

## **CDM in MENA countries: Strengths, Weaknesses & Opportunities**

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### **Abstract:**

The development of Renewable Energy Sources (RES) and Energy Efficient Technologies (EET) is a central aim of the world energy policy in order to contribute in reducing greenhouse gas emissions. The Clean Development Mechanism (CDM) is one of the three market-based mechanisms of the Kyoto Protocol that Annex I 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. The majority of the Middle East and North Africa (MENA) countries possess substantial potential for the implementation of CDM projects. Abatement of GHG emissions can mainly be achieved through utilizing the abundant renewable energy sources in the region and the implementation of energy efficiency measures. However, with few exceptions, the majority of MENA countries have a limited track record with registration of CDM projects in comparison to the major CDM-players, like Latin America and the Asia-Pacific regions. In this framework, this paper will present the current status of CDM in the MENA region and the existing financing opportunities. It is widely recognized that the various types of CDM projects result in differences in their risk profile, and therefore in the quality of the Certified Emission Reductions (CERs) generated. In this regards, the alternative ways in which CERs are created bilaterally, multilaterally or unilaterally, via programmatic/ sectoral or individual approaches, will be also presented depending on the project scale.

**Keywords:** CDM, MENA countries, RES/ RUE Potential, Financing opportunities

## **1. Introduction**

Climate change has emerged as one of the greatest threats to the planet and the combat against it is becoming one of the top priorities of the European Union (EU), the national governments and international organisations. A major step to the efficient and cost-effective fight against climate change was achieved in Kyoto in 1997 through the introduction of the Kyoto Protocol and the establishment of its three Flexibility Mechanisms: Joint Implementation (JI), Clean Development Mechanism (CDM) and Emission Trading (ET). A second very important step was taken with the ratification of the Kyoto Protocol by Russia and its entry into force on February 16<sup>th</sup> 2005.

Also important is the approval of the “linking directive” and consequently, the EU - Emission Trading Scheme (EU-ETS), which is the first in the world that recognises carbon credits of the CDM (from 2005) and JI (from 2008) as equivalent to EU Allowances and allows them to be traded under the scheme. Especially as concerns the CDM, the European Commission has clearly shown its willingness to directly use the CDM for the cost-effectively emission reduction [1].

The majority of the countries in the Middle East and North Africa (MENA) region possess an extensive potential to abate Greenhouse Gas (GHG) emissions by utilising Renewable Energy Sources (RES) and especially wind and solar energy. Moreover, nowadays, the increase of energy consumption in the region is, to a certain extent, an inevitable outcome of social and economic development [2]. Thus, the use of RES systems to reduce the energy cost in the final demand sectors and generally the promotion of Rational Use of Energy (RUE) are not only important, but urgent as well, in order to improve the security of energy supply by reducing dependence on fossil fuels [3].

In order to be able to identify potential CDM projects and to formulate a series of possible investment strategies with a CDM component, it is crucial to establish clear understanding of what the potential effects of CDM-related (procedural) issues such as validation and verification, as well as project development are [4].

The CDM, one of the three market-based mechanisms of the Kyoto Protocol, provides Annex 1 Parties with the opportunity to use it 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 [5].

In order to generate CERs, project initiators/investors/developers are expected to go through the 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.

Taking into account that 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 [6]. 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 different risk profiles, and therefore in the quality of the CERs generated. Thus, the main approaches through which CERs are created are Bilateral CDM, Multilateral CDM, Unilateral CDM and Programmatic CDM [7].

The paper is structured along the following sections:

1. Section 2 describes the present status of the MENA countries as regards their institutional setting for hosting CDM activities. Moreover, there is an overview of the current projects hosted in the region.
2. Section 3 describes the overall potential of the MENA region for hosting CDM projects broken down in the related sectors.
3. Section 4 deals with the financing of CDM projects explaining the schemes available categorized by their scale.

## **2. Review of CDM Projects (Present Status)**

Currently the CDM pipeline is filled with over 1.300 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 [8].

Figure 2.1 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 2.2) over the various project types, CER revenues do not match one-to-one with CDM project activities. For instance, HFC and N<sub>2</sub>O 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<sub>2</sub>O GHGs [9].

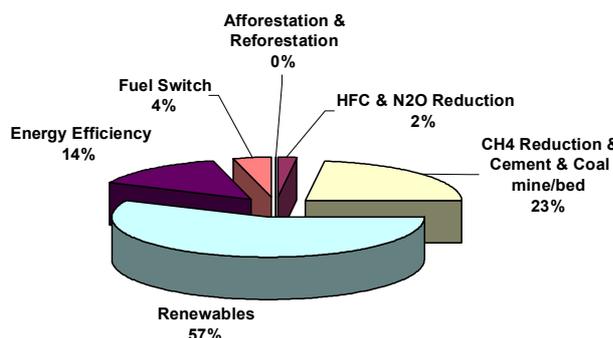
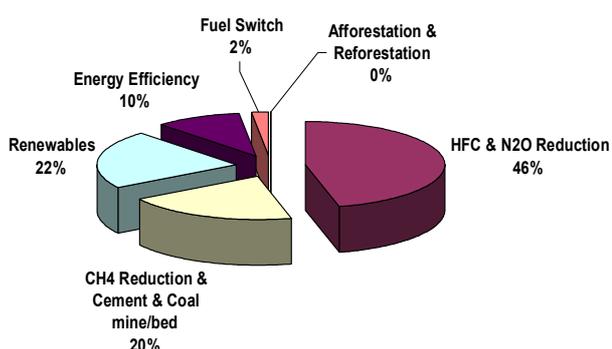


Figure 2.1: CDM project type distribution



Source: UNEP RISO, 2006

Figure 2.2: 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 2.1 below it can be seen that the North African and Middle-East as well as the Sub-Saharan regions are relatively underdeveloped CDM-host regions [8] [9].

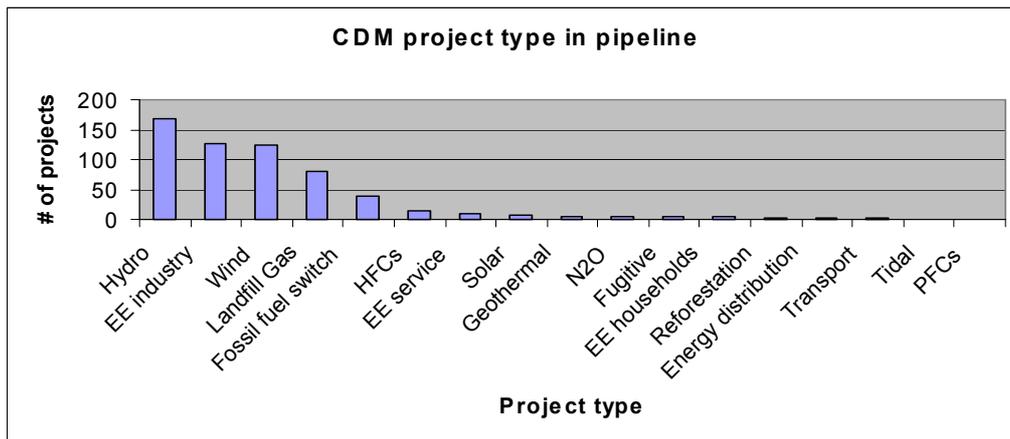
Table 2.1.: Regional distribution of CDM activity

Total in the CDM Pipeline	Number (2006)		2012 kCERs	
	Number	Percentage	Number	Percentage
Latin America	472	35,6%	302.716	21,3%
Asia & Pacific DC	800	60,4%	1.012.325	71,1%
Europe and Central Asia	16	1,2%	4.667	0,3%
Sub-Sahara Africa	21	1,6%	74.319	5,2%
North Africa & Middle-East	15	1,2%	29.440	2,1%
World	1324	100,0%	1.137.340	100,0%

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 Designated National Authorities (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.

In Figure 2.3 is depicted the type of projects that have proven to be relatively successful in CDM activity worldwide. The overview provided in this figure may also be of some interest for the MENA area, insofar as it suggests ongoing CDM-activity in actual practice. The Figure shows

that the most ‘popular’ projects (sectors) for investment, according to the CDM-pipeline, are: hydroelectricity, 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. 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 MENA area [9].



Source: UNEP RISO, 2006

Figure 2.3: CDM project type in pipeline Worldwide.

A very important aspect in the discussion regarding 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-investments to the end of the first commitment period. This time-constraint is even 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 a project’s PDD, the project then still needs to be validated and registered, which approximately takes 7 months. 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 stretch the length of the overall CDM-project cycle [10].

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 tertiary sector buildings (commercial, public, household) 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, thus the need for project clustering for the sake of reducing transaction costs is required much less [11].

In order to be able to register new CDM projects and generate credits for as many years as possible until 2012, 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 be 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 MENA region, not to overemphasize the possible contribution of CDM-credits to the overall projects' feasibility [8].

Limited CDM project activities are currently taking place (or are in the formal CDM pipeline) in the MENA region. Table 2.2 is compiled in order to establish a clear overview of the institutional structure in the MENA countries with desire 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.

Table 2.2.: MENA country KP status and apposite DNA

	<b>KP status</b> <i>Ratification (R)</i> <i>Acceptance (At)</i> <i>Accession (Ac)</i> <i>Approval (Ap)</i>	<b>Entry into force</b>	<b>DNA</b>
<b>Algeria</b>	16/02/05 (Ac)	17/05/05	Développement durable et des Affaires scientifiques et culturelles
<b>Bahrain</b>	31/01/06 (Ac)	01/05/06	General Directorate of Environment & Wildlife Protection
<b>Djinouti</b>	12/03/02 (Ac)	16/02/05	Direction de l'Aménagement du Territoire et de l'Environnement (DATE)
<b>Egypt</b>	12/01/05 (R)	12/04/05	Environmental Affairs Agency (EEAA)
<b>Palestinian Authority Gaza/West Bank</b>	-	-	-
<b>Iran</b>	22/08/05 (Ac)	20/11/05	Department of the Environment
<b>Iraq</b>	-	-	-
<b>Jordan</b>	17/01/03 (Ac)	16/02/05	Ministry of the Environment
<b>Kuwait</b>	11/03/05 (Ac)	09/06/05	Environment Public Authority

			(EPA)
<b>Lebanon</b>	13/11/06 (Ac)	11/02/07	Ministry of the Environment
<b>Libya</b>	24/08/06 (Ac)	22/11/06	-
<b>Morocco</b>	25/01/02 (Ac)	16/02/05	Ministry of the Environment
<b>Oman</b>	19/01/05 (Ac)	19/04/05	-
<b>Qatar</b>	11/01/05 (Ac)	11/04/05	Ministry of Energy & Industry
<b>Syrian Arab Rep.</b>	27/01/06 (Ac)	27/04/06	Ministry of the Environment
<b>Tunisia</b>	22/01/03 (Ac)	16/02/05	Ministry of the Environment
<b>Unite Arab Emirates</b>	26/01/05 (Ac)	26/04/05	Environment Agency
<b>Yemen</b>	15/09/04 (Ac)	16/02/05	Environment Protection Authority

The former precondition is (still) not yet fulfilled in: Palestinian Authority (Gaza/West Bank) and Iraq; 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 [8].

Though the KP is into force in most of the MENA countries, few (in particular only Egypt, Morocco, Qatar and Tunisia) have by now registered CDM projects and present some activity. Table 2.3 summarizes the current CDM project status in those countries [9].

*Table 2.3.: MENA region's CDM activity*

	<b>Registered</b>	<b>Under Validation</b>
<b>Egypt</b>	2 (review requested for another 2)	3
<b>Morocco</b>	3	3
<b>Qatar</b>	1	0
<b>Tunisia</b>	2	
<b>The following countries do not yet have any CDM project activity: Algeria, Bahrain, Djibouti, Palestinian Authority, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya Oman, Syrian Arab Rep., United Arab Emirates and Yemen.</b>		

### 3. Potential

Since every country has its own policy, industry, energy system, overall socio-economic structure and physical conditions, country statistics and characteristics are indispensable in order to be 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. The potential by sector can be categorized in the following sectors:

- Fuel switch and energy efficiency in power production
- Fuel switch and energy efficiency in industry
- Energy efficiency households/service potential
- Wind
- Solar (thermal and PV)
- Hydroelectricity
- Reforestation / biomass / agriculture
- Geothermal (conventional)
- Ocean energy (tidal and wave)
- GHG abatement
- Transport

### ***3.1 Fuel switch and energy efficiency in power production***

In some MENA countries there is significant potential for co-firing of biomass and fuel switch; however clean coal technologies might also be considered. Oil to natural gas (NG) fuel switch potential is especially high, particularly in the NG producing countries and those that have access through pipeline. For example, Tunisia, which has relatively few hydrocarbon resources but already have a natural gas grid connection, could upscale their share of natural gas in power generation or heavy industries at rather short notice [12].

### ***3.2 Fuel switch and energy efficiency in industry***

Significant potential for fuel switch in industry within most countries of the MENA region exists. 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 and large industrial energy consuming facilities are all in need of upgrading. 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<sub>2</sub>O emission reduction in fertilizer production, or measures with respect to emission reduction of HFCs, PFCs and CH<sub>4</sub> (e.g. landfill gas and fugitive emissions) [12].

For the major oil and gas producers in the region, it might prove to be interesting in the medium or long term to implement carbon capture and storage (CCS) activities, initially for Enhanced Oil

Recovery (EOR) purposes and possibly later for permanent storage in empty oil and gas fields. In the older hydrocarbon production basins EOR activities based on CO<sub>2</sub>-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.

The process upgrading and co-generation can yield significant financial and environmental benefits. 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 MENA region especially, in countries with a large industrial sector. Upgrading programs for refineries and transmission grids have already been initiated within the region.

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 [13].

### ***3.3 Energy efficiency households/service potential***

For this category the energy efficiency potential is especially high 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 only four CDM projects in the pipeline, this category is relatively immature. This may have to do with the individual project scale and the 'competition' with other financial support schemes for housing/building/construction initiatives, such as the ones from development aid.

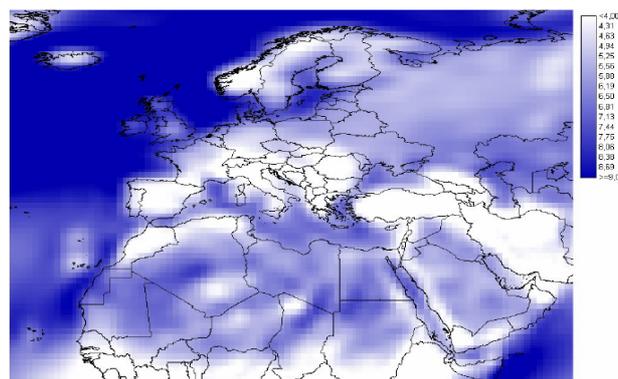
The implementation of similar household/servicing initiatives under Programmatic CDM could reduce the transaction costs and enhance the feasibility of the CDM-status. For instance, there would be CDM-prospects for energy efficiency improvement in the service sector, such as in

hotels, hammams, government buildings, etc. However, while clustering, coordination issues as well as methodological issues remain [14].

### ***3.4 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 3.1 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, into account should be taken the possibility of interference with shipping routes and water depth, which could limit offshore acreage substantially.

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 reveals that there are good prospects for wind energy in most of the parts of MENA region.



*Source: DLR, 2003*

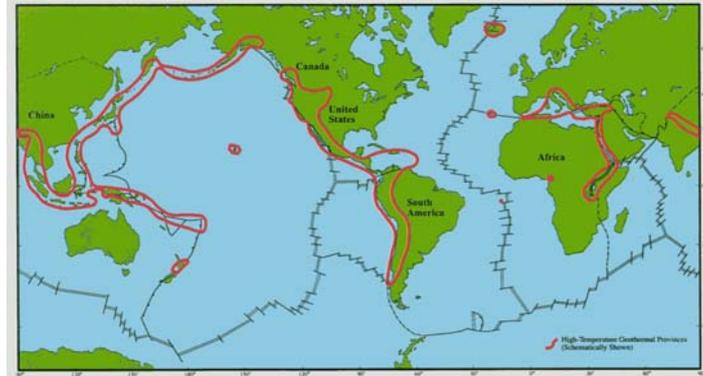
*Figure 3.1.: MENA region wind energy potential*

### ***3.5 Hydroelectric energy potential***

Hydroelectric power generation potential within the MENA region primarily exists only in some countries. Potential exists in Morocco, some parts of Algeria, Tunisia, Egypt, Iraq, Iran, and Syria where smaller-scale hydropower generation projects might be considered [13].

### ***3.6 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 3.2.



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

*Figure 3.2.: MENA region geothermal energy potential*

According to this figure, MENA countries have a large conventional geothermal energy potential. More specifically, the highest potential is found in Syria, Palestinian Authority, Lebanon, Jordan, Saudi Arabia, Yemen and Djibouti. 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. This is mainly due to the relatively high upfront investment costs for exploration, conventional geothermal energy faces ‘competition’ from the more mature RES technologies.

### ***3.7 Solar energy potential***

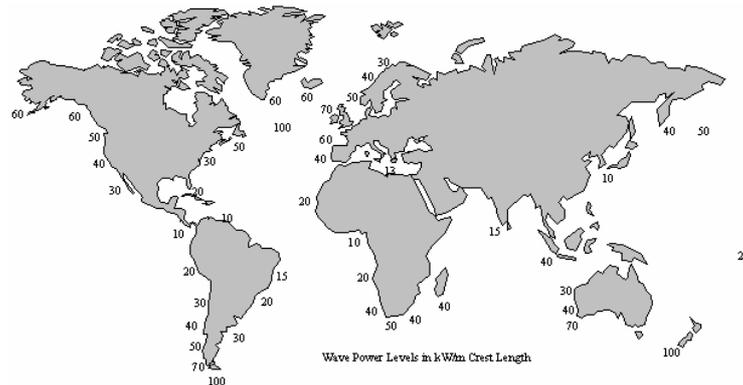
Solar energy is one of the most promising RES options within the countries under consideration. Both, photovoltaics and solar thermal power technologies (i.e. concentrating solar power, CSP), are already applied within the region at various scales. While solar power is primarily used for decentralized 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 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 [13].

### ***3.8 Ocean energy: tidal and wave energy***

The tidal energy potential in the MENA 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 3.3 it can be seen that the wave energy potential is relatively small in the MENA region. Nevertheless, when the technology, which is still largely in the research phase, develops it might prove to be a feasible energy technology on the long term; however this is much unlikely.



Source: WEC, 2006

Figure 3.3.: MENA region tidal and wave energy potential

### 3.9 Transport Sector

Within the selected countries, liquid fossil fuels are the fuels 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, 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 (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 grid will be a crucial factor for large-scale implementation.

In the more import dependent countries, such as Lebanon, Morocco and Tunisia, 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).

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 development [13].

### ***3.10 Reforestation / biomass / agriculture***

Biomass production in the region is low due to the problematic water supply situation and the inherent crop harvest volatility in agriculture. Therefore, especially for suitable (irrigated) acreage in this region, any prospective energy crops are likely to be easily competed by food crops.

Except from some niche opportunities for biomass energy production in well-irrigated areas, such as the Nile region in Egypt other areas seem to have a very low potential. Additionally, there are energy crops such as *Jatropha* that can be produced in more arid regions and may under some conditions be commercially feasible. In fact, this energy crop is already produced at some scale in some MENA countries and further potential exists.

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

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 [13].

## **4. Financing of CDM Projects**

The costs of completing the entire CDM project cycle have a strong fixed element. For instance the costs for PDD preparation, methodology development, validation, and 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 can be replicated widely and often have high sustainable development benefits for the local population.

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 favourable financing on non-competitive or non-market conformal 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 [14].

Also several political or marketing related arguments can be found that could justify non-competitive funding by the MENA economies. Nevertheless, these types of funding schemes are inherently obstructed by the fact that they generate no real measurable performance other than a required return on capital investment [15]. Besides that, defining a clear investment objective in political or marketing terms might prove to be difficult with such funding schemes [16].

The main approaches through which CERs are developed are:

- *Bilateral CDM*: 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 [7].
- *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 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 [17].
- *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 [18].
- *Programmatic CDM*: It involves the aggregation of a number of relatively small emission reduction activities 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 baseline determination and monitoring of the project performance[19].

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 that can be applied in order to generate CERs are presented. 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 [20].

#### ***4.1 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 loses 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. Unilateral CDM scheme can be applied since the host country is most probably to walk through the entire CDM project cycle. 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. This approach of course doesn’t exclude the use of bilateral or multilateral CDM; however, in small scale projects IFI’s seem reluctant to invest [18].

#### ***4.2 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. Financing of small projects through programmatic CDM is most straightforward under a unilateral approach but can also be implemented under a bilateral or multilateral scheme. Moreover, 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 and do not easily attract the interest of foreign investors [19].

#### ***4.3 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. In this framework they have proposed a tax on 'low-cost/low SD CERs', such as for example HFCs, N<sub>2</sub>O or CH<sub>4</sub> emission reduction projects, which are usually reinvested in other clean energy projects. 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. A bilateral investment strategy where the host country project and the Annex 1 public representative engage in a one-to-one negotiation process would be most appropriate for financing such projects. 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 [20].

#### ***4.4 Large scale (region)***

Some MENA 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. Multilateral CDM schemes lower the transaction costs significantly, as the intermediary (*e.g.* World Bank Carbon Finance Unit, Netherlands Community Development Fund) has the know-how and experience in dealing with CDM projects and their cycles. Price and delivery risk are relatively low since the intermediary is most likely to pursue a portfolio strategy, involving both low risk and high risk CDM-projects [17].

## 5. SWOT Analysis

The following SWOT analysis (Table 5.1) summarizes the main points as regards the strengths, weaknesses, opportunities and threats, thus a clearer view is to be formed regarding the further development of CDM in the Region.

As already mentioned, the MENA countries are presenting various levels regarding their institutional, technical etc. capacities for CDM implementation and thus a specific strength of one country maybe characterized as weakness in another (eg. the existence of well organized and capable DNA is a definite asset as regards CDM development in a country and on the contrary the non existence of well organized DNA a serious weakness).

Table 5.1. SWOT Analysis

1. Strengths	2. Weaknesses
<ul style="list-style-type: none"> <li>• Existence of well organized and staffed with capable and supportive personnel DNAs</li> <li>• State authorities sensitized and interested in promoting CDM</li> <li>• The potential in several sectors is significant</li> <li>• Already developed pipeline with CDM project proposals</li> <li>• Projects have been already registered or are under registration by the EB</li> <li>• The local agencies, NGOs, organisations, consultants etc. are keen to be involved in CDM</li> <li>• Existence of approved methodologies for most of the proposed CDM projects</li> </ul>	<ul style="list-style-type: none"> <li>• Local Industries / Utilities / Enterprises etc. are facing difficulties in the development of attractive CDM project proposals (lack of specialized knowledge, limitation of resources, lack of financing)</li> <li>• Non existence of well organized DNAs</li> <li>• Relatively small number of trained and active local consultants in many sectors related to CDM</li> <li>• A significant number of the proposed CDM projects are small scale activities which makes difficult financing from IFIs and Multilateral funds and donors</li> <li>• High transaction costs are associated to CDM project proposals.</li> <li>• Low prices of electricity and fossil fuels</li> <li>• The local banks have not yet been involved in CDM financing (lack of specialized financing facilities)</li> </ul>
3. Opportunities	4. Threats
<ul style="list-style-type: none"> <li>• High interest of IFIs and multilateral donors for financing CDM projects and providing technical assistance and Grants</li> <li>• Experience and knowledge created by already registered projects can be exploited</li> <li>• Positive Socio-economic impacts through the implementation of CDM</li> <li>• Government interest in CDM and in promoting specific development projects through it</li> <li>• Ability to implement clustering of small scale</li> </ul>	<ul style="list-style-type: none"> <li>• Eventually closing the window of opportunity by the UNFCCC, by applying stricter criteria for registration</li> <li>• Uncertainty of the future of CDM, beyond 2012</li> <li>• Long and complex CDM project cycle discourages some investors / promoters</li> <li>• Substantial CDM costs and risk of no success discourages some investors / promoters</li> <li>• Awareness of CDM benefits does not reach all potentially interested parties</li> </ul>

activities in order to increase the attractiveness of CDM project proposals	
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### ***5.1 Strengths***

The existence of a well organized DNA is a definite asset for the host countries. Only a few countries in the MENA region have already established fully operational DNAs. However, in most countries the state authorities are gradually increasing their interest in promoting CDM. Although CDM activity in the MENA region is at its early infancy, there are already more than 100 CDM project proposals in the developed pipeline and for most of those projects an approved methodology already exists. In addition to this, the local agencies, NGOs, organizations, consultants etc. are keen to be involved in CDM.

### ***5.2 Weaknesses***

Though the MENA region has significant potential for CDM development, in some countries the local industries, utilities, enterprises etc. are facing difficulties in the development of attractive CDM project proposals due to the lack of specialized knowledge and the fact that there are a small number of trained and active local consultants to CDM. Moreover, there is a significant number of the proposed CDM projects that are small scale activities which makes their financing difficult. Another financial barrier is the high transaction costs that is associated to CDM project proposals and the low prices of electricity and fossil fuels that are the main energy threat of renewable energy sources. In addition to this, the local banks have not yet been involved in CDM financing and their know-how in financing CDM activities is still very low.

### ***5.3 Opportunities***

As it is mentioned before, there is significant potential for CDM activity development in the MENA region and thus, substantial interest is shown by IFIs, donors and funds for CDM projects financing and for providing TA and Grands. Some countries such as Egypt and Morocco have already registered CDM projects and the experience and knowledge gained can be exploited for further CDM development. Moreover, there is substantial governmental interest in CDM and in promoting specific development projects through it since the positive socio-economic impacts through the implementation of CDM are recognized.

### ***5.4 Threats***

The main threat for CDM activity is the closure of the opportunity window by the UNFCCC through the application of stricter criteria for registration and the uncertainty of the future of

CDM, beyond 2012. Moreover, the long and complex CDM project cycle and the substantial CDM costs and risk of no success discourages some investors and promoters.

## **6. Conclusions**

CDM potential in the MENA region 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 of the majority of the developing countries, exploitation of this CDM potential goes hand-in-hand with the accomplishment of other aims, such as increase of living standard, environmental improvement fight against poverty & desertification.

However, CDM potential in the MENA region is still in its very initial stages of exploitation. This applies not only to the scope for several types of small-scale projects, but also to larger programmes, which could span activities that transcend single actors. Such programmes would call for intensive and extensive 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 etc.

Through the CDM models the region may exploit its potential to the fullest and achieve significant gains both environmental and financial. 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. Some political or marketing related arguments can be found that could justify the non-competitive funding by the MENA economies. Nevertheless, MENA countries have a significant potential for CDM and its well targeted/programmed exploitation will strive towards the achievement of main sustainable development goals in the region.

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