Mediterranean Environmental Technical Assistance Programme Project Preparation Unit (METAP PPU) in 2000 prepared a document that constitutes a broad regional analysis of solid waste management (SWM) in eight of the countries and territories in the eastern and southern Mediterranean basin within the geographic area of METAP activity. The countries and territories that are the focus of this document are: Lebanon, Syria, Jordan, West Bank/Gaza, Egypt, Tunisia, Algeria and Morocco. The analyses contained in this document are intended to: assist countries as they consider future initiatives to develop enhanced solid waste management systems; and provide a basis for the development of a proposal to be submitted to the European Union for financing a regional SWM project.

2.2 Institutional setting for CDM projects' hosting

CDM project activities in the Mediterranean region are currently taking place (or are in the formal CDM pipeline) in: Egypt, Tunisia, Morocco, Cyprus and Israel. Table 2.1 is compiled in order to establish a clear overview of the institutional structure in the Mediterranean countries who want to host CDM project activities. Political commitment to the KP in some clear manner (ratification, acceptance, accession or approval) on the one hand and institutional acknowledgement of the CDM-option (in the form of establishment of a DNA and/or other local capacity to handle CDM-activity) on the other hand are both a precondition for a country to be able to host CDM-projects.

The former precondition is (still) not yet fulfilled in: Libya, Turkey, Gaza/West Bank and Malta; this will effectively rule out the option of any CDM-related investments in these

countries in the short-term. Irrespective whether or not a country is well prepared for hosting CDM-related activities it may always provide short-term incentives to support investment in energy-related activities that may in due time develop into CDM-projects.

When considering CDM within this region, it is important to note that any CDM-project activity should meet the national sustainable development criteria, which will commonly be formulated according to a country's specific technology and development needs.

Table 2.1: Country CDM and Kyoto Protocol ratification status in the Mediterranean region (UNFCCC, 2006)

	KP status *Ratification (R) Acceptance (At) Accession (Ac) Approval (Ap)*	**Entry into force**	**DNA**	**CDM projects (proposed or in pipeline)**
FEMIP Countries				
Algeria	16/02/05 (Ac)	17/05/05	No	No
Egypt	12/01/05 (R)	12/04/05	Environmental Affairs Agency (EEAA)	Yes
Gaza/West Bank	?	?	?	?
Israel	15/03/04 (R)	16/02/05	Ministry of the Environment	Yes
Jordan	17/01/03 (Ac)	16/02/05	Ministry of the Environment	No
Lebanon	13/11/06 (Ac)	11/02/07	Ministry of the Environment	No
Morocco	25/01/02 (Ac)	16/02/05	Ministry of the Environment	Yes
Syrian Arab Rep.	27/01/06 (Ac)	27/04/06	Ministry of the Environment	No
Tunisia	22/01/03 (Ac)	16/02/05	Ministry of the Environment	Yes
Turkey	-	-	No	No
Non-FEMIP Countries				
Cyprus	16/07/99 (Ac)	16/02/05	Ministry of the Environment	Yes
Libya	24/08/06 (Ac)	22/11/06	No	No
Malta	11/11/01 (R)	16/02/05	No	No

Those countries that meet both preconditions mentioned above are: Egypt, Israel, Jordan, Morocco, Syrian Arab Rep., Tunisia and Cyprus. Of these countries only Jordan and the Syrian Arab Rep. do not host any CDM project activity. In Table 2.2 the CDM

project pipelines within this region's most active (5) countries are specified according to project-status and –type. In these countries the priority clearly should be to get the planned and new CDM-activity off the ground.

In the other category of Mediterranean countries, those that either have not ratified the Kyoto Protocol or do not have a DNA, etc. the prime focus of policy attention would need to be more general support in terms of information, on the role of climate policy and support for capacity building programs (such as CD4CDM). Moreover a stable political climate and a facilitating institutional framework needs to be in place in order to activate the interest in future hosting of CDM-activities within these countries. Supporting this could be helpful as an indirect means to lay the foundations for future CDM-activity/investments. As of January 2007 it is unrealistic to expect any near-term CDM-activities (let alone CDM-investments) within the Mediterranean FEMIP-countries other than those mentioned in Table 2.2.

Table 2.2: Existing CDM pipelines in Mediterranean region[3]

Host country (# projects)	Project status	Project type
Egypt (5)	Registered (2)	N_2O (1)
		Landfill gas (1)
	At validation (3)	Wind (1)
		N_2O (1)
		Landfill gas (1)
Tunisia (2)	Registered (2)	Landfill gas (2)
Morocco (6)	Registered (3)	Wind (2)
		Solar (1)
	At validation (3)	EE industry (1)
		Wind (1)
		Landfill gas (1)
Cyprus (2)	At validation (2)	Wind (2)
Israel (9)	Registered (2)	Landfill gas (1)
		EE industry (1)
	At validation (7)	Biomass (3)
		Fuel switch (1)
		Landfill gas (1)
		Wind (1)
		N_2O (1)

As the CDM potential within Egypt, Tunisia and Morocco are already assessed within chapters 4, 5 and 6 of this report, the only two remaining countries where CDM-activities

[3] Since the selected case study countries, Tunisia, Egypt and Morocco, already have a CDM pipeline, transaction costs should be relatively low for projects based on standardized methodologies and existing baselines.

can be implemented in a relatively short notice are Israel and Cyprus. However, given the expected and relative small scope for CDM in Cyprus and due to its accession to the EU – due to which it has to comply with the 'acquis communautaire', which in turn reduces the scope for CDM – only near-term CDM activity within Israel can be expected (in addition to activities in the three case-study countries mentioned above). The country context of Israel will be dealt with later in this chapter.

2.3 CDM Potential by Sector

Since every country has its own policy, industry, energy system, overall socio-economic structure and physical conditions, country statistics and characteristics are indispensable for being able to appreciate the specific country's energy investment potential. For some sectors, however, data quality is relatively poor, for instance in sectors with small-scale and/or mobile emission sources/energy consumers.

Industrial & Services Sector

Fossil fuels supply situation and related CDM potentials in Mediterranean[4] (top down)

With respect to hydrocarbon exploration and production, Libya, Algeria and Egypt fulfill a regional and international function as energy exporters. These countries are increasingly aiming to switch to natural gas instead of oil for power generation, and for the industrial sector in order to free up oil for export. Therefore fossil fuel switching, which is eligible under CDM, could be an interesting option within these countries, especially because significant new power plant construction and/or upgrading initiatives are taking place in the region while currently no CDM project proposals for fossil fuel switch in the region are in the official CDM-pipeline. A point in case can be that when power plant or process facility upgrading or fossil fuel switch are becoming part of formal government policies and regulations, this may create additionality issues in any subsequent CDM-procedure.

In other countries with a higher import dependence on oil and/or a larger share of oil for electricity generation, such as Israel, Jordan, Lebanon, Syria and Morocco, fossil fuel switching to natural gas - by upscaling domestic natural gas exploration and production or increasing natural gas imports (via pipeline or LNG) – may bear significant CDM potential. In fact, given the various grid interconnection development initiatives projected, for both natural gas and electricity, in a large number of countries in the Mediterranean region, CDM could prove to be a valuable stimulus for fossil fuel switch from primarily oil to natural gas in most of these countries.

Countries such as Turkey and Tunisia, which have relatively few hydrocarbon resources

4 The information provided in this section stems from multiple sources such as the IEA, WEC and several other sources.

of their own but, already have a good natural gas grid connection due to their strategic position in the international gas infrastructure, could upscale their (already significant) share of natural gas in power generation or heavy industries at relative short notice. In Turkey there seems to be sufficient potential to do so, since a situation of oversupply of natural gas is expected (e.g. due to over contracting of supply). As a result other sectors in that country with potential for the use of natural gas, such as transportation and the build environment, could also implement fuel switch based CDM relatively easily. The current status of Turkey under the KP has so far remained unclear, since it has the status of Annex 1 country, but without a GHG emission reduction obligation.

The potential for fossil fuel switch from coal to natural gas for power generation is limited within the Mediterranean region since just a few countries, namely Israel, Morocco and Turkey, depend on coal for a significant share (averaging around 30%) of their primary energy supply. In these countries co-firing of biomass or of some high-quality streams of municipal solid waste might also be considered. Besides that clean-coal or coal/biomass-gasification technologies might have some potential, especially because there is a common understanding that new state of the art coal-fired power plants are probably less commercially feasible in these countries.

The potential for fossil fuel switch in the highly oil import dependent countries Malta and Cyprus is very limited and depends on natural gas grid development initiatives and interconnection initiatives with the regional power grids. Both countries are currently not connected to either a gas or an electricity transmission grid. More flexible energy supply for both countries could be achieved with LNG as a supply option. Currently a LNG terminal as well as a gas grid connection with Egypt is under consideration/projected in Cyprus.

CDM initiatives for large-scale energy efficiency can be considered in the entire region since large segments of the current installed infrastructure, such as energy conversion facilities, large industrial energy consuming facilities, and the electricity transmission grid are all in need of upgrading. Some upgrading programs, e.g. for refineries and transmission grids, have already been initiated within the region. Apart from upgrading activities to enhance energy efficiency there are also possibilities in the region for upgrading or retrofitting industrial facilities in order to limit GHG emissions, such as N_2O emission reduction in fertilizer production, or measures with respect to emission reduction of HFCs, PFCs and CH4 (e.g. landfill gas and fugitive emissions).

In the medium or long term it could prove to be interesting for the major oil and natural gas producing countries[5] in the region (Libya, Algeria and Egypt) to implement carbon capture and storage (CCS) activities, initially for Enhanced Oil Recovery (EOR) purposes

5 Within the region there are several countries, such as Morocco, Turkey, Israel and Jordan, that have significant oil shale reserves that could also be exploited at some point in the future; however oil shale exploitation under CDM seems an unlikely activity. Coal mining activity within the selected countries is marginal and is not considered further in this paper.

and possibly later for permanent storage in empty oil and gas fields. In the older hydrocarbon production basins EOR activities based on CO_2-injection could be considered in order to support production levels; this could serve as a substitute for natural gas injection. Recovery of associated gas that would otherwise have been flared is also a possible realistic option in the region that is eligible under CDM.

Public authorities currently dominate the energy market for oil, natural gas and electricity within the region; the majority of the related assets (oil and gas production and processing facilities, power generation facilities and energy transmission and distribution grids) are state-owned or state-controlled. All activities within the energy market are heavily regulated and in some cases pose a significant barrier for foreign investors. In some parts of the energy sector, however, privatization programs and market reform may have a positive influence on foreign direct investment. These parts include oil and natural gas exploration and production, which is often conducted under a production share agreement (PSA) with the national oil company, and power generation, where the built-own-operate-transfer (BOOT) construction is mostly applied.

Energy Sector

Besides the various CDM investment opportunities that are related to fossil fuels, various countries also have taken measures to promote and implement Renewable Energy Sources (RES) technologies, which will be discussed in detail below.

RES situation and potentials in the Mediterranean (top-down)

In this section renewable energy sources (RES) will be discussed on the basis of various literature sources. RES categories and certain sectors that will be discussed are:

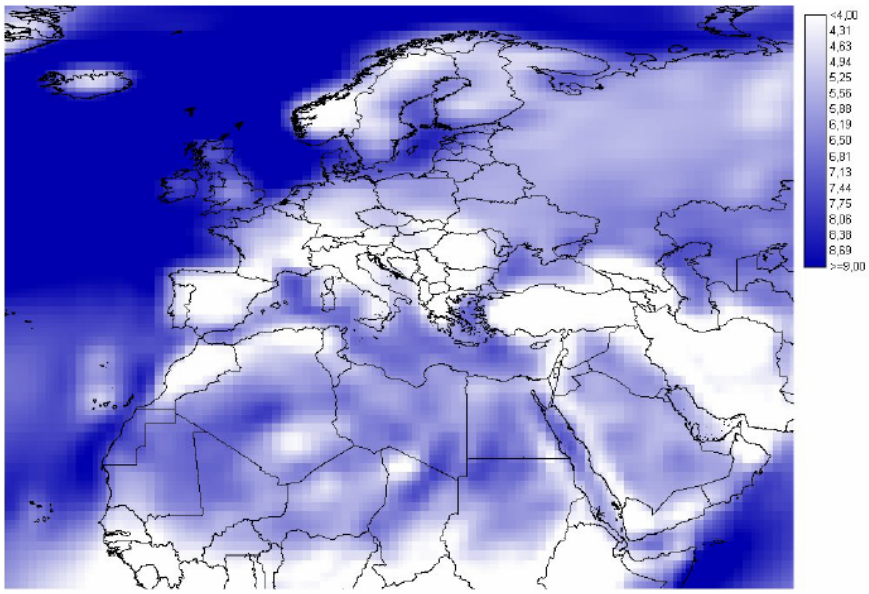
- Wind energy
- Hydropower
- Geothermal
- Solar thermal and photovoltaics
- Ocean energy: tidal / wave
- Reforestation / biomass / agriculture
- GHG abatement (landfill gas / municipal solid waste)
- Transport
- Energy efficiency in households
- Energy efficiency in services

The analysis is qualitative in nature and is meant to provide an overview of the general

RES potentials within the various Mediterranean countries. Subsequently, more country-specific information will be given for Morocco, Tunisia and Egypt on the basis of the mission reports and numerous project fiches.

Wind energy potential

The use of wind energy for power generation is most effective at places with relatively stable and higher wind speeds and can be applied onshore as well as offshore. Figure 2.1 shows wind energy potential based on rudimentary calculations for which generalized assumptions were made on annual load factor and maximum amount of installed capacity. Offshore power generation based on wind energy has substantial potential but is more costly than onshore construction and maintenance. Moreover, account should be taken of the possibility of interference with shipping routes and water depth, which could limit offshore acreage substantially.



Source: *DLR, 2003.*

Figure 2.1: Average annual wind speed (80 m above ground level in m/s).

In some circumstances it might also be possible for niche opportunities to combine wind energy with other offshore activities, such as oil and gas production. The Figure 2.1 shows that there are good prospects for wind energy spread fairly evenly around the Mediterranean region.

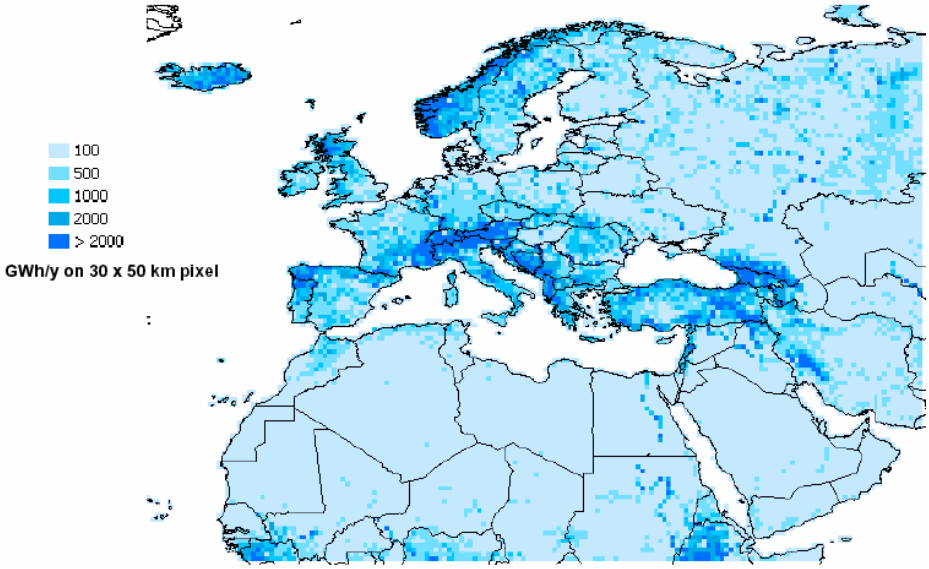
For countries such as Cyprus and Malta wind energy might prove to be one of the few feasible RES options[6], whereas offshore as well as onshore (near coastlines) wind energy in other countries might have to compete with other feasible and lower-cost RES options.

6 Besides perhaps some waste (solid or liquid) treatment potential.

Current wind energy activities, under CDM, are concentrated in Cyprus and Morocco. Two onshore wind energy projects are at validation for Cyprus, while for Morocco also two onshore wind energy projects have been registered. Other countries, like Turkey, Egypt and Algeria, also have significant wind energy potential. More country-specific data on both onshore and offshore wind power generation potentials will be needed in order to identify the most promising investment projects. Multiple wind energy projects have been registered under CDM, which makes this a relative mature CDM-investment category.

Hydroelectric energy potential

Hydroelectric power generation potential within the Mediterranean region primarily exists in Turkey, where installed capacity already is amongst the highest in the region. Figure 2.2 also shows other areas with hydro-potential such as Morocco, some parts of Algeria, Tunisia[7] and Egypt[8], where smaller-scale hydropower generation projects might be considered. Calculations for mapping the hydro-capacity potential were made on the basis of annual full load hours and on existing literature.



Source: *Lehner et al., 2005.*

Figure 2.2: Gross hydropower potentials in Mediterranean region.

Hydropower potential in countries such as Algeria and Libya and large parts of Egypt is relatively limited and is under constraint due to the already limited water availability in that part of Northern Africa. The 'Great Man Made River' project in Libya, where fresh water is drawn from large underground water deposits (aquifers), and the various large-scale water desalination initiatives are exemplary for trying to deal with the relative water

7 Tunisia is host of the Mediterranean Renewable Energy Centre that tries to promote the development of RES technologies and –activities across the Northern African region.

8 Some examples of hydropower capacity initiatives in Egypt are the 64 MW Nag Hamadi project and Aswan hydro upgrading.

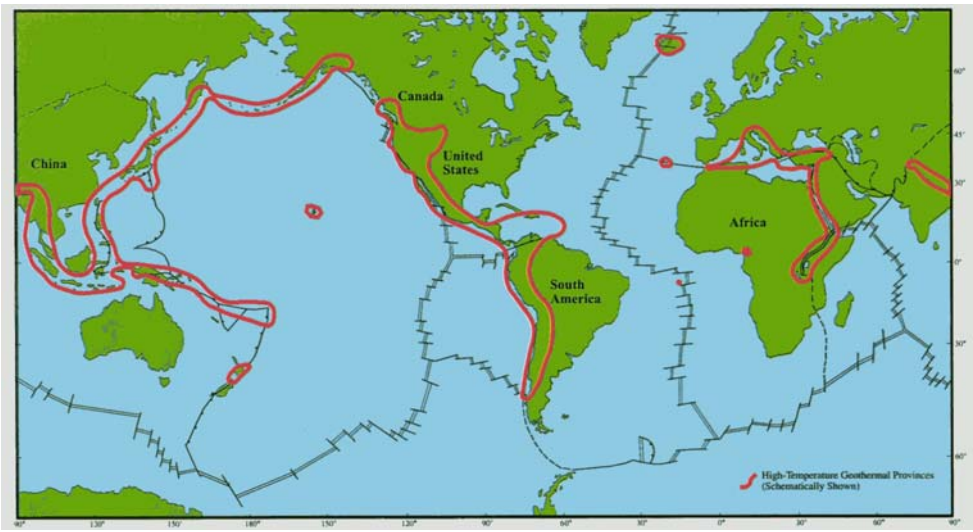
scarcity in the region.

Development, validation and registration of hydropower generation can also be regarded as a mature CDM project category, since worldwide a multitude of such projects are registered and implemented. Additionality issues are unlikely, and significant experience with baseline development and the availability of standardized methodologies should facilitate project registration.

Geothermal energy potential

Conventional geothermal potential can be found in regions nearby the brink of the continental plates where there is significant seismic or geothermal activity. The so-called 'ring of fire' is shown on Figure 2.3.

Turkey has a large conventional geothermal energy potential. In the Northern part of Africa, in particular in Algeria, Morocco and Tunisia, some smaller geothermal potential seems to exist. In the CDM-context, conventional geothermal activities have been recorded in seven projects in the CDM pipeline from which five are currently registered. Mainly due to the relatively high upfront investment costs for exploration conventional geothermal energy faces 'competition' from the more mature RES technologies.



Source: *University of Utah. Geothermal Energy, 1998.*

Figure 2.3: Conventional geothermal energy potential.

The unconventional geothermal energy potential based on hot dry rock (HDR) technology has also been estimated for the Mediterranean region; Figure 2.4 provides an overview based on some generalized calculations.

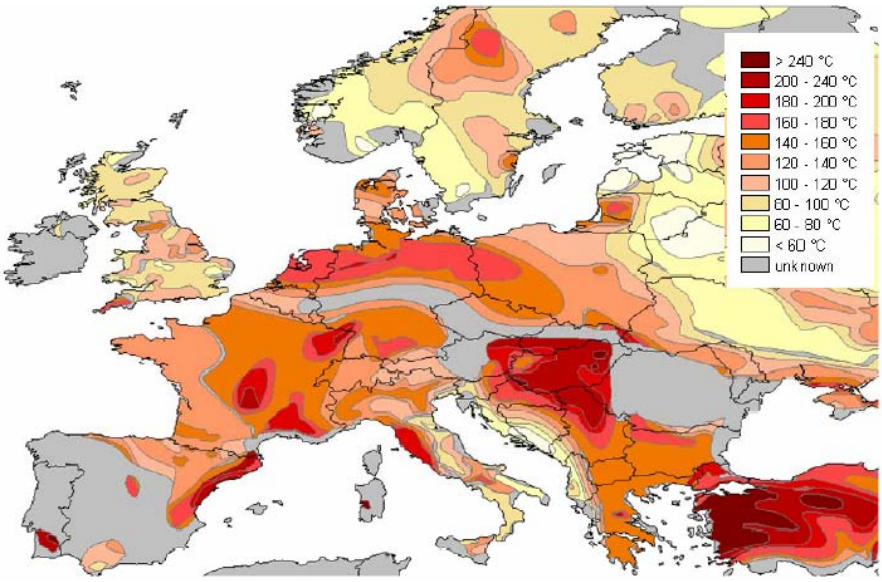


Figure 2.4: Unconventional geothermal potential

Solar energy potential

Solar energy is one of the most promising RES options within the countries under consideration. Both, photovoltaics and solar thermal power technologies (*i.e.* concentrating solar power, CSP), are already applied within the region at various scales. While solar power still is primarily used for decentralized energy production mostly at the household level for heating purposes or in remote off-grid areas, significant economies of scale can be achieved with large-scale solar power projects. In Algeria, for instance, a hybrid solar[9] and natural gas fired power plant is under consideration. Moreover desalination plants are often linked with large-scale solar power generation in order for the latter to supply the required energy.

Figure 2.5 shows the solar irradiance figures, based on calculations on direct normal irradiance, DNI[10], for the Mediterranean region. Overall irradiance figures indicate a large and well-distributed potential for both large- and small-scale solar power generation technologies.

9 Algeria aims to increase the share of solar power in electricity generation. They also have signed an agreement on solar technology development cooperation with the IEA.

10 DNI calculations are based on quantified atmospheric components that absorb/reflect sunlight, such as ozone, water vapour and other gases.

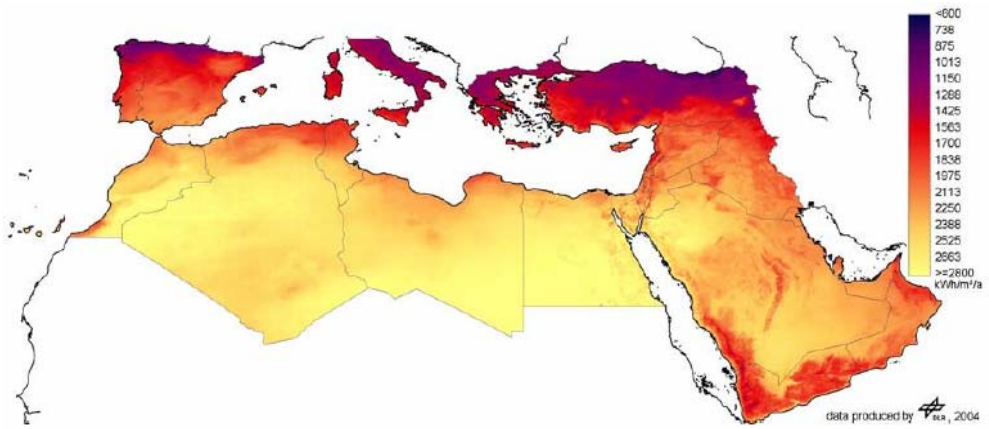


Figure 2.5: Annual direct normal irradiance, 2002

Current CDM-activity related to solar power has remained limited so far: just seven projects in the pipeline of which two are already registered. This could indicate that the technological status and economical performance of solar power needs to be improved.

Ocean energy: tidal and wave energy

The tidal energy potential in the Mediterranean region is limited due to the low tidal amplitudes. Suitable locations for tidal energy generation are primarily in estuaries for which suitable sites have been identified such as in Argentina, Australia, Canada, India, South Korea, Mexico, the United Kingdom Russia and the United States. Currently there is one CDM tidal energy project registered (South Korea).

Wave energy can be generated in regions with high wave power and intensity. In Figure 2.6 it can be seen that the wave energy potential is relatively small in the Mediterranean region, except from some areas facing the Atlantic Ocean especially at higher latitudes (also Portugal). Nevertheless, when the technology, which is still largely in the research phase, develops it could prove to be a feasible energy technology on the long term within this region.

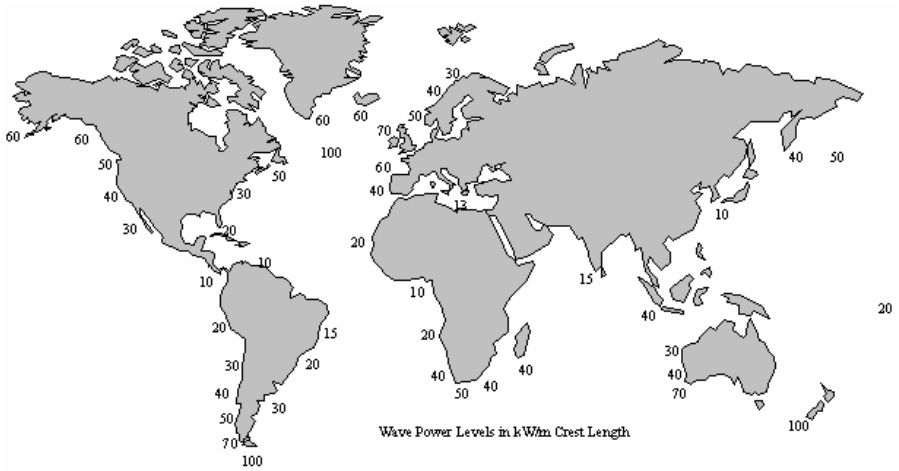


Figure 2.6: Wave power levels. WEC, 2006.

Currently there are no wave energy initiatives in the CDM pipeline.

Energy efficiency households/service potential

For this category the energy efficiency potential is especially large in densely populated regions, where efficient lighting, cooling and heating with the aid of intelligent building design can result in significant efficiency gains. In rural non-grid connected areas significant efficiency gains can, for instance, be achieved with the usage of fuel-efficient cooking stoves or efficient biomass heating systems.

With currently four CDM projects in the pipeline (as of August 2006) this category is relatively immature, which may have to do with the individual project scale and the 'competition' with other financial support schemes for housing/building/construction initiatives, such as from development aid.

Clustering similar household/servicing initiatives together in one project could reduce transaction costs and enhance the feasibility of a CDM-status. For instance, there would be CDM-prospects for energy efficiency improvement in the service sector, such as in hotels, hammams, government buildings, etc. However, while clustering, coordination issues as well as methodological issues remain.

Waste Sector / Landfill Management

The quality of municipal solid waste (MSW) management[11] within a developing country is crucial for determining the potential for landfill gas CDM-projects. Landfills are estimated to be responsible for about six percent of global methane emissions[12]. Countries with more strict MSW regimes generally possess landfills that are more suitable for LFG application through methane capture and flaring and in some cases combined with power production. For the latter the costs of supplying the generated electricity should be lower than the expected sales revenues (based on power sales and additional CERs). In general, however, power production is not economical because the amount of CERs generated without energy production generally does not differ substantially from LFG-projects including energy production. With increasing urbanization MSW management is expected to become a higher priority in the majority of developing countries.

Research suggests[13] that there are good prospects for LFG-projects in the Mediterranean countries. Despite poor data quality various assessments of LFG-potential have been made. Jordan and Israel turn out to have a relatively high LFG-CDM potential, due to the

11 Note that wastewater treatment and high purity waste streams are not included in the analysis, due to lack of sufficient data/literature.

12 Methane possesses a global warming potential of 21 CO2-equivalent over a 100-year time horizon.

13 'Possibilities for CDM Landfill Gas Projects'. M. Vrins, 2006.

high quality of their MSW management system and well-designed landfill sites. Other countries in the region with good LFG prospects are Turkey, Egypt and Algeria where initiatives to improve MSW management are projected/implemented.

With about 80 projects in the current CDM-pipeline LFG can be considered a mature CDM category, with the possibility of swift implementation. However, in countries with substantial open (uncontrolled) dump sites additional investments in sanitary landfill sites and/or MSW policy reform might be needed first. In addition, there could be local opposition to implementing LFG technologies, since in various countries people depend on landfills for their daily needs.

Transport Sector

Within the selected countries liquid fossil fuels are the fuel of choice within the transport sector, which mainly has to do with the relative abundance of oil supply. The potential of fuel diversification within this sector depends largely on a country's import/export position and the possibility to engage in fuel switch. Within the large oil and natural gas exporting countries, Libya, Egypt and Algeria, the economic base for fuel diversification to biofuels (*e.g.* biodiesel and ethanol) for transport is relatively weak and therefore it is unlikely to be an option of major importance. In these countries hybridization of the transport sector, large-scale implementation of natural gas vehicles[14] (NGVs), particularly in urban areas, and introduction of LPG as a transport fuel might prove to be a more optimal solution. The development of a natural gas fuelling grid will be a crucial factor for large-scale implementation.

In more import dependent countries, such as Cyprus, Malta, Israel, Lebanon, Morocco, Tunisia and Turkey, fuel diversification might be of strategic importance and, depending on country-specific biomass production potentials, could also include the production as well as the import of biofuels. With hybridization being a feasible option for all these countries, implementation of NGVs largely depends on infrastructural developments (*i.e.* natural gas pipelines and LNG terminals). Countries such as Cyprus and Malta currently have limited access to natural gas supplies.

Currently there are only two CDM projects for transportation in the pipeline, which partly reflects the complex nature of baseline development and monitoring of mobile emission sources. Similar methodological issues can be seen when several small-scale projects, such as is the case for small-scale methane capture in rural agricultural areas, are clustered in one large project proposal.

Prime incentives for stimulating a cleaner transport system can be found in potential CER revenues (since transport is one of the largest GHG emitting and fastest growing sector in the world) but also in the improvement of local (urban) air quality and possible rural

14 It is also possible to mix biogas and/or synthetic gas with natural gas for transportation purposes.

development.

Other Sector (including agriculture)

As Figure 2.7 shows, the Southern and Eastern part of the Mediterranean possesses relatively marginal forests acreage aside from some parts of Morocco, Northern Algeria and larger parts of Turkey. The low biomass productivity of the region, the problematic water supply situation and the inherent crop harvest volatility in agriculture, especially in Algeria, Tunisia, Morocco and Libya, limit the overall biomass production potential. Therefore, especially for suitable (irrigated) acreage in this region, any prospective energy crops are likely to be easily out competed by food crops.

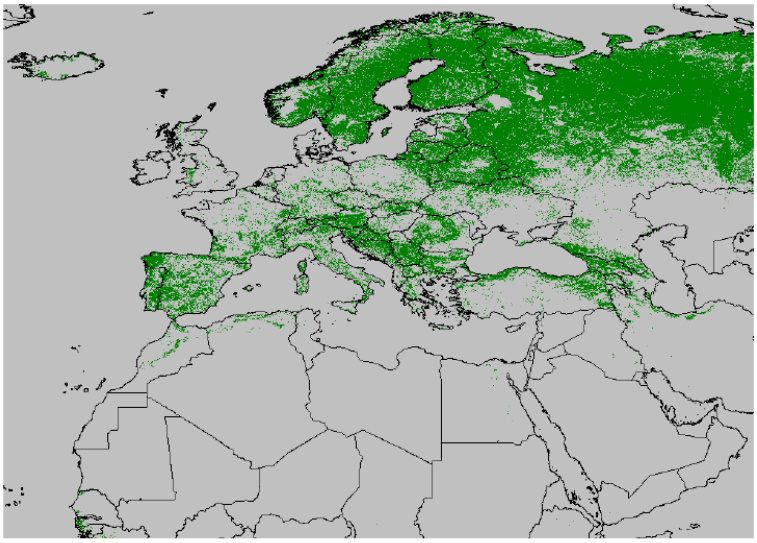


Figure 2.7: Forest area in Europe and Mediterranean area.

Except from some niche opportunities for biomass energy production in well-irrigated areas, such as the Nile region in Egypt and some parts in the Eastern Mediterranean (including Turkey), there could be significant potential for greenhouse agriculture. Additionally, there are energy crops such as Jatropha[15] that can be produced in more arid regions and may under some conditions be commercially feasible. In fact, this energy crop that is already produced at some scale in Egypt and Tunisia as well as in other parts of the African continent, has the potential to stimulate rural development and can also be used to combat desertification.

The reforestation potential in the region is relatively small in comparison with other RES options, and currently with three CDM projects in the pipeline, this category is likely to contribute only marginally to climate change mitigation initiatives. Biomass based project

15 Other energy crops with similar characteristics could also be used.

activities under CDM in this region could also involve methane recovery from small-scale biogas installations.

Several conversion technologies[16] are available for generation of a range of biomass-based (and/or waste based, see below) products, such as power, heat and various biofuels. More accurate estimates for the open biomass production potential in this region still need to be established.

In some regions really massive food/biomass production in greenhouses might be considered, from which the waste streams can be used in power generation and/or waste incineration.

Large-scale import or domestic waste stream usage of biomass for power generation (co-generation) or for production of transport fuels is likely to face severe competition from conventional fossil fuels due to the regions' relative abundance of such fuels.

Nevertheless, some niche opportunities for biomass import could exist in high oil import dependent countries, such Malta, Cyprus and perhaps Tunisia. The latter country is an exporter of crude oil products and importer of refined oil products (due to a lack of refining capacity); due to a rational waste management policy Tunisia has the highest share of renewables and waste in primary energy supply.

Israel country context[17]

For national security reasons the Israeli energy sector remains largely nationalized and state-regulated. This is mainly due to the fact that Israel is highly import dependent (97% of primary energy). Nevertheless, the Israeli government in principle favors privatization and market liberalization. Energy supply source diversification with respect to fossil fuel import for coal (30%, mainly for electricity generation) and oil, as well as energy technology diversification towards fossil fuel switch to natural gas due to significant offshore natural gas discoveries, and RES (solar thermal, wind and hydro) is being pursued by the Israeli government. The Israeli Electricity Corporation (IEC) has converted oil and diesel-fired generators into natural gas over recent years and aims to generate an increasing amount of its electricity from natural gas. Measures are being taken to reduce the air pollutant emissions from coal-fired power plants, with the aid of desulphurization units and low nitrogen combustion systems.

In terms of technology transfer it should be noted that Israel has specific high-tech areas in the field of energy (*i.e.* solar thermal large-scale and domestic appliance) in which they are well developed. The potential on the short to medium term for implementing wind

16 Biomass [waste] conversion options are: co-firing, esterification, fermentation, gasification, liquefaction, (flash)pyrolysis, hydro thermal upgrading, biofuel production.

17 Based on country context analysis prepared by Tel Aviv University (ICTAF) within the context of the ENTTRANS EU 6th Framework Programme. For more information see www.enttrans.org.

energy in Israel is estimated to be around 700MW, based on low wind-speed wind technology.

Israel, as a Non-Annex 1 country under the United Nations Framework Convention on Climate Change (which it ratified on June 4th, 1996), is also signatory to the Kyoto Protocol (signed on December 16th, 1998) and ratified it in 15 of March 2004. Procedures for the assessment of CDM project proposals and their alignment with national sustainable development criteria and a 'service platform' to assist project developers have been established.

Israel's environmental legislation is wide ranging. It covers the entire range of environmental issues, uses all forms of legislative instruments - laws, regulations, administrative orders and bylaws - and is linked to international environmental law. Israel's DNA for the CDM was set up within the framework of the Ministry of the Environment in 2004. The Israeli DNA includes representatives of various government and public bodies, as well as NGOs. The Ministry of National Infrastructures supervises the energy sector, by the means of the 'Fuel Authority' for the oil sector and of the 'Electricity Authority' for the electricity sector; the development of gas projects depends on the 'Natural Gas Projects Management'.

Despite national security concerns a gradual trend towards liberalisation of the energy sector can be expected. One of the main goals is the encouragement of competition in electricity production. The Israeli government has set a target of increasing the generation of electricity by independent power producers from 0,8% of the total domestically installed generating capacity to 20%. Rules and regulations developed for the build environment stipulate standards for insulation values for newly build houses, the monitoring of which falls under the responsibility of the Ministry of Housing and local municipalities. It is enforced trough the local and regional and governmental construction committees.

Israel has extensive environmental policies based on environmental protection and preservation and rational use of (environmental) resources. The Ministry of Environment is implementing a wide range of programs and activities, which include information, standardization, legislation and enforcement. However, it has been noted that the concrete effects of these efforts are limited, since many of the standards are voluntary, and the enforcement of most of them complicated.

Besides other CDM-opportunities, the waste management and energy sectors have been identified as the most promising in terms of generating CERs. Over the past decade, Israel has either modernized or closed down many of its landfills, but the methane emissions from the waste decomposition are hardly anywhere in Israel utilized for heat and electricity generation. Up to March 2006, nine projects had been submitted for approval to Israel's National Designated Authority. Together, they are expected to deliver a total of 1.800.000 tonnes of $CO_{2\text{-eq}}$. (CERs). The distribution of the projects submitted to the DNA by activity is as follows:

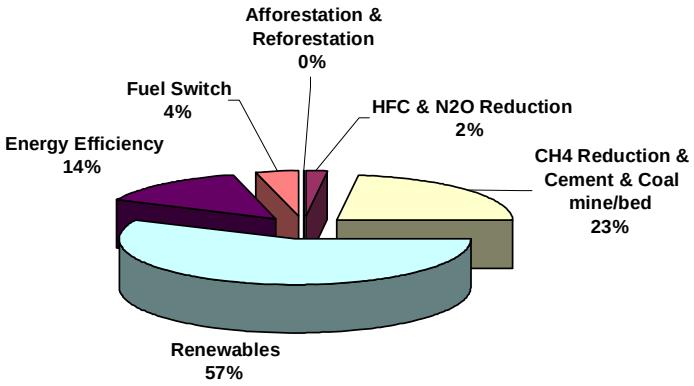
- Two projects on landfill reclamation, including production of clean energy.
- Three projects on the generation of clean electricity using natural gas and wind.
- Three projects on improving production processes in chemical plants.
- One project on manure treatment in pig farms.

Israeli projects/methodologies submitted so far to the CDM EB include: the Hiriya Landfill Project, the Talia Landfill Gas Recovery Project and Electricity Production., the Energy efficiency project in the Ramla Cement Plant in Israel through instalment of new grinding technology, the Methane capture from swine manure treatment for Kibbutz Lahav, the Small-scale grid connected wind farm, the Biomass Based Steam Genaration at Galam Factory, the Offis Textile Ltd. Fuel Switch, the Project for the catalytic reduction of N2O emissions with a secondary catalyst inside the ammonia reactor of the N3 nitric acid plant at Haifa Chemicals Ltd. and the Emek Hefer Biogas Project.

As Israel has proven to be fairly able to acquire adequate funding for its projects a unilateral approach towards the creation of CERs can be expected to dominate CDM project development and financing in Israeli energy sectors.

2.4 Review of CDM Projects (Present Status)

Currently the CDM pipeline is filled with over 1300 CDM projects that are at various procedural stages. In order to establish a thorough understanding of the current direction of CDM investment activities, some general characteristics regarding project type, country and region of this pipeline are presented below.

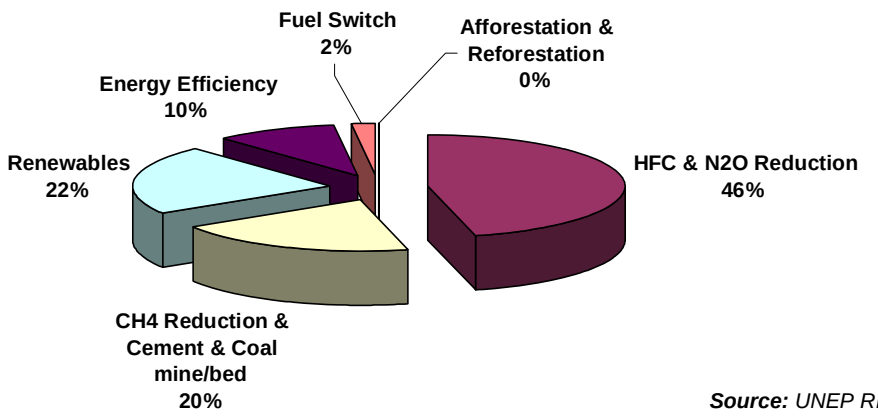


Source: *UNEP RISO, 2006.*

Figure 2.8: CDM project type distribution

Figure 2.8 shows in which sectors most CDM project activities take place. This may serve as an indication for CDM project investments considered. However, when looking at the distribution of CERs (Figure 2.9) over the various project types, CER revenues do not

match one-to-one with CDM project activities. For instance, HFC and N_2O reduction projects that make up about two percent of the CDM project activity generate about 46 percent of the issued CERs in the CDM pipeline. This can mainly be attributed to the high global warming potential of HFCs and N_2O GHGs.



Source: *UNEP RISO, 2006.*

Figure 2.9: CERs distribution per project type

Given the large differences in country circumstances, specific sectors or project categories where investors can reasonably expect an acceptable rate of return from their CDM-related investments should be selected with the aid of a country- or region-specific analysis.

Currently CDM activity is distributed unevenly over the globe, with Latin America and the Asia-Pacific region as the major CDM-players. From the Table 2.3 below it can be seen that the North African and Middle-East as well as the Sub-Saharan region are relatively underdeveloped CDM-host regions.

Table 2.3: Regional distribution of CDM activity

Total in the CDM Pipeline	Number		kCERs	2012 kCERs	
Latin America	365	36,9%	42357	290628	25,6%
Asia & Pacific DC	585	59,1%	116732	782563	68,8%
Europe and Central Asia	10	1,0%	468	2973	0,3%
Sub-Sahara Africa	17	1,7%	7112	42319	3,7%
North Africa & Middle-East	13	1,3%	2998	18858	1,7%
World	990	100%	169667	1137340	100%

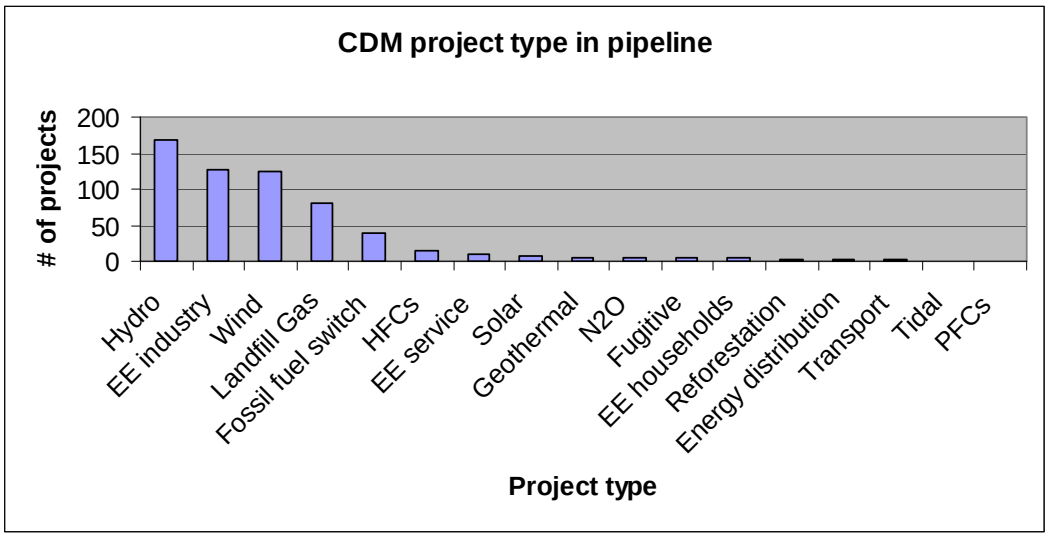
Source*: UNEP RISO, August 2006.*

Within the defined world regions in most cases a few countries are responsible for the

bulk of CDM-activity. This indicates that once the appropriate institutions, such as a DNA, are in place, CDM can develop rapidly. Nevertheless, it should be noted that a rapid take-off of CDM activity is usually also the result of genuine investors' interest, which may serve as another indicator for a potential for CDM project development.

For instance, in Latin America, Brazil and Mexico host about 65 percent of all the CDM-activities in that region, 49 and 18 percent respectively and with corresponding CERs volumes of 51 and 17 percent. In the Asia Pacific region the bulk of CDM-activities are concentrated in India and China, with respectively 61 and 21 percent (CERs volumes resp. 31 and 50 percent).

In answering the question what kind of projects have proven to be relatively successful in CDM activity worldwide, Figure 2.10 may serve to clarify. The overview provided in this Figure may also be of some interest for the Mediterranean area, insofar as it suggests ongoing CDM-activity in actual practice. The Figure shows that the most 'popular' projects (sectors) to invest in according to the CDM-pipeline are: hydroelectric, energy efficiency in industry, wind power, landfill gas and fossil fuel switch. For these project types (multiple) methodologies are developed and transaction costs are relatively low. The other project types in Figure 2.10 reflect the relative immaturity of the underlying technology (e.g. solar) or the high (up-front) investment costs of a project (e.g. conventional geothermal exploration). Obviously the figure just gives a snap-shot of the present global picture, and does not take into account the specific economic, technical and climatic circumstances in the Mediterranean area.



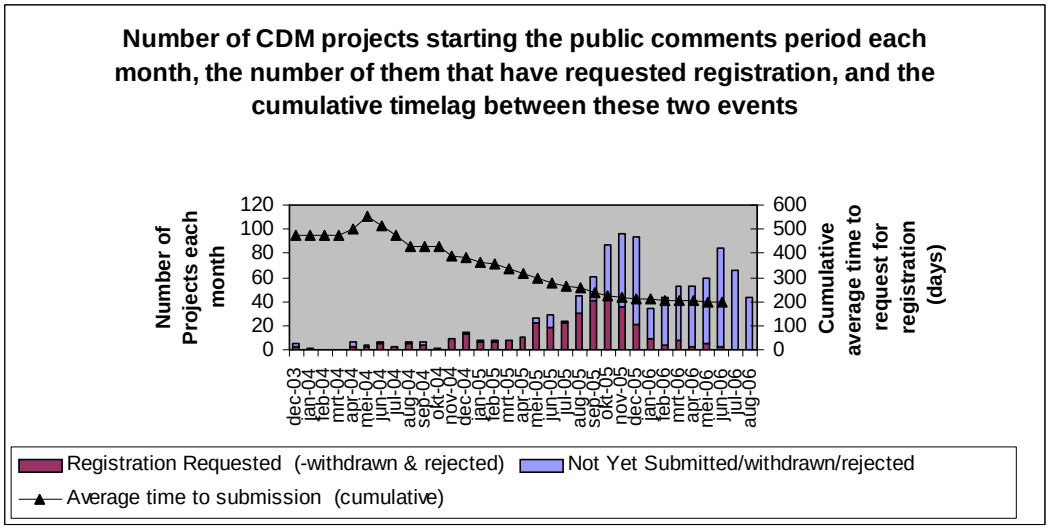
Source: *UNEP RISO, 2006.*

Figure 2.10: CDM project type in pipeline

A very important aspect in the discussion where and in which sector/project one should invest within the CDM-framework is related to the (limited) time-span that is left to initiate

'new' CDM projects until the end of the first commitment period (end of 2012). As long as clarity about the post-Kyoto regime is lacking, investors will have to limit their time horizon for CDM-investment to the end of the first commitment period. This time-constraint is the more important as the development of new methodologies and baselines have proven to be time-consuming and sometimes costly. In addition, the overall procedure is lengthy, because after a host country's DNA has approved the PDD of a project, the project then still needs to validated and registered, which approximately and on average takes about 200 days (see Figure 2.11). Earlier in the CDM-cycle other country- or project-specific hurdles in the project development phase could obviously also lead to unwanted delays, which further stretches the length of the overall CDM-project cycle.

CDM-related transaction costs vary from one sector to another; in general it can be stated that small-scale and decentralized CDM projects for sectors such as the build environment and transport will need some form of clustering and coordination in order to create sufficient economies of scale to redress transaction costs to acceptable levels. For other sectors, such as heavy industries and power generation, especially for large-scale projects, transaction costs per CER generated usually are relatively low, so that the need for project clustering for the sake of reducing transaction costs is required much less.



Source: *UNEP RISO, 2006.*

Figure 2.11: Timing of 'normal' CDM project validation and registration

In order to be able to register new CDM projects and generate credits for as many years as possible until 2013, the balance of the long project development lead time, the lengthy CDM-procedure, and the relatively short period during which CDM-credits can be expected to generated, may well seriously limit the interest in initiating new CDM-activity. The later such initiatives start, the less interesting such initiatives may turn out to be in

terms of generating credits. It would therefore be wise, in searching for new energy related project activity in the Mediterranean area, not to overemphasize the possible contribution of CDM-credits to the overall projects' feasibilty.

The increasing time-pressure on CDM-activity may induce potential CDM-investors to more and more focus on '*getting through Bonn*' where the CDM Executive Board resides, on 'standardized' and approved technologies and on accepted baselines and methodologies for the 'vested' CDM-project categories (see Figure 2.11).

The CDM guidelines prescribe that projects have to contribute to sustainable development (SD) as defined by the (sovereign) host country. This may involve that projects are prioritized not only on the basis of rate of return and emission reductions, but also on the basis of other, social, technological, environmental and economical criteria. Sometimes governments have introduced elegant solutions to deal with SD-dilemmas. In China, for instance, up to 65 percent of the CER-revenues generated from HFC-projects (which have a relatively high GHG emission reduction effect, but are generally considered to contribute relatively little to SD targets) are withheld for financing other, less easy to handle, CDM-projects with a higher SD-contribution, such as (small-scale) projects in transport, build environment and decentralized energy systems. Because it seems feasible to expect that some competition between high SD and low SD CDM-activity may also occur in the Mediterranean area (see also next), such a 'solution' to SD dilemmas could be interesting for the Mediterranean area as well.

The following table provides a scoping overview of the estimated CDM project potential in the Mediterranean countries, based on expert judgment for a series of project categories.

Table 2.4: CDM project potential for various project categories

Project categories	Description	Estimated potential in Mediterranean region
Fuel switch in power production	Coal/Oil to NG	• Coal to NG potential in: Morocco, Israel and Turkey. Co-firing of biomass, fuel switch but also clean coal technologies might be considered. • Oil to NG potential in: 1st tier; Libya (Algeria and Egypt already produce most of electricity in gas-fired power plants), 2nd tier; Lebanon, Jordan, Syria, 3rd tier; Israel, Morocco, Tunisia, Turkey, Malta and Cyprus. • NG oversupply in Turkey or good grid connection Tunisia and Turkey might stimulate additional fuel switch. • Countries with already high share of NG in power generation are more prone to diversify primary energy sources.
Fuel switch in industry	Oil to NG	• Significant potential for fuel switch in industry within most countries within the region, except maybe for Malta and Cyprus. • In developing countries fuel switch in industry sector generally lags behind power sector due to time

		required for grid development.
Energy efficiency in centralized power generation	Process upgrading and co-generation	• Depending on industrial/domestic heat demand or the presence of a significant geographical discrepancy between heat supply and demand, there is significant widespread potential for process upgrading or CHP in the Mediterranean is. • Especially in countries with a large industrial sector such as, Algeria, Libya and Egypt. • No data/information is found on potential for CHP in Mediterranean power sector.
Energy efficiency in industry	Process upgrading and co-generation	• Significant potential for EE in industry in the Mediterranean, which could be, implemented parallel with implementation of fuel switch to NG in industry. More specific and BU-oriented analysis per country required.
Energy efficiency in service	Energy system upgrading	• Significant potential in countries with large service sector (i.e. tourism). Decentralized nature of service sector complicates implementation of EE, due to coordination issues and information/knowledge asymmetries. • Options: use of energy efficient lighting / cooling / heating systems, building design, etc. • Small scale CHP based on NG could compete with solar heat production, depending on respective country's NG and power grid development strategy.
Energy efficiency in households	Energy system upgrading (lighting, heating, cooling and building design)	• Significant potential in Mediterranean, due to urbanization. Decentralized nature of sector complicates implementation of EE, due to coordination issues and information asymmetries. • Options: use of energy efficient lighting / cooling / heating systems, building isolation, etc. • Small scale CHP based on NG could compete with solar heat production, depending on respective country's NG- and power grid development strategy.
Wind	RES	• Wind energy potential fairly evenly spread across Mediterranean region. Multiple countries already have practical experience with wind power implementation. • Country potential depending on coastal line and available suitable acreage for onshore and offshore placement. • Implementation further depending on national policy concerning power generation.
Solar (thermal and PV)	RES	• Modest usage of solar energy potential in Mediterranean region so far. • Solar energy (either thermal or PV) has one of the largest RES potentials in the Mediterranean and is widespread across the region. • Significant potential for large-scale solar power (possibly combined with fossil thermal and/or desalination) generation. • Small-scale (off-grid) decentralized solar has significant rural as well as urban potential. • Implementation currently depending on economy technology.

Hydroelectricity	RES	• Overall potential concentrated in just few regions, mainly Turkey, Morocco and in some parts of Algeria, Tunisia and Egypt. • Fairly standard RES option under CDM.
Reforestation / biomass / agriculture	RES	• The strict water supply situation in the region is main determinant for aforestation / reforestation or biomass production. • Energy crops are likely to compete for land with food crops. • Potential for energy crops production, requiring significant irrigation, mainly concentrated in Turkey, Morocco Algeria and Egypt. • Potential for energy crops (i.e. jatropha) with low irrigation requirements and that are suitable for arid regions (i.e. to prevent desertification), widely spread across region in.
Geothermal (conventional)	RES	• Potential for conventional geothermal energy production is limited to just a few countries within the region, such as Turkey, Egypt. There are possibly some small parts of Algeria, Morocco, Tunisia and the Eastern Mediterranean that are economically exploitable. • Possibly significant and more widespread hot dry rock (HDR) potential. • Relatively high upfront investment costs (exploration and drilling).
Ocean energy (tidal and wave)	RES	• Ocean energy potential based on tidal and wave movements is of limited importance in Mediterranean region. Certainly in short to medium term, due to current technology status. • For medium term some niche market at Atlantic cost might be present (Morocco).
GHG abatement	N_2O, CH_4 (methane capture LFs, waste water treatment, etc.), HFCs, PFCs, fugitive and CO_2 (CCS)	• Significant GHG abatement potential, especially with respect to N2O (cement / fertilizers) and CH4 (landfills / waste water) emission abatement. • High LFG potentials are identified for Jordan, Israel, but also Turkey, Egypt and Algeria, primarily depending on MSW management. Other countries have LFG potential too. Niche opportunities in Malta and Cyprus might also be present. • Some niche potential for HFCs and PFCs present but is uncharted at the moment. More country specific- and bottom-up analysis required. • Significant CO2 abatement in form of Carbon Capture and Storage (i.e. underground CO2 storage) possible in medium to long term. • Short- to medium term some niche opportunities for CO2-Enhanced Oil Recovery might exist (more analysis required), especially in more mature hydrocarbon production areas (Algeria, Libya and Egypt and other regions with declining hydrocarbon production). Other storage options in empty gas fields or aquifers might also be considered in the long-term.
Transport	Biofuels (production and consumption),	• Biofuels consumption potential is significant, but faces severe competition of conventional fossil fuels; however blending might be a (strategic)

	natural gas vehicles, LPG, GTL, LNG, hybridization and hydrogen of road (and water, i.e. ferries, etc.) transport. Public transport and transport efficiency, etc.	substitution option for countries that already import significant quantities of refined oil products. • Biofuels production potential is limited due to water supply situation and measures that will be taken for rural development, reflected by the scale of biofuels production in arid regions (i.e. Jatropha, etc.). Some niche opportunities exist in countries with biomass waste streams (i.e. Morocco, Turkey) of a certain magnitude. In some cases competition for biomass waste streams might occur when co-firing in coal-fired power plants is also an option. • Application of natural gas in transport as a substitute for diesel and gasoline has significant potential, but is highly dependent on distribution structure development. • Significant (niche) opportunities for LPG, GTL and LNG application in transport might also be present, especially in Algeria, Egypt and Libya, and perhaps also in other Mediterranean countries. • Hybridization with conventional fuels (diesel and gasoline) provides significant opportunities in the oil import dependent nations and who have no natural gas grid connection.

2.5 Financing of CDM Projects

When looking at other means of financing sustainable energy production and/or efficient energy use one should bear in mind what type of deliverable project developers expect. Since CER transactions involve the creation of concrete project deliverables, market conformity is guaranteed and normal competition and negotiation conditions apply to the terms of the fund transfer from the Annex 1 country to the project initiators. Offering other means of favorable financing on non-competitive or non-market conform terms might reduce the scope for effective and efficient market development. Only in those energy production sectors (RES) that face severe competition from over subsidized energy sectors (fossil based) non-competitive funding can be justified based on the market principle of a level playing field.

Also several political or marketing related arguments can be found that could justify non-competitive funding by the EIB in the Mediterranean economies. Nevertheless, these type of funding schemes are inherently obstructed with the problem of that they generate no real measurable performance other than a required return on capital investment. Besides that defining a clear investment objective in political or marketing terms might prove to be difficult with such funding schemes.

As project scale, in terms of GHG emission reduction, is an important feature for CDM project development, several energy/climate investment strategies or schemes can be identified based on that criterion. Below four rudimentary investment schemes are presented which can be applied in order to generate CERs. When looking at other means of financing sustainable energy production and/or efficient energy use one should bear in

mind what type of deliverable is expected from the project developers.

For the various project types or categories certain 'optimal' investment strategies can be formulated. Based on the specific project characteristics and country context, a specific form of CDM (i.e. unilateral, bilateral, multilateral or programmatic) might be preferential for project development purposes in order to either minimize the associated transaction costs or to optimize the CER revenues.

Small-scale investments

A case-by-case approach for each project type within a selected category is pursued in order to optimize a projects finance structure. This is a viable strategy in relatively heterogeneous project categories. This approach depends primarily on bottom-up (BU) initiatives. This is generally considered an adequate strategy to gain (capacity building) experience in the CDM host country and which therefore is useful in the first experimental and explorative stages of the new CDM market. As more projects are being developed this strategy looses its value since the transaction costs associated with project validation and registration are relatively high given the low GHG abatement component of this project type.

Small-scale (bundling)

A financing or CER purchase facility is developed for projects with similar characteristics within the same sector/category. Active screening of the various promising sectors within a country for relatively standard GHG emission reduction opportunities will be part of this investment strategy. Standardization with respect to baseline determination and monitoring procedures can usually be achieved resulting in lower overall transaction costs per individual projects. This 'programmatic' investment strategy will require some form of coordination of the investor country with the respective host country focal point that could either be a public or private entity. Within this strategy, as well as in the first strategy, the specific projects' contribution to sustainable development (and e.g. employment) is likely to be favorable.

Large scale (country)

In countries where substantial large-scale GHG abatement options exist a case-by-case investment strategy can be the best option. However, the specific underlying project type/category that is selected for investment is of particular importance, since some countries question the sustainable development contribution of some large-scale GHG abatement options. So, some countries have proposed a tax on 'low-cost/low SD CERs', such as for example HFCs, N_2O or CH_4 emission reduction projects, which are usually reinvested in other clean energy projects or the like. This option involves more detailed analysis of the various promising CDM sectors. Moreover, the national and local governments have a substantial role to play in such an investment strategy. In this strategy large-scale options, such as large-scale solar thermal and sectoral fuel switch

programmes, could be considered.

Large scale (region)

Some Mediterranean countries are already working closely together within certain sectors (*e.g.* in the natural gas industry). Large-scale cross-country projects could prove to be an interesting investment strategy. However, political coordination and cooperation issues will undoubtedly surface and transaction costs could therefore be substantial. An example would be a multi-country CSP-project, where solar thermal energy is used for electricity production/desalination purposes. A multi-country integrated programme would, however require substantial negotiation at the political level.

3. Project Approach

The current chapter describes the approach that was adopted in conducting the three country case studies, as well as in the elaboration of the “Early Warning System”.

The approach was based primarily on the experts’ contribution and outputs and secondarily on selected information and data by various information sources, such as publications by international organisations (European Commission, UNFCCC, etc.) and by bilateral and multilateral institutions. The input and feedback provided by various parties during the workshop that was implemented in Cairo in the framework of this study have also contributed to the output of this study.

The structure of the country cases studies, which are presented in the following chapters, is briefly laid out below. It is followed by a concise description of the approach used for the elaboration of the “Early Warning System”.

Country Analysis

Each of the country studies, which aims to present the CDM status in the target country, comprises seven integrated sections.

The first section analyses the existing and upcoming CDM related policies. The Kyoto Protocol ratification status, as well as any other existing international agreements, the general country policy for the promotion of CDM project ideas, and initiatives familiarizing the society with the CDM concept are thoroughly presented. Any known scheduled or upcoming related policies are also discussed.

The second section presents the institutional setting of the apposite national designated authority. The DNA structure is clearly described and the participating ministries and organisations are identified.

In the third section, the country’s CDM potential is discussed and its existing assessments presented. This starts with a short synopsis of the GHG emission reduction potential classified by sector; then the existing potential for energy savings and GHG abatement is analysed separately for each sector.

The fourth section presents a review of CDM projects (at various stages of maturity) in the country. After a short description of the country’s CDM project portfolio, including the registered projects and those requesting validation and registration, the most “interesting” projects, as identified by the experts, are briefly presented, classified by sector. It should be noted here that the identification of a few “interesting” projects among a large number of project ideas in each country, required a strict, though necessary, selection process,

which was performed by the country experts, on the basis of their best judgement. The main criteria used for this selection were the probability that the project be carried out successfully (as assessed by the expert) and achieve CDM registration, the seriousness of the organisation and the persons in charge, the absence of an already closed financing scheme and the requirement to have as wide a cross-sectoral distribution as possible in each country. The information contained in the project fiches, including the expert's comments, is, for the most part, based on the information made available by the project promoters. As further progress of each project is affected by many factors, several of them unexpected, it is obvious that the consultants' judgement can in no way ensure the success of the proposed ventures.

The fifth section makes a short reference to the national, international and bilateral entities and funds that finance or are interested in financing the development of CDM in various contexts in each target country.

The sixth section is aimed at the identification of the political, financial and technological barriers that hamper the development of CDM projects.

The seventh and final section is a SWOT analysis for CDM in the country, complied by the country expert.

Early Warning System

The main aim of the Early Warning System (EWS), as laid out in the ToR of the study is to allow the EIB and other bilateral / multilateral institutions to identify CDM projects in Mediterranean countries during their conception / design phases, as well as weaknesses in institutional arrangements for underpinning CDM activity in each country. Two types of contacts are distinguished:

- key contacts within the CDM-related institutional environment, who would be best placed to give credible information on upcoming CDM projects; and
- an informal network of experts between the partner countries and the IFIs, which can regularly exchange information on upcoming carbon initiatives.

In the course of their missions to the targeted countries, the experts have contacted a large number of individuals representing government officers with direct or indirect relation with CDM, operating organisations, financing institutions and consulting entities. The study workshop has also given rise to new contacts or strengthened the existing ones. The Consultant is thus in position to present to the EIB a concrete proposal for an early warning system, which will include selected potential contacts belonging to all the aforementioned groups.

We believe that this can best be accomplished by a two-tier strategy. The upper tier will consist of "key contacts", i.e. contacts that the country expert considers indispensable or

extremely useful to anyone who is involved or wishes to be involved in promoting and financing CDM in the country. In order to avoid confusing the EIB staff, only a small number of contacts (25 per country at most) are identified as key experts. The EIB staff are advised to contact all of these experts early in their involvement, in order to obtain reliable information, find valuable collaborators or identify potential important customers in their task of promoting CDM and identifying potential projects or just-formulating project concepts. Key experts belong to all of the above categories and represent most CDM sectors of interest in each country. In the cases of more than one individual contacts within the same organisation only one (or at most two) are identified as key contacts. The identification of a contact as a key one is based on a set of criteria which includes openness and ease of communication, importance in the sector, authority within the organisation, manifest personal interest in CDM, and assessed potential assistance to the EIB.

The lower tier comprises all other contacts that the country experts have made and who are believed to be potentially helpful to the EIB in relation to CDM. They are listed in a separate table, classified per type of affiliation. The EIB is advised to seek contact with some of these experts, on the basis of the Bank's specific interests in the country, as they evolve or focus in the future. It is believed that the contact with the key experts will also open additional contact possibilities to the EIB staff, depending on the specific interests expressed by the EIB.

For all identified contacts complete contact details are provided, namely their full name, affiliation and position held, telephone number, fax number and and e-mail address. Comments are used occasionally to provide further information, when deemed appropriate.

4. Egypt

4.1 Existing and upcoming CDM-related Policies

Egyptian policy for the promotion of CDM related activities has been one of the most active among the FEMIP countries, as in the past years the country has acceded to the most significant international agreements towards the promotion and development of CDM projects.

More specifically, Egypt signed the United Nations Framework Convention on Climate Change (UNFCCC) during the Earth Summit held in Rio de Janeiro on the 9th of June 1992, ratified it on the 5th of December 1994 and put it into force on the 5th of March 1995.

In accordance to the above, on the 15th of March 1999 the Egyptian government signed the Kyoto Protocol and ratified it three years later on 12th of January 2002. The protocol has been entered into force since the 12th of April 2005.

Consequently, the establishment of the Egyptian Designated National Authority (DNA) in the Egyptian Environmental Authority (EEAA) was decided by the Minister of State for Environmental Affairs in March 2005 (Ministerial Decree No. 42 on 14/3/05).

In general, the Egyptian government is actively involved in tackling the climate change. In this framework, a large number of activities and initiatives have been realized, the most important among them being the following.

In 1997 the National Committee for Climate Change was created and by 1999 the initial National Communication was drafted. Furthermore, the National Environmental Action Plan was drafted in 2002, while the same year one of the most significant initiatives in Egypt, the National Strategy Study for CDM, was prepared. Another important step to promote the CDM mechanism in Egypt is the Capacity Building Program CD4CDM, which was launched in 2002 and it is still on going, as well as the country's Energy Strategy Planning, which has been reviewed and formulated so as to include energy efficiency improvement policy measures. The overall objective is to decrease the energy consumption's annual growth rate from 9% in 1998 to 5,25% in 2017 and to reduce the demand for conventional fuels, mainly oil and natural gas from 1.770 Mtoe to 1.180 Mtoe for the corresponding time period.

There are also some recent developments and initiatives in various fields, which are expected to have an impact on CDM. One of the most promising among them is the organization of the Conference "Environment 2007", at the end of May 2007, following the successful implementation of the conference "Environment 2003". "Environment

2007" places particular emphasis on renewable energy sources and provides businesses, institutions, governmental representatives and donors interested in environmental compliance and renewable energy sources with a forum for networking, exchanging of experiences and launching of joint projects.

Finally, other initiatives aiming mainly towards pollution abatement in the city of Cairo are:

- Cairo Air Improvement Project (CAIP). This is a project jointly implemented by the United States and Egypt, aiming towards the reduction of vehicular emissions and the establishment of long-term efforts focused at the reduction of air pollution through demonstrations and pilot tests of alternative technologies, with increased public awareness and training.
- The Egyptian Pollution Abatement Project (EPAP), launched in the period 1997-2004. The main goal of the project was to help Egypt to reduce industrial pollution by strengthening the enforcement and monitoring capabilities of the environmental administration at regional and local levels.
- The Second Pollution Abatement Project (SPAP), covering the period 2006-2012. The project aims to demonstrate that market-based financial/technical approaches are effective in reducing industrial pollution in selected hot spots areas in and around the Alexandria and Greater Cairo areas.

4.2 Institutional setting for CDM projects' hosting

The institution responsible for all related CDM activities in Egypt is the Egyptian DNA, established in the Egyptian Environmental Affairs Agency according to Ministerial Decree No. 42 on 14/3/05, and composed of the following dual-structured units.

The first one is the Egyptian Council for CDM (EC-CDM), which at national level sets plans & policies, supervises the implementation of the whole CDM process in Egypt and provides related advices to the government and official authorities. At international level, it is the official counterpart to the CDM Executive Board and is the link agency with any potential international CDM stakeholder. It is headed by the Minister of State for Environmental Affairs and consists of 15 members, among them being six representatives from relevant departments of the Ministry of State for Environmental Affairs, one representative from various ministries (Ministry of Foreign Affairs, Ministry of International Cooperation, Ministry of Electricity & Energy, Ministry of Transportation, Ministry of Trade & Industry, Ministry of Agricultural & Land Reclamation, Ministry of Petroleum, Ministry of Investment, Ministry of Finance), as well as one representative from NGOs. A steering committee, consisting of five members from the Council has expedited and intermediate responsibilities related to the process of implementation under the supervision of the EC-CDM. The EC-CDM meetings are held on a quarterly basis, but specific meetings can be convened, upon request from the Steering Committee in order to react pro-actively to any relevant and urgent issue that might be crucial for the progress of the CDM activity in Egypt.

The other unit is the Egyptian Bureau for CDM (EB-CDM), which acts as the Permanent Secretariat of the EC-CDM and is operating at the Climate Change Unit of the Egyptian Environmental Affairs Agency (CCU/EEAA) within the Ministry of State for Environmental Affairs. The Egyptian Bureau for CDM is headed by the CEO of the EEAA and consists of 7 members. More specifically, the EB-CDM consists of five representatives from the Ministry of State for Environmental Affairs, as well as one representative from the Ministry of Electricity & Energy and one representative from the Ministry of Trade & Industry.

The Egyptian DNA's structure is best depicted in Figure 4.1

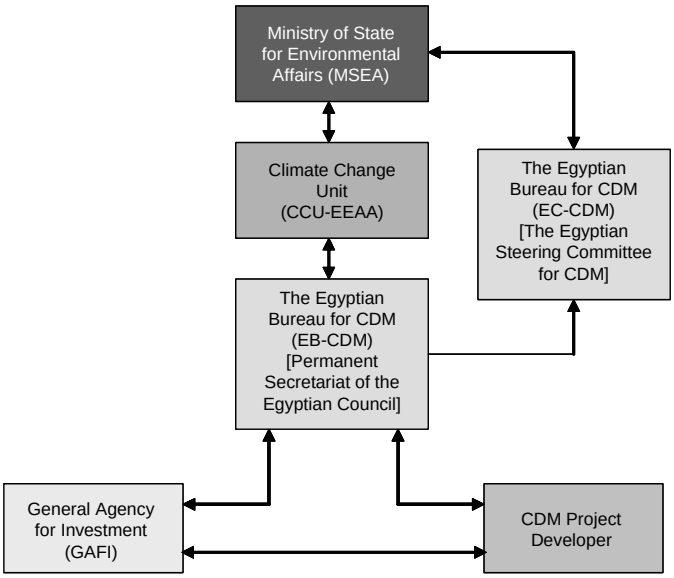


Figure 4.1 Structure of the Egyptian DNA

The Egyptian DNA currently does not charge any fee for its activity and its operating budget is secured by the Ministry of State for Environmental Affairs. However, in the future, its activities are expected to be sustained through a combination of bilateral and multilateral donations or other funding sources such as fees-for-services to be indexed on project CERs revenues.

4.3 CDM Potential by Sector

Achieving GHG emission reductions is a big challenge in Egypt, due to its great potential for developing renewable energy sources and its crucial geographical position. The total CO_2 emissions in the period 2004 was ~140,5 million tons, of which 34% was due to the energy sector, 26% to the transportation sector, 31% to the industrial sector, 9% to the residential as well as commercial sector, as depicted in Figure 4.2 below.

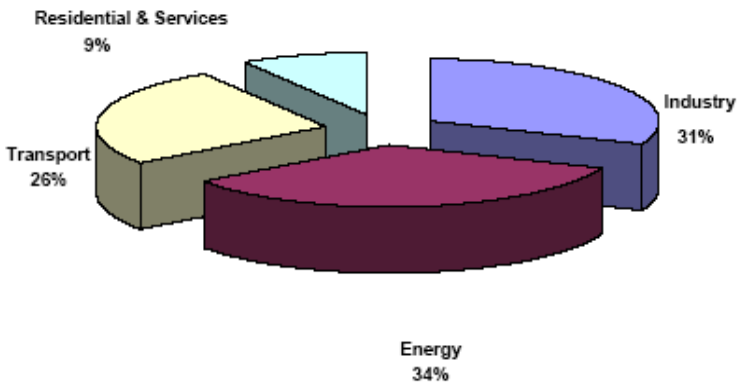


Figure 4.2: CO_2 emissions per sector (2004).

The GHG emissions are expected to grow more than double by the year 2020. This significant increase is due to the energy (mainly because of the continuously increasing consumption of the services and the residential sector) and the industrial sector. In particular, the electricity consumption is estimated to grow by about 4% the period 2007-2008, largely due to the much more extensive electrification of the country.

The overall estimated CDM potential reduction, identified by the Egypt's National Strategy Study (NSS) on CDM, is considered to be 2,1 Mt CO_2 / year. In addition to this, according to the study "Clean Development Mechanism In Egypt, Opportunities And Prospects", carried out in 2004 by the EEAA in collaboration with Tabbin Institute for Metallurgical Studies (TIMS) and Energy & Environment Research Center (E2RC), CDM projects in Egypt have the potential to reduce GHG emissions by approximately 1,5 – 3,0 million tons of CO_2-eq under different scenarios by 2010.

Indeed, there is a substantial potential for the implementation of CDM projects in Egypt. Renewable energy sources (wind, solar, biomass), energy efficiency both in the industrial and residential sector, waste management and forestation afford a variety of opportunities for saving on GHGs. The most important opportunities for CDM projects, at the present, lies in the following sectors, in order of importance:

- Industrial & Services Sectors;
- Energy Sector;
- Waste Sector / Landfill Management;
- Transport Sector;
- Other (Agro-forestry sector).

The identified potential per sector is thoroughly described in the following paragraphs.

Industrial & Services Sector

The Industrial & Services sector is the major consumer, using in 2004 approximately ~37% of the total final energy consumption (IEA), according to the most recent published energy data. The efficiency of oil, gas and electricity consumed in this sector can be improved by 30% and in the residential sector by 15%.

Moreover, two Solar Industrial Processes Heat (SIPH) projects have been operating successfully since 1990 and 1993 respectively, saving about 1,8 kToe/year. In the framework of comprehensive planning of Solar Industrial Processes Heat (SIPH) and Waste Heat Recovery Systems (WHRS) for medium temperature in Egypt (1997 -2012), NREA performed a study to estimate, through field Energy Audits, the potential of SIPH and waste heat recovery systems for six industrial sub sectors.

Following the economic reform in Egypt in the early nineties, energy efficiency awareness has been increased. This is very important taking into account that the annual growth rate of 5,5 % in energy consumption may reach 7 %, by the year 2017.

The quite large energy savings potential, and therefore the GHG emission reduction potential, is also evident from the number of projects in the Egyptian CDM project portfolio for industry, which reaches 27 projects, covering all priority sectors.

Energy Sector

The share of Renewable Energy Sources in primary energy is approximately 6%, due to significant hydro resources from Nile river, which is rather high, compared to the other Mediterranean countries and satisfactory compared to EU Mediterranean countries. In particular, the potential per renewable energy source is briefly described below.

Hydropower

The river Nile is the only significant source of surface water in Egypt. About 90% of the Nile hydropower potential has already been utilized with the installation of just over 2.800 MW. The total available hydropower energy is about 1,55 Mtoe (12,65 TWh). Some of the remaining available hydropower resources are expected to be utilized in the future through hydropower stations at Nag Hamadi and Assiut Barrages, with a total estimated power of 165 MW.

Wind Energy

By 2004, the installed wind energy capacity was 140 MW, and a target of the installed capacity to reach 850 MW is set to be achieved by the year 2010. Moreover, NREA's wind energy plan from 2010 up to 2024 is the construction of 200MW of wind farms

annually. The Egyptian wind energy program for electricity generation represents a leading example in the region. Studies by the Danish specialized RISO labs and NREA revealed that the area in the west of Suez Gulf is considered one of the best uninhabited desert regions that can host wind farms installed capacity of about 20 GW.

Solar Energy

Most of the photovoltaic applications were demonstrated and field tested as water pumping, desalination, clinical refrigerators, village electrification, etc., while telecommunication systems, navigation and airport aid lights and highway advertising boards are already commercialized. The capacity of the PV projects presently in operation amounts to about 2,0 MWp. Furthermore, since early 1980s, low temperature DSWH has been produced locally through joint ventures. Currently, eight companies are active in the field of production, design and installation. The annual production capacity exceeds 25.000 m^2 of collectors and over 300.000 m^2 have been installed and are operational particularly in new cities and tourist villages.

Waste Sector / Landfill Management

Solid waste management is considered to be the most attractive to implement, since it comes with a very low abatement cost (approximately €0 per ton CO_2) according to the Egyptian National Strategy Study, and given the national priorities regarding environmental issues.

Production of biomass energy using agriculture, animal, human, and solid wastes has high potential. More specifically, the potential of energy production from agriculture waste is estimated to be 3,6 Mtoe, where 2,0 Mtoe would come from utilization of the biogas created from sugar cane processing, and 1,1 Mtoe from biomass utilization originating from agriculture wastes. Energy from animal wastes could contribute about 0,4 Mtoe, and municipal solid waste about 0,083 Mtoe.

Transport Sector

Currently, there is not any registered, nor at validation stage, CDM transportation activity in Egypt.

Other (including Agro-forestry sector)

About 9% of the nation's territory is considered protected area (24 protected areas). Though the Government is pursuing aggressive measures to protect the biodiversity in Egypt, until now there is not any registered CDM forestation / reforestation.

4.4 Review of CDM Projects (Present Status)

Egypt, through the Egyptian DNA, developed a project portfolio of about 39 CDM projects. These projects are at different stages of maturity. The projects' breakdown by sector is as follows:

- Industrial & Services Sector: 27
- Energy Sector: 9
- Waste Sector / Landfill Management: 1
- Transport Sector: 1
- Other (including Agro-Forestry Sector): 1

Currently, there are two registered CDM projects in Egypt and three under validation. In particular:

- Registered Projects:
  - The Catalytic N_2O destruction project in the tail gas of the nitric acid plant of "Abu Qir Fertilizer Co". The project aims to reduce (almost eliminate) N_2O emissions at the nitric acid plant ABU QIR II, with potential additional environmental and social benefits;
  - The Onyx Alexandria landfill gas capture and flaring project. The project is a comprehensive waste management system that intents to improve the quality of life for the 5 million residents in Alexandria.
- Request for Validation:
  - The 120 MW Zafarana wind power plant project. The project is financed by the Japan Bank for International Cooperation (JBIC), is expected to generate 452 MWh per year, with a capacity factor of 43%, contributing to GHG reductions of 254,485 tCO2e;
  - Al-Sindian 13 MW Natural Gas based Cogeneration Package Project. This project is a packaged combined heat and power project in Cairo, Egypt. The proposed project involves the installation of a package cogeneration system, which consumes natural gas and generates electricity and heat for the paper mill. This system will displace energy that otherwise would have been utilized from the grid which is dependent on fossil fuels. In addition the project activity will eliminate the purchase of natural gas for boilers;
  - Egyptian brick factory GHG reduction Project. The project aims at replacing the heavy oil burners with gas burners and control systems. It will also include the installation of connecting gas pipelines and pressure reducing stations. This project proposes to reduce 376.403tCO2/year.

Based on the Project Identification Notes (PINs) submitted, out of the 39 projects in the Egyptian CDM project portfolio, 15 projects have been approved by the Egyptian DNA. Moreover, 10 out of these 15 projects have already secured their financing. The Project Design Documents (PDDs) for many of these projects are currently under development. It can be mentioned that although Egypt didn't have an early start up, currently presents an intensive activity with tangible results.

According to the above, there are 23 potential CDM projects, seeking financing at the moment. The expert, Dr. Alexandros Flamos, identified 6 promising CDM project activities, which are presented briefly below categorized by sector. The criteria, based upon which the project selection was realized, are presented in Chapter 3: The project Approach.

Industry & Services Sector

The industry & services sector is one of the CDM sectors with the highest potential for CDM project development. There is already one registered CDM project activity in the industrial sector: The Catalytic N_2O destruction project in the tail gas of the nitric acid plant of "Abu Qir Fertilizer Co".

Most of the CDM projects proposed in this sector involve GHG abatement technologies, energy efficiency, mainly waste heat recovery and cogeneration, and fuel substitution in large industrial processes.

In this framework, below are described the key points of the projects identified by the consultant.

- **Waste Heat Recovery (Abou Zaabal Company for Fertilizers):**

  The particular energy efficiency project aims at the capacity increase of the already existing cogeneration unit up to 11 MW. The specific project idea is targeted not only towards the reduction of the plant's electricity consumption coming from the grid, but also towards the provision and selling to the grid of the remaining electricity.

  The estimated total project cost is approximately 4,7 million euros, while the emission reductions achieved for the project's crediting period are estimated at 1,36 million tons of CO_2-eq.

- **22 Brick Kilns Fuels Switching Project**

  The project aims at switching 16 burners for each of 22 brick kilns to operate with NG by installing natural gas-based burners and an automatic control system for the burners.

  It is estimated that the project will achieve 252.000 of CERs through a crediting period of 21 years. The total estimated cost for the project's deployment is 2,4 million

euros.

- **Nitrous Oxide Emission Reduction in Nitric Acid Unit**

  Elnasser for coke and chemicals company facilities include two nitric acid production lines. The project activity proposed is to introduce a new basket of specific catalyst to decompose nitrous oxide gas into its elements nitrogen and oxygen. The decomposition contribution to GHG mission reduction of more than 75.000 ton CO_2 equivalent per year for the duration of the 15 years of project activity.

  The project cost is yet to be defined; however, a Letter of No Objection has been issued by the Egyptian DNA.

- **Perflurocarbon's Emissions Reduction**

  The Aluminium Company of Egypt is proposing this CDM project which will implement the best available proven technology to reduce emissions of GHGs through reducing the time of cell upset (anode effect). The proposal is to install a new algorithm to avoid/minimize what is called “Anode Effect”. During the aluminium’s melting process perfluorocarbons (PFCs), tetrafluoromethane (CF_4) and hexafluroethan (C_2F_6) are produced during brief process upset periods, anode effect. In addition Carbon Dioxide CO_2 is emitted from anodes consumption. The project will achieve 3.900.582 t CO_2 eq through the 21 years of crediting period.

Energy Sector

As mentioned above Egypt has a significant potential of developing wind power. Currently, procedures are being taken to earmark another area, apart from Zafarana, of 700 km^2 at Gabal El-Zeit. The new site is classified with excellent wind speed that reaches to 10,5 m/s and can host about 3.000 MW wind power plants. During the expert’s missions a wind farm project was identified.

- **200 MW wind farm at Gabel El-Zeit area**

  This project is proposed by NREA (New and Renewable Energy Authority) to be jointly funded by the Egyptian Government (contribution of 65 million euros) and European Investment Bank (contribution of 210 million euros). The wind farm is proposed to be deployed at Gulf of El-Zeit at an area of 40 km^2. The total capacity of the wind farm will be 200 MW (implemented in one phase) and generating ~1.000 GWh/year. The total emission reductions to be achieved are 12,7 Mt of CO_2-eq.

Other (Agro-Forestry Sector)

A promising CDM afforestation project is being proposed by the Egyptian Environmental Affairs Agency.

- **The Greater Cairo Ring Road Afforestation project**

  The proposed project will help improve the quality of air in Egypt as it has been

severely degraded by car exhaust and industrial emissions. The forest that will be planted will be irrigated by agricultural drainage treated water and will absorb 100,000 tons of CO_2eq annually. Thus, the proposed project will help offset the liability of car manufacturers and utility companies for future regulatory action such as a carbon tax or reducing the numbers of cars.

This project received a Letter of No Objection by the Egyptian DNA and is currently seeking funding that is estimated to €3 million.

4.5 Financing of CDM Projects

There is a significant number of international and bilateral entities and funds that finance or are interested in financing the development of CDM in various contexts (as expected, a significant part of the financing is directed towards the utilization of wind recourses). The most important of these are:

- The Kreditanstalt Für Wiederaufbau (kfW) which has financed and is financing several projects (eg. wind farms at Zafarana area);
- The Danish International Development Assistance (Danida), which has financed and is financing several projects (among them wind farms at Zafarana area);
- The Japan Bank for International Cooperation (JBIC) (wind farm at Zafarana and Gable El-zayt area);
- The Spanish Carbon Fund (wind farm at Zafarana area);
- The World Bank (WB), which financed the “Kureimat Power Project” and the “Egypt Pollution Abatement Project”. WB’s activities in the area of pollution abatement are continuing with the ongoing project “Second Pollution Abatement (EPAP II) Project : safeguards diagnostic review”;
- The European Invetsment Bank (EIB) which has financed the current study for the identification of CDM project opportunities and is on board with WB for EPAP projects;
- UNDP is providing technical assistance to the Ministry of State for Environmental Affairs to build its capacity to manage environmental resources, to develop strategies and to promote the utilization of environmentally-sound technologies (Capacity Building and Institutional Support to Nature Conservation Sector (NCS), Energy Efficiency Improvement and Greenhouse Gas (GHG) Reduction and others);
- The Sindicatum Carbon Capital (SCC), which is involved as a consultant and as a financing organization;
- Ecosecurities, is also involved as a consultant and, potentially, as a financing organization;
- The Finnish Environment Institute (SYKE) took part in projects such as the “Hazardous Waste Management Project in Alexandria: Review of the 1st Phase and

Preparation of the 2nd Phase" and the "Egyptian Pollution Abatement Project (EPAP)";

- The Global Environment Facility (GEF), has provided grants for some projects (Support the Implementation of the National Biosafety Framework, Introduction of Viable Electric and Hybrid-Electric Bus Technology, Climate Change Enabling Activity (Additional Financing for Capacity Building in Priority Areas), Solar Thermal Hybrid Project and others).

Although there is an abundance of funds for financing CDM projects, there is a number of financial barriers related to CDM financing. These barriers are presented in the next section.

4.6 Barriers to CDM

As mentioned above, there is a series of financing institutions interested in investing on CDM projects in Egypt. In this framework, this chapter aims towards the identification of those political, financial and technological barriers, hampering the development of CDM projects.

Political – Regulatory

The main political and regularity barriers, hampering the implementation of CDM projects are the following:

- The electricity market is presently arranged in a single buyer form in which all generation companies sell their electricity to the transmission company (the single buyer), and the single buyer in turn sells the electricity to all distribution companies and high voltage consumers. This market form with the current tariff structure which is characterised by heavy cross subsidies is reducing the financial attractiveness of RES and Energy Efficiency improvement projects.
- Bureaucratic delays hurdles foreign investors of CDM projects.
- Absence of governmental incentives such as advantageous customs, taxes and customs duties for CDM activities.

Economical – Financial

The financial barriers are of crucial importance for the development of CDM activities in Egypt and are mainly a cause of the country's economic situation as a whole. In particular, some of these barriers are as follows:

- Local industries, enterprises, etc. are not taking "hard currency" loans and the reluctant involvement of local banks in CDM financing is posing a significant financial barrier.
- Local banks are not familiar with the CDM market and have not yet developed

specialized bank products for facilitating the financing of CDM projects.

- High interest rates and inadequate maturity of the market infrastructure to support CDM projects (eg. not availability of specialised carbon credit risk management tools) is hurdling potential investors.
- The equipment required for the exploitation of RES is not fully locally manufactured and in this framework RES CDM projects are associated with relatively high capital costs which are discouraging potential investors.
- High transaction costs are associated to CDM project proposals development and especially SMEs cannot afford expensive specialised consultancy for the preparation of PINs, PDDs, etc.
- A significant number of the proposed CDM projects are small scale activities with low attractiveness for IFIs, multilateral and bilateral funds and donors.

Technological and Other

The technological barriers present in Egypt are also quite important and include:

- Lack of specialised knowledge on the procedures and modalities of CDM within most of the local industries, utilities, enterprises, etc. which has as a direct effect the difficulty to identify and develop promising CDM projects.
- Lack of knowledge regarding environmental friendly technologies, which could be implemented within the framework of the CDM.
- The strictly hierarchical management with concentrative decision making and the lack of application of modern management skills (especially at public sector enterprises, industries and utilities), creates a bottleneck for new ideas, new mechanisms, innovative technologies etc.
- The relatively small number of trained and active local consultants with deep knowledge of the CDM is driving to higher costs associated with the development of CDM projects and consequently to the utilisation of a small part of the huge CDM potential existing in Egypt.
- Long and complex CDM project cycle discourages some investors and project promoters.
- The limited time-span that is left to initiate “new” CDM projects until the end of the first commitment period (end of 20012) and the high uncertainty of the future of CDM (beyond 2012), discourages a significant part of the investors and is excluding certain project types from being implemented.
- Clustering of small scale activities in order to achieve the critical mass for attracting IFIs financing presents several organisational and technical complexities.
- Lack of awareness regarding the benefits of specific energy efficiency technologies and practices.
- Awareness of CDM benefits does not reach all potentially interested parties.

4.7 SWOT Analysis

The following SWOT analysis summarizes the main points of the foregoing analysis.

Table 4.1: SWOT Analysis for CDM in Egypt

Strengths	***Weaknesses***
• The DNA is well organized and staffed with capable and supportive personnel. • State authorities sensitized and interested in promoting CDM. • The potential in several sectors is significant (Energy, Industry, etc.). • Already developed pipeline with near 40 CDM project proposals. • Existence of approved methodologies for most of the proposed CDM projects. • CDM projects already registered or in the registration process. • The local agencies, NGOs, organisations, consultants etc. are keen to be involved in CDM.	• Local Industries / Utilities / Enterprises etc. are facing difficulties in the development of attractive CDM project proposals (lack of specialized knowledge, limitation of resources - financing, personnel- etc.). • Relatively small number of trained and active local consultants in many sectors related to CDM. • A significant number of the proposed CDM projects are small scale activities which makes difficult financing from IFIs, multilateral and bilateral funds and donors. • High transaction costs are associated to CDM project proposals. • Low prices of electricity and fossil fuels. • The local banks have not yet been involved in CDM financing (lack of specialized financing facilities).
Opportunities	***Threats***
• Substantial interest of IFIs, donors and funds for CDM projects financing and for providing TA and Grands. • Experience and knowledge created by already registered projects can be exploited. • Positive socio-economic impacts through the implementation of CDM. • Government interest in CDM and in promoting specific development projects through it. • Ability to implement clustering of small scale activities in order to increase the attractiveness of CDM project proposals.	• Eventually closing the window of opportunity by the UNFCCC, by applying stricter criteria for registration. • Uncertainty of the future of CDM, beyond 2012. • Long and complex CDM project cycle discourages some investors / promoters. • Substantial CDM costs and risk of no success discourages some investors / promoters. • Awareness of CDM benefits does not reach all potentially interested parties.

5. Morocco

5.1 Existing and upcoming CDM-related Policies

Morocco is a developing country that has clearly declared its willingness to pursue Sustainable Development in the last two decades. This was translated into concrete action, with the creation of a ministerial department for the environment in 1992 and the implementation of a process with fully integrated environmental protection concerns in the social, political and economic plans.

To contribute in the effort of the international community to reduce the climate change impact, Morocco signed the United Nations Framework Convention on Climate Change during the Earth Summit in Rio de Janeiro in June 1992, ratified it in December 1995 and set it into force on 27th March 1996.

In the same spirit, the country set up a National Committee on Climate Change in 1996 and a National Scientific and Technical Committee in 2000, while in 2001 Morocco organised the COP-7 and submitted its first National Communication on Climate Change (October 2001). The Kyoto Protocol was ratified on 25th January 2002 and entered into force on 16th February 2005. Currently, Morocco has launched the preparation procedures for its Second National Communication.

A national strategy for environmental protection and sustainable development was elaborated and adopted in 1995. It specified the objectives for the years 2005 and 2020, such as increasing RES share in Moroccan energy supply to 10% by 2011, as well as the priorities for environmental action. The National Action Plan for the Environment (PANE), established within the framework of the UNDP's Capacity 21 program, aims at implementing the principles of this National Strategy. Programs have thus been developed in the sectors of water and soil resources, forestry, watersheds, energy, coastal areas, oases, etc. Two programs have been the focus of special attention since 1996: the Action Program for the Protection of Biological Diversity and the Action Plan for Combating Desertification. These programs have been elaborated within the framework of the related Conventions.

Although Morocco is actively involved regarding Climate Change, no specific CDM law has been adopted yet. Three new environmental laws are, however, in force as of 2003. One of them is related to environmental impact studies that are also required for CDM projects (some implementation regulations with obligatory standards are still missing, however). The other two are relative to environmental protection, notably law 11-03 refers to environmental protection and valorization and law 13-03 is relative to combating atmospheric pollution.

In spite of the absence of a CDM legal framework, a CDM National Strategy covering the period 2003-2005 was developed with support from the UNDP-UNEP. This strategy

aimed at attracting CDM investments and implementing the institutional and structural framework required to operate the CDM mechanism, as well as developing the national capacities in this field and promoting the Moroccan CDM potential internationally. The strategy was based on the following principal objectives:

- National structures and procedures:
  - Implementation of the institutional setting for monitoring CDM, the CDM Designated National Authority, established in 2002;
  - Development of national procedures to promote CDM activities in Morocco, such as procedures for investors, national economic operators, etc.
- Capacity building of economic operators, namely information to operators interested in CDM opportunities and procedures, nationally and internationally, the creation of strategic partnerships between the Secretary of State for the Environment and a number of CDM economic operators in Morocco, etc.;
- Capacity building, including training the CDM National Council (NC) and the CDM Permanent Secretariat (PS) members in CDM related fields, as well as of national experts (individuals and companies) on CDM project preparation, including development of PDD;
- Promoting the Moroccan CDM projects internationally;
- Monitoring CDM international negotiations.

There are also two very recent (end of 2006) policy developments in different fields, which are expected to have an impact on CDM.

More specifically, the first policy development regards an officially announced change to the electricity law that allows electricity autoproducers to build up to 50 MW of power generation capacity (an increase from the previous limit of 10 MW); Moreover, autoproducers are now allowed to transport electricity from the location of its generation to a different location for consumption, at a fixed transport tariff (about 0,006 €/kWh). These changes have been officially announced by the Government and will be ratified by law very soon. This development is expected to boost investment in renewable energy generation, especially wind energy, mainly by large industrial complexes, which have large electricity demand; in fact, cement factories as well as some industrial associations were fast to respond with the announcement of investment plans.

The second development regards the nomination of the institutional entity “Fonds d’ Equipement Communal” (FEC; a state organisation under the Ministry of Interior) as the unique entity responsible for waste management projects in all communities over the country. The FEC will thus be the one-stop shop interlocutor for foreign and local organisations interested in investment in this sector. This development is expected to unblock many projects in these sectors, some of which may have a significant CDM

potential (methane elimination).

5.2 Institutional setting for CDM projects' hosting

The Moroccan DNA ("AND MDP Maroc") was established by ministerial decree on 18th September 2002. The DNA consists of the National Council (CDM NC) and the Permanent Secretariat of the National Council (CDM PS). The seat of the DNA is at the Ministry of Territorial Planning, Water and Environment.

The structure of the Moroccan DNA is shown in Figure 5.1.

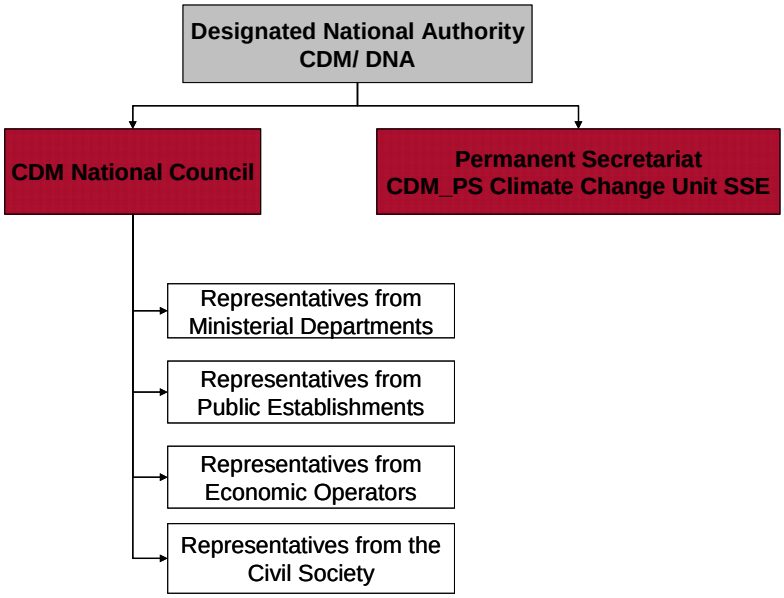


Figure 5.1: Structure of the DNA in Morocco

The DNA has two main areas of responsibility. On the one hand the regulation of CDM in line with the international requirements of the Kyoto Protocol on the other, the initiation and assessment of projects under this regime accounting for the national criteria for sustainable development.

The members comprising the CDM NC are representatives from all relevant ministries, organizations representing the major relevant economic sectors, as well as representatives from civil society and individuals. Members include the Ministry of Foreign Affairs and Cooperation, the Ministry of Industry, Commerce and Economic Modernisation, the Ministry of Interior, the Ministry of Agriculture and Rural Development, the Ministry of Energy and Mining, the Ministry of Finance and Privatization, the Ministry of Equipment and Transport, the High Commission of Waters and Forests and the Fight against Desertification, the General Confederation of Moroccan Enterprises, as well as the Centre of Development of Renewable Energies.

The CDM National Council has the following missions:

- The review and assessment of projects submitted to the CDM DNA by the economic operators for financing within the CDM framework. The recommendation of the council is considered to be the justified decision originated from the DNA.
- The approval of sustainable development criteria and of the modalities to putting them into operation;
- The approval of guidelines and manuals, for the evaluation CDM verification and monitoring of CDM projects;
- The encouragement of competent entities to be engaged in highly technical CDM activities: Capacity Building, Consulting, and Research and Development activities to the benefit of economic operators;
- The preparation of an annual report on the activities of CDM in Morocco.

As regards the organizational structure of the CDM Permanent Secretariat, it is currently staffed with 5 persons. The most significant task of the CDM PS is to ensure the smooth operation of the CDM projects identification procedure, namely:

- To be the one-stop-desk for CDM project economic operators;
- To transmit the projects to the CDM NC for review, to communicate the results to the project promoters and to register and deliver the accepted project approvals in the name of the CDM National Council;
- To initiate contacts and communicate with potential investors from carbon purchasing organizations and industrial countries, as well as with organizations that are able to help economic operators to develop CDM projects;
- To inform, nationally as well as internationally, on Moroccan CDM procedures, organization and project portfolio and to promote the potential of Morocco's CDM projects;
- To ensure the monitoring of projects throughout their life cycles;
- To get fully updated on the evolution of rules and procedures of the CDM on the international level and the national level.

5.3 CDM Potential by Sector

Morocco’s GHG emissions from fuel combustion were estimated at about 33,1 Mt CO_2 in 2002, and are expected to grow quickly (more than double by the year 2020). This big increase is mainly due to the growth of the residential sector and the energy sector. The latter has been growing by about 9% annually in the past years, largely due to the much more extensive electrification of the country (89% is now electrified, compared with 18% in 1995, as a result of a successful rural electrification program).

There is a very substantial CDM potential in Morocco. Renewable energy sources (wind, solar, hydro, biomass), energy efficiency, rationalization of local transport, waste management and forestation provide different opportunities for saving on GHG. As the country imports 95% of its energy, the high international energy prices act as an incentive for Morocco to implement relevant projects.

The percentage of CO_2 emissions in 2003, emitted by each type of combustible fuel are shown in Figure 5.2

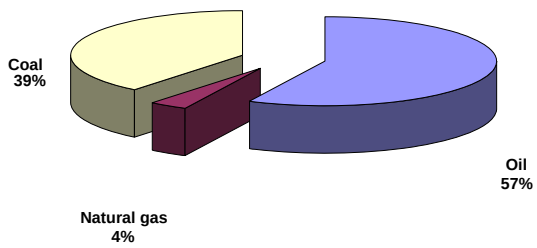


Figure 5.2: Combustible fuels' contribution in CO_2 emissions for 2003

Moreover, the emitted CO_2 percentage per economic sector is presented in Figure 5.3

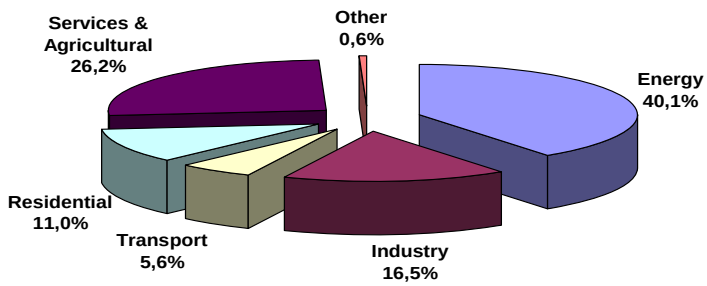


Figure 5.3: CO_2 emissions by sector for 2003

The existing CDM potential per sector is described in detail in the following paragraphs.

Industry & Services Sector

Morocco has substantial heavy industry as well as medium industry (mainly agro-food), with industrial processes where energy is an important component of the production cost. The largest industrial complex in the country is OCP, engaged in the production of phosphates and their derivatives (phosphoric acid, fertilisers), with four mining sites and

two chemical plants in the country. In addition, there are nine cement industries belonging to four industrial complexes, namely Lafarge, Ciments du Maroc (Italcimenti), Holcim and Asment-Temara.

According to the DNA, the potential for energy efficiency in the Moroccan industrial sector is estimated at 20% of the current consumption, which accounts for an annual economy potential of around 300 ktoe.

The number of CDM proposals in the Moroccan project portfolio for the industrial sector is fourteen.

Energy Sector

Morocco possesses significant renewable energy potential, particularly solar and wind resources, but needs to develop the means for their mobilization. The strategic plan aims to: reduce dependence on imported energy; improve energy supply in rural areas; reduce deforestation associated with unsustainable use of biomass for rural energy; attract private investment; generate rural employment; and protect natural resources and the environment.

A national strategy foresees increasing their share in Moroccan energy supply to 10% by 2011. The country is basically very well suited for the use of renewable energies. By 2010, the plan expects to achieve a 80 percent rate of rural electrification, install 1.000 megawatts of wind capacity and 400.000 square meters of solar collectors, reduce rural use of biomass for energy by 50 percent, and supply 12 percent of the nation's energy with renewables.

More specifically, the potential per renewable energy source is identified below.

Wind Energy

With a 3.000 km-long coast and mean wind speeds of up to 11 m/s, the viable wind power potential alone is estimated at about 6.000 MW.

Solar Energy

The conditions for solar energy are also extraordinarily favourable. Given its geographical position, Morocco has considerable solar potential, as the duration of sunlight is estimated at more than 3.000 hours/year. In addition, the electrification of remote rural areas with solar home units is a major policy goal.

Hydro Energy

Morocco has four perennial rivers and many dams with hydroelectric potential. The

hydro-electric potential estimated at more than 5.000 GWh/year, of which about 40% is presently used in 24 hydroelectric power stations.

Till now, though, development of renewable energy sources has made slow progress in Morocco. Of special importance in this connection is the strong position of the national provider ONE, still virtually an electricity monopoly. The main constraint on the sector is the lack of legislation or its inadequate scope.

A clearer picture regarding the savings potential of the sector can be provided from the number of existing projects in the Moroccan project portfolio related to the energy sector, which reach 27 proposals.

Waste Sector / Landfill Management

The CDM potential of waste management and water treatment throughout the country (through methane sequestration projects) is unknown at this stage; existing estimates are not trustworthy.

Waste management has recently become a central consideration of the Moroccan governmental policy. Government has adopted new stricter norms for waste management.

Biomass energy (firewood, charcoal, farming residues, etc.) represents the country's second source of energy in terms of potential. It holds approximately 30% of the overall energy consumption. Furthermore, Biogas is of special interest for CDM projects. Several cities are reportedly seeking partners for the utilization of landfill and sewage gas.

The rate of waste production across the country is estimated at 6,5 million tons per year (DNA). Both solid waste management and water treatment represent a sizeable potential for reduction of GHG emissions, mainly through biogas (methane) incineration. The DNA estimates this potential at 2,2 ton of CO_2-eq per year (for existing sites and new sites together).

Transport Sector

There are a number of planned interventions, mainly aiming to improve the quality of air in the urban centers. In 1999, the CO_2 emissions from the transport sector were 2 millions metric tones, which indicates a very big savings potential in this sector.

Other (including Agro-forestry sector)

Agriculture-forestry-animal husbandry (agro-forestry), is considered vital sector for the

country and the primary concern of the country today is to predict, with scientifically-acceptable uncertainty margins, potential impacts of climate change foreseen by IPCC on this sector.

5.4 Review of CDM Projects (Present Status)

Morocco, through the Ministry of Territorial Planning, Water and Environment, has developed a project portfolio of proposed CDM projects since 2002. This portfolio contains currently about 60 projects, at different stages of maturity. Some of them will probably never materialize but some are sound project ideas. The projects' breakdown by sector is as follows:

- Industrial & Services Sector: 14
- Energy Sector: 27
- Waste Sector / Landfill Management: 13
- Transport Sector: 1
- Other: Agro-Forestry Sector: 4

  Carbon sequestration: 1

To date, the CDM DNA has approved 27 projects, among which:

- 7 projects with PDDs (of which three are registered by the Executive board and three others are under validation).
- 20 project PINs.

The only three Moroccan CDM projects that have so far been registered with the competent UN body for the respective international approval, the CDM Executive Board (EB) are all renewable energy projects:

- **Tétouan Wind Farm Project for the Lafarge Cement Plant**: The 10,2 MW wind farm is worth some US$ 10 million. It supplies power to a cement plant run by the Lafarge group. The plant went on line in 2005 and is estimated to save 28,6 ktn of CO_2 emissions per year. Registered 23/09/2005
- **Essaouira wind power project**: The project executing agency is the national (state) power supplier, Office National d'Electricité (ONE). The 60 MW wind park in Essaouira is estimated to cost about US$ 90 million and was financed in part by KfW (the German Kreditanstalt für Wiederaufbau). Annual CO_2 savings are estimated at 150 ktn. Registered 29/10/2005.
- **Photovoltaic kits to light up rural households in Morocco**: This project is part of the nationwide rural electrification programme by the ONE. The project involves the use of stand-alone photovoltaic systems (about 105.000 solar home systems). Parts

of this programme are cofinanced by KfW and AFD (Agence Française de Développement). Registered 28/04/2006.

Three other projects are under validation. One industrial energy efficiency project, one biogas recovery and flaring project (methane sequestration), and one wind farm, which are mentioned below.

- Heat Recovery System in a Chemical plant (Safi);
- Biogas recovery and flaring in the Oulja landfill;
- 10 MW Wind farm for the Tan Tan desalination plant.

Moreover, one project has its PDD approved by the DNA, the “Biogas recovery and flaring in the landfill of Akreuch”.

Currently, the Moroccan DNA has approved 19 PINs. The PDDs for many of these projects are currently in preparation. The projects include several wind parks, two hydropower stations, a biodiesel project, several biogas facilities in waste management.

It can be said, in general, that ratification of the Kyoto Protocol and the establishment of the DNA in 2002 led to a period of intensive activity and enthusiasm vis-à-vis CDM. This was followed by a period of relative stagnation, as project promoters faced the complexity of CDM procedures and confronted a number of other barriers, discussed below. Recent policies, especially the changes in the electricity law and the manifest government interest in energy efficiency, seem to be catalyzing CDM activity again, leading to a period of renewed interest, especially in the sectors of renewables, industrial energy efficiency and, in the medium term, waste management.

The most important opportunities for CDM projects, at the present time, lie in the following sectors, in order of importance:

- Energy sector;
- Industry (energy efficiency and fuel substitution);
- Waste management and water treatment.

Industry & Services Sector

A number of potential industrial energy efficiency projects have been included in the national project portfolio. The most advanced one is a project by OCP (Office Chérifien des Phosphates), concerning a Heat Recovery System (HRS) at the Jorf Lasfar chemical plant, in the process of production of sulphuric acid. There are similar projects under development at other OCP plants at Safi, also at a rather advanced stage.

The cement factories have elaborated CDM project ideas but they don't appear to pursue them very enthusiastically, with the exception of wind energy projects. Lafarge is planning an extension of its 10 MW wind farm in Tetouan, which is already registered and in operation, to a capacity of 30-50 MW, depending mainly on financing. Holcim and Ciments du Maroc (CdM) are also pursuing the development of their own wind farms to satisfy their electricity needs.

In medium industry, there are concepts of relatively small projects which, for this reason, are harder to develop as CDM projects, in the light of the complexity and the substantial costs involved. A number of industrial associations, mainly in industrial zones, are pursuing medium-size projects, by combining similar interventions on different industries. Technical assistance and funding of the CDM development costs are crucial needs for such industries.

Below follows a short description of the proposed projects by the expert, Mr. David Moisis, in the industrial and services sector.

- **Systems in the OCP Unit of Safi (Maroc Phosphore I & II):**

  Two energy efficiency projects have been proposed by OCP, which aim at improving the energy efficiency of the chemical complexes "Maroc Phosphore I and Maroc Phosphore II" at Safi. Both systems concern installing a Heat Recovery System (HRS) on sulphuric acid production units (an old and a new unit). In each case, the HRS systems will recover the heat of the hot sulphuric acid stream (at about 220°C), to produce medium pressure steam. Annual CO_2 emissions reductions are estimated at 126.000 tons for the Phosphore I Unit and 69.600 tons for the Phosphore II Unit.

- **Industrial Energy Efficiency in the Sidi Bernoussi Industrial zone:**

  This project plans to apply varied energy efficiency interventions on some 10 medium industrial enterprises, which are members of the association and where concrete energy efficiency measures have been recommended through recent diagnostic programs. These actions are expected to result in about 20% energy and water conservation. Izdihar seeks to combine all interventions into a comprehensive CDM project. The total project is about 4 million euros, while the emission reductions to be achieved during the project's crediting lifetime are calculated to be 21.000 tons of CO_2-eq per annum.

- **Wind farm 2 X 10 MW – Industrial zone of Tangier Dalia I and Dalia II:**

  The Association of the Tangiers Industrial Zone (AZIT) plans to establish two wind farms (10 MW each) at the Oued Rmel and/or Dalia regions (Atlas Mountains), to cover part of the electricity needs of its members. These will be developed practically as two different projects or as two stages of the same project. The total project cost is estimated at 29 million US$, while the annual emission reductions were calculated to be 55.000 tons of CO_2.

- **Energy efficiency and process change in olive oil enterprises:**

This project, promoted by CMPP, regards the establishment of a new technology processes on 5 enterprises in the Meknès region, mainly producing olive oil. The process change will result in both the improvement of the product quality and the reduction of energy consumption. The project is estimated to reach a cost of about 10 million euros.

- **Wind farms by the cement industry:**

Following the recent limited liberalisation of power generation, Ciments du Maroc (CdM) and Holcim have declared their intention to establish their own wind electricity farms at appropriate locations, for the supply of their cement production plants. The projects remain to be concretised.

Lafarge also plans to expand its existing 10 MW power plant at its Tetouan industrial location to 20-30 MW. The additional electricity will be used to provide additional supply to the Tetouan plant and/or to other Lafarge industrial plants in the country. The estimate of the total project cost is between 10 and 20 million euros, depending in the final size of the project, while CO_2 emission reductions were calculated to be 29.000 – 57.000 tons of CO_2 per annum.

Energy Sector

Wind Energy

Wind energy projects appear to be presently the easiest and most mature way to develop CDM projects in Morocco, due partly to the expertise already acquired. In addition to the industrial projects and prospects mentioned above, the ONE has several specific wind energy projects under development. Moreover, the ONE is pursuing a new large-scale multiproject, aspiring to establish 1000 MW of wind power at appropriate locations, to be developed mostly through PPAs with IPPs. This ambitious project is at a premature stage and requires technical assistance for its mounting. Small wind farm projects are also pursued by the ONEP (Office National de l'Eau Potable) and the industrial association of the Tangiers industrial zone (AZIT).

Solar Energy

Despite the fact that insolation is abundant, solar energy applications have not been developed to any significant extent. For the time being the ONE has a small registered PV project and is pursuing other PV applications. It plans also to construct a thermo-solar plant, which is probably not CDM-eligible, as it is financed through a GEF grant. The CDER (Centre des Energies Renouvelables) is managing an application of solar water heaters in the residential and tertiary sectors; this effort, however, is far for being developed as a CDM project, for various reasons.

Energy Efficiency

In the field of power transmission and distribution there are a number of potential CDM projects under development by both the ONE and companies that are undertaking electricity distribution in cities, under concession agreements. The largest of these companies is LYDEC, concessionaire in the Casablanca Greater Area, which has a number of project ideas ranging from energy efficiency in lighting to energy efficiency in transformers to SF6 emissions reduction; they are, however, temporarily frozen, for contractual reasons. The ONE has also similar projects but these are relatively small (for the ONE's standards) and the company will probably finance them internally.

Interesting projects in the energy sector include the following.

- **60 MW wind farm in Taza by the ONE:**

  This project concerns the installation of wind energy generation capacity of 60 MW in the Taza province. The anticipated average annual production is 170 GWh. The project's cost is estimated at 82,5 million US$ and the emission reduction at 128.000 tons of CO_2-eq annually.

- **1000 MW wind farms by the ONE:**

  The ONE is pursuing an ambitious program of developing 1000 MW of wind power installations throughout the country. The company has just tendered widespread measurements at specified regions in the country, with the aim of selecting the best specific locations. The ONE then plans to develop most locations by cooperating with the private sectors through PPAs.

- **5-10 MW wind farm for the Tan Tan desalination plant by the ONEP:**

  The ONEP is going to build a desalination plant to enhance the potable water production system of the city of Tan Tan. The plant will be equipped with a 5-10 MW wind farm, which will cover the foreseen needs of the plant. The total project's cost (desalination plan and wind farm) is estimated at 36 million euros. Emission reductions are expected to reach some 17.200 tons of CO_2-eq annually.

Waste Sector / Landfill Management

There are several CDM project ideas in the national portfolio. Two of them (at the Akreuch site in Rabat and of the Oulja site) are the most advanced, with PDDs approved by the DNA.

In general, all projects (not just CDM projects) in these sectors have suffered from chronic delays, due to organizational reasons related to the operation of the communes. This barrier has been removed through the very recent nomination of FEC as the national entity responsible for such projects; it is expected, thus, that this sector will be developed in the short-to-medium term.

Transport Sector

Although several initiatives are underway and even measures have been officially announced, progress towards rationalization of the transport sector has remained almost nil over many years. Although the sector needs drastic changes, it appears that serious barriers have hampered their enforcement. No important developments are expected in this sector in the medium term, at least in regards to CDM.

Other

The Government is pursuing an aggressive forestation / reforestation project which, however, is lagging behind, for a number of reasons. There is uncertainty as to the CDM eligibility of many of the forestation projects. Thus all relevant project ideas are still under development and the Government is currently trying to assess the CDM potential of the entire forestation sector. This sector is currently being investigated in depth, with the aid of specialized consultants; it is one of the sectors that the DNA, as well as the UNDP aspires to develop.

- **Biodiesel Morocco:**

  The particular production of biofuels project is targeting in creating an alternative energy source to fossil fuels by establishing a plantation of a euphorbia known as JATROPHA CURCAS in the marginal terrain between arid and semi-arid zones (region of Chichaoua), which will contribute to the sequestration of CO_2, as well as the establishment of a biodiesel production unit (refinery) within 24 months of project start. This is a complex and novel project for Morocco and North Africa in general.

  An estimation of the total project cost is calculated at 132 $ US million and the emission reductions achieved for the project's crediting period is estimated at 618.750 tons of CO_2-eq per annum.

5.5 Financing of CDM projects

There are numerous national, international and bilateral entities and funds that finance or are interested in financing the development of CDM in various contexts. The most important of these are:

- UNDP-UNEP, which has provided technical assistance to finance the initial organisation on national level, the elaboration of a national strategy and the compilation of the initial national CDM portfolio;
- The GEF, which has provided grants for some projects and contributes to the UNDP;

- The World Bank, with a particular interest in waste management projects;
- The AFD (French bilateral aid), which financed projects through the French FFEM and through technical assistance;
- The kfW, which has financed and is financing several projects;
- The gtz (German bilateral aid), which provides technical assistance;
- Ecosecurities, which is involved as a consultant and, potentially, as a financing organisation (carbon bank);
- The local CDG (Caisse de Dépôt et de Gestion), which has recently set up a fund of about 10 million € for financing CDM projects.

Although there is an abundance of funds for financing CDM projects, there are a number of financial barriers related to CDM financing. These are discussed in the next section.

5.6 Barriers to CDM

As mentioned above, there is a series of financing institutions interested in investing on CDM projects in the region. This subchapter presents and discusses the political, financial and technological barriers, which hamper the development of CDM projects.

Political – Regulatory

- In its fervor to promote CDM, the DNA has adopted a lenient approach towards the approval of submitted documents (PINs and PDDs), at least initially. This approach may backfire when promoters of projects approved by the DNA are confronted with the severity of the registration procedure.
- There is no provision for independent electricity generation for sale to the grid or directly to customers (apart from PPA agreements strictly controlled by the ONE). This precludes extensive involvement of the private sector in wind energy and other renewables applications.
- There is no adequate legal framework to limit or control emissions in the transport sector. Although the application of transport codes (for automobiles, fuels, etc.) has long been under discussion, the state has been reluctant to actually impose them so far.
- Heavy subsidies on some fuels (mainly butane) distort market conditions and hinder energy efficiency actions in some sectors.

Economic – Financial

- The substantial costs of CDM project development, coupled with the complexity and uncertainty of the registration process, prevents many companies, especially SMEs from getting involved in the CDM process. The EIB's CCTAF can play a pivotal role in addressing this barrier.
- The long duration of the CDM project cycle (at least until eligible costs can be undertaken), again coupled with the uncertainty of the process, prevents some project promoters from developing the CDM-component of several profitable projects, since earlier profits compensate for the loss of CER earnings.
- Although there is an abundance of funding for CDM projects, in general finance at good conditions is available only to large and economically healthy enterprises, which can generally finance most of the projects themselves. Debt finance is either not accessible or expensive for SMEs, which are the ones that mostly need such financing.
- Financing is available through bilateral and international funds (credits or grants) as well as national state funds. Local banks have not yet been involved in CDM financing on special terms.
- Long-term financing in hard currency is not acceptable to most companies which earn all or most of their revenue in Morocco, due to the exchange rate risk involved and the absence of relevant hedging facilities. This barrier is particularly relevant to companies that run electricity, water and sanitation projects under concessions in several large cities or regions (wilayas).
- There are no special tax benefits or other fiscal incentives on the earnings from the sale of emission reduction certificates (CERs) or other aspects of CDM projects.

Technological and other

- There is limited local technical expertise in developing the CDM aspect of projects and guiding it throughout the CDM project cycle. This makes technical assistance a critical factor, especially in regard too medium-size projects developed by medium enterprises.
- There is limited awareness of the Greenhouse effect, the Kyoto Mechanisms and the economic benefits that can ensue from CDM for one's own company, especially among small and medium enterprises.
- The absence of natural gas availability precludes several types of CDM projects (fuel swap, higher combustion efficiencies).

5.7 SWOT Analysis

The following SWOT analysis summarises the main points of the foregoing analysis.

Table 5.2: SWOT Analysis for CDM in Morocco

Strengths	Weaknesses
• Early start and sensitisation of state authorities • Good organisation, with competent and supportive DNA • Local organisations, associations, NGOs etc. exhibit interest in CDM projects • Trained and active local consultants in many sectors related to CDM • Substantial potential in several sectors • Abundance of financing sources for CDM • No electricity subsidies; electricity prices are high enough to promote RES projects	• Legislation in electricity does not allow full private sector involvement • Subsidies of butane and other fuels distort market and delay energy efficiency projects • No concrete strategy in transport sector • Lack of concrete energy efficiency / RES policies with incentives and measures • Uncertainties in the forestry sector • Unilateral CDM approach by large companies may discourage foreign investors • Limited access of SMEs to local or foreign financing facilities • A large part of CDM projects are too small to benefit from IFI funding • No involvement of local banks in specific CDM financing facilities.
Opportunities	**Threats**
• Interest by many local groups, organisations and consultants, who can promote projects • Interest by foreign and international organisations • Grants and credits available by IFIs and bilateral organisations • Additional training, awareness and technical assistance to be provided by new UNDP • Opportunities for renewable projects created through recent changes to electricity law • Experience and knowledge created by already registered projects can be exploited • New possibilities in waste management, after recent appointment of a unique interlocutor • Manifested Government interest in energy strategy	• Eventually closing the window of opportunity by the UNFCCC EB, by applying stricter criteria for registration • Uncertainty of the future of CDM, beyond 2012 • Long and complex CDM project cycle discourages some investors / promoters • Substantial CDM costs and risk of no success discourages some investrors / promoters • Awareness of CDM benefits does not reach all potentially interested parties.

6. Tunisia

6.1 Existing and Upcoming CDM-related Policies

Tunisia signed the United Nations Framework Convention on Climate Change as of its adoption in 1992 and ratified it in July 1993. Tunisia adhered to the Kyoto Protocol in June 2002.

Before the UNFCCC came into force, Tunisia had initiated an environmental and energy policy based on the ecologically rational management of waste, the energy management, the promotion of renewable energies and the development of the vegetable and forest cover. In particular, since the UNFCCC ratification, Tunisia performed the following actions:

- Publication of the first national communication in November 2001;
- The carrying out of the national inventory of the GHG emissions of all sectors for the years 1994 and 1997
- The carrying out of the national inventory of the GHG emissions of the energy sector for the year 2000;
- The evaluation of the attenuation potentials of the GHG emissions in the fields of energy, agriculture, forests, waste and climate change effects on soil;
- The carrying out of studies of vulnerability and adaptation to the unfavourable effects of the climatic changes.

In 2002, within the framework of UNDP-GEF project of reinforcement of the capacities of the Maghreb countries in the field of the climate changes, Tunisia submitted a report regarding its future environmental strategies. The document aims at developing 8 energy axes namely (I) Cogeneration, (II) Energy Service Companies (ESCOs), (III) Wind Power (IV) Biogas, (V) Solar Heating Systems, (VI) Transport Flow Streamlining by Setting up Freight Centers (VII) Energy Efficiency in Public Lighting and (VIII) Promotion of Low Consumption Lamps.

In 2003, Tunisia presented 47 GHG emissions attenuation options: 33 related to the energy sector (primary energy demand accounts for 92% of the GHG emission), 4 to the agricultural sector, 6 to the forestry sector and 4 to waste management. The total emission reduction potential of all these projects, over the period 2002-2020, amounts to 240 Mton of CO_2-eq.

In 2004, the National Agency of Renewable Energies (ANER – ex-ANME) set up the Information Center on Sustainable Energy and Environment (CIEDE) to implement the relevant national commitments, namely: promotion, education, training and information.

Tunisia has set itself ambitious goals for the future. By 2011, it plans to have projects underway to save altogether 12,7 million tonnes of carbon dioxide equivalent (CO_2-eq), of which 5,4 million tonnes in the energy sector alone and 5,6 million tonnes in waste management. Additional reductions of 16,9 million tonnes of CO_2-eq are planned for the period 2012 to 2016. A strategy devised in 2005 to establish the mechanisms for initiating and approving CDM projects at national level is being implemented as of 2006. From 2006 to 2011, the Tunisian CDM strategy envisages the development of numerous CDM projects, at a target rate of at least 20 projects a year.

6.2 Institutional setting for CDM projects' hosting

Founded by ministerial decision on 24 December 2004, the Tunisian DNA was registered at the UNFCCC in early 2005. The DNA's permanent secretariat is located in the Directorate General for the Environment and Quality of Life in the Tunisian Ministry of Environment and Sustainable Development (Ministère de l'Environnement et du Développement Durable). On its foundation, a committee was appointed as a decision-making body initially made up of representatives of six ministries and ANME and then enlarged to 15 members in December 2005 with other representatives from three ministries, important state-owned enterprises, the industrial association UTICA, the association for agriculture and fishery,UTAP and the central bank also joining. The DNA, whose status so far has been based on an administrative act, will soon be "legalized" by ministerial decree or even a vote of parliament.

The structure of the DNA in Tunisia is as follows:

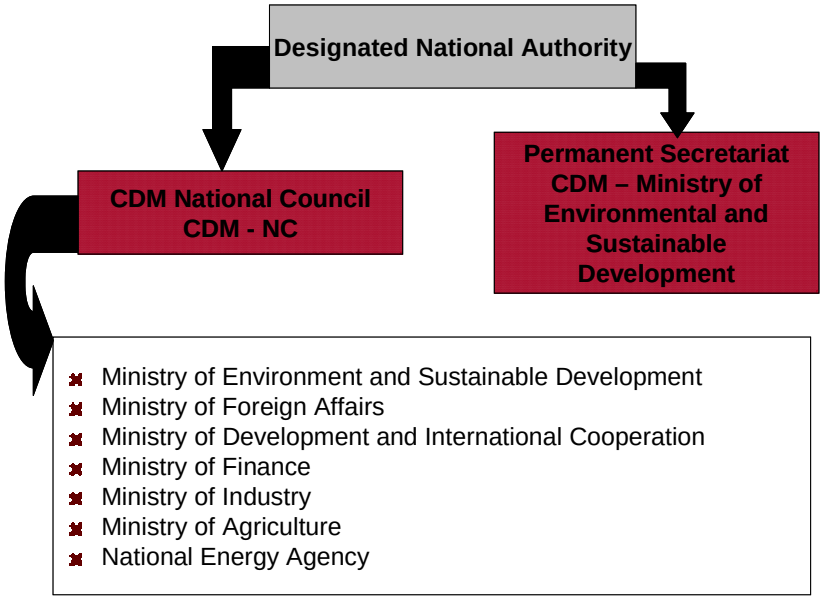


Figure 6.1: The structure of the Tunisian DNA

In mid-2006, the statutes for the DNA and standing orders for the decision committee were drawn up, stipulating the competencies of the individual committee members and the approval procedure for CDM projects. Here the time frame was also set for provisional project approvals based on PINs (two to three weeks) and for final national approval based on PDDs (four weeks). These standing orders have up to now, however, neither taken effect nor been published.

The criteria now drafted for assessing sustainability pertain to various indicators on economic, social and environmental performance and the strategic role of projects. It is unlikely that these were consistently applied when selecting the two landfill gas projects presently registered.

So far, information on the approval procedure for project developers and certificate buyers has only been provided in individual cases and is not generally available.

It seems that more involvement can be achieved in the projects identification and promotion. The DNA plans to define a strategy for the CDM implementation promotion in Tunisia. Moreover, the Tunisian DNA proposes to be the referent contact regarding any action or involvement of international and national CDM stakeholders.

In addition, Tunisia concluded various MoU (Memoranda Of Understanding) in partnership with at least 6 bilateral agencies from various countries (Italy, Spain, the Netherlands, Germany, Austria, Canada) to promote and develop CDM projects.

Moreover, the World Bank has been involved in CDM in Tunisia since the setting up of the Carbon Fund in 2003. The WB participates in projects identification and financing in exchange for CERs. That is the case for the two CDM projects currently registered by the Executive Board which deal with methane flaring system installation in landfill sites.

6.3 CDM Potential by Sector

The GHG inventory updated in 1997 revealed that the total gross emissions add up to 32 Mt of CO_2-eq, of which 53% are due to the energy sector. A large part of the CDM potential corresponds to renewable energies, in particular:

- Wind energy with at least 1.800 MW technical potential, representing about 3 Mt of CO_2-eq per year.
- Solar thermal energy with 325.000 m^2 solar panels to install over the period 2007 - 2011, representing about 0,57 Mt of CO_2-eq per year. A second funding credit line would enable an additional 350.000 m^2 installation over the period 2012 - 2016.

In addition, a significant part of the workable CDM potential can be tapped through a

number of proposed projects, listed below:

- Three sizeable forestry projects. The investments are 7,8 M€, 12,5 M€ and 21,1 M€ corresponding to respectively 114.000 tones eq CO_2/year, 150.000 tones eq CO_2/year and 350.000 tones eq CO_2/year.
- Various actions related to energy efficiency and/or cogeneration in the main Tunisian industries, particularly in the cement, ceramic and glass factories. The real potential will be precisely defined through extensive and targeted energy audits.
- Electricity generation from biogas stemming from Djebel Chekir land fill site and sewage treatment plants (4 projects accruing 460.000 tonnes eq CO2/year).
- One project (already funded) related to energy efficiency on street public lighting. The potential of CERs would amount to 74.000, tones eq CO_2 per year.

The identified potential per sector is discussed in the following paragraphs.

Industrial & Services Sector

The Industrial & Services sector is the major consumer, using in 2004 approximately ~28% of the total final energy consumption (IEA). The share of oil, gas and electricity consumed in this sector are 41,6%, 33,7% and 24,7% respectively.

Since there is no sufficient expertise identified in Tunisia, energy efficiency programs especially related to the furnaces but also cogeneration and wind energy should be taken into consideration carefully by specialized international consultancy firms.

In addition, the potential related to associated gas recovery from the oil production sites for electricity generation and gas reinjection has to be followed-up. But no descriptive document enabling its first assessment is available in Tunisia.

Cogeneration is with wind energy one of the most feasible CDM projects in Tunisia, especially given the short-term implementation targets set by the Government.

Tunisia has a ready market for foreign companies to design and implement changes in industrial processes that effect energy savings and reduce pollution.

Energy Sector

One of the main CDM potential lies on the renewable energy development and particularly wind energy, which represents 85% of this potential. The overall national outlook is presented below.

Table 6.1: Renewable energy potential

Field	unit	2010	2020	2030
Wind	MW	310	1.130	1.840
Solar thermal	m^2	280.000	950.000	2.500.000
Photovoltaic	MWc	3,5	8,5	18
Biogas	MW	30	50	80

***Source**: ANME*

Wind Energy

Tunisia has high wind energy potential with more than 1.800 MW. Wind power could be competitive compared with conventional power stations. For example, the private wind operator Ener Ciel has proposed a more competitive selling price than the STEG's (considering that the average STEG selling price in 2005 stands at 0,083 Dinar/kWh). But because of the monopolistic position of STEG, it hasn't been able to implement any project so far.

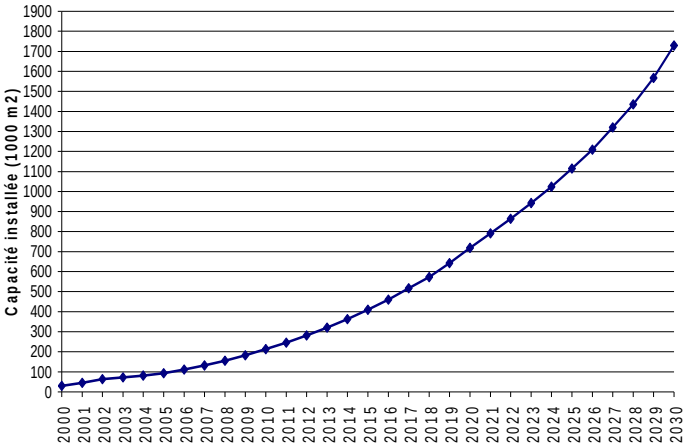
The overall wind energy outlook concerns on-shore and off-shore parks.

Solar Energy

The solar potential is high and could regard only grid connected application given the large extent of the grid. There is indeed no sizeable off-grid rural electrification application.

In addition, the glass company Technoverre plans to trade photovoltaic systems and low voltage bulbs. At a first stage, it plans to supply its factories with photovoltaic lighting. But this is still just an idea.

As solar thermal is quite new in Tunisia, the development potential is particularly promising, as shown on Figure 6.2, presented below:



Source: *ANME*

Figure 6.2: Solar thermal capacity outlook

Hydropower

The hydropower potential is very limited. STEG mentioned a dam with a 5 MW hydro power plant to be built by 2015 in Bab Melah Upstream (North-Eastern Tunisia). In addition, pumping/hydro turbines systems could be considered in the sewage treatment plants. But there is currently no project under development.

Waste Sector / Landfill Management

Municipalities collect over 1,2 million tons of household garbage annually. Problems with solid waste exist at the collection and disposal levels. The existing 66 dumpsites are uncontrolled and solid waste is not segregated before collection. Industrial and medical wastes are often disposed of with municipal refuse.

The solid waste sector is anticipated to be one of the most important areas for environmental intervention over the next 5 years. The Ministry of Environment and Land Use Planning established a national program for managing solid wastes. Under this program the Tunisian Government plans to build 29 controlled sanitary landfills, along with garbage sorting and transfer sites. This programme also calls for the cleanup of existing open landfills. The government is encouraging private funding for the management of these sites. Many municipalities have already moved to privatize trash collection services.

Djebel Chekir landfill site represents the unique future CDM potential, considering not only flaring outlet, but also electricity generaion, from landfills in Tunisia, as it concentrates 40% of the national domestic waste quantity.

Transport Sector

Tunisia requires engineering studies and equipment designed to save energy and increase urban transportation efficiency.

Other

The forestry potential is very substantial in Tunisia since three sizeable projects have already been proposed. It seems that the Department of Forestry is quite responsive and considers CDM as a good fund-raising opportunity to implement its afforestation/reforestation projects. This sector is crucial in Tunisia, considering the environmental issues and particularly the problems of water shortage and desertification.

6.4 Review of CDM Projects (Present Status)

Top priority projects must meet at least two of the following three criteria: (1) significant reduction of greenhouse gases; (2) recovery of most transaction costs through the sale of certificates; and/or (3) rapid implementation of the measures. They are located in:

- Waste management;
- Wind power;
- Cogeneration;
- Energy efficiency in large facilities;
- Fuel switching;
- Industrial process engineering;
- Oil and gas extraction (avoiding flaring).

The national plan is to initiate about 20 CDM projects by the end of 2006, in the first three sectors cited. PINs or PDDs have already been prepared for some projects, with finance still lacking. In the following two sectors, energy efficiency in large facilities and the substitution of oil with gas, about 20 measures were also being identified in 2006. Two to three projects are expected by the Tunisian Ministry of the Environment in industrial process technology.

A portfolio of 47 proposed CDM projects has been developed since 2003. It has to be noted that a large part (about ~ 60%) of the most workable Tunisian CDM potential lies on small scale projects. Various CDM portfolios of such projects are available but they are more a pool of project ideas rather than real workable projects. Therefore the top priority is now to make CDM projects a reality.

The following two projects have been registered by the Executive Board of UNFCCC

respectively on 6th October 2006 and on 23rd November 2006.

- Methane flaring system installation in the Djebel Chekir landfill site: 4,7 MteCO2 over a period of 10 years 2007 – 2016;
- Methane flaring system for 9 future bundled Landfill sites: 4,9 MteCO2 over a period of 10 years, from 2007 or 2008 onwards.

These two projects were proposed by ONAS (National Office of Cleansing) and benefit from a financial agreement with the World Bank, in exchange for 50% carbon credit.

3 more PINs have been approved by the Tunisian DNA:

- Energy efficiency with public lighting overhaul, proposed by Caisse des Prêts et de Soutien aux Collectivités Locales (CPSCL) and ANME (Financed by Spanish bilateral cooperation).
- Solar heating systems. Proposed by ANME. Funding is still not settled.
- 14 MW wind power in the cement factory CIOK. Proposed by CIOK industry. Funding is still not settled.

Industrial & Services Sector

Only a few project descriptions in energy efficiency are available. They concern about 6 energy-intensive industries, mainly in the ceramic, cement and glass factories, with most prominent among these the factories of the Groupe Chimique Tunisien in M'Dhilla, Sfax, Skhira and Gabes. In addition, a specific action, which would be a prerequisite for several CDM projects consists in connecting an industrial area to the STEG gas network.

Some energy efficiency and/or fuel switch projects exist but they are at an early stage.

The Forest Department of the Ministry of Agriculture put forward a project which aims at improving the charcoal supply chain and carbonization process. The size of this project is rather small for the EIB standards.

As regards cogeneration projects 4 PINs and 2 PDD drafts are already available for the following industries:

- SITEX
- SOTUBI
- Les Industries Alimentaires S.A. RANDA
- SOMOCER, Groupe Ab Corporation

In addition, an overall cogeneration project would concern at a first stage about 5 industries. The total capacity to install would be around 20 MW, the investment about 24

M€ and the carbon credits 32.000 TCO_{2eq} per year.

Because of the energy cost pressure, other cogeneration projects are under identification in the energy intensive industries, mainly cement, ceramic and glass factories.

In this framework, the key points of the projects identified by the consultant, Mr. Francois Carme, are described below.

- **3,8 MW cogeneration power plant in 4 food processing factories of "Mohsen Hachicha" group:**

  This project aims at the implementation of 4 cogeneration power plants in about 4 energy-intensive factories of the "Mohsen Hachicha" group for auto-consumption purpose. The power plants will use natural gas to cover the whole electricity demand of 4 factories of the "Mohsen Hachicha" group, namely 30 GWh.

  The estimated total project cost is approximately 5 million euros, while the emission reductions achieved for the project's crediting period are estimated at 140 000 tons of CO_2-eq.

- **14 MW wind power installation in the cement factory CIOK (Cimenterie Oum El Kelil)**

  This project aims at the implementation of at least 14 MW wind farm in the cement factory CIOK for auto-consumption purpose. The plan aims to cover up to 30 % of the electricity demand and substitute the electricity currently provided by the STEG through the national grid.

  The estimated total project cost is approximately 14 million euros, while the emission reductions achieved for the project's crediting period are estimated at 445 000 tons of CO_2-eq.

Energy Sector

The projects related to renewable energies concern mainly wind power and solar thermal systems.

Regarding wind energy, the current activities include:

- A 120 MW wind farm to be installed in 3 sites in Northern Tunisia through an international bid launched by the project promoter STEG;
- The private operator Ener Ciel (UPC Group) intends to set up 3 wind parks: 90 MW wind power installed in Zounkar area, 60 MW in Kechbata area and 120 MW in Sidi Abderrahmane area. These projects are pending, waiting for the Tunisian energy regulation to be clarified.
- A 14 MW wind project to be installed in the CIOK cement factory (stated owned industry) for auto-consumption purpose. The project, which was described above,

with the industrial projects, benefits from the technical assistance of ANME.

In addition to this, a potential is already identified in about 6 industries. But no PIN has been prepared yet. The key contact for these projects is ANME.

A 15 MW wind power project is under implementation by STEG with the support of the Spanish cooperation as an extension of the Sidi Daoud Wind Park.

Finally, an international call for proposal for 100 MW wind power launched by the World Bank and UNDP is pending, awaiting the energy regulation clarification.

One solar thermal project proposed by ANME is under development. It consists in the dissemination of 325.000 m^2 solar thermal systems to install through credit scheme in individual and collective residential buildings. This project aims at extending the previous pilot program called PROSOL, but at a larger scale: 325.000 m^2 solar panels to install over the period 2007-2011, while PROSOL's target was to install 68.000 m^2 from March 2005 to end 2006 (43.000 m^2 had already been installed up to August 2006). A second funding credit line over the period 2012–2016 could enable an additional 350.000 m^2 installation. It would involve the commercial banks, the suppliers and probably STEG for the implementation procedure, if it follows the same scheme like PROSOL program. This program is justified by the success of PROSOL and will enable the development of the local production and supply chain of solar thermal systems.

As regards energy efficiency projects, only one PIN is under development, which relates to procurement of 2 million low consumption bulbs for lighting.

One project related to energy efficiency on street public lighting through the installation of voltage regulator/variators is under identification. The investment is estimated at approximately 40 M€ (to be financed with Spanish funds). The potential of CERs would amount to 74.000 tCO_2-eq per year.

The key points of some projects identified by the consultant which could be interesting to the EIB are described below.

- **120 MW wind Farms in Tunisia**

  The project aims at reducing CO_2 emissions by displacing existing polluting generation by zero-emission renewable wind energy. This project will increase rated power from 53,5 MW to 173,5 MW, with the target of increasing the percentage of renewable in the country (only 3,83% currently), reducing the dependence on fossil fuel-fired power plants and contributing to the international effort of reducing GHG emissions.

  The estimated total project cost is approximately 140 million euros, while the emission reductions achieved for the project's crediting period are estimated at

200.000 tons of CO_2-eq/year.

Waste Sector / Landfill Management

The two main projects related to methane recovery and flaring have already been adopted by the WB and registered by the Executive Board in October and November 2006. These two projects regard the Djebel Chekir landfill site, which concentrates 40% of the national domestic waste quantity, and the 9 future municipal landfill sites. Both projects amount for 85% of the domestic waste potential. WB mentioned also the opportunity of electric biogas valorization from the landfill sites of Tozeur, Mehdia and Zaghouan through a bilateral funding.

Care will have to be taken as soon as ANGED envisages using the biogas from Djebel Chekir site for electricity generation. Although the baseline is going to be modified with the current CDM flaring projects, Djebel Chekir will still present a very interesting potential for electricity generation purposes. It seems that considering all existing and future dumps in Tunisia, a real environmental and economic interest to make the most of the Djebel Chekir biogas emissions exists illustration, in France, such a project (biogas valorization into electricity from domestic waste) is carefully taken into consideration from a waste treatment floor-capacity of 200.000 tons yearly. Djebel Chekir processes about 700.000 tons yearly.

In addition, ANGED plans to build 7 other small municipal landfill sites. The scale of such a bundled CDM project would be too small for EIB interest.

There is a plan of building a future industrial waste dump, which is not interesting regarding carbon credit output.

Beside this, ONAS (National Office of Cleansing) intends to make the most of the biogas produced from its sewage treatment plants. It envisages the setting up of power generator units for auto-consumption purpose. In addition, the site of Choutrana has already two power generators of 500 kW each using biogas produced from sewage sludge digestor. They cover 30% of the electricity demand of the treatment plant.

ONAS (National Office of Cleansing) has a series of 4 large projects of sewage treatment plants and electric valorization by anaerobic digestion. They concern:

- Sewage sludge of large Tunis area treatment plants;
- Sewage sludge of Sousse area treatment plants;
- Sewage sludge of Hammamet area treatment plants;
- Sewage sludge treatment plants which have a capacity above 10.000 m^3/day.

The key points of the project identified by the consultant are summarised below.

- **Electric valorization by anaerobic digestion from sewage sludge of large Tunis area treatment plants.**

  The particular waste project aims at generating an average of 500 m^3 of biogas at 70% methane per ton of sludge dry matter by anaerobic digestion technology from sewage sludge of large Tunis area treatment plants. The electric power plants will generate 2 kWh/m^3 of biogas, which will ensure the process of about 4.000 m^3/d of sludge with 70% organic matter.

  The estimated total project cost is approximately 32 million euros, while the emission reductions achieved for the project's crediting period are estimated from 180.000 to 230.000 tons of CO_2-eq/year.

Transport Sector

Various ideas related to transportation issues are identified but they are at a very early stage. Moreover, the CDM uncertainties are still very high and therefore no mature CDM project has been identified so far. However, three transportation ideas are mentioned:

- Fuel switch to NGV (Natural Gas for Vehicles) for bus fleet of Tunis area.
- Implementation of freight structures for lorries.
- Setting up of a fast railway network in the Greater Tunis area. This program would generate fuel savings of about 250.000 TEP per year which corresponds to 750.000 TCO_2-eq/year. This integrated program comprises five principal components:
  - Installation of a fast electric railway network, comprising five lines drawing 85 km accrued and serving the five main residential areas of Tunis;
  - Extension of the network of light subway;
  - Implementation of a bus network in protected site, ensuring a junction between railway, subway and bus stations;
  - Installation of peripheral stations for traffic streamlining;
  - Construction of dissuasion car parks for the individual vehicles.

The baseline should be defined, which is a tricky matter.

Other

Below are mentioned some data regarding promising CDM project ideas.

- Jatropha Development Project on irrigated area from sewage (in partnership with ONAS) is the most promising one with the biodiesel application outlet. But the technology and the market are still not mature in Tunisia. The biofuel output would amount to 30 M Litters per year. Cost of the project: 7,8 M€. Implementation duration before CER issuance: 4 years.

- Eucalyptus plantations project for charcoal production to be used in the iron manufactory of Bizerte is technically immediately feasible. Cost: 12,5 M€. Implementation duration: 3 years.

However, the project mainly worthy of EIB attention is briefly described below:

- **Afforestation/Reforestation and integrated development of forest vocation degraded lands**

  This reforestation and renewable energy project is oriented towards objectives of carbon sequestration from the atmosphere and contributes to the sustainable development of natural resources. The specific project aims at establishing a forest plantation covering 25.000 ha, agro-forestry plantations to the farmers and pastoral area reserves to habitual users of these fields.

  The estimated total project cost is approximately 22 million euros, while the emission reductions achieved for the project's crediting period are estimated at 3,5 millions tons CO_2.

6.5 Financing of CDM projects

There are several national, international and bilateral entities and funds that finance or are interested in financing the development of CDM in various contexts. The most important are discussed below:

- The World Bank is currently involved in the most workable CDM projects in exchange for carbon credits. It concerns particularly the two registered projects (biogas recovery and flaring from landfills) and N_2O abatement with the Groupe Chimique Tunisien.
- UNDP provides technical assistance and financial support for CDM costs. For example, they have been involved in the PDD drafting of the wind project of the cement factory CIOK. Furthermore, through an agreement with the World Bank, the *MDG Carbon Fund* has been set up to support financially CDM projects implementation.
- The GEF contributes to the UNDP.
- The International Bank for Reconstruction and Development (IBRD) is the managing company for the 2 registered biogas flaring projects. It is involved as the trustee of the Italian Carbon Fund (ICF).
- The Spanish Development Aid funded the 20 MW Sidi Daoud wind park operated by STEG. It is currently financing the extension of the park with an additional 15 MW.
- The Japan Bank for International Cooperation (JBIC).
- The AFD (French bilateral aid), which financed projects through the French FFEM and through technical assistance.

- The kfW is financing several projects such as 3 out of the 9 future landfill sites implementation (of which CDM component is under agreement with the WB).
- As mentioned above, Tunisia concluded various MoU (Memoranda Of Understanding) in partnership with at least 6 bilateral agencies (Italy, Spain, Netherlands, Germany, Austria, Canada) to promote and develop CDM projects.
- The private wind operator Enerciel could fund its own wind projects in case the regulatory framework makes them possible.
- The EC Delegation hasn't dealt with the Tunisian energy sector so far. The Delegation intends to identify the local needs in the energy field in order to provide mainly technical assistance.
- The GTZ (German bilateral aid) provides technical assistance and capacity building.
- ANME (Agence Nationale pour la Maîtrise de l'Energie) provides technical assistance in the energy sector and can play the role of coordinator of bundled projects.
- Ecosecurities, which is involved as a consultant (e.g. for the PDD drafts) and, potentially, as a financing organisation (carbon bank).

6.6 Barriers to CDM

As mentioned above, there is a series of financing institutions interested in investing on CDM projects in Egypt. In this framework, this chapter aims towards the identification of those political, financial and technological barriers, hampering the development of CDM projects.

Political – Regulatory

Until 1996, the national gas and electricity operator STEG had a monopoly over power production and still generates over 90% of Tunisia's power. The first independent power plant, a $261 million, 471 MW, combined cycle (natural gas and diesel-fired) power project went on-line at Rades in 2002. It is operated by a consortium comprised of U.S.-based PSEG (60%), and Japan's Marubeni (40%) on a 20-year BOOT basis. STEG provides the feedstock and buys the electricity, thus maintaining its monopoly over distribution and pricing. In July 2003, a 27 MW associated gas plant commenced commercial operations. It is operated by CME Energy and uses associated gas from the El Bibane, Zarzis oilfields. Previously, the gas was flared. In that way, Tunisia intended encouraging other projects in order to reach its goal of an installed capacity of 3.540 MW by 2006.

Nevertheless, it seems that meanwhile Tunisia has changed its policy, limiting the timid opening-up of the electricity production market. Except for a decree related to cogeneration, which guarantees an average tariff of 0,05 Dinar per kWh purchased by STEG (expected by the end 2006), there is no established regulation framework for IPP.

The tariff for auto-producer is settled under a case-by-case agreement. The tariff proposed by STEG is, at any case, much below the energy cost price. No incentive scheme for non-conventional energy sources through a preferential rate exists either. No procedure for technical connection requirements is available. The clarification of the regulation framework doesn't seem to be on the Government's agenda.

Moreover, Tunisia has no independent energy regulatory entity. In fact, it seems that STEG plays both roles: operator and energy regulator. The STEG management declares clearly to be opposed to the IPP integration, thus creating barriers for wind energy projects carried out by private developers.

Economic – Financial

Financial issues are not a specific constraint for the largest private industries such as the wind operator Ener Ciel or the Italian cement factory CAT Colacem. These companies belong to international holdings.

On the other hand, the public facilities or Tunisian companies need financial support, particularly for projects which are not run as business-as-usual or profitable activities, which is the case of CDM projects.

Paradoxically, it seems that the smaller the size of the project, the greater the financial need. This is the case for the energy efficiency programs or cogeneration projects that are implemented by Tunisian SME companies. A great part of the workable CDM potential concerns small scale projects run by SMEs, which account for 93% of the industrial base. The SMEs have limited financial and human resources available for CDM aspects.

At the same time, the Tunisian CDM context benefits from extensive support provided by numerous bilateral and multilateral institutions. The Tunisian government signed not less than 6 Memorandum Understanding to promote and develop CDM projects. The 2 most workable and advanced projects (biogas flaring from landfill sites) are already run under a financial agreement with WB in exchange for 50% of the carbon credits.

Technological and Other

Most of the CDM projects under identification do not face "hardware" technological barriers, except for the transportation/afforestation projects (e.g. biodiesel production from Jatropha plantation).

Technological barriers that a lot of CDM projects have to face in Tunisia are:

- The lack of knowledge regarding CDM activities. This concerns potential project

promoters as well as local consulting and financial auditing firms;

- The lack of knowledge regarding specific technological issues such as energy efficiency in the industrial sector;
- The technical complexity to bundle various small scale and scattered CDM projects. For example those run by SMEs, service sector (hotels, hamams) and public utilities (sewage treatment plants, municipal landfill sites);
- The organizational issues for specific projects, such as afforestation programs, which involve numerous stakeholders and which have to overcome land ownership hurdles;
- The lack of awareness and information access regarding Climate Change and CDM opportunities;
- The lack of local awareness and knowledge related to all energy efficiency measures and benefits;
- The limited local supply range for alternative energy opportunities, especially in the wind and photovoltaic fields;
- The lack of flexibility and responsiveness of the large public facilities. In general, these companies are quite compartmentalized with a traditional vertical management scheme.

6.7 SWOT Analysis

The following SWOT analysis summarizes the main points of the foregoing analysis.

Table 6.2: SWOT Analysis for CDM in Tunisia

Strengths	Weaknesses
• Abundance of financing sources and Technical support organizations for CDM: WB, GTZ, JBIC, AFD, Spanish cooperation, etc. • Abundance of renewable energies especially wind and solar. • Already existing various CDM project portfolios. • Significant momentum, as demonstrated by two recently registered projects. • No electricity subsidies; electricity prices are high to promote RES projects • Incentives in the field of energy efficiency, solar thermal and transportation. • Early start and sensitization of state authorities	• Uncertainties regarding energy regulation framework for IPP integration. • Low legitimacy and coordination skill of the DNA • Lack of dialogue or opposition between various stakeholders: STEG and IPP, Ministry of Environment and ANME, etc. • A large part of CDM projects are too small to benefit from IFI funding • Lack of tariff incentives for RE and cogeneration power plants connected to the grid • Limited potential for workable CDM projects • A large part of CDM potential lies in SMEs. SMEs have other priorities and limited resources and skills related to CDM issues. • Relatively small number of trained and active local consultants in many sectors related to CDM.
Opportunities	**Threats**
• Dynamism and availability of cooperation entities such as GTZ, UNDP, ANME for projects identification, training, technical assistance, coordination. • Strong involvement of ANME for CDM promotion. • Government interest in CDM as fund raising opportunity • Future opportunities for cogeneration projects through the next regulation clarification • Experience and knowledge created by the 2 registered projects can be exploited • Deficit of the energy balance in terms of fossil fuel could foster the development of renewable energies. • Willingness to implement forestry projects • Obligation for energy-intensive industries to carry out an energy audit. • Good potential for energy efficiency actions and cogeneration.	• No independent energy regulation entity • Uncertainties regarding the grid capacity to absorb wind energy. • Risk of overlap or competition between multilateral and bilateral cooperation facilities. E.g. Most of the main workable CDM projects (Landfills, N_2O abatement) are already supported by the WB in exchange for 50% carbon credits. • Technical and organizational complexity to bundle various small projects and scattered stakeholders. • Long period of projects implementation before CER issuance especially for forestry projects • Long and complex CDM project cycle discourages some investors / promoters, especially SMEs.

7. Project Results

7.1 Recommendations – General remarks

The CDM potential in the FEMIP region is still in its very initial stages of development. This applies not only to the scope for several types of small-scale projects, but also to larger programmes, which could span parts of the FEMIP region that transcend national borders and involve several countries. Such programmes would call for intensive and extensive cross-border or international cooperation, which would extend past the level of common conferences, seminars and workshops to the more practical tasks of harmonizing strategies on common problems, designing and implementing common programmes and projects, seeking financing jointly, exchanging information so that one country can learn from the others' experience, etc.

CDM potential seems to be particularly rich in a number of project sectors, notably fuel switch, energy efficiency improvement, solar and wind energy, and waste management. As is the case in most developing countries, exploitation of this CDM potential goes hand-in-hand with the accomplishment of other aims, such as increase of standard of living, fight against poverty, fight against desertification and environmental improvement.

Although the development of CDM in each FEMIP country relates to its particularities and specific traditions in matters such as public versus private initiatives, investment culture, investment institutions, cooperation with foreign organizations, etc., some common patterns emerge strongly. Thus, it can be stated quite generally that the main bottlenecks that hinder CDM development seem to be the lack of capacity and knowledge on the CDM as an investment option; the tradition of heavy fossil energy subsidies; the strong role of the state in domestic energy markets, which may slow down private initiatives; the insufficient level of practical government support for CDM-initiatives; and the difficulty of the funds and financing mechanisms to reach many of the entities that really need them, such as new entrepreneurs or SMEs.

In the following sections particular recommendations will be presented for the three countries that have been studied in detail, i.e. Egypt, Morocco and Tunisia. The fact that many of the recommendations appear to be the same underlines the similarity of the conditions and barriers. Nevertheless, the emphasis is often different in different countries.

7.2 Specific Recommendations for Egypt

The following policies / actions are recommended, in order to further encourage CDM:

- Provision of well targeted training to agencies, industries / companies / utilities (with significant potential) etc., in order to improve their in-house capabilities for the identification of attractive projects which could be implemented under the umbrella of CDM.
- In case of promising CDM projects, the provision of specialized Technical Assistance for the development of CDM project proposals (PINs, PDDs, etc.) will help local enterprises to afford CDM Project Cycle transaction costs.
- Encouraging the clustering of small scale projects into projects/programmes with a critical mass, in order to increase their attractiveness and to achieve economies of scale as regards the CDM transaction costs. In this framework, the financing of pilot activities will facilitate learning by doing and could achieve multiplying effects.
- Supporting with specialised technical assistance the concerned institutions, e.g. OEP, EEAA and other organizations working in these fields, is one of the recommended actions that will enable these institutions to play their role more efficiently.
- Provide financing with terms better than BaU commercial practice. (e.g. long pay back periods, low interest rates, soft loans etc.).
- Taking into account the limited time span that is left to initiate ‘new’ CDM projects, investors are advised not to overemphasize the possible contribution of CDM-credits to the overall projects’ feasibility.
- Preferential transactions for CDM projects, such as exemption from custom duties.
- Continuous adjustment of energy prices to reflect the real market costs will increase the competitiveness of RES and Energy Efficiency improvement projects.
- General subsidies of electricity and fuels, as a social policy practice, should be replaced by specific subsidies for the alleviation of poor people, who would be identified by a selective targeting method.

7.3 Specific Recommendations for Morocco

The following policies / actions are recommended, in order to further encourage CDM:

- Further progress towards liberalization of the electricity sector;

- Adoption of national strategies in different CDM sectors (renewables, energy efficiency, agro-forestry, waste management, transport) and implementation of those strategies with specific measures and incentives;
- Further information and awareness campaigns, targeted partly at SMEs but also at civil society at large;
- Investigation of possible ways to formulate CDM projects by clustering similar interventions in several SMEs;
- Further training and capacity development, encompassing also important CDM fields where there is presently little or no experience, such as forestation and methane sequestration projects;
- Provision of risk management facilities for CDM project development;
- Provision of financing through grants and/or credits for technical assistance for CDM development (entire project cycle), possibly coupling it to project financing;
- Making special financing for CDM projects available to medium enterprises – and for medium size projects – through local banks and other small financial institutions;
- Providing funds for CDM financing that are flexible and respond to the projects' particular needs.

7.4 Specific Recommendations for Tunisia

The following policies / actions are recommended, in order to further encourage CDM:

- Improvement of the energy regulatory framework, through the set-up of a really independent regulatory entity, the effective opening-up of the energy market to IPPs and the application of a clear regulatory framework for grid connection procedure, tariffs, etc.;
- Economic and financial measures, such as:
  - Incentive scheme, with a preferential rate for renewable energy systems connected to the grid;
  - Support of non profitable activities such as specific environmental and energy actions in public utilities or SMEs;
  - Specific support focused on small size projects (<5 M€), which represent a great CDM potential.
- Technological measures:
  - Continuous and extensive capacity building in CDM issues and feasibility studies;
  - Long term support for project implementation (tools and methods) to enhance the organizational capabilities;

- Detailed grid assessment for wind projects including reinforcement options and dispatching overhaul opportunities.

7.5 Difficulties Encountered during Project Identification

Egypt

One of the most important difficulties encountered during the period of the project proposals identification has been the limited background knowledge of the local energy market players on conceptual CDM rules, procedures and modalities. This lack of knowledge usually makes the communication difficult and in combination with the sometimes very poor English communication skills drives to misconceptions.

Another obstacle is the strictly vertical hierarchical & centralized management of almost all the large companies / utilities in Egypt which has an aversive effect to the medium level managerial personnel who could bring new ideas to the company for carbon financing, CDM implementation etc. This is mainly attributed to the fact that there are limited or no incentives for the medium managerial personnel of Utilities/ Large Industries to be involved in the CDM market. This parameter complicated the Consultant's communication with the local stakeholders, because although several meetings had been arranged and implemented with the top management of utilities/large companies, it has been proved difficult to collect on time accurate and well structured information on potential CDM projects from medium level managers.

Another important difficulty in identifying attractive project proposals was the fact that the majority of projects proposed by SMEs do not have the critical mass required in order to be attractive for IFIs. This resulted in the identification of the project proposals with the most promising CO_2 – eq reduction potential.

Moreover, the limited offer of good CDM project proposals results to high competition on the demand side, making hard for the interested IFIs to identify and contract the interesting project proposals with satisfactory financial terms. This is aggravated by the uncertainties of the CDM market and the existing asymmetry of information on CDM projects, opportunities, CER prices, associated risks, financing products, programmes etc.

As already mentioned, the language obstacle was an inhibiting parameter. The locals' communication skills in the English language are in some cases rather poor. Therefore, even when the meetings were realized, it was quite difficult to have a proper communication. The communication in Arabic could definitely increase the understanding

and facilitate the collection of information by the medium level personnel usually involved in such assignments.

Morocco

One of the difficulties that the expert was faced from the early beginning of his missions was the limited ability of the Moroccan DNA to support him in the interesting project proposals' identification. A great number of projects was identified through communication directly with project promoters from interested facilities. Moreover, quite often was the phenomenon of addressing to the DNA for a project's particular PIN, which the DNA couldn't provide for. The main reason accounting for these difficulties is the lack of capacity building, as some sections of the DNA are seriously understaffed.

Another inhibiting factor is the language barrier. Not only are the local stakeholders' communication abilities in the English language rather poor, but also all the relevant documents regarding a project idea are developed only in French, increasing in this way the difficulty level of identifying interesting CDM projects.

This barrier comes to enhance the difficulties deriving from the lack of knowledge observed among several stakeholders regarding the CDM organisational procedures.

Tunisia

One of the difficulties encountered involved the fact that the first mission in Tunisia had to take place during the low period of activity. This was mainly due to the change of the focus country from Lebanon to Tunisia, because of the upheaval occurred in Lebanon in July 2006. This reschedule entailed some difficulties to organize the meetings, because August is a low period in Tunisia. Although the expert started getting in touch since July, all stakeholders were not available or available only at the last moment. At the same time, the planning of the survey required the conduction of the first mission the soonest possible, i.e. before September 2006.

Another difficulty was the limited experience of the Tunisian DNA. It seems that the Tunisian Ministry of Environment (Which represents the permanent secretariat of the DNA) has still a very limited legitimacy and coordination skill. This gap was particularly obvious on the occasion of the organization of the workshop in Cairo. Various Tunisian stakeholders confirmed this appraisal as well. Furthermore, according to some of the stakeholders, the Ministry of Environment is in soft conflict with ANME (Agence Nationale pour la Maîtrise de l'Energie), one of the main Tunisian CDM Stakeholders that plays a very active role for CDM promotion. As a result, the Consultant had to conduct the survey

without the sound support of the DNA.

The lack of track records regarding CDM issues in Tunisia is a very inhibiting issue. Few actors in Tunisia are fully conversant with CDM matter. That means that the Consultant had to build his own list of potential CDM stakeholders (for example, by contacting the Industrial Promotion Agency) and to make his analysis by crosschecking and aggregating the various positions and points of view.

Another difficulty in the project identification procedure was the complexity of some institutions. A number of major national companies or institutions such as STEG, as well as some ministries, are quite compartmentalized with a traditional and vertical management scheme. They lack flexibility and responsiveness. For example, it is very difficult to identify the right person and afterwards to establish communication.

Finally, it was observed that a number of institutions without a fund raising problem, such as ANME and STEG, were not as enthusiastic as someone would anticipate, with the perspective of presenting a project idea to EIB.

7.6 Particular Recommendations to the EIB

As there are several funds on the market, and often technical assistance is provided through grants, the EIB can enter the CDM financing market by providing any of the following:

- Project financing on conditions that are at least as good as the currently existing ones (in terms of interest rate, percentage of debt finance, payout time, etc.);
- Accessibility to cheap financing for medium size projects and medium enterprises
- Flexible financing products, responding to the needs of the project (combining technical assistance, risk management and project finance; in local currency, etc.)

In most FEMIP countries, a wide range of CDM support and financing facilities and programs exist, from multilateral, bilateral and (to a limited extent) national institutions, each with its own terms, specific focus and priorities. It would be thus helpful for the EIB to provide clear information to all interested parties about the range of its financing facilities as well as its support and financing conditions. Such information would allow the prospective investors to select the most appropriate financing instruments for their needs and/or combine different instruments for optimum results.

In addition, to improve its understanding of the market and its contact with existing and potential market players, the EIB should establish itself more firmly in each country that it declares to be of interest, by:

- undertaking direct contact with interested investors;
- undertaking direct contact with local or foreign finance organizations, to shape common funds that respond to the needs of the market at large or specific market segments that the EIB may wish to target.
- undertaking contact with the UNEP-UNDP project, so that the information campaigns to be run in the near future include information about the EIB financing possibilities;
- organizing national or multi-national events in several countries of the region (for example workshops in Morocco and Tunisia similar to the one organized in Egypt), to provide further information and promote its financing facilities to all potentially interested parties.

Technical Assistance needs that should be covered to boost CDM include the following:

- CDM methodologies and CER market issues: development of baseline, PDD elaboration, CER negotiation process, CER exchange and brokerage systems, CER contract types, etc.
- CDM opportunities related to industrial processes such as cogeneration, chemical production process (e.g. for N_2O emission abatement), energy efficiency (in a specific factory component such as furnaces)
- CDM and forestry.
- Solar thermal for electricity generation.

7.7 Dissemination Activities

The regional Workshop “CDM in the Mediterranean Region: Progress, Issues, Financing Opportunities” was organised within the framework of the study.

Its main aim was to demonstrate and discuss CDM opportunities and attractive CDM project proposals, to present EIB’s activities in the FEMIP region, as well as to foster mutual trust and encourage the cooperation between investors and local actors.

Preparation of the workshop relied largely upon the experts’ missions to the three case study countries. A basic aim of these missions, apart from identifying promising CDM project proposals, was to establish an informal network of contacts with authority or high expertise on CDM related issues. The consultant’s intention was to develop an Early

Warning System, where all important national and international actors for CDM development and promotion of CDM projects would be incorporated. It should be noted that the key contacts from all three case study countries were invited to the workshop.

The workshop took place in Cairo, Egypt, on the 19th of November 2006. It was attended by representatives of a well targeted group, comprising potential investors and potential partners from Egypt, Morocco and Tunisia, the three countries that were selected as pilots for the study.

In addition, many important delegates of international organizations and institutions as well as key local energy actors with vast experience in climate change issues participated in the workshop and enhanced, with their views, the audience's understanding in these fields. More specifically, the workshop brought together potential investors from the EU and local CDM stakeholders in the potential CDM host countries in the Mediterranean, in order to explore the challenges and opportunities of the emerging climate change market. We believe that the workshop has thus made a contribution to the quick maturity of the CDM concept in the region.

Moreover, the workshop examined the current status and the medium-term prospects of CDM in the Mediterranean region, and, in particular, the progress achieved so far, the prerequisites for further progress and, especially, the relevant financing mechanisms. The focus was, of course, on Egypt, Morocco and Tunisia.

Following the participants' intense interest on the workshop's outputs, a website (http://eib-workshop.epu.ntua.gr) with material from the event was developed.

FEMIP for the Mediterranean

European Investment Bank

Facility for Euro-Mediterranean Investment and Partnership

The Study of CDM Project Identification in FEMIP countries aimed to:

- investigate the possibilities for carbon finance and crediting activities in the Mediterranean region, identify priority sectors and make relevant recommendations;
- build a pipeline of concrete CDM projects or project concepts that the EIB could help finance in the years to come;
- promote closer communication between the EIB and local CDM actors. The study focused mainly in Egypt, Morocco and Tunisia, which were selected as priority countries, in terms of their potential for CDM projects.

The third aim was accomplished through:

- a regional workshop, with participation from the three priority countries; this workshop took place in Cairo on 19 November 2006;
- recommendations for an Early Warning System that would be used by the EIB to identify CDM projects in their conception / design phase as well as technical assistance needs to be covered.

This Executive Study to the Final Report of the study summarises the findings and the recommendations of the study which are presented in detail in the report.

Press contacts and general information

Anne-Cécile Auguin
(+352) 43 79 - 83330
(+352) 43 79 - 61000
a.auguin@eib.org

European Investment Bank
98 -100, boulevard Konrad Adenauer
L-2950 Luxembourg
(+352) 43 79 – 1
(+352) 43 77 04
www.eib.org/femip – info@eib.org