

# Module 3: Carbon Finance



## **Lesson 9: Introduction to the project-based mechanisms of the Kyoto Protocol**

UNEP Finance Initiative (UNEP FI) e-Learning Course on  
**Climate Change: Risks and Opportunities for the Finance Sector**

in collaboration with



**unitar**  
United Nations Institute for Training and Research



## Lesson 9: Introduction to the project-based mechanisms of the Kyoto Protocol

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## Objectives and key questions

This lesson gives an overview on the procedures of the Clean Development Mechanism (CDM) and Joint Implementation (JI) project development. It especially aims to give an understanding of the project opportunities of CDM/JI for financial service providers and the steps to take in order to successfully use the mechanisms. Special emphasis is laid on the role of financial institutions in project implementation and the marketing of the emission reduction credits generated by CDM/JI projects.



Questions answered in this lesson are:

1. How do the project-based mechanisms CDM and JI work and what are their objectives?
2. What are the requirements for participation?
3. What are the central requirements for project development (baseline calculation and additionality)?
4. What are the steps of the CDM project cycle?
5. Who is involved in a CDM/JI project?
6. What is the marketing potential of emission reduction credits?
7. What are the main challenges in CDM/JI project implementation?

## CDM and JI – How does it work?

**C**DM and JI are the so-called project-based mechanisms of the Kyoto Protocol that allow for the generation of emission reduction credits through implementation of emission reduction projects. The generation of emission reduction credits creates an additional income stream that helps projects to overcome financial and technological barriers.



CDM projects are joint activities between participants from an industrialised nation (Annex I party) and a developing nation (Non-Annex I party)<sup>1</sup>. CDM projects have the two-fold function

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<sup>1</sup> Annex I refers to the first annex of the United Nations Framework Convention on Climate Change, which contains all member countries that face an emissions reduction commitment. Non-Annex I nations are accordingly parties to the Kyoto Protocol that do not have reduction commitments (i.e. developing nations).

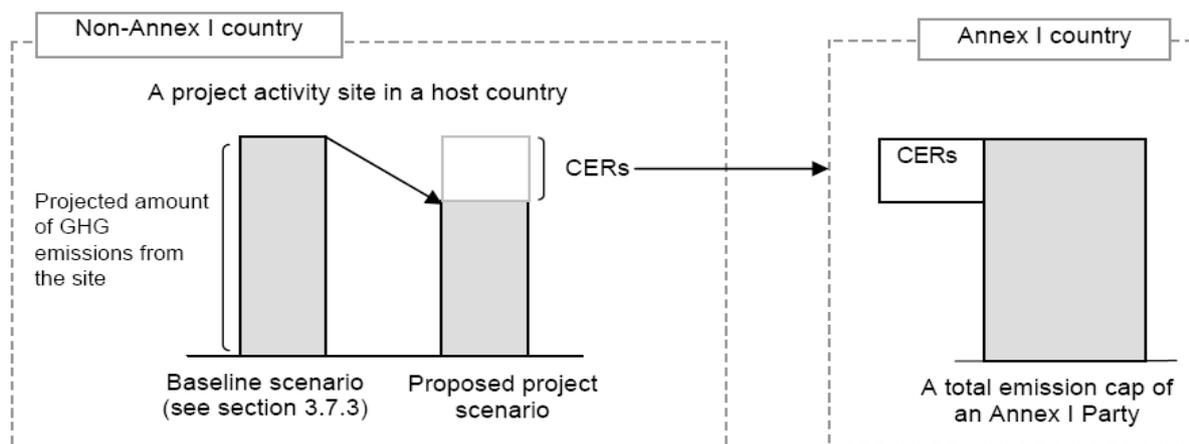
of supporting developing nations in their adaptation to climate change and at the same time providing industrialised nation participants access to cost efficient emission abatement technologies.

JI projects are joint projects between two Annex I parties that lead to the transfer of emission allowances between the registries of both countries. Any party that has ratified the Kyoto Protocol can participate in CDM and/or JI.

The emission reduction credits created by CDM are *Certified Emission Reductions* (CER). JI certificates are *Emission Reduction Units* (ERU), which have to be converted from AAUs from the host countries' overall emissions budget under the Kyoto Protocol.

This lesson will mainly focus on the CDM because JI constitutes so far only a very small share of the total market volume of project based credits.

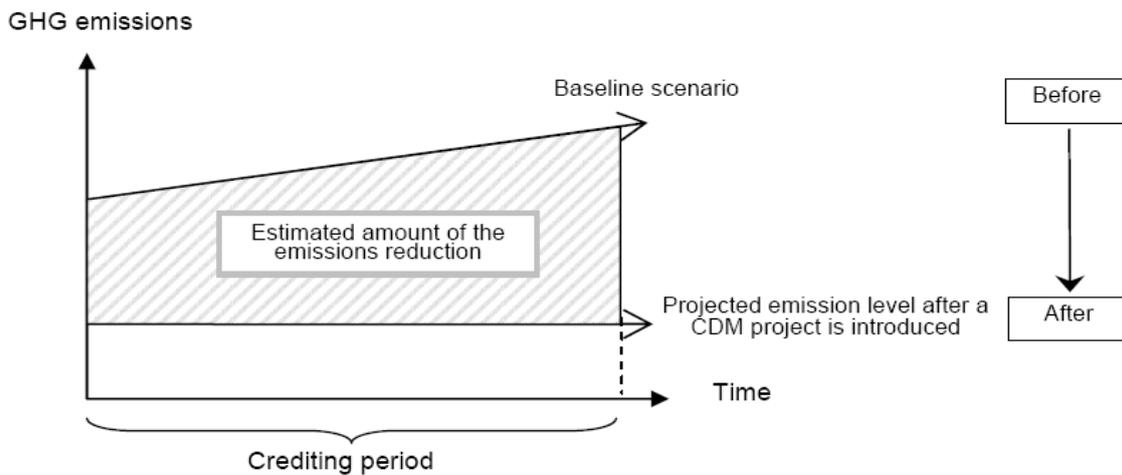
**Graph 1: The mechanism of CER transfer**



### Calculation of emission reductions of CDM projects

The emission reductions of a project and thus the amount of certificates that it creates is determined by subtracting the project's emissions from the so called *baseline emissions*. The baseline is the emission level that would occur within the project boundary in absence of the project activity. For the calculation of the baseline emissions, a *Baseline Methodology* that is approved by the United Nations Framework Convention on Climate Change (UNFCCC) has to be deployed. During project operation, all values are continuously measured and monitored, so that only the amount of definitely occurred reductions is credited. Monitoring also has to follow a methodology approved by the UNFCCC.

Graph 2: Calculation of emission reductions in CDM/JI projects



### Additionality

Additionality is defined in the so-called Marrakesh Accords: “A CDM project activity is additional if anthropogenic emissions of Greenhouse Gases by sources are reduced below those that would have occurred in the absence of the registered CDM Project activity.”

In order to be registered as a CDM project, a project has to provide evidence of its additionality. This implies that a project would not have been implemented without the incentive to generate emission reduction credits, e.g. that the income from selling the credits is a necessary condition to overcome barriers posed to the project’s implementation. This can be proven either by an investment analysis or a by a barrier analysis. An investment analysis aims to show that the project activity is economically not feasible or that a realistic alternative would be financially more attractive. The barrier analysis examines different barriers of economical, technological, legal or political nature that prevent the implementation of the project and that can be overcome through CDM.

**NOTE:** The development of the CDM aspects in a project should start at an early point in project development. Once implementation and financial closure are too advanced, it will be impossible to prove additionality.

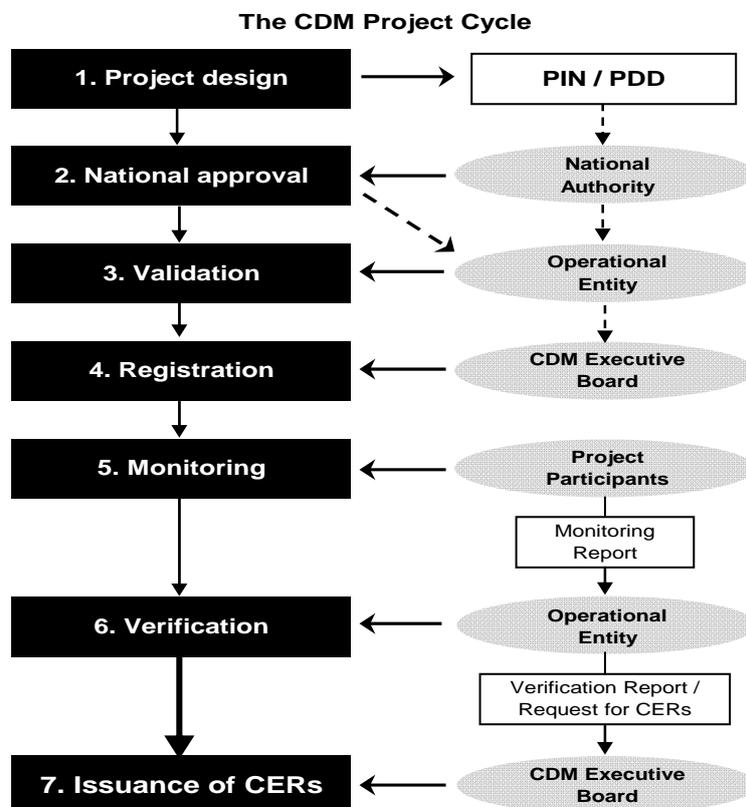
## The CDM project cycle

The CDM project cycle is supervised by the CDM Executive Board (EB) of the UNFCCC. In order to receive CERs, each project has to pass a complex registration procedure. The main documents necessary for registration are the Project Idea Note (PIN) and the Project Design Document (PDD). The PIN is a preliminary description of the key facts that serves mainly to attract investors/certificate buyers or to obtain endorsement from the host country. The PDD is a detailed document of the project. It contains:

- A description of the exact activity, the technology and the location;
- The application of a baseline methodology and detailed calculation of expected emission reductions;
- The argumentation of additionality;
- And a monitoring plan.

The following diagram shows the essential steps in the CDM project cycle and the players involved in each step:

Graph 3: The CDM Project Cycle



## **1. Project design**

The preparation of the project documents requires the exact calculation of the projected emission reductions via an approved baseline methodology. Many project types can revert to already approved methodologies. If this is not the case, a new methodology has to be developed and submitted. With an existing methodology the development of a PDD may take 3-6 months, depending on the complexity of the project and experience of the participants. The development and approval of a new methodology may take an additional 6-12 months.

## **2. National approval**

Each project has to be approved by the responsible authorities of host and investor countries. The host country letter of approval (LoA) is the first bottleneck for project registration. The national authority has to safeguard that a project contributes to the sustainable development strategy of the country and that it is developed according to CDM requirements. The time for the approval procedure varies from country to country. Usually it takes between 2 - 4 months but may take longer in countries with small number of projects.

## **3. Validation**

The project documents have to be reviewed by a so-called Designated Operational Entity (DOE) to affirm that the specifications and calculations are correct. DOEs have to be accredited by the UNFCCC. Validation (or determination for JI) is a prerequisite for registration. Validation currently takes on average between 8-10 months.

## **4. Registration**

The PDD, together with the LoA and the validation report, have to be submitted to the EB for registration. It will be open to public comment for one month before registration is decided upon. If details of the documentation are not sufficiently clear or do not meet the standards of the EB, the project goes into review. Registration at the EB takes about 3-6 months. If review is requested, this will take an additional 2-3 months.

## **5. Monitoring**

During project operation, the relevant parameters of the project have to be constantly monitored in order to ascertain the definite amount of emission reductions that result from the activity.

## **6. Verification**

Before issuance can be requested, the reductions have to be verified by a DOE based on the monitoring report.

## **7. Issuance of CERs**

The verified monitoring report is the base for the amount of reduction credits that is finally issued. Issuance will not occur before all inconsistencies are cleared and emission reductions are monitored and verified.

The transaction costs for the CDM procedures are usually between EUR 50,000 to 250,000 plus registration fee depending on project type and size. It may take approximately 1-2 years to get from the project idea stage to the actual registration of the project.

### **Differences between CDM and JI**

The main difference between both mechanisms is the fact that JI only leads to transfers of allowances between two national registries, while CDM projects actually lead to an increase in overall emission caps. The JI regulations generally distinguish between First Track and Second Track JI projects. First Track is a simplified procedure that does not fall under any UN supervision. To be eligible for First Track, the host country has to fulfil several preconditions to assure that the management of its emissions contingent and the reporting duties under the Kyoto Protocol are entirely fulfilled. In this case, the responsible national authority is solely responsible for approval of the projects and issuance of the credits. Ukraine and Russia, as well as most other Eastern European countries have successfully acquired 1st Track status, which allows them to host JI projects under a simplified procedure. In case where not all the requirements are fulfilled, the 2nd Track JI allows for a project procedure similar to CDM, only that the projects do not have to be registered at the UN. The JI Supervisory Committee (JISC) of the UNFCCC only gives final approval for the determination conducted by an independent accredited entity and for the verification of reduced emissions. Issuance of ERUs is carried out by the national authority.

The main reason for JI being far less developed than CDM until now is that CDM projects have been able to generate credits since 2000, whereas JI projects can only be credited from 2008 onwards. In October 2006, the regulations and procedures for JI projects were decided by the JISC. So far only 331 thousand ERUs have been issued with 33 projects registered. 160 projects are currently at determination. Hosting is dominated by Russia and Ukraine, with 93 and 31 projects (48 and 16 percent) respectively, thereby accounting for almost two thirds of all projects in the pipeline. However, none of JI projects hosted by Russia have yet been approved by the government. Central and Eastern European countries are less attractive for JI due to the problem of “double counting”, since they are covered by the EU ETS. Installations that receive EUAs under the EU ETS will not receive ERUs for JI projects, because this would lead to a double crediting, where reduced emissions are accounted for as ERUs from a JI project and at the same time the saved EUAs could be used.

There are still large risks in JI development given that the decision on ERU issuance is in the hands of national governments which have diverse and sometimes unclear decision procedures on JI approval.

## **Players involved in a CDM Project**

### **Project participants**

'Project participant' in a CDM project is an official status that entitles a company/government to become the owner of the emission reductions generated by the project. When implementing a CDM project, there is usually one participant from an industrialised investor country and one participant from the host country. However, also unilateral CDM projects do exist where a host country entity develops a CDM projects in its own responsibility.

### **Designated National Authority (DNA)**

For participation in the CDM, a country has to designate a national authority that is officially responsible for all related procedures. Usually this authority is located within the Ministry of Environment, or Economy and Trade. It is responsible for the LoA and assures that projects are conducted according to the national CDM requirements and the sustainability criteria defined by the individual country. For JI projects, the national authorities are called 'Designated Focal Points' (DFP).

### **Designated Operational Entity (DOE)**

DOEs are service providers accredited by the UN to validate and verify CDM project data. Validation of the PDD is a prerequisite for registration and verification of the monitoring report is prerequisite for issuance of CERs. For JI projects, the corresponding entity is called Accredited Independent Entity (AIE).

### **CDM Executive Board (EB) / JI Supervisory Committee (JISC)**

The UNFCCC has a gatekeeper function to assure that no misuse of CDM occurs and only eligible projects are credited. Thus, the registration at the EB is the most important institutional hurdle for a CDM project. Track 2 JI projects are supervised by the so-called JI Supervisory Committee (JISC).

## CDM/JI market development and potential

### The Supply side of the project market



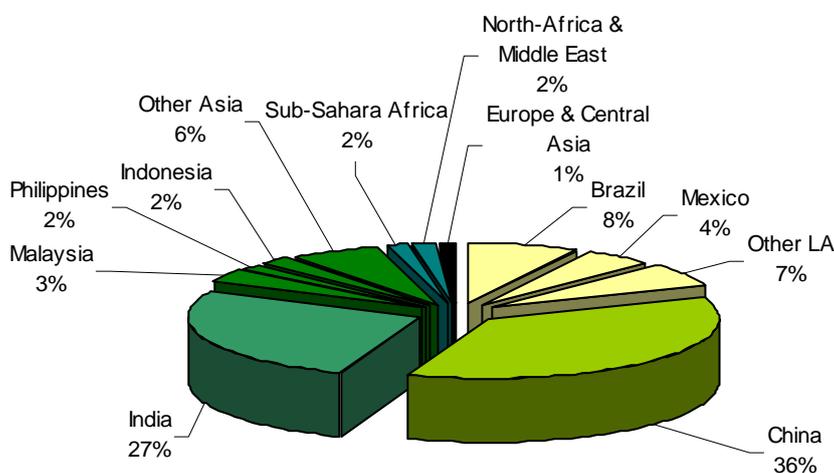
Up to April 1 2009, nearly 1516 CDM projects have been registered with a reduction potential of nearly 1.54 billion tCO<sub>2</sub>e until 2012. Around 3300 further projects were in the pipeline which adds up to a total reduction potential of the pipeline of about 3 GtCO<sub>2</sub>e until 2012.

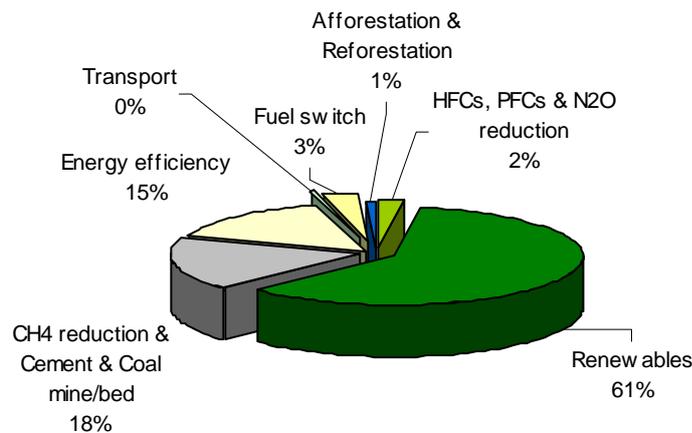
Projects in 55 nations have been registered. China and India are the market leaders with 63% of all registered projects and 70% market share in terms of CER volume. Latin America is the second region hosting 20% of registered projects. Implementation of JI still lags far behind.

### What kind of projects is eligible under CDM and JI?

Most emission reduction technologies are eligible for a CDM project as long as it does not cause severe ecological or social damages (nuclear power and some large dam projects are excluded!). It is important though, that the emission reduction is measurable and directly attributable to the project activity. The portfolio of registered projects in terms of CER volume is so far dominated by renewable energy and industrial gas capture projects. The gas capture projects make up for most of the emission reduction volume since they often target very potent GHGs that have a higher *Global Warming Potential* (GWP). HFC-23 for example, a gas that accrues as by product in the production of cooling liquids, has 11,700 times the warming potential of CO<sub>2</sub> (hence 11,700 times the credit potential). N<sub>2</sub>O has a GWP of 310. Also very prominent are methane capture projects in solid or liquid waste disposal sites. Other important categories are fuel switch from oil/coal to natural gas/renewable sources and energy efficiency improvements. The project trends begin to change as projects with the highest emission reduction potential, biggest revenue and thus lowest implementation costs (so called “low hanging fruits” – mainly projects that target industrial gases) are becoming scarce.

Graph 4: Projects in the CDM pipeline by regions and by type as at April 1 2009





### **Demand side of the project market**

Without differentiating by buyer types, the largest countries on the market in 2007 were the UK with 59% of purchases and Japan with 11%. However, especially the UK figure hides a large number of purchases by non-compliance buyers. Demand patterns for CER/ERU have evolved substantially since early 2000's when first projects were being developed. The current market is blossoming with a variety of buyers. Not only government and EU compliance installations are hunting for the projects and credits, but they need to compete against various carbon funds, banks and other intermediaries. Three buyer classes are presented here.

- Compliance buyers: Governments and EU ETS installations

Japan and a number of EU governments with a Kyoto shortfall have set up purchase programmes to foster CDM development. Some of the largest EU ETS compliance companies buy CDM projects themselves also. However, carbon funds are a popular way for both government and private entities to procure CERs. While the JI market was dominated for a long time by government buyers (90% in 2006), 2007 saw the first transactions with Japanese private companies buying from Eastern Europe. The CDM market is by far dominated by private sector players with a market share of over 80%. However, this large figure includes not only private compliance entities but also private funds and intermediaries as discussed below.

- Funds

There are numerous funds that purchase credits and give investment loans under favourable conditions to carbon credit projects. All together there are some 80 carbon funds today, of which around 40 meet the definition of investment funds, being a pool of investors. The World Bank alone operates 11 carbon funds. The European Investment Bank has four funds under management. The post 2012 Carbon Credit Fund managed by the EIB is the first fund focusing on the accumulation of carbon credits generated after the end of the first

commitment period of the Kyoto Protocol, thus setting important signals for the continuation of international climate change mitigation efforts after Kyoto.

- **Banks and intermediaries**

Besides carbon funds, numerous banks are engaged in financing CDM/JI project development or purchasing CERs. Among European banks the most active are Banco Santander, Barclays, BNP Paribas, Crédit Agricole, Deutsche Bank and UBS. All these are active in establishing capacity building programs and investing in carbon funds and projects. The large share of the private sector (and of the UK as most carbon desks are based in London) in the CER market is due to private intermediation. Large corporations, financial institutions, emission brokers and consulting companies offer services for project development, or raise carbon procurement funds to finance projects or develop project portfolios.

A large range of services has developed around the carbon market. In Asia Mitsubishi Financial Group is the most active in providing project support services, but also Mizuho and Sumitomo Mitsui Financial Groups are providing such services. Many international development agencies participate as facilitators of CDM/JI project origination and development. It is important to note though that CDM should not be understood as development aid.

Even non-ratifiers of the Kyoto Protocol can be involved in CDM projects. Before Australia's ratification of the Kyoto Protocol in December 2007, Australian companies were actively taking part in CDM projects. Pacific Hydro for example, an Australian renewable energy company, runs projects in Chile, Fiji and the Philippines that aim to register as CDM. The 155 MW La Higuera Run-of-River Hydro Project being developed by Pacific Hydro together with Statkraft Norfund Power Invest (SNPI) is even the largest investment by an Australian company in the Chilean electricity sector. Nonetheless it has to be acknowledged, that companies from countries that did not ratify the Kyoto Protocol can not act as official participants under CDM regulation and thus can not directly earn credits. Spokesmen of the Australian Institute of Energy and the Australian Wind Energy Association stated that a number of case studies indicate that other companies are favoured for renewable energy contracts over Australian firms for this reason. A non discriminating advantage for every company from affected sectors is that climate friendly technologies in general are gaining much traction through CDM and JI.

### **Matching supply and demand**

The supply side is evolving rapidly in the CDM market. The Executive Secretary of the UN Climate Secretariat states that investment flows to developing countries of up to US\$100 billion per year could be generated by carbon finance. The realisation of this potential largely depends on demand, which is defined above all by the demand structure within the IET and the EU ETS. In addition, proposals for the new national emissions trading markets include the possibility of linking up to the Kyoto trading system and thus adding to the demand for CERs. Taking into account the difficulty to predict the demand and supply size of carbon credits till 2012, there are different estimates of the market. The supply of CERs and ERUs is

estimated in the range of 1.5 – 1.8 billion tons, while the demand might range around 1.2 - 1.8 billion tons. Expectations on the carbon credits supply have recently been revised downward as a result of lack of financing to projects. However, demand especially from the EU ETS has diminished also as the recession has pulled emissions down.

### **Market development and prices**

Currently carbon credits are currently traded in three main forms:

- Forward (primary market) contracts

Purchasing credits directly from a CDM project is done as a forward transaction. Carbon credit volume and prices are fixed in a so called Emission Reduction Purchase Agreement (ERPA), which is a non standardized contract between the credit seller and buyer in order to define rights and liabilities of the parties. The physical transaction will be cleared as soon as the CER is issued.

- Spot (primary and secondary market) contracts

Spot transactions have been possible since the national registries were linked to international trading. Counterparties in a spot transaction can be anyone who has a registry account for carbon. Thus players on the market range from project owners through intermediaries to compliance buyers. Spot contracts are traded directly among counterparties (Over the Counter, OTC) or through exchanges like ECX and Bluenext.

- Future (secondary market) contracts

A sprawling exchange-negotiated futures market has also developed over the years. A future is a standardized contract which is negotiated on an exchange. The buyer does not know who the seller is. The contracts are commoditized, i.e. the buyer does not know what the project is underlying the credit to be delivered at a point of time defined in the future contract. Most of the futures contracts never result in delivery as they are used for hedging purposes and are cancelled before the date of delivery.

For the pricing of CERs there has to be made a distinction between the secondary market CERs and primary market CERs. The secondary market consists in deals with guaranteed delivery from reliable counterparties who sell from their own portfolio. The primary market comprises direct deals with the owner of the project at various stages in the project development cycle and thus with varying risk structures.

The secondary market price of an exchange-traded spot contract serves as a reference price for CERs which are traded on the primary market without delivery guarantee. The liquidity of secondary CER trade has grown significantly, passing from 25 million tons of CERs traded in 2006 to 250 million tons in 2007. Since then, the introduction of spot contracts on the exchanges has further contributed to the expansion of the secondary market.

The secondary CER prices are linked to the EUA prices with a certain discount. The discount is caused by remaining regulatory uncertainties on the eligibility of certain types of CERs in the EU ETS post 2012 and by the limits for import of CERs and ERUs into the EU ETS. For a

long time the Nordic power exchange Nord Pool was running the only index for secondary CERs, but recently also the ECX has started trading CER futures and spots. The price for primary credits is formed based on the market perception of risks associated with a given project and by the allocation of project risks among the buyer and the seller.

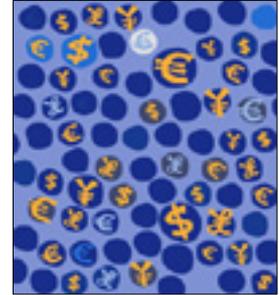
To date, almost all ERPAs only include transactions until 2012 because of the lack of clarity in view of the international climate change policy framework beyond 2012. The revision of the EU ETS directive brought certainty on CER demand in the EU at least until 2020. This has been reflected by a rise in demand for post 2012 carbon credits. Nevertheless these credits are still being sold at a discount compared to pre 2012 credits.

The choice of financial instruments in the carbon market becomes more sophisticated – financial institutions are developing indexes for carbon market related products in order to help investors to hedge climate change related risks that have impact on their main products. There are around 9 leading indexes consisting from 12 to 321 components that reflect climate change related opportunities (investing in renewable and clean technologies, in carbon trading firms), and negative impacts (weather changes). UBS Global Warming Index provides possibility for such business as gas industry to hedge the risk of temperature change by purchasing weather derivatives. Recently carbon unit component has also been included in the indexes. Thus, the UBS Greenhouse Index offers a 50:50 split between weather derivatives and EUA and CER; Barclays Capital runs the first pure carbon index that tracks only emission prices. Some recent indexes for tracking liquidity of EUA and CER trade include the ones launched by Merrill Lynch and by the French bank Société Générale.

## **CDM: Opportunities and Challenges**

### **Benefits of CDM**

The main objective of the CDM is to make emission reduction projects happen that would not have been feasible without the incentive to sell CERs. The internal rate of return (IRR) of emission reduction projects can be enhanced through additional incomes from reduction credits. This makes the CDM an interesting option for project financiers. According to the World Bank, a project's IRR can increase through the employment of CDM/JI between 0.5-2.5% in hydro, wind and geothermal projects and between 5-15% in methane reduction projects from landfills. For such projects, the certificate streams form a vital part of the financial balance; sometimes they are even the only income stream.



### **Main challenges in implementation**

Administering JI and CDM projects is complex and time consuming and the standards to be fulfilled are high to avoid misuse. The main challenge in project development is to meet these standards and thus minimise the risk of failing in the registration cycle. It has to be assured that the project documents are developed accurately in accordance with the CDM requirements. Special attention has to be paid to the correct application of the baseline and monitoring methodology and additionality. Furthermore – since CDM projects take place in developing countries – they are disposed to higher country risks such as currency risks, unstable political conditions or unclear legal regulations. Before an investment decision is made, these risks have to be assessed very thoroughly.

## Key Terms

- Accredited International Entity (AIE)
- Additionality
- Annex I party / Non-Annex I party
- Baseline / Baseline and Monitoring Methodology
- CDM Executive Board (EB)
- CDM project cycle
- Certified Emission Reductions (CER)
- Designated National Authority (DNA)
- Designated Operational Entity (DOE)
- Emission Reduction Units (ERU)
- Host Country Approval (HCA)
- JI Supervisory Committee (JISC)
- Project Design Document (PDD)
- Project Idea Note (PIN)
- Registration
- Validation / Verification



## Wrap up

This lesson discussed how CDM and JI projects are implemented and monitored. It was shown that the implementation of CDM/JI projects can imply considerable additional expense and additional costs. However, CDM/JI projects also open up new business opportunities. Lack of finance is the main bottleneck for CDM projects. This can be the entry point for financial institutions in order to expand their services to this new market. However, to successfully finance CDM projects it is crucial to build up specific expertise and to introduce specialised risk tools.



## Additional Reading

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- Grubb, Michael (2003): The Economics of the Kyoto Protocol
- ICF International (2009): Carbon Funds Outlook
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- The European Union (2004): Linking Directive
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- The World Bank (forthcoming): Clean Energy for Development Investment Framework: Progress Report on the World Bank Group Action Plan
- The World Bank (2008): State and Trends of the Carbon Market 2008
- United Nations Development Programme (UNEP) (2004): Legal Issues Guidebook to the Clean Development Mechanism
- United Nations Framework Convention on Climate Change (UNFCCC) (2006): CDM Project Design Document Form
- United Nations Framework Convention on Climate Change (UNFCCC) (2001): The Marrakesh Accords and the Marrakesh Declaration.
- United Nations Framework Convention on Climate Change (UNFCCC) (2005): Tool for the demonstration and assessment of additionality.
- Yamagata, Hiroshi (2005): The CDM and the Others Encourage Environmentally Friendly Energy Projects



## Related Links

**CD4CDM:**

<http://cd4cdm.org/>

**Climate Action Network:**

<http://www.climatenetwork.org/>

**Environmental Finance – Climate Change:**

<http://www.environmental-finance.com/online.htm>

**IETA:**

<http://www.ieta.org/ieta/www/pages/index.php>

**Joint Implementation Network:**

<http://jiq.wiwo.nl/>

**New Carbon Finance:**

<http://www.newcarbonfinance.com/>

**PointCarbon:**

<http://www.pointcarbon.com/>

**UNEP Risoe CDM/JI Pipeline Analysis and Database:**

<http://www.cdmpipeline.org/>

**UNFCCC:**

<http://unfccc.int/2860.php>

**WB Carbon Finance:**

<http://carbonfinance.org/>

**The World Bank Carbon Finance Unit:**

<http://carbonfinance.org/>



UNEP Finance Initiative (UNEP FI)

# **e-Learning Course on** Climate Change: Risks and Opportunities for the Finance Sector



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