

Chapter 3 International GHG Offset

Introduction

In this chapter, we will investigate the international Greenhouse Gases (GHG) emission reduction market. The chapter is divided into the following sections:

First: The framework of an international offset market.

Second: The options for market organizations and the implementation models of the CDM projects.

Third: The international market for GHG offsets.

The third section, in which we try to investigate the potential size of the international CDM market, and expected global market prices for GHG emission reductions, represents the core of this chapter.

The analysis is based on a spreadsheet-based Carbon Emission Reduction Trading (CERT) model developed in the framework of the World Bank's NSS program by Grütter et al.

In this model, the international offset demand is analyzed under different scenarios according to different emission levels of Annex I¹ countries (essentially developed countries and economies in transition) and other relevant factors. Different assumptions leading to different scenarios are also made for the international supply of emission reductions.

The interaction between global demand and supply defines the expected international prices of emission reductions in the different scenarios.

The study also performs some sensitivity analysis to test the impact of changing the value of some important variables on the resulting international price and quantity traded.

Fourth: The position of Egypt in the GHG offset market:

Finally, the study will investigate the position of Egypt in the offset market and its potential to participate in it. The study will concentrate on the attractiveness of Egypt thorough its image abroad; its economic indicators and CDM related activities.

Fifth: A short conclusion.

3.1 The Framework of an International Offset Market

3.1.1 Post-Kyoto UNFCCC Framework Conditions

The Third Conference of the Parties (COP-3) to the United Nations Framework Convention of Climate Change (UNFCCC), which was held on Kyoto on December 1997, established the relevant provisions for GHG emission reductions and also for their trading. The Kyoto Protocol set binding quantified emission limitation or reduction commitments for the period 2008-2012 for developed industrialized country parties. Each of the industrialized countries has its own target set out in Annex I of the Kyoto Protocol ranging from an 8% reduction to a 10% increase from the 1990 base year. The average reduction commitment is 5.2% for all Annex I countries.

¹ In this chapter, we will refer to Annex I countries as the countries, which have binding emission reduction requirements as defined in the Annex I of the United Nations Framework Convention of Climate Change. The complete list of countries with binding reduction requirements can be found in the Annex B of the Kyoto Protocol. Which are almost identical of Annex I countries.

Annex I Parties have set target that, foremost, implies a significant reduction of GHG emissions. The flexibility mechanisms for an extraterritorial fulfilling of the reduction commitment foreseen in the Kyoto Protocol not only reduce the cost of meeting the Kyoto goals for Annex I Parties, but also establish a new market and provide a new source of export earnings as well as a potential for the implementation of modern technologies in many areas for Non-Annex I Parties. Trading happens due to different marginal abatement costs of CO₂ (or other GHG) in different countries. Through trade worldwide abatement costs can be minimized, while still achieving the target of reduced carbon emissions, since the location of CO₂ emissions doesn't matter from global warming perspective.

The Kyoto Protocol provides at least six dimensions of flexibility: two internal (the basket of CO₂ and other greenhouse gases; and the possibility of realizing land-use, land-use change and forestry – the so-called “sinks” – projects) and four external, i.e. the possibility for any Party in Annex I to jointly fulfill their quantified emissions limitation and reduction commitments as well as the three Kyoto mechanisms for international transfers of emissions: International Emission Trading (IET); Joint Implementation (JI) or Activities Implemented Jointly (AIJ); and the Clean Development Mechanism (CDM).

Various studies have analyzed the cost reduction potential generated by IET, JI and CDM. These studies show substantial cost reductions:

- A. The average cost reduction from introducing Annex I wide emissions trading (and JI) is nearly 60% compared with no trading: costs are reduced to around 40% of the costs of the non-trading case;
- B. Allowing CDM also reduces costs to fewer than 20% of the costs of the original no-trading case.

It should however be remarked that the Protocol clearly states that the use of the above mechanisms will be “supplemental” to domestic actions.

Currently, major uncertainty exists with regard to the development of formal regulation of the mechanisms and the entrance into force of the Kyoto Protocol. This, together with the lack of incentives granted to foreign investors in the North, is a major reason for the slow progress in international climate technology transfer.

3.1.2 Post-COP-7 Regulation for CDM

At the resumed session of COP-6 parties reached political agreement focused on the general issues of: complementarity, the role of sinks in the Protocol, and the Protocol compliance system, funds under both the protocol and the convention and finally the compensations. During this session most of regulations, which are needed to activate the CDM were discussed including: accreditation, designated operational entities, participation, financing, validation and registration, monitoring, verification and issuance of certified emission reductions (CERs) in the CDM projects. However, based on the political agreement reached at the resumed session of COP-6 parties succeeded on adapting all needed decisions not only for the CDM but more important all the package of Buenos Aires Plan of Action which accommodate different parties interests and desires to ratify Kyoto Protocol.

The outcomes of COP-7, which so called Marrakesh Accords considered a corner stone in the entry into force of the Kyoto Protocol. Marrakesh Accords is supported by all UNFCCC parties, therefore most of the parties are in the process the ratification of the Kyoto protocol.

The following are the main features of the CDM as adapted in Marrakech Accords.

A. Supplementary

No quantification of supplementary, i.e. no determination of the share of the Quantified Emission Limitation and Reduction Objectives (QELROs) rather Annex I will achieve their respective QELRO chiefly by domestic action. This type of compromise was necessary in this critical negotiating issue.

B. CDM Project Cycle

A standard CDM project cycle is now in place with all needed procedural provisions at all levels and preset qualifications of all institutions involved in different stage of the project cycle (see Chapter 4). The members of CDM Executive Board were formally adapted at COP-7.

C. Inclusion of Sinks in CDM

Afforestation and reforestation activities are allowed in the CDM. Each Annex I party should select and notify the CDM Executive Board, in advance, on the type of activities that will be used under the CDM. Also, each Annex I countries is given a specific quota of GHG reduction to be realized by afforestation and reforestation activities as per Annex attached to land use, land use change and forestry decision of COP-7.

D. Adaptation Levy

A levy of 2% is placed on CERs “share of proceeds” achieved through CDM projects. This will be used for the funding adaptation activities. In principle, there will be no levy on JI and IET transfer. Only if the annual transfer of resources from Annex I Parties in the framework of the Adaptation Fund, Compliance Fund and the “additional resources” is less than US\$ 1, a levy will be placed on JI and IET transfers.

E. Expedited Project Approvals for Small-Scale CDM Projects

At COP-8, the Board will develop simplified modalities and procedures for small-scale renewable and energy efficiency projects.

F. Assistance to Developing Countries

An agreement has been achieved on different activities in favor of developing countries. The focus lies on capacity building, technology transfer and adaptation to adverse impacts of climate change and/or response measures. The assistance will be financed by different funds such as a climate change fund and the Global Environmental Facility.

3.1.3 Remaining Uncertainties Affecting the Offset Market

There are three kinds of uncertainties affecting GHG offset market:

3.1.3.1 Amount of Future Emissions

There is great uncertainty about the emission projections. Grubb noted “emission projections have repeatedly been proven wrong by reality and have usually been too high” [Quantifying Kyoto, Grubb, The Royal Institute of International Affairs, London, August 2000]. Furthermore, most projections include CO₂ emissions from fossil fuels only and ignore the other GHG gases of the Kyoto Agreement. Despite being run under comparable assumptions, the 16 models from the Emissions Modeling Forum (EMF) generate a wide variety of emission projections for the commitment period. For

instance, projections for the US vary from +20% to +36% above 1990 levels; the range of projections for the EU and other regions is much wider.

Considerable caution needs to be exercised in using “business as usual” projections, because business will never be as usual and projections are inevitably influenced by hopes and political objectives. It is difficult to estimate the marginal abatement curves independently, because activities that reduce emissions of one gas may change emissions of another gas. For these reasons, projections used to be inaccurate. Moreover, many projections do not consider political measures (such as CO₂ taxes), which can be introduced if the GHG emissions grow with a too large rate.

The only way to deal with this problem is to apply sensitivity analysis in order to reach different estimations of projected emissions, which will be finally used in estimating the demand curves. This sensitivity analysis can help to estimate the expected results of emission trading under different scenarios.

3.1.3.2 The Design of Policy Parameters

Regarding the implementation of the flexibility mechanisms, the main uncertainties concern the following parameters (situation after COP-7):

1. **Supplementarity / import ceiling:** Supplementarity refers to the requirements stated in the Articles 3, 6 and 12 of the Kyoto Protocol that the reductions reached through JI and CDM should be supplementary to the domestic reductions of Annex I countries. Hence, supplementary works as a limitation of the international GHG offset demand. It is still an open question; up to what level Annex I will use domestic action?
2. **Implementation rate:** The implementation rate, especially of CDM projects, refers to the rate of CERs that can be really realized in comparison to the theoretical number calculated with economic models. The implementation rate depends on the absorption capacity of the host countries and on the velocity, which can be achieved in the implementation of projects, above all, if trading picks up slowly. An implementation rate of x% means that at each price, only x% of the potential supply can actually be realized.
3. **Retaining of assigned amounts of Annex I countries:** The retaining of amounts refers to the discussed provision that Annex I Parties should retain a portion (70%) of their assigned amount of emissions, preventing them (essentially the Former Soviet Union and Eastern Europe Countries) to oversell ERUs.
4. **Transaction costs / costs for the Adaptation Fund / costs for the Convention Fund:** Transaction costs for project-based emissions reductions depend largely on legal and administrative requirements and increase the project costs. The same is true for levies for the financing of funds.

3.1.3.3 The Effective Ratification of the Kyoto Protocol

After COP-7, the seriousness of Annex I country parties in ratification of the K.P. in light of the current announced US policy towards the protocol is one of the major concerns. The protocol will become effective only if ratified by at least 55 Parties whose GHG emissions represent at least 55% of the total from Annex I parties in the year 1990. This means all Annex I country parties must ratify the protocol so that the protocol can enter into force. Also, it means if one country with considerable GHG emissions hold back the protocol will not come into force after huge efforts done starting from 1995 in COP-1 with the Berlin Mandate.

3.2 Options for Market Organization

3.2.1 Prerequisite: Compliance and Sanction Mechanisms

Compliance and sanction mechanisms are a prerequisite for successful implementation of the flexibility mechanisms. Steps to address cases of non-compliance with the provisions of the CDM should be based on guidelines to be laid down by the COP in accordance with the procedures defined under Article 18 of the Kyoto Protocol.

In case of one Party's non-compliance with its obligations resulting from the Protocol, and from its Article 3 commitments in particular, CERs acquired under the CDM should be invalidated, either in full or in part, and can not be counted as the fulfillment of assumed obligations to reduce GHG emissions.

According to the Kyoto Protocol and compliance system adapted in COP-7, a Party included in Annex I shall lose its eligibility to participate in the mechanism when it is in non-compliance with any guideline, modality, rule or principle established or decision or action taken by the COP pursuant to Article 3 of K.P.

At COP-7, the decision agreed on the penalty for the non-compliance of Annex I parties: These parties will be required to pay back their excess emissions with an interest penalty of 30% (i.e., 1.3 tons must be paid back for every excess ton of emissions). Parties out of compliance must pay the penalty in the second commitment period, and develop a compliance action plan that gives priorities to domestic actions; moreover, they are suspended from making transfers under Article 17 (IET) of the Protocol. The compliance system will have also appeal and party-to-party trigger.

3.2.2 Institutional and Organization Set up

There are many design parameters that affect the trading systems. CERs trading can only take place on the basis of concrete GHG emissions reduction projects. The claimed or actual emissions reduction of these projects must have been verified and certified by officially authorized procedures.

It should be mentioned that the international brokers firms could facilitate the international trading process, which will lead finally to increase the market efficiency and functioning. For instance, a quite big portion of emission trading in the United States is today realized with the help of international brokers like Nat source. Up till now there are very few of them.

3.2.2.1 The Implementation Models of the CDM Projects

There are four different implementation models: bilateral, multilateral, unilateral and an "open architecture" mechanism that envisions all of the implementation models co-existing and operating in parallel.

➤ Bilateral CDM

This model is characterized by a close relationship between Annex I investor and host country in the design (development) and financing of a project. Such an approach envisions one or more Annex I investors as direct participants in the development, financing and possibly operation of a CDM project. In this decentralized model, the project selection, financing, and sharing of credits (and any pricing agreement) are worked out directly between parties (developers, investors, host government) on a project-by-project basis.

➤ **Multilateral CDM**

This model is analogous to a mutual fund of CDM projects, and is therefore often referred to as “portfolio” or “fund” approach. Financial resources flow from Annex I investors through a centralized investment fund, and are channeled towards project activities in host developing countries. Thus, there is a clear separation between project development and financing on the one hand, and Annex I investor on the other. Once emission reductions from project activities are certified, credits would be sold or issued through a centralized body to the Annex I investors. Investors would receive a share of (or the purchase rights on) the CERs proportional to their capital contributions to the fund.

➤ **Unilateral CDM**

The defining feature of a unilateral CDM is the absence of an Annex I entity in the development and financing of a project. Such a model places project development and financing, as well as its associated risks, entirely in the realm of the host country. Non-Annex I parties would be free to develop and fund domestic activities that lead to additional emission reductions. Once certified, emission reductions from these activities would accrue directly to the host country. The Non-Annex I country could, in turn, sell CERs to interested Annex I corporations or governments.

➤ **Open Architecture CDM: A Flexible Implementation Model**

An open architecture CDM envisions the three different core models described above in parallel. This approach, however, would not obligate any country to participate in the CDM in any particular fashion, but would rather enable a choice of one or more channel of participation, according to the national circumstances and preferences.

3.2.2.2 Institutional Instruments for Non-Annex I Countries

If Egypt, as a developing country, desires to participate in the international GHG offset through CDM projects, an institutional structure must be developed and implemented. Egypt has actually realized a good record in attracting Foreign Investment.

The Egyptian Government should identify a pipeline of economically attractive CDM projects and reliably analyze their probable costs and reduction potential. This series of potential projects must then be included in a “shopping list” which can be offered for realization within a framework of one (or more) bilateral governmental agreement(s) with interested investor countries.

It should be emphasized that CDM projects should be carefully identified and selected to insure the achievement of the economic development goals. The new projects should involve modern technology that can be introduced to the local environment. This action in turn requires reliable and efficient implementation of the necessary institutional instruments, including:

- Intergovernmental agreements.
- Project plan verification and approval.
- Project monitoring / verification.
- Information system on project opportunities.
- Reporting and management system.
- Financial flow schemes (domestic level).
- Regulation or guidelines on the establishment of baseline data and for calculating net-cost and reductions at project level.
- Development of GHG-inventory at the national level.

3.3 The International Market for GHG Offsets

Through Article 6 of the Protocol, Annex I Parties can transfer to, or acquire from any other Annex I Party emissions reduction units (ERUs) resulting from projects aimed at reducing emissions by sources or enhancing removal by sinks of GHG in any sector of the economy. The Parties refer to this mechanism as Joint Implementation (JI) of commitments to the UNFCCC. Through the Clean Development Mechanism (CDM), established in Article 12 of the Kyoto Protocol, Parties included in Annex I of the Protocol may use certified emissions reductions (CERs) generated by projects that assist Parties not included in Annex I (i.e. Developing Countries) in achieving sustainable development. These two mechanisms (CDM and JI) must be distinguished from two other mechanisms, which provide flexibility to Annex I Parties in meeting their quantified emissions limitation and reduction. Article 4 permits any Party in Annex I to agree to jointly fulfill their quantified emissions limitation and reduction commitments. Article 17 calls for the Conference of the Parties to the UNFCCC to define principles, modalities, rules and guidelines for international emissions trading (IET) between Annex I countries.

Here, a trial to estimate the demand and the supply of the potential GHG offset market (JI, CDM, IET) under the Kyoto Protocol over the first commitment period 2008-2012 will be done.

3.3.1 Data and Model Used

In the analysis of the GHG offset market, we will use the CERT (Carbon Emission Reduction Trade) model that was developed by the World Bank.

CERT is a computational framework to present and analyze the GHG offset trading market. It is not a new general equilibrium model but a “meta-model” which uses inputs like Business as Usual (BAU) emissions forecasts and Marginal Abatement Cost Curves (MACs) from other models and includes various scenarios. Concretely, the CERT model relies on 11 different base scenarios which differ in the modeling of BAU, the inclusion of CO₂ or all GHG, the inclusion of sinks for Annex I countries or not, and the elaboration of MACs based on a top-down or a bottom-up approach. The outcomes of the different scenarios will then be calculated with different options such as inclusion or not of hot air, different implementation rates for projects, inclusion or not of transaction costs etc.

A detailed list of the base scenarios and their principal features can be found in the Annex 3.1 of this chapter. It should be remarked that, in the CERT model, JI and IET are treated as equivalent.

3.3.2 International Offset Demand under Different Scenarios

In this section, we will outline the core factors that influence the size of the projected GHG demand and relate demand to those factors.

All data are always in metric tons of carbon equivalent (tC) respectively in million metric tons of carbon equivalent (MtC).

3.3.2.1 Methodology

Estimating the size of the GHG offset market involves three steps. The first step consists of determining the GHG emissions for each Annex I country in the base year (1990).

The second step is to determine the Kyoto target for each Annex I country in 2010. By multiplying each Annex I country's emissions in the base year by one plus its allowed percentage change from its base year emissions level, we can obtain the Kyoto target in 2010 for each Annex I country. An overview of the reduction commitments by country groups is given in Annex 3.3. The Kyoto commitments in total add up to a reduction of 5.2% below Annex I countries base year emissions levels.

The third and trickiest step in estimating the demand of GHG offsets is to estimate "business as usual" (BAU) GHG emissions for each Annex I country over the commitment period. Projections here vary between sources. BAU estimates depend to a great extent on projections concerning GDP and population growth, energy and carbon elasticity, energy prices and policies implemented by governments. Policies also include the future scope of usage of nuclear energy. This accounts basically for the large differences in the various scenarios presented. In Annex 3.4, BAU projections for different scenarios are given.

Countries and/or regions have been summed in the groups listed in Table 3.1.

Table 3.1: Regions²

Annex I Countries and Regions	Non-Annex I Countries and Regions
EEC: European Union (EU 15 members)	EEX: Energy Exporting Countries
JPN: Japan	CHN: China
OOE: Other OECD Countries	IND: India
EET: Eastern Europe	DAE: Dynamic Asian Economies
FSU: Former Soviet Union	BRA: Brazil
	ROW: Rest of the World

3.3.2.2 Model Parameters

Next to the differences in BAU projections and MACs between the different scenarios incorporated in the CERT model, there are sets of additional model parameters that can be varied in the CERT model. These parameters describe the possible outcomes of the actual political discussions concerning the possible implementation forms of CDM (see also Section 3.1.3):

- Trading of hot air (0-100%).
- Supplementary / import ceiling (0-100%).
- Implementation rate (0-100%).
- Retaining of assigned amounts of Annex I countries (0-100%).
- Transaction costs / Costs for the Adaptation Fund / Costs for the Convention Fund (in US\$).
- BAU and MACs based on CO₂ only or on all GHG.
- Inclusion of sinks: The CERT model allows the inclusion of sinks in Annex I countries. These sinks are modeled to zero costs. Sinks in Non-Annex I countries are not considered.
- Monopolistic / oligopolistic supply: Monopolistic or oligopolistic supply describes the possibility of the building of a monopoly or oligopoly by countries that export GHG offsets, which would hence maximize their revenues. The monopolistic / oligopolistic supply could be favored by a cartel of Non-Annex I countries (plus the Former Soviet Union and the Eastern Europe Countries) or by

² For a list of countries per region see Annex 3.2.

a very strong market position of few suppliers like China and India. These solutions can be modeled with the CERT model.

- Finally, the withdrawal of some Parties (for instance: the US) from the Kyoto Protocol can be modeled by setting their BAUs equal to their assigned amounts.

3.3.2.3 GHG Offset Demand

To estimate the GHG offset demand, the Kyoto target must be subtracted from the BAU estimates. This gives the GHG offsets, which must be reduced (GHG offset demand). Tables 3.2a and 3.2b give the required emission reductions for CO₂ only and for all GHG.

Table 3.2a Estimates of the Emissions Reductions Requirements for Annex I Countries in MtC, only CO₂

Model	Japan	EU	OOE	EET	FSU	All Annex I	Total Reduction Related to Land Use	Net Demand of Annex I Countries
EPPA (scenario 1)	99	320	87	-8	-81	507	54.5	452.5
RIIA (scenario 3)	76	92	62	31	-49	262	54.5	207.5
Cicero (scenario 6)	66	129	54	38	-45	287	54.5	232.5
GTEM (scenario 8)	68	144	96	19	-204	327	54.5	272.5

Source: CERT

Table 3.2b Estimates of the Emissions Reductions Requirements for Annex I Countries in MtC, all GHG

Model	Japan	EU	OOE	EET	FSU	All Annex I	Total Reduction Related to Land Use	Net Demand of Annex I Countries
EPPA (scenario 2)	111	388	122	20	-28	840	54.5	585.5
RIIA (scenario 4)	71	60	58	17	-76	205	54.5	150.5
Cicero (scenario 7)	65	103	51	30	-44	248	54.5	193.5
Zhang (scenario 5)	71	29	60	15	-80	175	54.5	120.5
GTEM (scenario 9)	79	150	116	-18	-55	344	54.5	289.5

Source: CERT

The total range of estimates listed above is between 207 and 452 MtC for CO₂ only and between 120 and 585 MtC for all GHG (excluding “hot air”). It is clear from these data that GHG reduction requirements are significant for many countries. Using the EPPA model, on average a 30% reduction is necessary comparing BAU with the emission target.

3.3.3 International Offset Supply and the Marginal Abatement Costs

The world supply for GHG offsets is a projected supply based on Marginal Abatement Cost Curves (MACs). The meaning of MACs as well as the difference in the MACs of the different regions will be illustrated in the following section.

3.3.3.1 Marginal Abatement Cost Curves

MACs represent the marginal costs of reducing carbon emission by different amounts within an economy. MACs can be derived with a top-down or a bottom-up approach.

Top-down approaches use a multi-sectoral computable general equilibrium model of economic activity, energy use and carbon emissions. Bottom-up estimates are often based on engineering estimates of reduction potentials, leading often to a large amount of so-called no-regret options (negative abatement costs). MACs are either derived for CO₂ only or for all gases targeted by the Kyoto Protocol. The latter are however less reliable estimates.

Figures 3.1a and 3.1b compares MACs for Annex I countries derived from two different scenarios (EPPA and GTEM), which are incorporated as options in the CERT model. The GTEM MACs have a stronger slope and thus higher marginal abatement costs. Both estimates show that the US has fairly low MACs compared to the EU or Japan. While differences occur in the slope of the curves, both models show similar trends and similar relative abatement costs. This shows clearly that already trading inside Annex I countries is advantageous for low-cost GHG reduction strategy.

In Figure 3.2a and 3.2b the MACs for Non-Annex I countries, again for EPPA and GTEM, are given. It should be noted that both EPPA and GTEM assume an overwhelming potential of low cost CER from China.

3.3.3.2 Some Observations on MACs

1. The international price determines the optimal quantity (Q) of GHG abated by each country in light of its MACs.
2. The marginal abatement cost of carbon at this point corresponds to the international price per ton (P).
3. At all the quantities abated before this point (Q), the country realizes profits because the MAC is less than the international price.
4. Any ton abated after the (Q) will cause losses because the costs of abatement are higher than the international price. In this case, if the reduction commitment of an Annex I country is higher than its (Q), this country can import the additional amount from another country that can realize the emission reductions at a cost less than the international price.
5. Actually, the countries with lower MACs can export the additional amount required by other countries with higher MACs.
6. Figures derived from the model show the very low MACs of China, with a very flat slope, thus potentially determining to a great extent the CDM market. India also shows a large potential, while other country groups have less potential and higher MACs.
7. On the other hand, the Figures show that Japan and OOE have the highest MACs with a stronger slope, thus leading to a higher demand for GHG reduction (in percent of the required emissions reduction) on the international market. US has fairly low MACs compared to the EU or Japan.
8. However, the total demand depends not only on the slope of the MACs, but even on the absolute amount of required emissions reductions. For this reason, the US (with its large amount of emissions reductions to be achieved according to the Kyoto Protocol) is the largest expected buyer of GHG offsets on the international market, even if its MACs have a very flat slope.

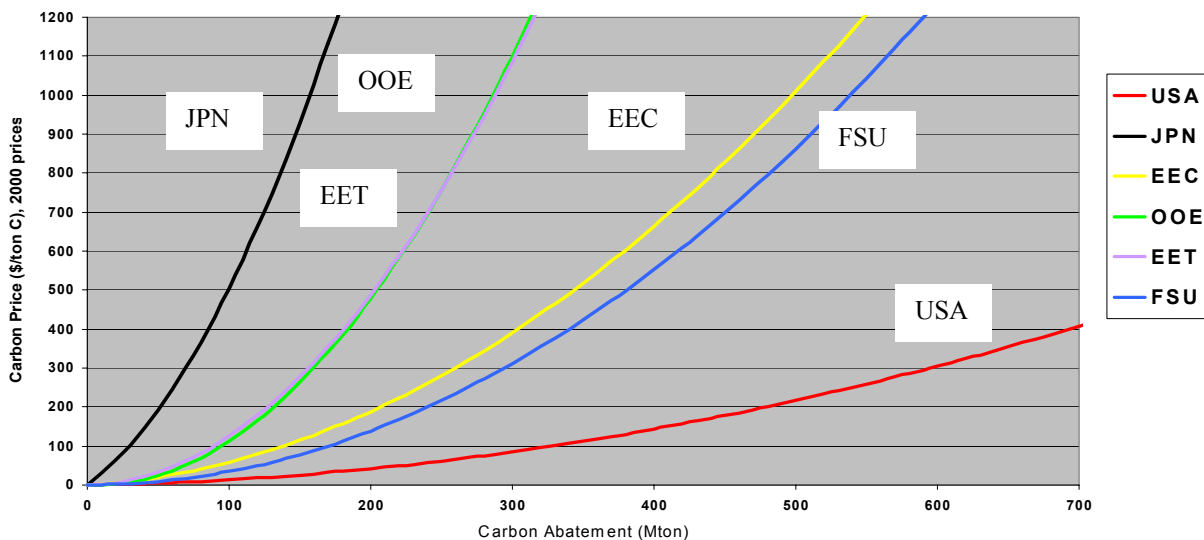


Figure 3.1a: MACs Annex I Countries, Based on EPPA CO₂ Only

Source: CERT model based on EPPA, scenario 1

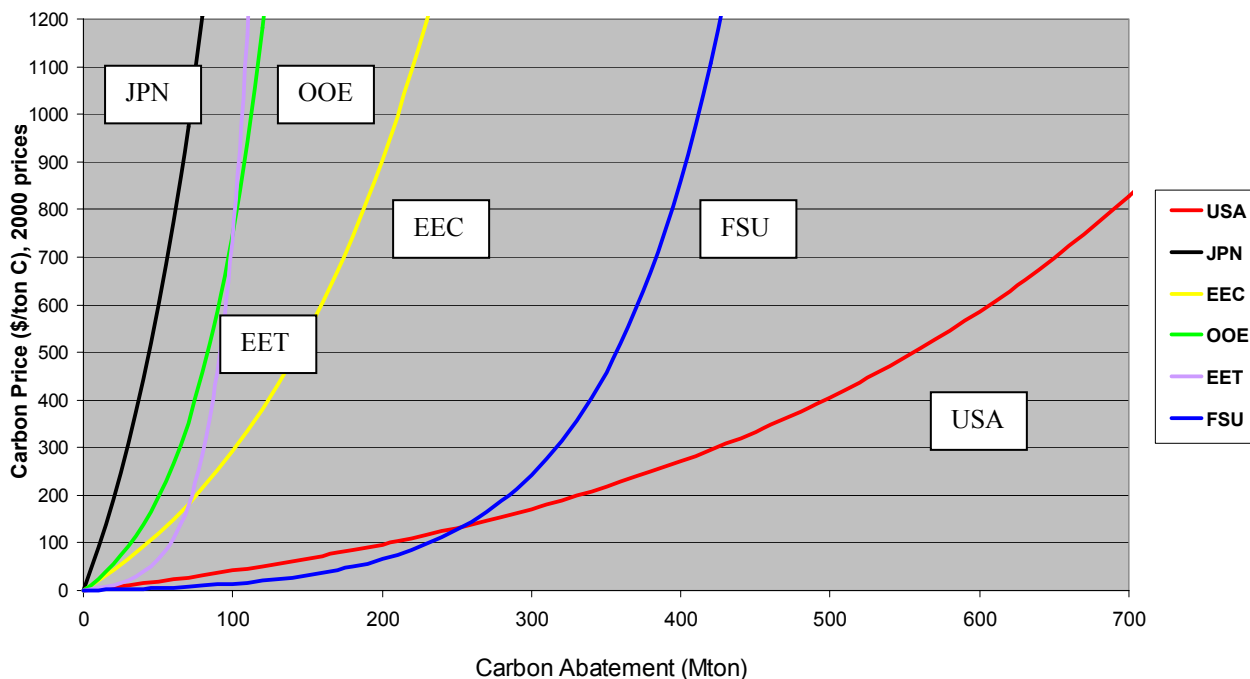


Figure 3.1b: MACs Annex I Countries, Based on GTEM CO₂ Only

Source: CERT model based on GTEM, scenario 8

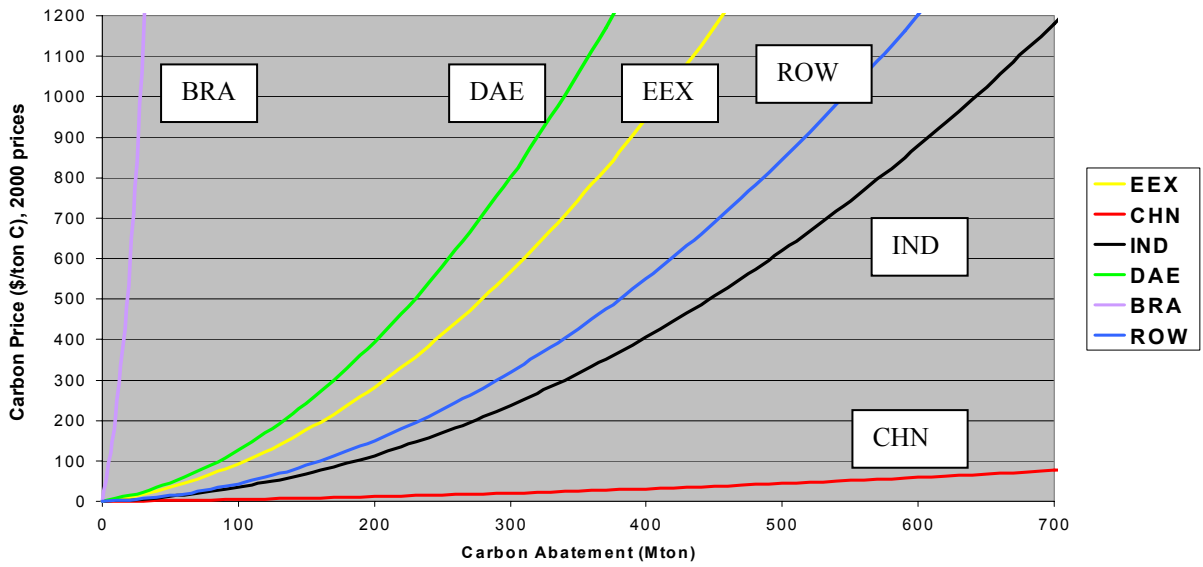


Figure 3.2a: MACs Non-Annex I countries, based on EPPA CO₂ only, excluding sinks

Source: CERT model based on EPPA, scenario 1

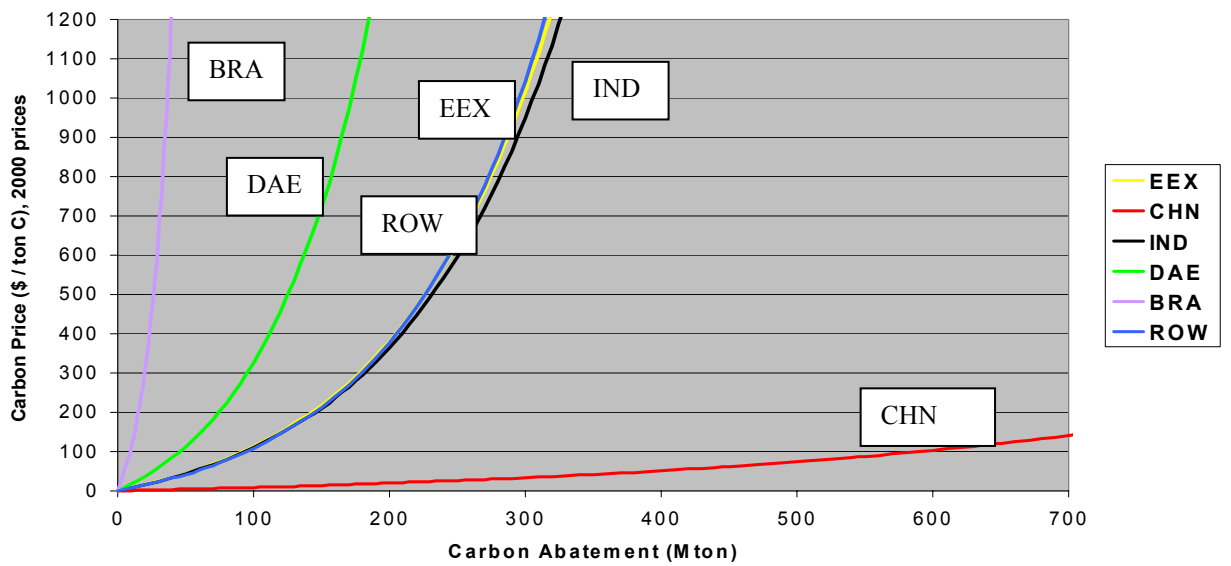


Figure 3.2b: MACs Non-Annex I countries, based on GTEM CO₂ only, excluding sinks

Source: CERT model based on GTEM, scenario 8

3.3.4 Resulting Offset Prices and Monetary Value of GHG Market Volumes under Different Scenarios

The interaction between demand and supply generates the current price and quantity estimates for the worldwide trading of GHG offsets – Figure 3.3:

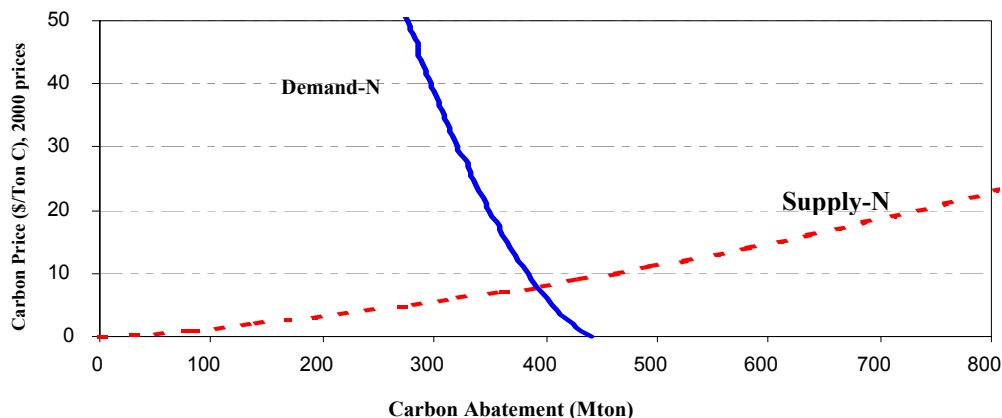


Figure 3.3: D-S Curves

The standard scenario chosen in this study corresponds to the standard scenario of the CERT model after considering the US withdrawal and the amount of reduction related to land use in Annex I countries, which was approved in the last COP. It is based on the following assumptions (full trade model without hot air):

- Full trade (Annex I and Non-Annex I countries participate to trade)
- BAU and MAC based on CO₂ only
- Hot air not traded
- No import ceiling (no supplementary provisions)
- No retaining of assigned amounts for Annex I countries
- Implementation rate = 100%
- No transaction costs
- No Adaptation Fund
- No Convention Fund
- No monopolistic / oligopolistic supply.

Applying the EPPA (Scenario 1) on the CERT model after making the mentioned adjustments related to US withdrawal and considering the allowed potential for Annex I countries using Land Use change and Forestry approved in the last COP we got the following results – Table 3.3:

Table 3.3: Principal Results of the CERT Model in the Standard Scenario

Expected International Price	Quantity Internationally Traded	Export Revenues of Non-Annex I Countries
7.8 US\$/tC	388 MtC	3 billion US\$

Of course the resulting international price is considered very low compared to the original result before US withdrawal which reached to 31 US\$ and the quantity

internationally traded amounted to 809 MtC, while the export revenues of Non-Annex I countries reached to 21 billion US\$. The results of this scenario and the related sensitivity analysis are shown in Annex 3.5 and Annex 3.6.

However, CDM projects face considerable barriers which have not been taken into account fully in the CERT modeling and which reduce the number of projects that could be implemented and therefore supply until 2012 significantly. Also, a substantial demand for GHG reductions (outside the Kyoto Protocol) from US private sector may be assumed, which is not represented in the present analysis. Therefore, the US\$ 7.8 per ton of Ceq may be regarded rather as a lower boundary. Actual estimates, e.g. from the Prototype Carbon Fund indicate somewhat higher prices in the range of US\$ 11-14 per ton of Ceq (3-4 US\$/tCO₂eq).

Nevertheless, it should be noted that the price formation will be the result of market mechanisms, and that attractive and cost effective projects and low transaction costs will be key to the competitiveness of Egypt in the market.

3.3.5 Major Suppliers and Buyers of GHG Offsets

Figure 3.4 gives an overview of major suppliers and buyers of GHG based on the CERT data, using the EPPA scenario. We clearly see that China with around 50% is by far the largest supplier, followed by India and the country group FSU. Regarding the demand for traded GHG, the EEC is the largest buyer followed by the Japan and OOE. Other scenarios have, however for the EEC much lower estimates for required emission reductions and thus come to a much lower trade demand. In the case of suppliers, all scenarios come to similar results with China having an outstanding supply role followed by India. The supply of EET and, particularly, FSU is much larger if hot air is included. Supply estimates of FSU also vary considerably due to different BAU estimates between different scenarios.

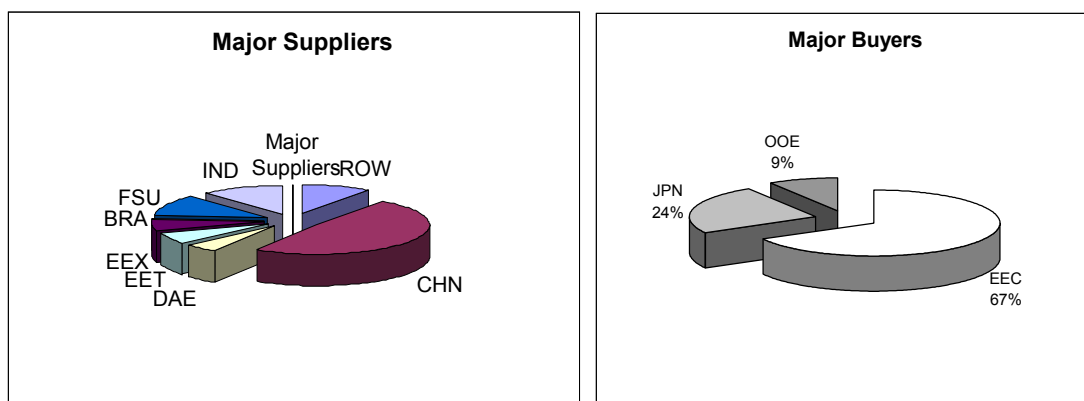


Figure 3.4: Major Suppliers and Buyers of GHG Offsets

It can be expected that the price of GHG offsets on the international market will remain low until the reductions requirements contained in the Kyoto Protocol put into force. Assuming that this will be the case in the period 2008-2012 and excluding a withdrawal from the Kyoto Protocol of important GHG offset buyers (other cases will be discussed in the next section), it can be expected that the price during the period 2008-2012 will sharply increase.

If, as this will be probably the case, the implementation rate of projects remains quite low in a first phase (according to Grütter, an implementation rate of 50% or less is probably a realistic assumption due to limited absorption capacities and a rather small time frame to adjust), an under-supply of emission reductions will result and an even

sharper price increase will be the consequence. After a period, the implementation rate will increase and full trade will be realized. At this moment, the price will decrease to its equilibrium value given in Section 3.3.4.

A qualitative picture of the possible price path is given in Figure 3.5.

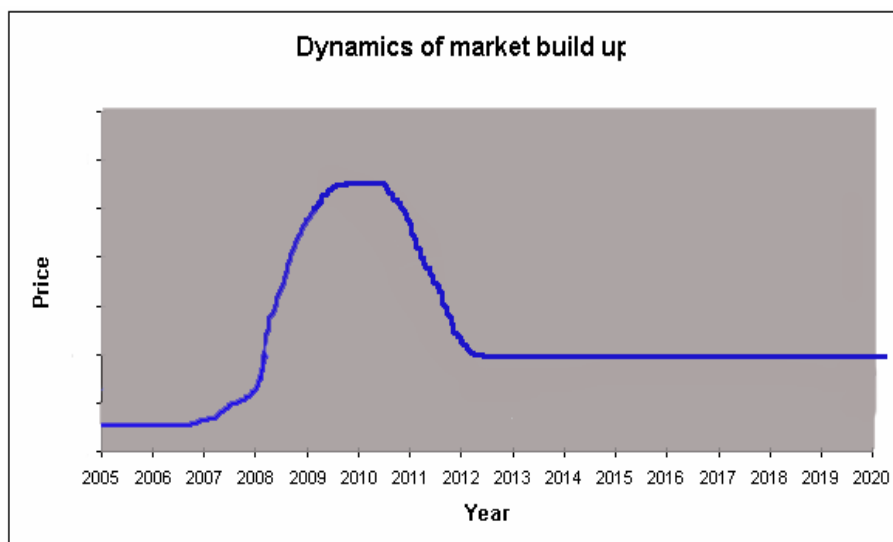


Figure 3.5: Dynamics of Market Build Up

Under these assumptions, the most important consequence of the forecasted dynamics of market build up is that an early market entrance can be an important competitive advantage for Non-Annex I countries. An early market entrance will allow to temporarily realizing higher profits due to the temporary under-supply and the high market prices of GHG offsets.

3.4 The Position of Egypt in the GHG Offset Market

3.4.1 Egypt's Market Share

In light of Egypt's current and projected GHG emissions and the expected reduction potential under different scenarios of implementation rates discussed in Chapter 2, Egypt's market share can be estimated under different scenarios related to expected international price of CERs as shown in Figure 3.6 and in Tables 3.4, 3.5 & 3.6.

Assuming 100% Implementation rate, Figure 3.6 reveals that Egypt can sell up to 2.6 MtC achieving 20.28 million US\$ based on the selected projects. This amount represents 0.67 % of the total market as shown in Table 3.4.

Assuming 70% Implementation rate, Figure 3.6 reveals that Egypt can sell up to 1.8 MtC achieving 14.04 million US\$ based on the selected projects. This amount represents 0.46 % of the total market as shown in Table 3.5.

Assuming 50% Implementation rate, Figure 3.6 reveals that Egypt can sell up to 1.25 MtC achieving 9.75 million US\$ based on the selected projects. This amount represents 0.32 % of the total market as shown in Table 3.6.

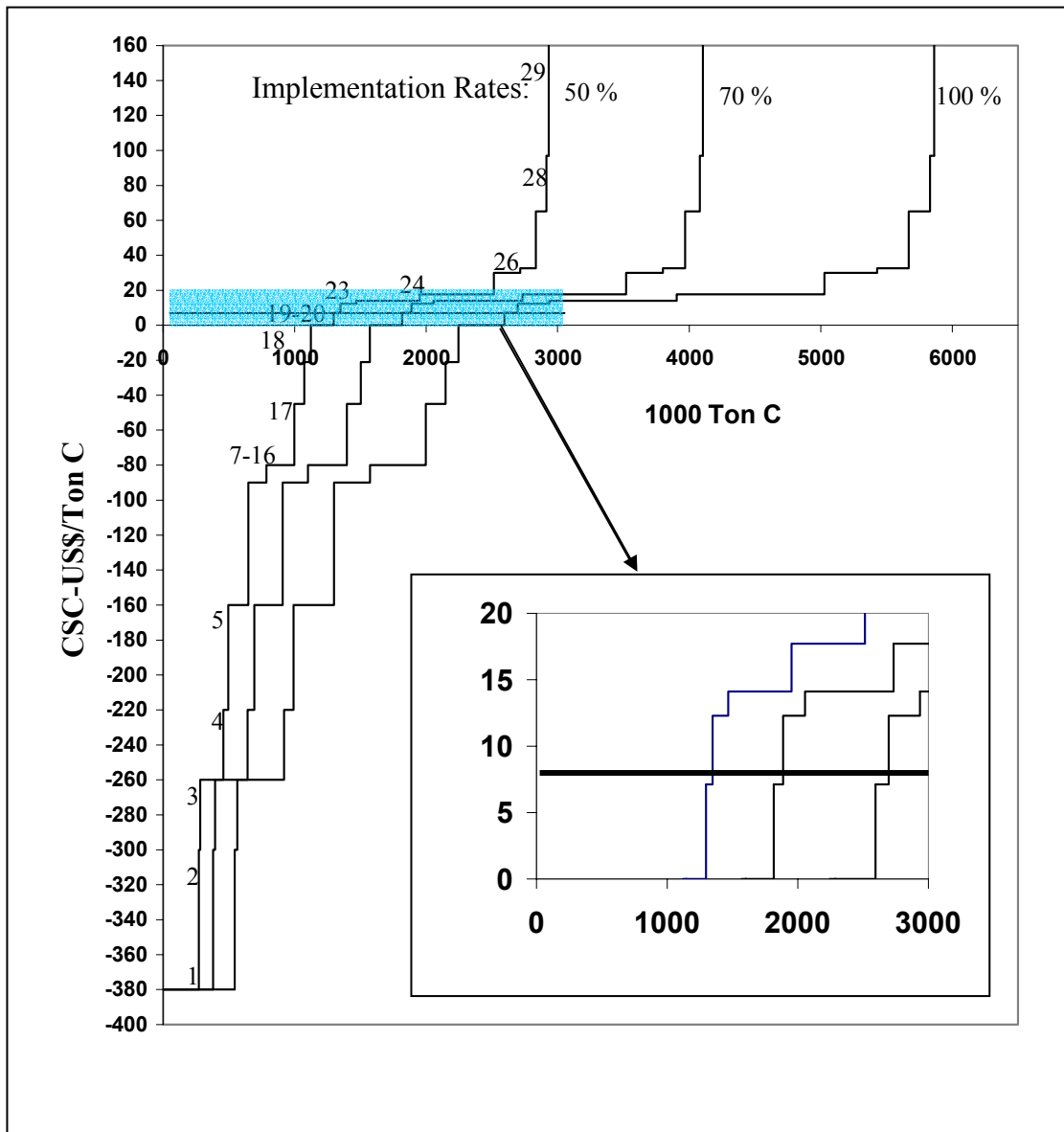


Figure 3.6: Egypt's Marginal Abatement Cost "MAC"

Table 3.4: Egypt's Position in the International GHG Offset Market
(In Case of 100% implementation rate)

Expected International Price US\$/tC	Expected Implementation Rate	Quantity that Egypt can sell Million tons	Export revenues to Egypt in Million US\$	Egypt's Market Share %
7.8	100%	2.6	20.28	0.67

**Table 3.5: Egypt's Position in the International GHG Offset Market
(In case of 70% implementation rate, medium scenario)**

Expected International Price US\$/tC	Expected Implementation Rate	Quantity that Egypt can sell Million tons	Export revenues to Egypt in Million US\$	Egypt's Market Share %
7.8	70%	1.8	14.04	0.46

**Table 3.6: Egypt's Position in the International GHG Offset Market
(In case of 50% implementation rate, low scenario)**

Expected International Price US\$/tC	Expected Implementation Rate	Quantity that Egypt can sell Million tons	Export revenues to Egypt in Million US\$	Egypt's Market Share %
7.8	50%	1.25	9.75	0.32

Since the COP-3 at Kyoto and the progress of COP-process during The Hague, Bonn, and in Marrakesh, the outline of the GHG-market became clearer, but also the potential CER demand is still very limited. The limited GHG market clearly points to the fact that the demand is relatively smaller than the supply.

Please note that this estimated CDM potential in Egypt is based on a limited list of projects that have been proposed for implementation and for which data was available. Also, the replication potentials are restricted to specific applications proposed by the project proponents and based not on a comprehensive assessment of the fields of application. Therefore, the presented potential serves mainly to illustrate interesting options for CDM in the country; it may be assumed that the actual potential for CDM projects in Egypt is higher.

3.4.2 The Investor's View

The analysis in Section 3.4.1 relies on the assumption that the allocation of resources in the international GHG offset market is only based on price considerations. In reality, international investors give their preference to countries, which assure a greater reliability. They are possibly ready to pay higher prices in order to get their returns with less risk. For this reason, in this and the following sections, we will analyze the position of Egypt in the international GHG offset market in terms of its level of reliability.

3.4.2.1 Potential International Investors

The potential investors for the CDM projects in the developing countries are governments, private sector companies and GHG funds, which are interested in investing in developing countries and the emerging markets for emission reductions under JI and CDM.

At the time, the main buyers of CERs include the carbon finance initiative of the World Bank (Prototype Carbon Fund, Community Development Fund, BioFund), the Dutch tender program CERUPT, as well as different Country initiatives from the Finland, Japan, Netherlands, Canada etc.). Investment by private companies or funds is still rather limited. With the putting into force of the Kyoto Protocol, it is expected that demand from private sector will overtake the role of the classical donors.

Table 3.7 contains a sample of potential investors who may participate in CDM projects in Egypt:

Table 3.7: List of Potential Investors

Governments	Private Sector & Companies	Pure GHG Funds (World Bank, National Funds)	Other Funds
Switzerland	British Petroleum – Amoco (U.K.)	Prototype Carbon Fund, Community Development Fund, Bio Fund (World Bank)	Private equity funds aimed at JI and CDM projects, for instance: <ul style="list-style-type: none"> • Credit Lyonnais / Arthur Andersen (France) • Clean Energy Fund (Bermuda) • Environmental Financial Products (USA)
Canada	Gas De France (France)	CERUPT (CER tender program of the Netherlands)	New Energy Funds
Finland	Deutsche Bank (Germany)		(Forestry Funds)
Japan	Chugoku Electronic Power Co. (Japan)		NGO Funds
The Netherlands	Norsk Hydro (Norway)		
Norway	Rabo Bank (Netherlands)		
Sweden	Mitsubishi Corp. (Japan)		
Any other Annex I country	Statoil (Norway)		

For more details on the existing funds (including the fund assets) see Newcombe, February 2001 and September 2002.

3.4.2.2 Criteria of Potential International Investors

As mentioned above, the foreign investors in general are always seeking to minimize the risk of his investments at different levels: country risk, industry risk and company risk.

Therefore most of international investors aim to diversify their investment portfolio, investing in different countries and regions and in different sectors.

The international investors in CDM projects are expected to look particularly at these criteria:

- Low price of emission reductions to ensure achieving high rate of return.
- Feasibility of CDM projects from different points of view: technical, marketing, environmental, and organizational aspects as well as financial feasibility aspects of the proposed project.
- Amount of incentives granted to such projects as well as the guarantees provided against nationalization and expropriation.

From the other side, the international investors are seeking to avoid investments in countries facing some kinds of barriers like:

- Financing problems,
- Uncertain market,
- Problems with obtaining local permits,
- Insurance related difficulties,
- No reliance local partners,
- Low rate of return,
- Unsuitability of foreign exchange rate.

(Source: ERUPT “Emission Reduction Unit Procurement Tender” www.senter.nl/erupt/)

3.4.3 Egypt's Competitiveness

In this section of the report, we will try to assess Egypt's competitiveness depending on some economic indicators and to show the image of Egypt abroad.

3.4.3.1 Key Economic Indicators

The economic indicators given in Table 3.8 show a good improvement in the Egyptian economy at the macro level up to the year 98/99. In 99/2000 some indicators slightly turned negatively.

Table 3.8: Key Economic Indicators for Egypt

	95/96	96/97	97/98	98/99	99/2000
GDP * Per Capita (L.E.)	3.955	4.303	4.556	4.726	4.537
Real GDP Growth Rate (%)	5.0	5.3	5.7	6.1	5.1
Average Annual Inflation (%)	7.3	6.2	3.8	3.8	2.8
Unemployment (%)	9.2	8.8	8.3	7.9	7.6
Fiscal Deficit (% GDP)	(1.3)	(0.9)	(1.0)	(4.2)	(3.6)
Current Account (% GDP)	(0.3)	0.2	(3.0)	(1.9)	(1.2)
Foreign Debt (% GDP)	46.2	38.1	34.0	31.7	28.3
Total Liquidity (M2), (billion L.E.)	168.02	193.43	209.97	234.07	254.72
Net Int. Reserves (million L.E.)	90,737	94,031	81,616	66,459	60,263
Central Bank Reserves (million L.E.)	61,478	67,751	67,023	60,262	51,000
Reserves/Months of Imports (Month)	15.7	15.7	14.3	12.7	10.2

* GDP refers to Gross Domestic Product

Source: Ministry of Finance, Ministry of Planning and Central Bank of Egypt (CBE)

Concerning the real GDP growth rate, the government is currently targeting to reach stable 6% in 2001. In order to achieve this target, the amount of investment needed has to reach 25% of GDP and the amount of foreign capital needed is estimated by 5 billions US\$ as an annual cash in-flows in terms of fresh equity capital, foreign loans and grants to be invested in new or existing projects. In June 2001, the Egyptian government succeeded in floating 1.5 billion US\$ sovereign bond through the international market. The proceeds from this issuance will be mainly used to finance the new required investments needed to reach the targeted growth rate.

3.4.3.2 Image of Egypt Abroad

Two international rating agencies have revealed their opinions over the effects of the market reforms recently realized in Egypt and assessed the investment climate for foreign investors. Moreover, interesting rating criteria are described in the World Competitiveness Yearbook, in which 47 nations (not including Egypt) are ranked according to their competitiveness. Finally, some considerations about the quality of Egyptian labor force as central competitiveness criterion are made at the end of the section.

A. Fitch IBCA

Greater encouragement was drawn from a solicited rating awarded by Fitch IBCA in August 1997, which was then reconfirmed by further research in October 1998. The resulting assessments awarded a BBB- (BBB minus) long-term foreign exchange rating of F3 (Fair credit quality), and a long-term local currency rating of A- (A minus) which is considered a good rating compared with other CDM competitors like South Africa, India and Brazil as will be shown later.

The agency stated that it was the ability to survive the shocks that had confirmed its view that the Egyptian economy had been substantially reformed.

B. Standard and Poor's (S&P)

The assessment made by Fitch IBCA was similar to that of Standard and Poor's, whose June 1997 solicited rating drew heavily upon the government's strong commitment to reform as a source of confidence. The agency awarded Egypt a BBB- (BBB minus) foreign currency rating, and A- (A minus) local currency rating, both of which with a stable outlook.

C. World Competitiveness Yearbook

In the World Competitiveness Year Book 47 nations (not including Egypt) are ranked according to their international competitiveness. Some hundreds of criteria are used to establish the ranking. In Table 3.9 few criteria are given for which data for Egypt are available and comparable according to the ranking table.

Table 3.9: Ranking of Egypt Regarding Some International Competitiveness Criteria

Criterion	Value mid 2000	Rank
Nominal GDP (billion US\$)	100	35
GDP per Capita (US\$)	1538	NA
Central Government Domestic Debt (% of GDP)	57	37
Real short-term Interest rate (%)	6.3	37
Roads (Km per Sq.Km)	0.41	30
Population (mid 1999- millions)	66.9	11

D. The Quality of Labor Force

Total private sector employment rose steadily indicating the growing importance and the expansion of the private sector in absorbing more labor force during the last few years. The quality of this expanding private sector labor force is high. According to the World Economic Forum 1996 Competitiveness Report, which surveyed 47 countries on a variety of competitive indicators, Egypt ranks the top for engineering scientists, the tenth for qualified engineers, the twelfth for secondary and technical training and the fifteenth for the supply for skilled labor. (Ref: "Investing in Egypt", Ministry of Economy & Foreign trade, June 2000, p. 87)

3.4.3.3 CDM Specific Measures

The proposed NSS action plan aims to facilitate CDM investments and encourage and facilitate the issuance of permits. Finally, it aims also to reduce bureaucracy through different steps and procedures.

3.4.4 The Position of Concurrent Countries

In order to compare Egypt with its major CDM competitors like India, China, Brazil and South Africa, we will characterize these countries using the same criteria and the rating of the same Agencies as we did in Section 3.4.3 for Egypt.

Rating Agencies

Table 3.10 shows that Egypt is in a better ranking position compared to India and Brazil and in the same position compared to South Africa, but in a lower position compared with China (See also Rating Indexes in Annex 3.7).

Table 3.10: Rating of Major CDM Competitors According to Rating Agencies

Country	S & P	Fitch IBCA
India	BB	BB+
China	BBB	A-
Brazil	BB-	BB-
South Africa	BBB-	BBB-
Egypt	BBB-	BBB-

Source: Brady Net: General Rating: <http://www.brady.net.com/e870.html>

The Brady Rating Ladder

The Brady Net Rating Ladder is the calculated average of four agencies participating on Brady Net: Moody's, S&P, Fitch IBCA, and Thomson. Table 3.11 shows the rating granted to Egypt as well as its competitors:

Table 3.11: Brady Net Rating Ladder

Country	Score
China	68.06
South Africa	56.78
Egypt	55.34
India	49.76
Brazil	42.60
Russia	30.78

World Competitiveness Yearbook

Table 3.12: Rating of Major CDM Competitors According to World Competitiveness Yearbook

Criterion	India		China		Brazil		S. Africa	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Nominal GDP (Billion \$)	440.5	12	991.2	7	606.2	9	131.1	29
GDP per Capita (U.S. \$)	446	NA	782	NA	3696	NA	3042	NA
Central Government Domestic Debt (% of GDP)	54.3	36	4.1	2	36.5	28	48.8	35
Real Short Term Interest Rate (%)	-4.7	2	5	33	22	46	12.8	43
Roads (Km per Sq.Km)	0.73	21	0.16	38	0.24	34	0.29	32
Population (million)	987	2	1267	1	164	5	43.1	17

Source: World Competitiveness Yearbook

With respect to the criteria of Table 3.12, Egypt is in a middle (third) position with regard to GDP per capita and real short term interest rate; it is in the second position with regard to roads, and in the last position (but just after South Africa and India) with regard to Central Government Domestic Debt (see Table 3.11). Population and nominal GDP are absolute criteria, which are given only for information, not being really apt for a competitiveness comparison.

CDM Specific Aspects

Reviewing the existence of National Strategy Study in competitor countries revealed the following – Table 3.13:

Table 3.13: Current Situation of NSS

Country	Current Situation of NSS
India	In preparation
China	Ongoing
Brazil	Under discussion
South Africa	Completed

Source: NSS Program

3.5 Conclusions

- The market for GHG offset is still characterized by a big amount of uncertainty concerning the market parameters and the market participation.
- The USA withdrawal from the Kyoto Protocol has affected to a great extent the total volume of the international trade, and accordingly the export revenue to Non- Annex I countries.
- Also, the behavior of some major suppliers of CDM projects, like China and India, will have a central influence on the market prices and traded volumes
- The expected international price for GHG offsets after US withdrawal will drop to 7.8 US\$ per ton of Carbon only (2.1 US\$/tCO₂eq).
- The Position of Egypt in the GHG offset market lies between 2.6 million tons of carbon under the optimistic scenario and 1.25 million tons of carbon under the pessimistic scenario.
- The possible export revenues quoted in Tables 3.4, 3.5 & 3.6 have been calculated assuming an homogeneous market, without taking into account some institutional factors and competitiveness aspects which also could strongly influence the market opportunities of Egypt.

Firstly, it should be mentioned that the actual export revenues could depend on the chosen implementation models of CDM projects, and in particular on the level of involvement of international investors: an involvement of a Annex I investors in an early stage of the project financing could reduce some realization difficulties, but possibly also reduce the export revenues at the end of the project, depending on the pricing agreement between developers, investors and host government.

Secondly, the actual export revenues will also depend on the competitive position of Egypt compared to its major competitors in the CDM market like China, India, Brazil and South Africa. With regard to this, it can be stated that Egypt is, generally speaking, in a middle position: on a general level of competitiveness, it seems that China and South Africa are better off, while India and Brazil have some disadvantages compared to Egypt. From the point of views of CDM-specific competitiveness aspects, only South Africa and Brazil seem to have already realized the potential of CDM for their economic and ecological development, while China and India have apparently not yet realized concrete plans or studies in order to facilitate the market access to CDM investors.

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