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- Joint Implementation in Central and Eastern Europe
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Renewable energy technologies and Kyoto Protocol mechanisms

JOINT IMPLEMENTATION IN CENTRAL AND EASTERN EUROPE

CLEAN DEVELOPMENT MECHANISM IN THE MEDITERRANEAN AREA

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Foreword

Since the signature of the Kyoto Protocol (December 1997), Europe is ahead in terms of political will to fight against global warming and to act in favour of a more sustainable world, as demonstrated in all the positions taken by the EU in international fora like the Johannesburg Conference (August-September 2002).

To achieve its Kyoto commitments the EU will have to make strong efforts both domestically and internationally.

At home, the EU is already implementing various policies and measures in order to increase the share of renewable energy sources and combined heat and power, to improve energy efficiency (for example in buildings and industry) and to raise the level of alternative fuels for transport. Moreover, maintaining a substantial share of nuclear will be necessary to avoid large increase of CO_2 in the electricity sector.

The EU target to reach 3% of GDP dedicated to Research and Technological Development in 2010 will also help to develop cleaner, smaller and more efficient technologies, i.e. emitting less greenhouse gases in the whole life cycle of products. Some practical examples will be provided by the forthcoming Environmental Technologies Action Plan.

At the international level, there is a great potential for the so-called "flexible mechanisms" and especially for Joint Implementation projects in transition economies and for Clean Development Mechanism projects in developing countries. This aim is to reach the global emission reduction target in a cost-effective way while transferring advanced technologies to other industrialised and developing countries.

This brochure focuses on co-operative projects between partners from the EU and its neighbouring countries. It highlights the various steps, advantages and practical information needed to build such projects oriented towards renewable energy technologies.

I am convinced that the methods and tools provided by these study results will help governments, businesses and non-governmental organisations in the EU, Central and Eastern Europe and Mediterranean Countries to fully benefit from these challenging partnerships.

For the future, European research will continue to support both technological advances, for example in the transition towards hydrogen, and socio-economic research providing scientific background data to decision-makers.

Philippe Busquin
Member of the European Commission
Responsible for Research

Introduction and acknowledgements

This brochure provides general background information on the possibilities for Joint Implementation in Central and Eastern Europe and Clean Development Mechanism in the Mediterranean area, in particular in the field of renewable energy.

The objective of this publication is not to present prescriptive methods for project developers, but to increase capacity building in the countries of these regions and to help various stakeholders (government, businesses, and NGOs) to prepare and evaluate Joint Implementation and Clean Development Mechanism projects. This is achieved by illustrating different assessment tools developed by two European research projects known as BASE and CDMEDI.

Different in both scope and objectives, BASE (Baseline and additionality for Joint Implementation in Central and Eastern Europe) and CDMEDI (Development of renewables in Southern Mediterranean region through Clean Development Mechanism) provide useful tools and methods that have been summarised in a single publication which, it is hoped, will also increase the interest of potential investors in these Kyoto Protocol project-based mechanisms.

The publication is divided into various parts: the Kyoto Protocol and the project-based mechanisms; the BASE and CDMEDI European research projects; the prospects for renewables in Central and Eastern Europe and in the Mediterranean area; and the Joint Implementation and Clean Development Mechanism project cycles, design and appraisals. The annexes give examples of potential Joint Implementation and Clean Development Mechanism projects and actual contact points in Central and Eastern Europe and in the Mediterranean area.

This brochure has been prepared by two consortia of European research organisations and funded by the European Union under the Fifth Framework Programme for RTD (DG Research, Energy programme, socio-economic activities).

The two team coordinators of the BASE and CDMEDI projects and the main authors of this brochure are Madeleine Rawlins from ESD (Energy for Sustainable Development) and Houda Allal from OME (Observatoire Méditerranéen de l'Energie). Domenico Rossetti di Valdalbero from the European Commission, DG Research, has supervised the work.

Participants in the BASE and CDMEDI projects were Kari Hämekoski from Electrowatt-Ekono, Magdalena Rogulska from EC BREC/IBMER, Manfred Stockmayer from KWI Architects Engineers Consultants, Marjan Seliskar from ISPO, Ylo Mets from Estivo, Sandor Molnar from Systemexpert Consulting Ltd, Ludmila Skurovcova from CityPlan, Néjib Osman from ANER, and Roberto Vigotti from Enel Green Power.

Valuable comments have been received from Samir Allal (University of Versailles/OME, France), Hélène Connor (HELIO International), Susanne Haefeli (International Energy Agency), Aphrodite Mourelatou (European Environment Agency), Juan José Peña (Unión Fenosa Energías Especiales, S.A, Spain), and Norbert N. Vasen (ETA - Renewable Energies, Italy). Thanks for reading also go to Tahar Abdessalem (Ecole Polytechnique de Tunisie, LEGI, Tunisia), Abdelhanine Benallou (CDER, Morocco), Tomas Chmelik (Ministry of Environment, Czech Republic), Jérôme Halbout (SGAM, France), Ezzedine Khalfallah (ANER, Tunisia), Gareth Phillips (SGS Climate Change Programme, UK), and Andréa Pinna (PCF, WB, US).

On behalf of the European Commission, constructive remarks have been made by Jürgen Salay, Peter Zapfel and Damien Meadows from DG Environment, Sandra Stevens from DG Transport and Energy, Maria Lamin from DG Development, Liisa Tanttari from DG Enlargement, and Wiktor Raldow, Michel Poireau, Barry Robertson and Pierre Valette from DG Research.

List of acronyms

AAU:	Assigned Amount Units
BASE:	Baselines for Accession States in Europe – Promoting Clean Energy Investments through Joint Implementation in Central and Eastern European Countries
CDM:	Clean Development Mechanism
CDMED:	Scenarios and strategies for the implementation of the Clean Development Mechanism of the Kyoto Protocol in the Mediterranean region
CDMEDI:	Promoting and financing Clean Development Mechanism renewable energy projects in the Mediterranean region
CEE:	Central and Eastern Europe
CEEC:	Central and Eastern European Countries
CER:	Certified Emission Reductions
CHP:	Combined Heat and Power
COP:	Conference of the Parties
DH:	District Heating
DNA:	Designated National Authority
EB:	Executive Board
ERU:	Emission Reduction Units
ERUPT:	Emission Reduction Units Purchasing Tender
ESD:	Energy for Sustainable Development
ETS:	Emissions Trading System
EU:	European Union
GHG:	Greenhouse Gas
GWP:	Global Warming Potential
IET:	International Emissions trading
IPCC:	Intergovernmental Panel on Climate Change
IRR:	Internal Rate of Return
JI:	Joint Implementation
JOINT:	Joint Implementation for International Emissions Reductions through Electricity Companies in the EU and Central and Eastern European Countries
MED2010:	Large-scale integration of solar and wind power in Mediterranean countries
MOP:	Member Of the Parties
NGO:	Non-Governmental Organisation
OME:	Observatoire Méditerranéen de l'Energie
PAM:	Policies and Measures
PCF:	Prototype Carbon Fund
PDD:	Project Design Document
PIN:	Project Idea Note
PV:	Photovoltaics
SEMC:	Southern and Eastern Mediterranean Countries
SSC-PDD:	Small-Scale Project Design Document
SSN:	SouthSouthNorth project
UNFCCC:	United Nations Framework Convention on Climate Change
US:	United States of America

Kyoto Protocol and project-based mechanisms

A global strategy on climate change has been agreed under the 1992 United Nations Climate Change Convention and its 1997 Kyoto Protocol. This international legal regime promotes financial and technical co-operation to enable all countries to adopt more climate-friendly policies and technologies. It also sets targets and timetables for emission reductions by developed countries.

Specifically, the Protocol requires 39 developed countries to reduce their greenhouse gas (GHG) emissions by an average of 5.2% relative to 1990 levels. These annual emissions reductions must be reached by 2008-2012, referred to as the first commitment period. The developed countries with emission reduction targets are called Annex-I countries (industrialised countries), whereas those without targets are the non-Annex I countries (developing countries).

Within the Kyoto Protocol is a provision for the creation of a "bubble" of emissions commitments. The EU bubble allows the EU Member States to act as a group and to negotiate a formal, binding redistribution of their global commitments which, in total, account for an 8% reduction in GHG emissions. The agreement on these commitments will remain valid throughout the commitment period and therefore the EU cannot expand this bubble into the Accession States, where the commitments have already been far exceeded through economic decline.

KYOTO PROTOCOL – EU MEMBER STATE COMMITMENTS

Country	Internal commitment (% change from 1990 levels)
Austria	-13
Belgium	-7.5
Denmark	-21
Finland	0
France	0
Germany	-21
Greece	+25
Ireland	+13
Italy	-6.5
Luxembourg	-28
Netherlands	-6
Portugal	+27
Spain	+15
Sweden	+4
United Kingdom	-12.5

The Protocol will only enter into force once it has been ratified by at least 55 Parties to the Climate Change Convention, including industrialised countries, representing at least 55% of this group's total 1990 carbon dioxide emissions. As of June 2003, the first condition for the Protocol to enter into force has been more than fulfilled since 108 countries have ratified the Protocol. The second condition is almost fulfilled. The "Kyoto Thermometer" has reached 43.9%. The following Annex I countries are missing: US, Russia, Australia, Monaco, and Liechtenstein. Only the US (36.2%) and Russia (17.4%) have emissions large enough to fill the gap. However, Russia is expected to ratify the Protocol in 2003. Once the Kyoto Protocol enters into force, the Conference of the Parties (COP) of the United Nations Framework Convention on Climate Change (UNFCCC)[1] will also serve as the formal Meeting of the Parties (MOP) for the Kyoto Protocol. This is referred to as the COP/MOP.

The Kyoto Protocol allows developed countries to reach their targets in different ways. They have to implement domestic Policies And Measures (PAM) and they are allowed to supplement these PAM with projects abroad and with market instruments, also called "flexibility mechanisms". The following section describes these mechanisms as they were conceived by the Protocol and have been better defined during the ensuing negotiations.

International Emissions Trading (ET) as set out in Article 17, permits an Annex I Party to sell part of its "assigned amount" (the amount of emissions the Party may emit during the commitment period) to another Annex I Party ("Assigned Amount Units" – AAUs).

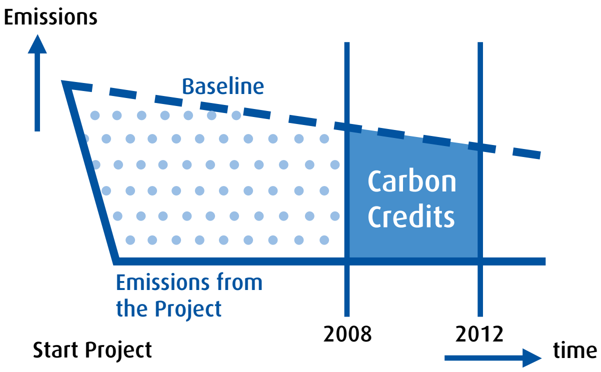
Joint Implementation (JI), defined in Article 6, allows Annex I Parties to implement projects that reduce greenhouse gas emissions by sources, or enhance removal by "sinks", in the territories of other Annex I Parties, and to credit the resulting "Emissions Reduction Units" (ERU) against their own emission targets. (The term "Joint Implementation" does not appear in Article 6, but it has entered into common usage as convenient shorthand.)

The Clean Development Mechanism (CDM), defined in Article 12, allows Annex I Parties to implement projects that reduce greenhouse gas emissions in non-Annex I Parties and has the twin goal of assisting non-Annex I Parties to achieve sustainable development and contribute to the ultimate objective of the Convention, i.e. to stabilise greenhouse gas emissions at levels not dangerous to human development. Under the CDM, the Parties not included in Annex I will benefit from project activities resulting in Certified Emission Reductions (CER) while Parties included in Annex I may use the CER accruing from such project activities to contribute to their compliance with part of their quantified emission limitation and reduction commitments under Article 3. The CDM thus allows the transfer of CER to a party investing in GHG emission reduction projects. This transfer, or trade, is a market-based system that allows individual firms, as well as countries, to select the most effective solutions to achieving GHG emission reduction. The CDM is supervised by an Executive Board (EB), and a "share of the proceeds" from project activities will be used to assist particularly vulnerable developing countries in meeting the costs of adapting to climate change.

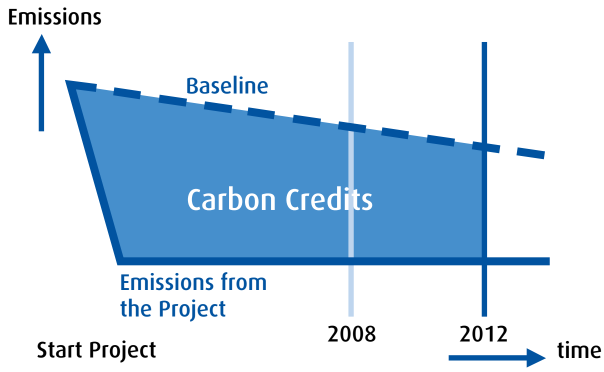
JI projects can generate emission reductions only as of the start of the commitment period (see below). Emission Reduction Units (ERU) are only generated after the beginning of the commitment period (in 2008). CDM projects can generate CER before the commitment period, i.e. the crediting period is different from the commitment period. The crediting period for CDM projects starts after registration at the earliest. Such registration can occur as soon as the procedures are settled. There is an exception for projects that have started as of the year 2000 and before 10 November 2001, where exceptionally the crediting period may start prior to registration, but not before 1 January 2000. The crediting period can be selected as being either seven years with twice the option of renewal, or ten years without renewal.

1. *www.unfccc.int*

BASELINE EMISSIONS, ACTUAL PROJECT EMISSIONS AND THE RESPECTIVE CARBON CREDITS FOR A JI PROJECT



BASELINE EMISSIONS, ACTUAL PROJECT EMISSIONS AND THE RESPECTIVE CARBON CREDITS FOR A CDM PROJECT



Note: the start of the project must be after 2000.

The last Conference of Parties (COP-9), which took place in New Delhi, India, in October-November 2002, adopted the "Delhi Ministerial Declaration on Climate Change and Sustainable Development". Among other statements, the Declaration indicates that actions are required to develop cleaner, more efficient and affordable energy technologies, including fossil fuel and renewable energy technologies; and actions are required, with a sense of urgency, to substantially increase the global share of renewable energy sources.

EU research projects: from theory to practice

BASE

The BASE[2] European research project was conceived after experience with the JOINT project[3] and other 'learning-by-doing' activities (particularly ERUPT – Emission Reduction Units Purchasing Tender and the PCF – Prototype Carbon Fund) showed that there was very little in the way of harmonised approaches for the definition of additionality and baselines in the field of JI in the Accession States of Central and Eastern European Countries (CEEC). In particular, it was shown that there was very little agreement on the means by which to demonstrate additionality under the Kyoto Protocol of the UNFCCC. The methodology and, indeed, the nomenclature for baselines were often confusing and inconsistent.

Furthermore, it was clear that there was a considerable replication of work being carried out on baselines in the CEEC as each baseline was established on a case-by-case basis. There was a need to consolidate this work to harmonise baselines and baseline approaches and thus to reduce the transaction costs for developing JI projects.

BASE was designed to bring key stakeholders together in each country in order to reach consensus on:

- defining how baselines should be developed alongside the requirements put on JI applicants as regards demonstrating additionality under Kyoto;
- developing a harmonised nomenclature on, and framework for, baselines ranging from the simplest heat-only projects to the more complicated combined heat and power grid feed in projects;
- familiarising key players in each country with various baseline methodologies and then 'testing' an agreed baseline approach on 'real' projects in each country;
- developing national electricity sector baselines working with key electricity sector players in each country and key government stakeholders in each country;
- comparing approaches and results between countries in a learning-by-doing approach.

In each country, a BASE 'country team' was established bringing the focal points, other key government agencies (electricity sector, environment, energy, regulators), and key industry players (specifically from the electricity sector) to work through the various aspects of the BASE project.

BASE addresses both the needs of industry and government in investor and host countries. The primary objectives of BASE were to agree on methodologies to be applied in the host countries covered by the project (Czech Republic, Estonia, Hungary, Poland, and Slovenia), to integrate into national baseline definition the work that is already being carried out in each country on emissions reporting and energy sector modelling, and to produce transparent guidelines for investors and governments on how to design, develop and approve eligible JI projects.

BASE is working with the UNFCCC 'focal points' in each country and other key stakeholders (e.g. electricity and heating industry, research institutions) to develop a set of baseline tools, methodologies and guidelines tailored to each country's climate change objectives.

2. The BASE project (Baselines for Accession States in Europe – Promoting Clean Energy Investments through Joint Implementation in Central and Eastern European Countries) has been funded by DG Research under the EU Fifth Framework Programme for Research and Technological Development – http://base.energyprojects.net/

3. The JOINT project (Joint Implementation for International Emissions Reductions through Electricity Companies in the EU and Central and Eastern European Countries) has been funded by DG Research under the EU Fifth Framework Programme for Research and Technological Development – http://joint.energyprojects.net/

The project has developed consensus among the key stakeholders (particularly those ministries most relevant to promoting and approving JI projects) on the processes necessary to satisfy minimum requirements of additionality for JI applicants.

Baselines have been assessed in each of the participating CEEC at the national level, looking at individual energy sector plans and modelling activities in each. BASE then tested these by focusing at a JI project level. Potential JI projects were identified in each country, and their eligibility under JI was tested. The potential credits that could be generated by these projects were assessed in each country by the BASE core team.

The focus on real projects was key throughout the BASE project. Until recently, baselines were very hypothetical and academic, lacking the practical experience of getting projects approved and through the process of validation. Over the past two to three years there has been a far greater focus on tangible projects, through BASE, JOINT, ERUPT, the PCF and other emerging programmes. This has allowed the BASE project team (including the country teams) to consolidate the wealth of experience on defining JI project additionality, and to apply baseline methodologies in JI host countries.

BASE developed a project boundary definition system built up from a number of project components that are common to all energy sector projects. The system developed under the BASE project has already been adopted with some adjustment by the Austrian government. In addition, BASE is working alongside governments to facilitate JI project development by developing national criteria for JI project implementation which are clear and transparent both to potential investors and to key government stakeholders.

Guidelines have been set out for the practical implementation of JI projects, setting out the methodologies to be applied in each case, providing indications of the levels of expected credits from each type of project, and setting out requirements that will be expected for JI project baseline development in each country and internationally.

BASE has consolidated existing databases in each country that are being used for a number of purposes, such as the national communications being prepared by the UNFCCC focal points and the energy planning being carried out by those government agencies responsible in each country for the energy sector.

Furthermore, working alongside governments, BASE has defined baselines for the electricity sector in each country, using tools and models that are already being used by governments and the relevant sectorial players to establish the emissions framework for the sector in each country, and thereby set the framework for defining the additionality of proposed JI projects. In working with governments on JI and baselines, there are a number of benefits that the BASE project has brought to each of the host governments within the project:

- The ability to deal systematically with the key issues of additionality;
- A nomenclature and methodology to review and appraise JI projects;
- The ability to compare the advantages and disadvantages of JI vis-à-vis other types of support (e.g. subsidies, targets, etc.);
- More confidence on the part of host governments in working with investors who propose JI projects, and in evaluating their JI proposals; and
- An understanding of the project cycle and project risk, and how they can reduce costs in JI.

Considerable practical skills have been gained during the BASE project. However, there are a number of issues that still hinder JI in these countries. The most notable issue is that climate change, while important in each of the CEECs, is only one of a number of areas requiring intensive focus as they prepare for accession to the European Union.

In all cases, governments lack the personnel, hence the capacity, to deal with the numerous pressing issues of climate change, from developing national communications under the UNFCCC, to negotiating national positions at the COP/MOP, to complying with the new EU directive on emissions trading[4], to reviewing JI project applications. Indeed, if the climate change agenda in each CEEC is to be fully developed in each Accession State, the issue of capacity and capacity building must be dealt with quickly.

CDMEDI

The objective of CDMEDI[5] is to support the development of renewable energy projects in the Southern Mediterranean region through the CDM, and to help European countries achieve their Kyoto targets in accordance with the objectives of the European Union, the Mediterranean countries and the Kyoto commitments. This will also contribute to sustainable development both in the Northern and in the Southern Mediterranean regions.

The CDMED[6] and MED2010[7] projects showed that the Mediterranean countries are endowed with high potential of renewable energy sources and that these resources are underdeveloped because of many existing barriers. The projects also showed that CDM could play a positive and important role in developing the renewable energy market in the Mediterranean region, thereby contributing to the sustainable development of the region.

Indeed, the MED2010 project analysed the large-scale integration of wind power and photovoltaics (PV) in Morocco, Tunisia, Egypt and Turkey, with the objective of reaching, by 2010, a share of 10 to 12% of these energy sources in the electricity balance of the countries studied. This objective is in agreement with those of the European Directive on the promotion of renewable energy in the EU countries, and also with the strategic guidelines on renewable energy set by the countries analysed. The work accomplished by the partners within the framework of the project comprised the assessment of the existing resources and analysis of sites for wind and PV projects, the development of wind atlases, and the preparation of integration plans and the design of business plans in view of implementing the identified and studied projects. The analysis of institutional, regulatory and financial aspects of wind and PV programmes in these countries, as well as the new financial instruments available, such as the green certificates, are also of great importance to the study.

For wind power, the economic potentials have been estimated: in Morocco (6,000 MW), Tunisia (1,000 MW), Egypt (10,000 MW, technical potential 100,000 MW), and Turkey (10,000 MW, technical potential 88,000 MW). Selected sites have also been analysed by the Wasp software program and concerned wind farm project potential totals: Morocco (200 MW), Tunisia (150 MW), Egypt (130 MW), and Turkey (70 MW). Integration plans for the selected projects have been developed along with analyses of the institutional and financial aspects.

Because of its low rural electrification rate and high population, the Moroccan PV market is the biggest among the three countries studied in MED2010 (Morocco, Tunisia and Egypt). Indeed, the potential PV market in Morocco amounts to 100,000 to 200,000 PV systems, as against 6,000 to 15,000 PV systems in Tunisia and 4,500 in Egypt. Thus, the integration plan developed for Morocco focused on a selected region representing a market of 9,500 PV systems; in Tunisia the target was 50% of the potential PV market, while in Egypt the integration plan concerned the total PV market potential.

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4. Common position adopted by the Council on 18 March 2003 with a view to the adoption of the Directive of the European Parliament and of the Council establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC.

5. The CDMEDI project (Promoting and financing Clean Development Mechanism renewable energy projects in the Mediterranean region) has been funded by DG Research under the EU's Fifth Framework Programme for Research and Technological Development – www.ome.org/cdmedi

6. The CDMED project (Scenarios and strategies for the implementation of the Clean Development Mechanism of the Kyoto Protocol in the Mediterranean region) has been funded by DG Research under the EU's Fifth Framework Programme for Research and Technological Development. See Allal H., Nogaret E., Clausen N.E., Lundtang Petersen E., Georgy G., Casale C., Russ P., "The development of wind power in the Mediterranean region in the framework of the Clean Development Mechanism of the Kyoto Protocol", Global Wind Power Conference, Paris, 2002. To obtain a copy of the CDMED published report: allal@ome.org.

7. The MED2010 project (Large-scale integration of solar and wind power in Mediterranean countries) has been funded by DG Research under the EU's Fifth Framework Programme for Research and Technological Development – www.ome.org/renewable/med2010.

But despite high renewable energy resources, MED2010 confirmed the lack of adapted institutional frameworks for the large-scale integration of wind power and PV in the Southern and Eastern Mediterranean countries (SEMC), and the need for specific financing schemes, such as the CDM, to allow the renewable energy market to really develop in the Mediterranean region.

The results of the CDMED project on both medium- and long-term potential (2010 to 2030) for CDM projects, based on co-operation between the EU and in the Southern Mediterranean countries, coincides with other studies on CDM that drastic cuts in emissions reduction cost can be expected if all deviations from the baseline are considered to be acceptable as CDM projects. Limiting CDM projects to projects for renewable energy based electricity generation would reduce these impacts. However, important cost advantages can still be expected. The induced amount of additional capacity of renewable technology installed in Southern Mediterranean countries would be significant. In this region, the capacity would almost double as compared to the reference case. The potential related to the CDM would thus reach 16,000 MW of additional renewable energy technologies installed capacity, mostly wind.

To conclude, CDMED and MED2010 projects showed that an interesting potential for renewable energy CDM projects does exit in the Mediterranean region. If implemented in the region, the CDM could contribute to economic growth and sustainable development of the SEMC hosting such projects through the transfer of funds and technology from the European countries.

That said, the implementation of the CDM of the Kyoto Protocol in the Mediterranean region requires definition of the type of projects which could be implemented, and the development of adequate strategies. Also, in order for the Mediterranean renewable energy market to benefit from the CDM, it is very important that the main actors and potential investors in CDM projects be aware of the opportunities to implement renewable energy CDM projects and of the high potential of renewable energy sources with which the region is endowed.

Prospects for renewables and energy efficiency in Central and Eastern Europe

CONTEXT

Most of the countries in Central and Eastern Europe (CEE)[8] are dependent on imports of fossil fuels for their energy. There are only three countries that stand out as not being dependent on imports: Poland has abundant coal reserves, Romania has abundant gas reserves and Estonia has abundant oil shale reserves. However, the CEE region is well endowed with renewable energy resources which are currently under utilised, and could contribute significantly to reducing import dependency and greenhouse gas emissions.

As these countries move towards EU accession, energy pricing is becoming more transparent, and policy-makers recognise the significant benefits of renewable energy development such as employment, revenues, regeneration and environmental performance, renewables are beginning to get the attention they deserve.

The region has a history of energy-intensive industry and high consumption of fossil fuels for energy production. The extended period of under-investment, limited environmental controls and the absence of exposure to market- based fuel and power markets is currently generating many challenges for CEE as the countries move towards accession into the European Union (EU). The CEE region represents a huge opportunity both in the exploitation of its renewable energy potential and in terms of energy efficiency.

There is a significant prevalence of district heating systems in the CEE region and there is a need for substantial refurbishment of the systems. This provides great scope for energy efficiency, combined heat and power (CHP) and fuel switching, leading to both economic and environmental performance improvements.

CEE energy sectors have embraced change and have taken many large strides towards achieving the requirements of EU accession. Structurally the sectors are changing fast, with the traditional state-owned energy monopolies partially or fully unbundling and privatising. Over the past ten years, the CEE energy sectors have experienced the same trend of investment as the European sector, with Western corporate entities acquiring generation and distribution businesses and assets. This, combined with evolving national energy regulatory policies and frameworks, has stimulated investment into energy efficiency and environmental performance.

RENEWABLE RESOURCES

The CEE countries offer rich renewable resources[9] – biomass is particularly abundant and the countries have the potential to further develop biomass energy through agriculture. In conjunction with agricultural production, biomass provides more than 50% of the region's renewable energy resource. Most of these countries have more than 40% forest cover, and some have as much as 80%. The potential to develop bioenergy crops is considerably higher in the CEE region than in the EU, with former agricultural land available for energy crops such as rape and short-rotation coppice.

The CEE region is rich in hydro resources, with considerable untapped potential, particularly in the Slovak

8. Poland, Estonia, Lithuania, Latvia, Czech Republic, Slovakia, Hungary, Romania, Bulgaria and Slovenia.
9. For an analysis of the factors that led to the successful implementation of renewable energy projects at EU Member State level, the reader is referred to the European Environment Agency's report: "Renewable energies: success stories", Copenhagen, 2001.

Republic, Romania and Bulgaria. Seventy per cent of the most accessible large hydro potential is currently being exploited. Small hydro has been largely neglected during the last 30-40 years, and it remains an area of major interest and potential. Harnessing the energy potential of small hydro projects is becoming more common with the decentralisation of energy supply responsibilities, with regional administrations initiating community-scale energy projects.

There are significant geothermal resources in CEE, with accessible resources in Bulgaria second only to those found in Italy. Hungary, Poland and Slovenia also have geothermal resources which can feasibly be exploited. Opportunities for district heating heat sources exist where lower temperature geothermal resources are found.

Wind resources are sufficient to be commercially exploited in the Baltics and in Black Sea coastal regions. Because of the relatively low wind resources compared to countries on the Atlantic coast, wind energy has not received much attention and has not been viewed as a high priority in the CEE region. However, the successful growth levels in Western Europe during the last 15 years, particularly in areas of relatively low wind speeds, are pushing wind up the agenda at a rapid rate. In 1990, the total installed wind capacity in the EU was 439 MW. This had grown to more than 20,000 MW by the end of 2002 (European Wind Energy Association, 2002). This growth has exceeded all expectations.

In retrospect, there are many lessons that can be taken from this, the main one being that given the correct economic, political and financial framework, even the most optimistic forecasts can be surpassed for wind energy. The greatest solar resource may be found in Romania and Bulgaria. The use of solar heaters for water is common, but the opportunities to increase and improve the application of solar energy are huge. The potential for PV applications is currently underutilised.

There are a number of drivers for change in the CEE energy sectors. Arguably, the predominant factors are commercial and political. The political drivers relating to accession to the European Union requires the region to integrate EU policy into domestic legislation, thus greatly influencing the energy sector in terms of market liberalisation and environmental performance. Fundamental changes to national generation capacity are integrated into the accession process, including the decommissioning of the 1,500 MW Ignalina Nuclear Power Plant in Lithuania and the 3,400 MW Kozloduy Nuclear Power Plant in Bulgaria. In addition to these changes, increasing environmental performance standards will limit the use of existing fossil fuelled capacity, or require significant refurbishments. The EU has also proposed three sets of renewable energy targets – for renewable energy, renewable electricity and biofuels – to 2010.

Under the renewable electricity Directive, the Member States of the European Union are required to set national indicative targets for the consumption of electricity produced from renewable sources. As part of the *acquis communautaire* towards accession, the CEE countries have negotiated indicative targets for 2010. This process is now complete. At the time of writing, the agreed indicative targets between the CEE countries are still not in the public domain.

There is no shortage of opportunities, resources and drivers to reduce fossil fuel use in the region through clean energy technologies such as energy efficiency, renewables and CHP, and this is reflected in the growth in this field. However, many projects are at the commercial margin where they require financial support to enhance their viability. In the absence of financial support mechanisms, it is hard to forecast significant developments in energy efficiency and environmental performance improvements. The European Commission recently indicated that the investment required for ensuring compliance with environmental law is estimated at €120 billion for the ten CEE countries[10].

10. DG Enlargement, European Commission, 2002.

The financial support currently available for energy sector projects which deliver environmental benefits varies greatly from preferential loans to grants. These are funded from both domestic and international sources. The Kyoto Protocol's JI mechanism currently offers financial support for projects which deliver environmental performance improvements. Within the EU, other renewable energy support mechanisms are currently emerging such as tradable Green Certificate and Energy Feed-in tariffs. A variety of national support mechanism are now being established in CEE – mainly Energy Feed-in tariffs – although the Tradable Green Certificate solution is becoming increasingly interesting as the costs to the country of achieving growth in renewable energy is perceived to be lower.

JOINT IMPLEMENTATION OPPORTUNITIES

Joint Implementation (JI) is a 'project-based' tool that holds out considerable hope for transferring modern, clean energy technologies – particularly in the renewable, cogeneration and energy efficiency fields – from more developed countries (e.g. the EU), to economies in transition (e.g. the Central and Eastern European Countries). In so doing, the investment leads to GHG reductions that can be verified externally and credited to the investment. These Emission Reduction Units (ERU) can then be utilised by the investing entity to meet environmental targets or, increasingly, obligations (liabilities) in their host country, or to be traded to other parties to achieve the same objectives.

JI offers great opportunities for a large number of clean energy projects that need additional support to make them economically viable. Depending on the technology, the credits will have a varying impact on the Internal Rate of Return (IRR) for the project. The table below illustrates the typical impact that credits may have on the IRR. It should however be noted that there are many cases where the impact will be well in excess of this, particularly where methane abatement is involved, due to the potency of the GHG. It should also be noted that for smaller projects it could be a lot less as the transaction cost of JI will reduce the benefit.

POTENTIAL CONTRIBUTION FROM ERU TO PROJECT FINANCE

Technology	Variation of the IRR
Energy efficiency district heating	1.4%
Wind	0.3 – 1%
Hydro power	0.2% – 0.8%
Bagasse	0.5% – 3.5%
Biomass with methane	Up to 5%
Biogas with methane	> 5%

Source: Prototype Carbon Fund, 3 USD per tonne of CO_2

Having experienced economic decline, the Accession States of CEE have reduced their consumption of fossil fuels and thus the generation of GHG emissions. In the context of the Kyoto Emission Reduction Targets, the economic decline of these countries provides them with a tradable asset. They are able to sell the excess emission reductions to countries which may find it difficult to meet their targets because they have higher GHG emission abatement costs.

Each CEE government has the option to retain the emission reduction from the base year (generally 1990), or to sell part of their emission reductions in excess of their targets to other countries where the cost of reducing emissions is higher. All ten of the CEE countries have signed and ratified the Kyoto Protocol.

Prospects for renewables in the South and East Mediterranean Area

CONTEXT

The Southern and Eastern Mediterranean countries (SEMC) are facing high demographic growth combined with high socio-economic energy development. The population of the SEMC was 240 million in 2000, and is expected to increase to 323 million in 2020, according to the United Nations (*Plan Bleu*) and the International Energy Agency.

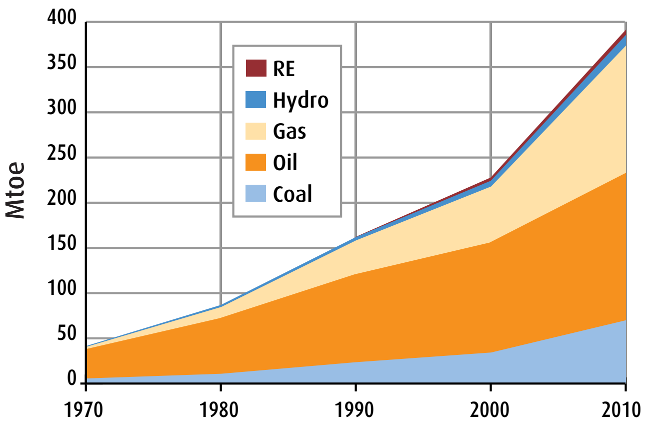
In addition to these demographic trends, high economic growth is of vital importance and energy is considered to be an important element for socio-economic development. Moreover, the urban populations are expected to increase from 150 million in 2000 to 250 million in 2020. The majority of these populations are and will be located in costal regions which will become more and more overcrowded and ecologically threatened. This double phenomenon of urbanisation and littoral concentration will have a marked influence on the nature of energy use in the future.

According to the *Observatoire Méditerranéen de l'Energie* (OME), based on national forecasts, primary energy use in SEMC is expected to increase dramatically from 225 Mtoe in 2000 to some 390 Mtoe by 2010. This growth is, among other things, driven by the increase in electricity demand which should progress from 350 TWh in 2000 to 700 TWh by 2010. For the energy sector alone, investment needs have been estimated by the OME at $190 billion between 2000 and 2010. More than half of investment needs are for the electricity sector.

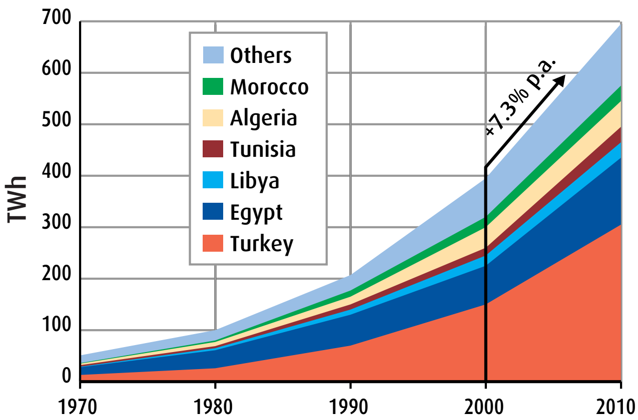
POPULATION OF THE SOUTHERN AND EASTERN MEDITERRANEAN COUNTRIES

					ANNUAL GROWTH RATE		
M PEOPLE	1990	2000	2010	2020	1990-2000	2000-2010	2010-2020
Algeria	24.9	30.4	34.9	39.9	2.0%	1.4%	1.3%
Cyprus	0.73	0.82	0.84	0.89	1.4%	0.7%	0.5%
Egypt	52.4	64.0	78.2	89.6	2.0%	2.0%	1.4%
Israel	4.7	6.2	6.7	7.5	2.8%	0.8%	1.2%
Jordan	3.2	4.9	6.7	8.2	4.4%	3.2%	2.0%
Lebanon	3.6	4.3	5.6	8.0	1.8%	1.8%	3.6%
Libya	4.4	5.3	7.2	8.3	1.9%	3.1%	1.4%
Morocco	24.0	28.7	32.3	36.3	1.8%	1.2%	1.2%
Palestine	2.0	3.2	4.2	5.5	4.6%	3.0%	2.5%
Syria	12.1	16.2	19.2	22.4	3.0%	1.7%	1.5%
Tunisia	8.2	9.6	10.9	12.3	1.6%	1.3%	1.2%
Turkey	56.2	66.8	75.7	83.8	1.7%	1.3%	1.0%
PSEM	**196**	**240**	**283**	**323**	**2.0%**	**1.6%**	**1.3%**

PRIMARY ENERGY CONSUMPTION BY SOURCE



POWER PRODUCTION IN THE SEMC



Investment stakes in the energy sector are, therefore, very important. While their financial resources are limited, the SEMC have to find a way of financing highly capital-intensive investments with a low rate of return. In addition, energy projects compete with other infrastructure needs (roads, hospitals, schools, etc.). Among various solutions, opening up to international investment is often presented as the best way of palliating the local lack of financial resources. In the context of market liberalisation and globalisation, international organisations, such as the International Monetary Fund, the World Bank and the European Commission, invite countries to reform their institutional framework in order to stimulate private initiative and attract foreign direct investment. Most SEMC have already implemented institutional reforms.

Moreover, the SEMC are facing two major problems: how to meet the increasing demand for commercial energy for those with access (principally in the cities), and how to provide access to modern, efficient and clean forms of energy for the majority of the population in rural areas. Renewable energy technologies, fuel switching and energy efficiency provide the best solution in many situations.

As for renewable energy, and as will be briefly detailed hereafter, several studies carried out and coordinated by the *Observatoire Méditerranéen de l'Energie*[11] have revealed the large and untapped potential for the development of renewable energy that could be used to increase total energy production and to exploit indigenous energy resources more fully. However, the effective market penetration in most SEMC falls far below expectations.

RENEWABLE RESOURCES

The Mediterranean region has a vast potential for development of renewable energy because of its large population and vast solar and wind resources. Moreover, in order to supply the energy and electricity needed for the social and economic development of the countries of the region, while preserving the environment, it is essential to promote advanced energy technologies, in particular, renewable energy. The

11. These include, in chronological order: APAS, INTERSUDMED, IRESMED, MEMA, CDMED, MED 2010 and MEDSUPPLY. These studies have been co-funded by the EU (DG Research and DG Energy and Transport from the European Commission) and performed by a consortium of Euro-Mediterranean partners.

important roles that renewable energy could play in contributing towards sustainable development and poverty alleviation were also confirmed at the Johannesburg World Summit on Sustainable Development.

The MEDSUPPLY project analysed the current role of renewable energy by considering five selected SEMC for which data was readily available, namely Algeria, Egypt, Morocco, Tunisia, and Turkey. Together these countries represent 84% of the total SEMC population and 71% of the total energy consumption. The results point to the minor role of renewable energy in their energy balances, except for high levels of biomass consumption in some countries. As for renewable energy-based power generation, it is mainly dominated by large hydro in Turkey and Egypt. Excluding these, the remaining renewable energy-based power generation reached 398 MW in 2000, with small hydro and wind taking up the largest share.

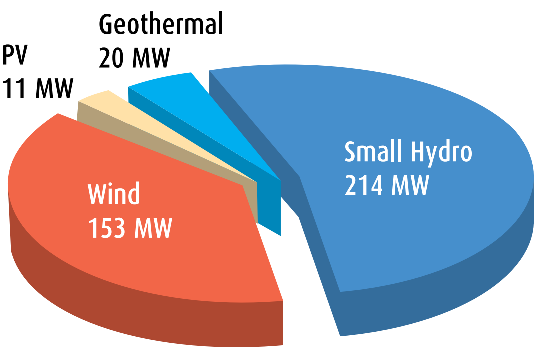
In addition, two scenarios have been built and analysed to assess the potential trends in renewable energy by 2010. In the 'modRES scenario', power generation from renewable energy could reach 22% by 2010, driven by strong growth in large hydro capacity mainly in Turkey and in Morocco. A specific scenario has been developed excluding large hydro. In such a case, renewable energy-based capacity should increase from the current 398 MW to about 4,364 MW in 2010, providing all currently announced projects are carried out. Renewable energy (excluding large hydro)-based power generation would increase from the current 0.4% to 2.6%. Wind would take the lead, followed by geothermal (albeit only present in Turkey at the moment) and small hydro.

The second scenario, 10% RES scenario, focuses on the increase of renewable energy (excluding large hydro) by allocating them a 10% share in power generation. This would mean that a very proactive policy is actively pursued by both SEMC governments and the international community. In this case, renewable energy sources-based capacity would reach 17,000 MW, mainly dominated by wind energy.

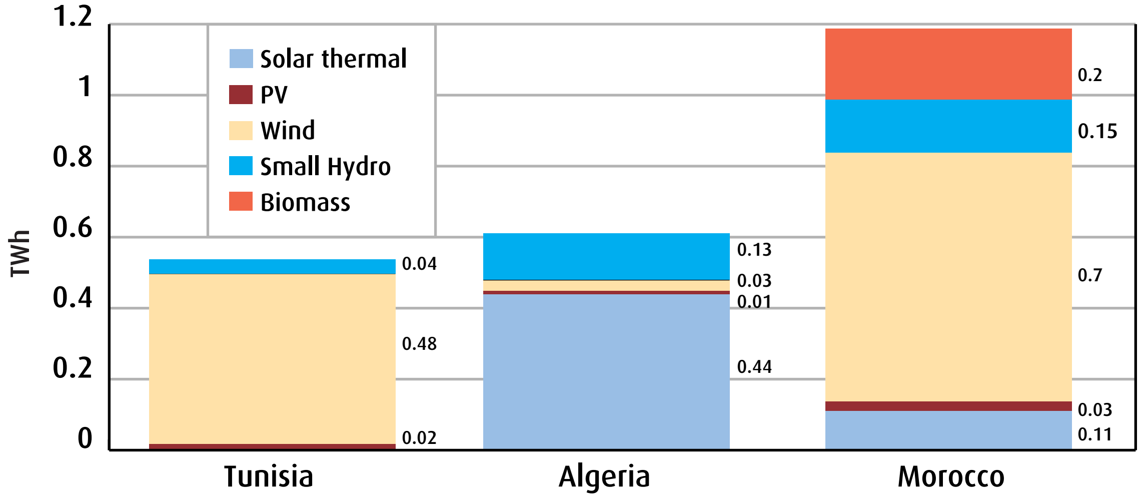
CLEAN DEVELOPMENT MECHANISM OPPORTUNITIES

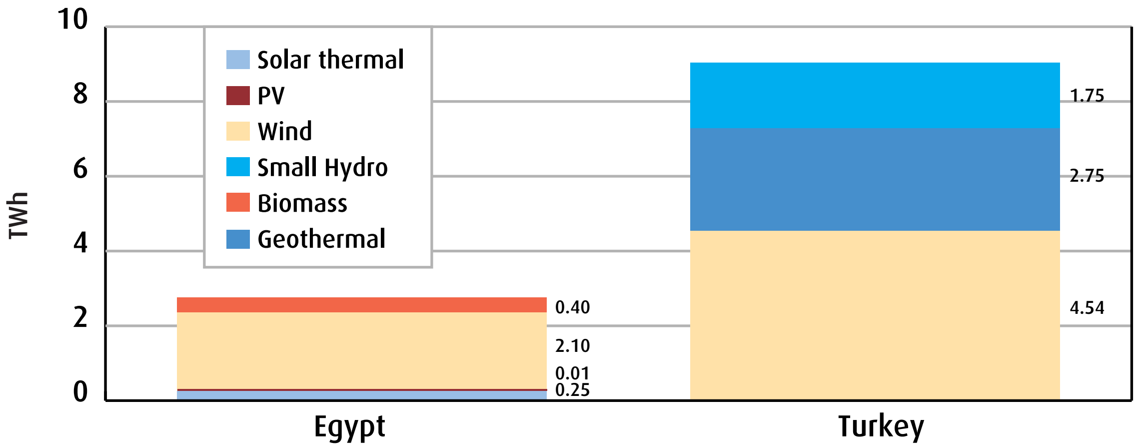
The full extent of the potential benefits available to the SEMC under the CDM is difficult to forecast, but its potential to promote sustainable development and increase foreign investment flows is clear, especially for renewable energy projects. With thoughtful planning and the development of a national CDM strategy, it can also assist in addressing local and regional environmental problems and in advancing SEMC social

RENEWABLE ENERGY (EXCLUDING LARGE HYDRO)-BASED POWER CAPACITY IN 2000 (MW)



RENEWABLE ENERGY SOURCE (EXCLUDING LARGE HYDRO)-BASED POWER GENERATION IN 'MODRES 2010 SCENARIO'(IN TWh)
(by source and country)





development goals as well as industrial and economic development in European countries. The CDM allows SEMC to participate in the global effort to combat climate change at a time when other development priorities may limit the funding for GHG emission reduction activities.

The CDM is not the only solution that will remove the barriers facing the large-scale development of the renewable energy market in the SEMC but it could be an additional measure to increase the share of renewables.

Joint Implementation

PROJECT CYCLE

The broad process of establishing validated emission reductions is common to all potential JI projects, although there will be variations between projects, purchasers and countries. The identification and marketing of emission reductions should be an integral part of the normal project development cycle and the figure below illustrates the relationship between the conventional project cycle and the JI process.

The host government's endorsement of the emission reduction is crucial to the projects success, and an indication of the government's willingness and eligibility to transfer ERU should be assessed at the very beginning of planning a project for JI.

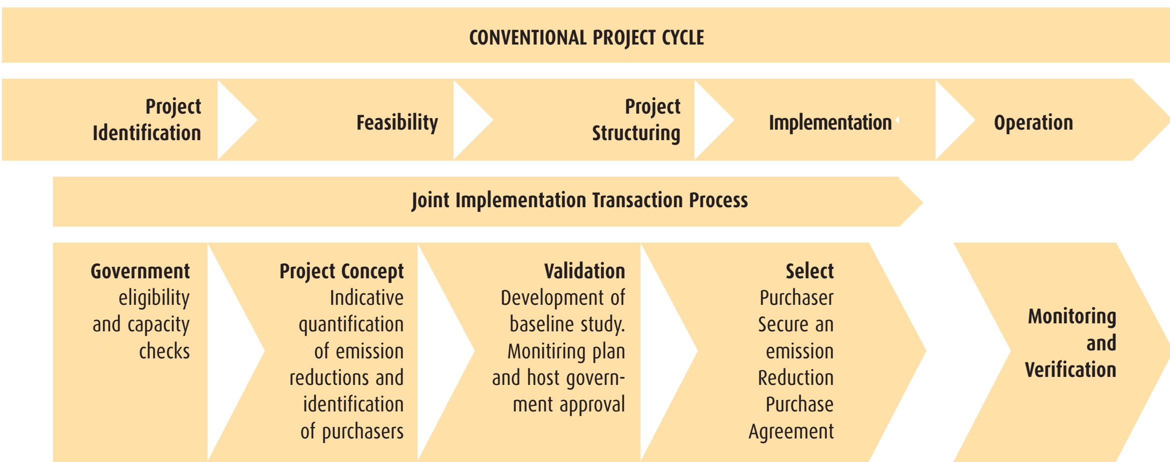
Assuming that assessment of the initial scope of the project shows that there is a good potential for JI and that the host government is behind the project, the project concept would be developed in the form of a Project Idea Note (PIN). A PIN generally contains a description of the project, description of the partners involved in it, an indication of the baseline, and an estimation of the ERU that will accrue from the project. This is carried out in parallel with the feasibility assessment of the project.

The third step for JI is to develop a Project Design Document (PDD) which is described briefly in the next section on JI design. It is at this stage in the JI project cycle that the greatest level of effort is engaged. A full baseline study and monitoring plan must be developed and validated by an independent third party entity. In addition, at this stage host government approval must be sought for the project. Once the PDD has been validated and the approval has been granted the "emission reduction purchase agreement" needs to be agreed and signed by both investor and purchaser.

The final stage in the JI project cycle comes after implementation of the project when the project operator must monitor and report on the emission reductions generated by the project. The performance of the project and thus the emission reductions may then be verified again by a third party entity. This should be built into existing environmental management systems to avoid duplication of reporting requirements on-site.

The transfer of ERU must then take place between the two governments involved in the project as they will need to transfer assigned amount units.

ENERGY PROJECT AND JOINT IMPLEMENTATION TRANSACTION PROCESS



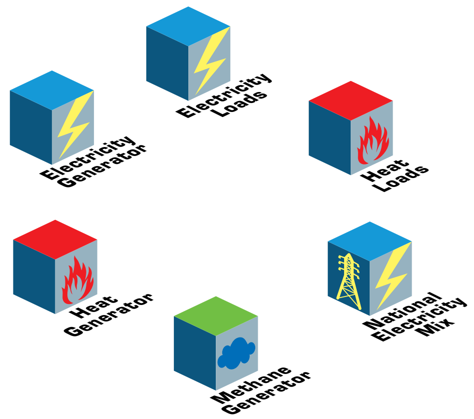
JI DESIGN

It is a requirement for each JI project to submit a project design document (PDD)[12]. The key elements of this are as follows:

- Technical description of the project
- Baseline study
- Projections of estimated ERU accruing from the project
- Monitoring plan
- Approval from the parties involved (investor and host country authorities)
- Environmental impact assessment in line with the local legislation and regulation

The first task that must be carried out before moving on to these discrete elements of the PDD is to define the boundaries of the project[13]. The project boundary defines the emission sources/sinks that are affected by the project. The technical description of the project, the baseline study and the monitoring plan must be consistent with the project boundary. BASE has developed a typology for the systematic description of projects and their boundaries in the energy sector of Central and Eastern European Accession States. BASE then goes on to define how the boundaries affect the choice of baseline determination methodology.

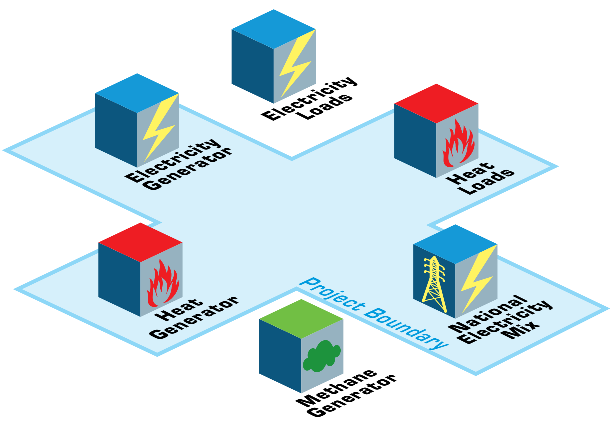
PROJECT COMPONENTS



A project boundary will more than likely comprise a number of different components, such as power generation, heat generation, new heat consumers, landfill gas reduction, etc., and for each of these different components a baseline will need to be established. The components are broadly illustrated in the figure. The boundary of a JI project may then be built up using one or more of these basic components.

This means that a project is likely to displace a number of different sources of greenhouse gas emissions and the baseline for the project will, therefore, be a composite of one or more individual baselines.

EXAMPLE – PROJECT BOUNDARY FOR CHP



The best illustration of how to define a boundary is the case of CHP which is illustrated in the figure. In this instance the electricity and heat generation have been included in the boundary as well as the heat loads and the national electricity grid. It may be the case that the electricity grid is not included in the boundary, but rather the CHP plant is providing electricity for on-site purposes only.

12. *"Project participants shall submit to an accredited independent entity a project design document that contains all information needed for the determination of whether the project has been approved by the parties involved; would result in the reduction of anthropogenic emissions by sources or an enhancement of anthropogenic removals by sinks that are additional to any that would otherwise occur; and has an appropriate baseline and monitoring plan." Marrakesh Accords, November 2001.*
13. *The Marrakesh Accords state "under the control of the project participants" as one important criterion for project boundaries in baseline studies.*

PROJECT COMPONENT CLASSIFICATION

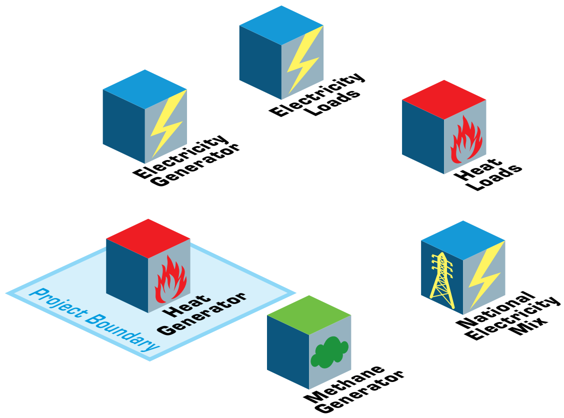
A typology has been set out to further define the components stated above. It seeks to address the impacts of increasing or decreasing the power and heat generation on the heat and electricity loads. This typology and the different project type components are described below. Again, these project type components may be used as building blocks for definition of the project boundary – for any one project, more than one component may apply.

PROJECT TYPE COMPONENT H0:

Heat-only project with unchanged heat loads (change in fuel type, fuel consumption or efficiency)

If the heat loads connected to the central generating unit remain unaffected by the project in terms of total load, consumption pattern, etc., the boundary may be considered to be the generator. EXAMPLE: A fuel switch project, replacing a DH coal boiler with a new DH gas boiler while the connected loads and the heat generation remain unchanged.

→ The project boundary includes only the boiler unit (the coal boiler in the status quo case/the gas boiler in the project scenario case). It is only the change in boiler emissions that matters.

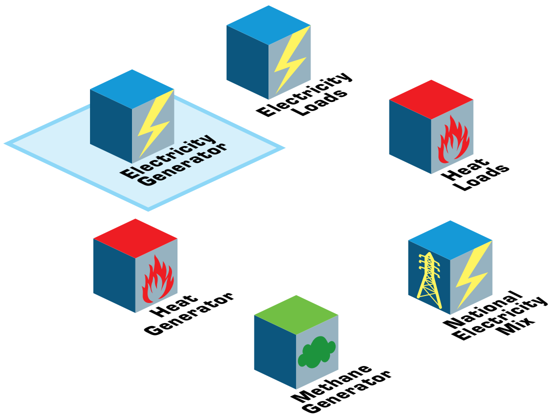


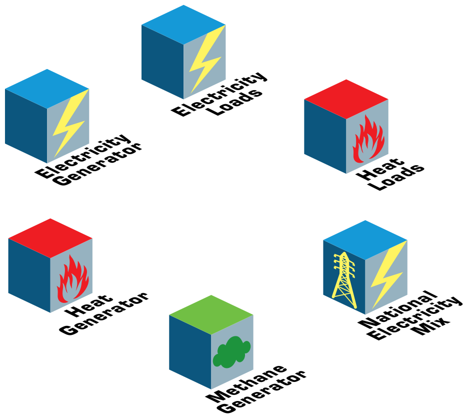
PROJECT TYPE COMPONENT E0:

Electricity only, no or negligible change in consumption from or supply to the grid (change in fuel type, fuel consumption or efficiency of electricity supply on-site)

EXAMPLE: A CHP which is used to cover the base load demand of a paper mill is reconstructed in order to be fuelled with biomass. There is no change in electricity consumption from the grid or supply to the grid as a result of this project – all electricity is consumed on-site.

→ The project boundary includes only the electricity generator and the emissions from the generator. If electricity were to be sold to the grid in the future then the project would be reclassified as E± and a subsequent reassessment of the baseline would need to be carried out to include the electricity grid.

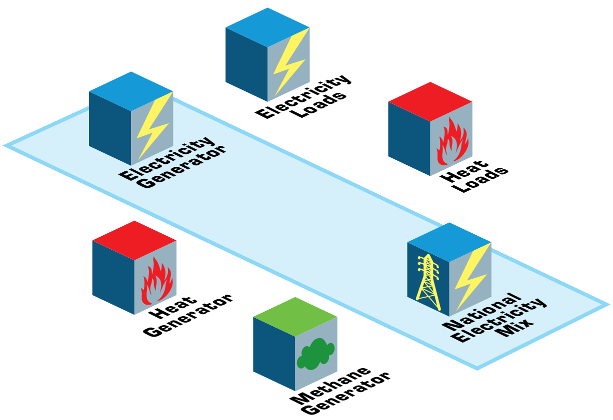




PROJECT TYPE COMPONENTS H±:

Heat only, increase or decrease in connected heat loads, possible change in fuel type, fuel consumption or efficiency of the suppliers

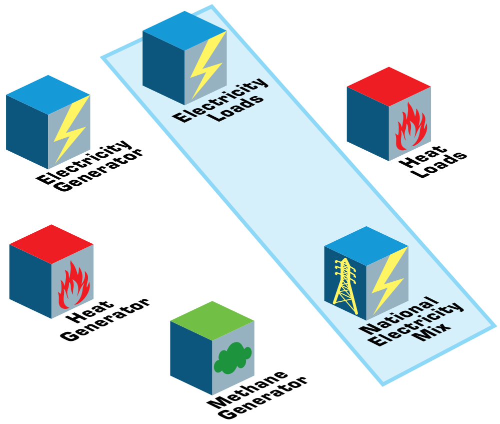
EXAMPLE: A project leads to an extension of a municipal DH-network which is supplied by a gas boiler. New customers are connected as a result of the project. The heat loads that would have continued to be supplied by oil boilers (current situation) are now supplied with DH.
→ The project boundary has to include the gas boiler (increased gas consumption) and the additional heat loads (as they switch to DH and no longer have individual heating systems).



PROJECT TYPE COMPONENTS E±:

Electricity only, increase in supply to the grid, possible change in fuel type, fuel consumption or efficiency of the electricity suppliers on site

These component types are analogous to the H± components (substituting electricity for heat).
EXAMPLE: An existing power plant is refurbished. After project implementation, the electrical capacity is increased and more electricity is fed into the grid.
→ In this case the project boundary has to include:
a) The power plant on-site itself (because the plant's operating parameters change – both the efficiency and the electricity output increase);
b) The power generating units which make up the national electricity mix.



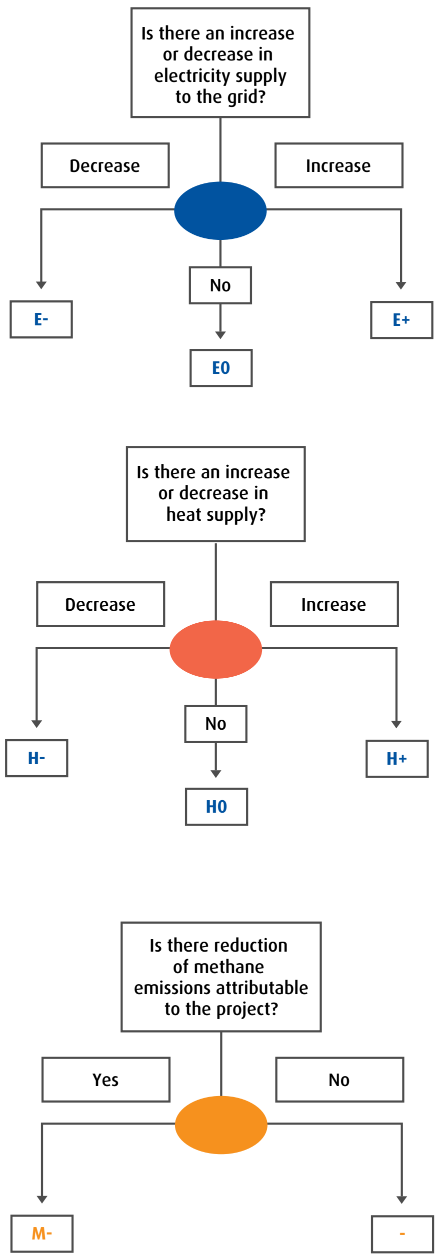
PROJECT TYPE COMPONENTS E±: (DEMAND-SIDE MANAGEMENT)

Demand-Side Management is a special case for electricity because off-site emissions are reduced by changing loads (the demand-side) instead of increasing the production on-site. The effect from these projects on the grid is similar to feeding additional electricity into the grid and therefore the grid must be considered.

PROJECT TYPE M-: Methane abatement

Methane abatement may be achieved by a variety of measures. The resulting project boundary depends on the way energy is recovered (if at all) from the methane and if heat or power is generated. For instance, landfill gas may be simply flared (smallest project boundary) or combusted in a CHP-unit, a boiler, etc.

DECISION TREE TO IDENTIFY PROJECT COMPONENT CLASSIFICATIONS



For each project component a baseline must be established and therefore if a project is made up of more than one element, such as a heat generator and heat loads (H+), a baseline will have to be drawn up for each individually.

The application of these project types is dependent on the eligibility provisions set out in the EU ETS Directive, as discussed below.

IDENTIFICATION OF PROJECT TYPE COMPONENTS

The figure on the left provides a route to classifying the components within a project and, as will be seen later, each component that has been classified here will have specific issues when selecting which baseline methodology to apply.

PROPOSED PROVISIONS TO AVOID DOUBLE COUNTING

Component	Definition
H0	Direct replacement of heat supply to existing customers
H±	A heat supply project that involves a decrease/increase in supply (e.g. network connections/customers)
E0	Direct replacement of an existing electricity demand with new generation (would normally be off-grid)
E±	An electricity project that affects supply of electricity to the grid
M-	A project that directly reduces methane emissions

BASELINE DEVELOPMENT

The BASE project addresses baseline development in two parallel phases: the first looks specifically at project case studies and the baselines that will need to be developed in each case in accordance with the typology set out above; the second is the development of national baselines for the electricity sector (E±), working with government and the national electricity sector companies.

For all other project components (H0, H±, E0 and M-) for the energy sector, project specific baseline approaches have been assessed. These approaches include: investment analysis, control groups, and scenario analysis. These methodologies are described briefly below, and recommendations on their application to the different project components are suggested.

INVESTMENT ANALYSIS

The investment analysis or financial analysis approach seeks to simulate the investment decisions that would be taken in the absence of an Emission Reduction Purchase Agreement, thereby selecting the baseline option with the least cost (or highest IRR).

The methodology ranks all plausible alternatives or scenarios (including the 'business as usual') according to their (risk adjusted) internal rate of return (or their costs or net benefits), and selects the project with the highest rate of return (or least cost, or highest net benefit) as the baseline project. All project alternatives must satisfy the relevant legal, political, social, economic, technical and environmental constraints and requirements.

Step 1	Identify project alternatives
Step 2	Calculate the IRR or cost per kWh for each option
Step 3	Calculate the emissions from the best investment option or the option with the lowest cost (baseline project)
Step 4	Calculate emission reductions

INVESTMENT ANALYSIS IS CONTROVERSIAL BECAUSE:

- The private sector cannot make publicly available some of the investment appraisal components;
- The investment additionality changes with the company's portfolio and is thus too situation specific;
- This method discourages economical performance as an IRR which is too good does not get credits; and
- When it is not possible to establish sector wide baselines, the investment analysis proves to be a relatively simple means by which to argue additionality.

CONTROL GROUP METHODS

A control group method would seek to find a town, region, country etc. which is comparable to the area and the circumstances that prevail at the site where the project is proposed. This 'proxy' area could then be used to monitor developments in the absence of the intervention. This would serve as a comparison for the project, with specific regard to the level of emissions. The approach is best applied when the number of observation units is very large, for example in individual heating units.

Step 1	Identify a similar observation group that is not affected by the JI project
Step 2	Determine sample size
Step 3	Establish methods for estimating activity and performance within the control group
Step 4	Monitor emissions from this control group and the project
Step 5	Calculate emissions reduction as the difference between the two

SCENARIO ANALYSIS

The scenario analysis approach, like the investment analysis, seeks to simulate the decisions that would be made in the absence of JI. However, the scenario analysis would be used when non-economic constraints predominate. The methodology employs a multidimensional analysis which assesses all the risks/constraints/barriers to implementation of a project and therefore seeks to identify the most likely course of development. In fact, the scenario-based analysis is generally used in conjunction with an investment analysis to assess the validity of the investment opportunities.

Again, first of all the approach identifies all plausible project alternatives that satisfy the relevant constraints and requirements. Then, an assessment is made of the cost, risks and other influencing parameters for each option. In this way the method develops an argument for the most likely scenario taking into account costs, external risk factors and other factors such as market demand, revenues and political environment, as necessary.

Step 1	Describe current situation
Step 2	Identify plausible scenario alternatives
Step 3	Assess costs, risks and other influencing factors such as political and social drivers
Step 4	Select the baseline by process of elimination
Step 5	Calculate emission reductions

The table below describes the strengths and weaknesses of each of the three project-specific approaches and, based upon those, a table has been made to help select which methodology should be applied to the different project components.

In general, the investment analysis is preferred for its simplicity and transparency and should be applied where possible (specifically in the cases of H0, E0 and M- where there can be substantial variations between sites). An investment analysis is not recommended in cases where there are a large number of consumers (H±) who would need to be assessed and therefore a large number of individual investment decisions would

STRENGTHS AND WEAKNESSES OF PROJECT-SPECIFIC APPROACHES

Methodology	Strengths	Weaknesses
Investment analysis	- Transparency - Cost effective - Emission reductions fixed - Considers site-specific issues	- Hurdle rates are variable - Financial data may be confidential - Financial data may be not appropriate when non-economic factors predominate in the investment decision
Control groups	- Ability to deal with a large number of individual units	- Finding a valid control - High data requirements - High monitoring requirements - Emission reductions not fixed at the beginning of project - The control may be influenced simply by being selected as a control
Scenario analysis	- Comprehensive view of the baseline options - Ability to deal with economic and non-economic factors	- Qualitative data is difficult to validate - Includes a high number of variables and therefore requires a large database

have to be made. In this case, a scenario analysis or control group should be used. If the number of additional consumers is small, an investment analysis may still be applied. This is the only case where a control group is recommended. An investment analysis may also not be appropriate when there are drivers for the implementation of a project that exceed its financial performance, such as social considerations or other political drivers.

The only other situation where an investment analysis would not be recommended is for the E± component where there are a large number of individual generators in an electricity grid. In this case, a national electricity sector baseline should be established – the next section deals with this.

✓✓ Highly recommended
✓ Recommended
✘ Not recommended

METHODOLOGY SELECTION FOR EACH PROJECT COMPONENT

Project component		Project specific		National baseline
	Investment analysis	Scenario analysis	Control group	
H0	✓✓	✓	✘	✘
H±	✓	✓	✓	✘
E0	✓✓	✓	✘	✓
E±	✘	✓	✘	✓✓
M-	✓✓	✓	✘	✘

NATIONAL ELECTRICITY SECTOR BASELINES

In co-operation with the relevant ministries in each country, the BASE project is applying models and tools that are already being used for energy sector planning and statistics, as well as for climate change strategies and reporting to the national electricity sector for baseline definition. Each country has selected a model, in accordance with government preferences, to determine the national baseline.

Different methodologies for the application of the models have been assessed and, to summarise, the preferred methodology involves using a least-cost dispatch methodology to identify the marginal plant that would be displaced. The data on costs and generating plant has been used for each and information on marginal plant may be obtained from the BASE team. However, this section sets out the average emissions rate in the electricity sector in each country, for simplicity and commercial confidentiality.

CZECH REPUBLIC

BASELINE EMISSION FACTORS (TONNES CO_2/MWh)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
GEMIS results	0.913			0.796				0.745				0.741
Extrapolated results		0.874	0.835		0.783	0.771	0.758		0.744	0.743	0.742	

The baseline projection has been made using the GEMIS model which is updated yearly with the support of the Czech Energy Agency.

VALIDITY OF BASELINE

The baseline could be valid until 2012 as there will be no significant changes in investment or plant closures. The figures presented here may be used by an investor over the lifetime of a project. However, once the figures have been updated, the revised figures should be used. The baseline should be updated in 2005 when a new Act concerning the implementation of RES comes into force. The total power production can be checked once a year and any significant changes might trigger an update of the baseline.

ESTONIA

BASELINE EMISSION FACTORS (TONNES CO_2/MWh)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Emission factor		1.18	1.16	1.14	1.09	1.08	1.06	1.04	1.04	1.03	1.02	1.01

The baseline projection has been made using spreadsheets and the investment programme of the national utility.

VALIDITY OF BASELINE

The baseline should be valid until 2012, but revisions will be required because of specific events that will substantially affect the baseline (reconstruction and closures of the largest 200MW power blocks in oil shale fuelled plants) which are likely to take place in 2005 and after 2008. This is also dependent on international treaties, specifically the SO2 treaty between Finland and Estonia, and EU directives, such as the Large Combustion Plant Directive. The baseline should therefore be revised in 2005 and 2008 when these events occur.

HUNGARY

BASELINE EMISSION FACTORS (TONNES CO_2/MWh)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Emission factor		0.557	0.558	0.558	0.559	0.559	0.560	0.557	0.558	0.557	0.548	0.547

The baseline projection has been made using the ENPEP model which is used by the national utility and the Ministry of Environment for greenhouse gas projections under the climate change strategy.

VALIDITY OF BASELINE

The baseline should be considered as valid since it represents the retrofit/replacement/extension scenario that is the officially accepted scenario in Hungary; therefore there is only a very small chance that the emission baseline would become outdated. The baseline and accompanying databases will be updated annually within the framework of the UNFCCC.

POLAND

BASELINE PROJECTIONS

BASELINE EMISSION FACTORS (TONNES CO_2/MWh)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Emission factor	-	-	-	-	0.853					0.669		
Extrapolated results	-	-	-	-		0.810	0.770	0.740	0.700		0.640	0.620

The baseline projection is based on data from the Third National Communication, "Assumptions of Energy Policy up to 2020", and the SAFIRE model.

VALIDITY OF BASELINE

The baseline could be valid until 2012 because there will be no significant changes in investment or closures. The figures presented here may be used by an investor over the lifetime of a project. However, once the figures have been updated, the revised figures should be used. At the end of 2003, The National Climate Policy should be accepted as well as the Renewable Energy Act. The Assumptions for Energy Policy up to 2020 are monitored and updated every two years (last update was in 2002), so the baseline scenario should be updated accordingly.

SLOVENIA

BASELINE EMISSION FACTORS (TONNES CO_2/MWh)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Emission factor	-	0.405	0.407	0.412	0.408	0.397	0.395	0.392	0.384	0.380	0.376	0.376

These factors are not yet official; they are in a first draft which is subject to revision.

VALIDITY OF BASELINE

The baseline will be valid until 2012. It should be revised if the planned time schedule for some closures or new capacities are substantially changed or delayed. The Slovenian Government should update the baseline for its own purposes every four years.

Clean Development Mechanism

PROJECT CYCLE

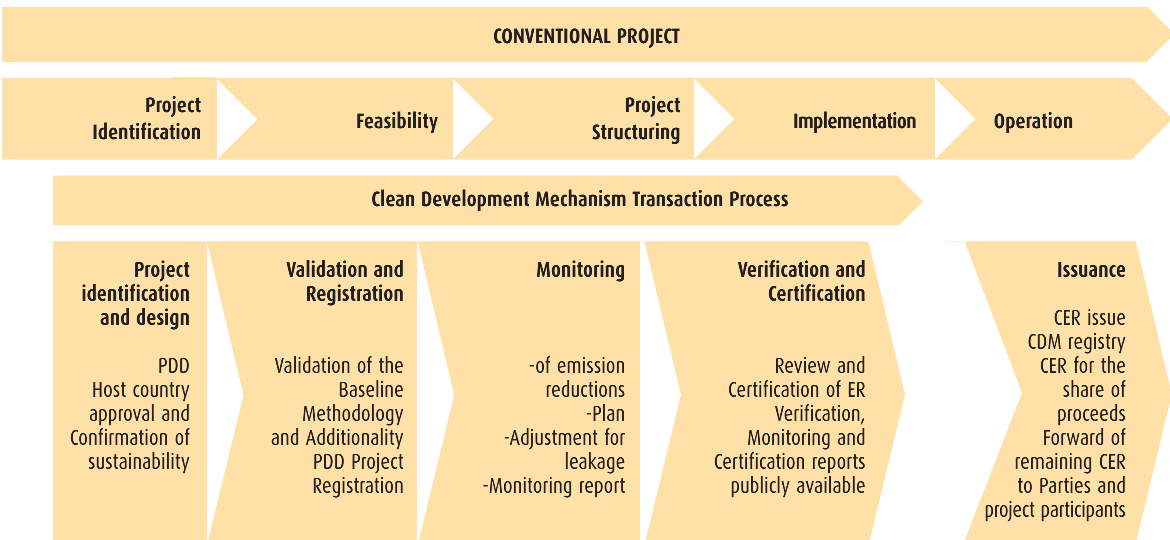
All projects that aim to be accredited as a CDM project must meet the same criteria and fulfil the same steps. This process is commonly known as the CDM project cycle. As currently envisaged in the Marrakesh Accords to the Kyoto Protocol and shown in the figure below, this project cycle requires investors or project developers to undertake a number of additional steps compared to those required for investing in conventional projects to qualify their projects under the CDM. Those are described briefly in the next section on CDM design.

Since CDM projects take place in countries without Kyoto targets, it is particularly important that projects result in genuine and additional emission reductions. CDM projects must also reinforce sustainable development as defined by the host country, and create other host country benefits, where possible. They will be granted approval on the basis of:

- Participation being approved by each party involved;
- Real, measurable, and long-term benefits related to the mitigation of climate change; and
- Reductions in emissions that are additional to any that would occur in the absence of the certified project activity.

Moreover, all countries wishing to participate in the CDM must ratify the Kyoto Protocol and establish a Designated National Authority (DNA) which will have the responsibility to decide whether a CDM project activity assists in achieving sustainable development and whether the country agrees to participate in the project. The host DNA will confirm its approval of a CDM project by a Letter of Endorsement. The DNA will also serve as a point of contact. Although the international process has given general guidelines on baselines and additionality, each developing country has the responsibility to determine the national criteria for project approval.

ENERGY PROJECT AND CLEAN DEVELOPMENT MECHANISM TRANSACTION PROCESS



Once identified and approved, the project concept would be elaborated by the project developer in the form of a Project Idea Note (PIN) which usually contains a description of the project, a description of the partners involved in the project, an indication of the baseline, and an estimation of the emission reductions that will occur with the project. The benefit of preparing a PIN is that the developer will receive feedback indicating whether the project is of interest to potential buyers and for what reasons. This is carried out in parallel with the feasibility assessment of the project. Unilateral projects can be done without having a buyer identified and without Annex I country involvement.

Together with the investor, the host country must prepare a Project Design Document (PDD[14]) which is described briefly in the next section on CDM design. As for JI, it is at this stage in the project cycle for CDM that the greatest level of effort is engaged. A full baseline study and monitoring plan must be developed and validated by a Designated Operational Entity which has been accredited by the Executive Board (EB). This Operational Entity will then send the PDD to the EB for registration as a CDM activity. The PDD must be sent together with confirmation from the host country that the project activity assists it in achieving sustainable development and that it agrees to participate in the project.

The final stage in the CDM project cycle comes after implementation of the project. The CDM project is then monitored by the project participants until the end of the crediting period. Finally, another operational entity is chosen to verify the emission reductions. This must ensure that the CER are the result of the guidelines and conditions agreed upon in the initial validation of the project.

Following a detailed review, the operational entity will produce a verification report and then certify the amount of CER generated by the CDM project. It will then send a letter of certification to the EB which will issue the CER into the CDM registry, transfer the CER to the project participants (host country, implementing institution, donor country) and pay the CDM an adaptation charge[15]. The EB must issue the CER to the project partners within 15 days after receipt of this certification report.

CER obtained during the period from the year 2000 up to the end of the first commitment period of the Kyoto Protocol (2008-2012) can be used to assist in achieving compliance in the first commitment period. However, existing projects started after 1 January 2000 and before the adoption of the Marrakesh Accord at COP7 (10 November 2001), can only be eligible for the first commitment period if they are submitted for registration before 31 December 2005.

CDM DESIGN

Initial considerations must take into account whether there is a need for a CDM project and whether there is a market demand for CER. If there is, then preparation and a project review can start. Some key preparation and review considerations include:

- Specific host country concerns and issues should be addressed and agreed with the relevant DNA;
- Agreement should be reached on how risks and benefits are to be shared among participants; and
- Project financing must be arranged.

As far as renewable energy technologies are concerned, a proposal was made at COP6 to qualify automatically renewable energy projects based on the following technologies as eligible for CDM: solar energy, wind energy, sustainable biomass, geothermal heat and power, small-scale hydropower, wave and tidal power, ambient heat, ocean thermal energy conver-

14. The CDM-PDD can be obtained electronically through the UNFCCC CDM website (http://unfccc.int/cdm), by e-mail (cdm-info@unfccc.int), or in printed format from the UNFCCC secretariat (Fax: +49 228 8151 999).

15. CDM adaptation charge represents a levy offsetting climate change adaptation costs in those developing countries considered most vulnerable to the implications of climate change – such as unusual hurricane and drought patterns, loss of territory due to rising sea levels, etc. This levy is seen as a percentage of the total project financing cost, which is paid before the project launch by the project sponsor in the form of either currency or emission credits. Proceeds are held in a climate change adaptation fund for later disbursement.

sion, activities to promote anaerobic digestion, and energy recovery from biogas, including landfill gas. Therefore, renewable energy sources with high potential in the Southern Mediterranean countries are eligible, and their impacts on the sustainable development of these countries is easy to demonstrate, which makes them attractive to the CDM.

Once a project has passed the pre-qualification phase, it is publicised, a more detailed analysis of the project has to be carried out, and each CDM project must submit a project design document (PDD). The key components of this document are indicated in the following table and briefly detailed hereafter. Details will also be given in this section on small-scale projects.

REQUIRED CONTENT OF A PDD	
A.	General description of project activity
B.	Baseline methodology
C.	Duration of the project activity/Crediting period
D.	Monitoring methodology and verification plan
E.	Calculations of GHG emissions by sources
F.	Environmental impacts
G.	Stakeholders' comments
ANNEXES	
Annex 1:	Information on participants in the project activity
Annex 2:	Information regarding public funding
Annex 3:	New baseline methodology
Annex 4:	New monitoring methodology
Annex 5:	Table: Baseline data

PDD KEY ELEMENTS

DESCRIPTION OF THE PROJECT

This section provides guidance on information that the project developer should provide about the project. Some of this information is also required for the PIN and can be taken from the PIN document. However, the PDD requires some additional information as well. The following project information must be provided at the very least:

- Purpose of the project;
- List of project participants;
- Technical description of the project, including technical performance information; estimated energy output, and how the technology applied will be transferred;
- Additionality;
- A description and justification of the project boundaries: i.e. description of types of activities and GHG sources to be addressed by the project and the justification of the exclusion of other activities; and
- Justification that public funding, if used, is not being diverted from other uses.

In addition to the items listed above, it is recommended that the following issues be addressed to provide more insight into the project:

- Project background;
- Problems and barriers being addressed by the project;
- Details on the location of the project;
- Project planning (time schedule);
- Description of the key issues and stages in project development (milestones); and
- Any other information deemed relevant within reason – generally speaking, lengthy documents do not receive more attention.

Much of the information to be included in this section can be taken directly from a business plan or project proposal.

BASELINE METHODOLOGY AND ASSESSMENT OF ADDITIONALITY

Sections B and E of the current PDD address issues concerning baseline assessments, calculations of GHG emissions by sources, and additionality.

The baseline methodology section requires information about the type of methodology used. This information can be taken from the UNFCCC website which includes a reference list of approved methodologies. The analysis goes on to ask for a justification of the methodology and a description of how it is applied to the project activity.

The most significant part of this section is the discussion of additionality. In order to assess if the project activity results in a reduction of emissions, as compared to the 'business as usual' scenario, an emissions baseline has to be established. The assessment of whether the project activity results in the lower volume of GHG emissions relative to the 'no-project' case is referred to as 'environmental additionality'.

Environmental additionality can be measured by quantitative analysis. It can be assessed by quantifying the change in GHG emissions observed when comparing the emission baseline (i.e., the 'business as usual' scenario) and project emissions (i.e. the 'project scenario' case). A project activity is environmentally additional if it generates GHG emission reductions compared to the emission baseline.

Finally, the baseline section requests details on the project boundary and baseline development which can be cut and pasted from the baseline study.

CREDITING PERIOD

The crediting period is an important factor for the amount of emission reductions that can be generated from a CDM project as it defines the period over which emission reductions from project implementation can be claimed. Thus, the crediting period has a direct impact on the attractiveness of the project.

In this section, the projects participants must decide which of the two possibilities for the crediting period they prefer: a maximum of ten years or a maximum of seven years, with the possibility to renew a maximum of two additional seven-year periods (a maximum of 21 years).

When selecting the crediting period for a CDM project it is important to consider that this choice relates to the period over which the emission baseline (against which emission reductions are measured) is fixed. A fixed emission baseline is a baseline set and agreed upon when the project is designed (ex ante). Once validated it cannot be modified. This may be advantageous if a second validation of the baseline is too expensive.

MONITORING PLAN

The monitoring plan should provide for the collection and archiving of all relevant data necessary for estimating and measuring project-specific GHG emissions within the defined project boundary and for the appropriate crediting period. It must describe the relevant factors and the key characteristics of the project to be measured and registered by the project party. The plan may also indicate who is responsible for the measurements as well as the registration and reporting of the monitoring activities. Moreover, the monitoring should be carried out in such a way that the indicators of project performance and emissions can be compared with the baseline scenario.

ENVIRONMENTAL IMPACTS

The PDD should include an analysis of the environmental impacts of the project. This includes an assessment of non-GHG related impacts. If environmental impacts of the project are considered significant, or if an environmental assessment (or review) is legally required by the host country, an Environmental Impact Assessment has to be carried out. There are no specific indicators for determining what is considered to be a 'significant impact'. This will have to be assessed on a case-by-case basis.

STAKEHOLDERS' COMMENTS

An important step in the PDD is inviting local stakeholders to comment on the proposed project. Stakeholders are defined as the public, including individuals, groups or communities affected, or likely to be affected, by the CDM project activity. The PDD must include a description of the process for public comment. A specific format for submitting contacts and results of the stakeholder sessions is included in the PDD template. The inclusion of stakeholders and government at an early stage reduces CDM transaction costs.

SMALL-SCALE AND FAST-TRACK PROJECTS

In order to encourage small-scale projects to develop under the CDM, the EB is taking action to decrease the transaction costs faced by these projects and to simplify the application process. The Marrakesh Accords have defined small-scale projects activities for CDM as:

- Renewable energy project activities with a maximum output capacity equivalent of up to 15 MW;
- Energy efficiency improvement project activities which reduce energy consumption, on the supply and/or demand side, by up to 15 GWh per year; or
- Other project activities that both reduce anthropogenic emissions by sources and directly emit less than 15.000 tonnes of carbon dioxide equivalent annually.

Projects which fall into these categories will be 'fast-tracked' – fast-tracking implies that:

- The requirements for the PDD are reduced;
- There are simplified procedures for baseline and monitoring regulations;
- The same operational entity undertakes validation, verification and certification.

A special "Modalities and Procedures for Small-Scale CDM" guideline was adopted at COP8. Three annexes to this document were processed and adopted at EB7:

- Annex A: "Small-Scale Project Design Document (SSC-PDD)"[16]
- Annex B: "Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories"
- Annex C: Conditions "determining the occurrence of debundling"

SMALL-SCALE PROJECT DESIGN DOCUMENT

As for the small-scale CDM projects, the requirements of the project design document (SSC-PDD) are reduced. The key elements of this document are indicated in the following table:

REQUIRED CONTENT OF A SSC-PDD
A. General description of project activity
B. Baseline methodology
C. Duration of the project activity/Crediting period
D. Monitoring methodology and verification plan
E. Calculations of GHG emissions by sources
F. Environmental impacts
G. Stakeholders' comments
ANNEXES
Annex 1: Information on participants in the project activity
Annex 2: Information regarding public funding

BASELINE AND MONITORING METHODOLOGIES FOR SMALL-SCALE CDM PROJECTS

Simplified methodologies exist for most of the present eligible project categories. A CDM project participant can suggest a new methodology by making a request to the EB. At its next meeting the EB will then review the proposed methodology and, once approved, amend Annex B on their CDM homepage. The leakage calculation is only required if the technology is transferred from another activity.

ADDITIONALITY

Project participants shall give an explanation to show that the project activity would not have occurred anyway because of at least one of the following barriers: investment barrier, technological barrier, barrier due to prevailing practice or other barriers (institutional, limited information, managerial resources, organisational capacity, financial resources, or capacity to absorb new technologies).

16. The SSC-PDD can be obtained electronically through the UNFCCC CDM website (http://unfccc.int/cdm/ssc.htm), by e-mail (cdm-info@unfccc.int), or in print format from the UNFCCC secretariat (Fax: +49 228 8151 999).

DETERMINING THE OCCURRENCE OF DEBUNDLING

The text in Annex C was adopted at EB7. A small-scale project activity shall be deemed to be a debundled component of a large project activity if the project is a registered CDM project activity or an application with the same project participants, in the same project category and technology/measure; and registered within the previous two years and whose project boundary is within 1 km of the project's proposed small-scale activity at the closest point. If the total size is below the "15" limit, it is eligible.

PRESENT ELIGIBLE RENEWABLE ENERGY PROJECT CATEGORIES

As regards renewable energy projects, the following categories are eligible: electricity generated by user, mechanical energy for the user, thermal energy by the user, and renewable electricity generation for a grid. The modalities and procedures for these projects are:

- Electricity generated by user: this category comprises renewable technologies that supply individual householders or users with a small amount of electricity (solar home systems, micro-hydro, small wind power, solar/wind battery chargers, etc.). The baseline to be used for this category is the energy or the electricity used among similar electricity-consuming users in the nearest community. A default value of 0.9 kg CO_2/kWh can be used. Monitoring will be made by metering or through an annual check of a sample.
- Mechanical energy for the user (hydro power, wind power and other renewable energy technologies that provide mechanical energy used on-site by the household or user: wind-powered pumps, solar water pumps, water mills, etc.). The baseline to be used for this category is emissions for the same load with a diesel equal to 3.2 kgCO_2/kg of diesel fuel. Monitoring will be made through recording annually the number of systems operating and annual hours of operation for a sample.
- Thermal energy by the user: this category comprises renewable energy technologies which supply individual households or users with thermal energy that displaces fossil fuel or non-renewable sources of biomass (solar water heaters, solar dryers, solar cookers, energy derived from biomass for water heating, space heating, or drying, etc. The maximum capacity for cogeneration systems is 45 MW_{th}). The baseline to be used here is the fossil fuel and the biomass consumption used before multiplied by an emission factor for non-renewable biomass use. Monitoring will be made by metering the energy produced and for a reduction less than tCO_2/year/unit number of systems operating.
- Renewable electricity generation for a grid: this category comprises renewables (PV, hydro, tidal/wave, wind, geothermal and biomass making electricity for a grid). For small networks' emissions the coefficients below are used. For other systems, an average of "approximate operating margin" and "build margin" is used, or a weighted average emissions of current generation mix, if data are not available.

TENTATIVE SUSTAINABLE DEVELOPMENT APPRAISAL OF CDM

There appears to be a general understanding of what constitutes an unsustainable development, but the question of how to measure contributions of projects to sustainable development, needs to be defined. The SouthSouthNorth (SSN) project[17], an experiment in southern-led CDM project development, has proposed a methodology for appraising the suitability of candidate CDM projects. This methodology involves the use of criteria for assessing eligibility in the first instance, as well as a set of quantifiable indicators for use as a checklist against which project developers can test projects, not least in terms of a project's contribution to sustainable development. This methodology includes an incremental approach to ensuring that projects are assessed rigorously, by proposing a list of indicators that must be satisfied before projects are likely to be given formal approval by the DNA. The SSN project proposes this methodology as one way to reduce the risks involved in the proportionally high transactional costs of CDM projects. At the same time, the methodology promotes the preservation of environmental integrity/ sustainability and capacity building in the host country.

The SSN methodology could be helpful to every stakeholder in the CDM, both on the side of the developer of a scheme and on the side of the government which needs to evaluate, approve and/or reject CDM projects before they can proceed to detailed project design, leading to project registration.

Projects would be excluded initially if they were not eligible, i.e. did not conform to the Kyoto Protocol requirements. The eligibility tests have "yes" or "no" answers. The additionality tests require an assessment of what would have happened in the absence of the project or a baseline – the development of which is an evolving science in itself.

Once a project has passed the eligibility tests, it is appraised using sustainable development indicators. These indicators do not provide "yes" or "no" answers, like the eligibility tests, but rather a rating of how the project scores against a particular index. The appraisal provides a rating between -3 and +3, with +3 being a very positive contribution, 0 being no change in the index, and -3 very negative. With few exceptions, the first stage of the project appraisal is qualitative. The same ratings are applied to the feasibility criteria. These criteria were devised to provide indications of project feasibility and possible success for the project development team and, in some instances, indications of eligibility[18].

SSN has used this rating matrix tool to appraise and rank a variety of projects in each country where it operates, testing the appraisement tool against actual projects. SSN has accordingly insisted on full transparency to enable the greatest possible means of sharing what it learns from the process, along with all the reports on the respective websites. The criteria and indicators and their current definitions are included below in full.

17. The SouthSouthNorth project, SSN for short, is an initiative aimed at developing confidence in developing country agencies in the public and private domain to deal effectively with the CDM. A uniquely southern-based drive, SSN is a non-profit NGO designed to experiment in learning by doing to help ensure the best possible practice in the countries in which it is based, in managing all aspects of CDM projects and capability, including the all-important requirement of defining and protecting sustainable development, in an effort to avoid a 'race to the bottom' in reducing the potential barriers to investment in projects that the sustainable development requirement could become. The SSN project used the indicators of sustainability developed by HELIO International. SSN project documents can be downloaded from www.southsouthnorth.org

18. In the case of project ownership, a project is most unlikely to succeed without enthusiastic ownership of the project.

THE CRITERIA AND INDICATORS APPRAISAL MATRIX

Eligibility criteria	Rating	Assessment
1. Energy project activities qualifying for the CDM	Y/N	It is proposed that CDM projects in the energy sector be confined to those that employ technologies and techniques which contribute to: - End-use energy efficiency (leading to real energy conservation). - Supply-side energy efficiency in newly constructed facilities (such as co-generation). - Renewable energy to supply energy services. - The reduction of methane emissions from landfills and other waste-handling activities. - The reduction of N2O emissions from chemical industries and PFC emissions from aluminium production.
2. Real and measurable benefits	Y/N	Only projects in which emissions are measurable should qualify for CDM.
2A. Positive contribution to sustainable development	Y/N	Environmental and social sustainable development indicators must all be positive.
2B. Owner allows adequate transparency	Y/N	Owners or their agents must allow transparency in their project development for the sake of broad-base capacity building.
Additionality filters		
3. Environmental additionality	Y/N	Emissions are reduced below those that would have occurred in the absence of the registered CDM project activity.
4. Financial additionality	Y/N	[Public] funding for [the acquisition of CER resulting from] CDM project activities from parties included in Annex I shall [be clearly additional to][and][not result in a diversion of [be separate from and shall not be counted towards] the financial obligations of parties included in Annex II to the Convention within the framework of the financial mechanism as well as to [current] official development assistance [flows].
5. Investment additionality	Y/N	This criterion can apply to interventions in business-as-usual projects that show both environmental and financial additionality, so as to have been implemented anyway, according to a realistic baseline. To receive CER, CDM projects must be truly additional to those that would have happened anyway.
6. Technological additionality	Y/N	To be eligible as a CDM project activity, a proposed project activity must achieve a level of performance – with respect to reductions in anthropogenic emissions by sources – that is significantly better than average compared with recently undertaken and comparable activities or facilities within an appropriate geographical area.
Sustainability indicators		
7. Indicator 1 – Contribution to the mitigation of global climate change	-3 to +3	Global environmental benefits will be measured by the net reduction of GHG emissions measured in CO_2 equivalent according to the IPCC Global Warming Potential (GWP) for 100-year horizon. Vector: 0 = No change in GHG emission level compared with the baseline. +3 = Total avoidance of the GHG emissions predicted. The main difficulty with quantifying this indicator is estimating the leakage (see below). Complete leakage accounting is required within the host country and sometimes abroad, for example, in cases where domestic fuels switch results in take- back in a range of energy services. For example, PV lighting replaces kerosene for lighting which then provides additional kerosene for cooking.

THE CRITERIA AND INDICATORS APPRAISAL MATRIX

Eligibility criteria	Rating	Assessment
8. Indicator 2 – Contribution to local environmental sustainability	-3 to +3	Local environmental impacts will be assessed by the percentage change in the emissions of the most significant local pollutant (oxides of sulphur, nitrogen, carbon and other atmospheric wastes; radioactive waste, VOC, TSP or any solid or liquid waste). A weighted average percentage change may be used when more than one pollutant is considered to be relevant. Vector: 0 = No change in emission level of the selected pollutant. +3 = Total avoidance of emissions of the local pollutant. -3 = Emissions of the local pollutant are doubled. Subjectivity is an unavoidable weakness of this indicator, given the necessary selection of sample pollutants for monitoring.
9. Indicator 3 – Contribution to net employment generation	-3 to +3	Net employment generation will be taken as an indicator of social sustainability, measured by the number of additional jobs created by the CDM project in comparison with the baseline. Vector: 0 = No change in employment level compared with baseline. +3 = Doubled number of jobs. -3 = Elimination of all jobs predicted in the baseline. This indicator is problematic in that it does not register a qualitative value for employment, such as whether the resulting jobs are highly or poorly qualified, temporary or permanent, secure or 'flexible'. Figures are also subject to inflation, depending on whether direct and indirect jobs are counted.
10. Indicator 4 – Contribution to the sustainability of the balance of payments	-3 to +3	Net foreign currency savings may result through a reduction of, for example, fossil fuel imports as a result of CDM projects. Any impact this has on the balance of payments of the recipient country may be compared with the baseline. Vector: 0 = No change in foreign currency expenditure compared with baseline. +3 = Total avoidance of foreign currency expenditure. -3 = Doubled net foreign currency expenditure. A major difficulty here is that estimates of future prices of imported goods and services replaced by the project can be quite uncertain (e.g. international oil prices).
11. Indicator 5 – Contribution to macroeconomic sustainability	-3 to +3	The alleviation of the burden on public savings will be measured by the reduction of direct government (national, provincial and local) investments (including state enterprise budgets) made possible by foreign private investment in the CDM project in comparison with the baseline. Vector: 0 = No change in public investments compared to the baseline. +3 = Total avoidance of public investments. -3 = Doubled public investments compared to baseline. The challenge here is to calculate the saving of public financial resources net of subsidies and to ascertain the additionality of the foreign private investment.
12. Indicator 6 – Cost effectiveness	-3 to +3	Cost reductions implied by the CDM project in comparison with the baseline will measure the contribution to increased microeconomic sustainability. The value of this indicator will only be positive in the case of 'win-win' ('no-regrets') projects and the sensitivity of the results to these key assumptions. Vector: 0 = No change in costs compared to the baseline. +3 = Total avoidance of costs compared to the baseline. -3 = Doubled costs compared to baseline.

THE CRITERIA AND INDICATORS APPRAISAL MATRIX

Eligibility criteria	Rating	Assessment
13. Indicator 7 – Contribution to technological self-reliance	-3 to +3	As the amount of expenditure on technology changes between the host and foreign investors, a decrease in foreign currency investment may indicate an increase in technological sustainability. When CDM projects lead to a reduction in foreign expenditure via a greater contribution of domestically produced equipment, royalty payments and license fees, imported technical assistance should decrease in comparison with the baseline. Vector: 0 = No change in foreign currency expenditures with technology compared to the baseline. +3 = Total avoidance of foreign currency expenditures. -3 = Doubled foreign currency expenditures with technology. Data collection on full technology costs can be difficult in some cases.
14. Indicator 8 – Contribution to the sustainable use of natural resources	-3 to +3	CDM projects should lead to a reduction in the depletion of non-renewable natural resources either through the adoption of technologies with higher energy efficiency or through an increased deployment of renewable resources, such as the replacement of fossil fuels with solar or wind energy. In both cases, CDM projects will contribute to a more sustainable use of natural resources. Vector: 0 = No change in non-renewable natural resource use. +3 = Avoidance of all non-renewable natural resources. -3 = Doubled use of non-renewable natural resources. Uncertainty regarding the performance of technological innovations must be accounted for. Again, two well-contrasted project performances can be used to provide a sensitivity analysis.
SUBTOTAL		Depending upon National/Local policy, this sub-total can be weighted (depending on the bias required towards SD requirements) against the Sustainable Development indicators.
FEASIBILITY INDICATORS		
15. Maximisation of project owner and southern country benefits	-3 to +3	The benefits to the project investor, owner, and other local and regional stakeholders can be assessed to establish what these could be. If the benefits are limited to technology and climate mitigation alone the project scores low; however, should the project host country also gain economic, social and/or environmental benefits including sharing CER and other win-win benefits with project stakeholders and the broader community, the project scores high.
16. Possibilities of South/South axis of technology and information transfer	-3 to +3	A desirable outcome of the SSN project is to improve the Southern axis of trade and innovation. Therefore, projects that involve a high component of technologies that can be sourced in the south will score high. Projects that have minimum contributions to southern-sourced technologies will score low on this criterion.
17. Chances of success in current policy and institutional environment	-3 to +3	The chances of success are a function of a number of parameters – here we are considering the policy and institutional environment of the host country. Is the project intervention in keeping with national energy/environment/trade, etc. policy? Is it backed up by the institutions in government? If the answer is yes to both, the project scores high on this criterion. Conversely, if there is outright rejection in the policy or by the institutions managing the project, it will score low. Policy appreciation of the project ideas without the backing of institutions can be ranked as neutral. Conflict with national policy can be considered as a fatal barrier to the project's consideration and the project should be dropped.
18. Barriers to implementation (no fatal barriers)	-3 to +3	An assessment of the size of technical, financial, institutional, human capacity and/or awareness barriers may provide a range of impediments that can vary in significance. Barriers that are entirely overcome by the CDM project score high, whereas projects that are impeded by barriers would score low. Any barriers that are considered to be fatal are to be presented in the introduction of individual projects, and the project should then be excluded.

THE CRITERIA AND INDICATORS APPRAISAL MATRIX

Eligibility criteria	Rating	Assessment
19. Possibilities for regional integration	-3 to +3	Consideration is given to the projects' ability to contribute to regional (within a country or sub-continentally) economic integration. The stronger the project's contribution to regional integration, the higher the score. Should the project have no direct or indirect impact on regional integration, the project will receive a low score for this criterion.
20. Project owners willingness to champion the project	-3 to +3 -	The project will not go ahead without the support and commitment of the project owner. In fact, projects could go very slowly unless owners are willing to lobby strongly those institutions that could drag their feet or become 'gatekeepers' for CDM projects. Strong commitment to own the project will score high whereas if the project does not have an immediate and existing owner the project will score low. Projects in which the owners show limited interest should be dropped.
21. The ability of a project owner to influence national political will and the general capacity of the project owner	3 to +3	In the first batch of CDM projects, institutional barriers will undoubtedly present the largest barriers to the candidate projects. This criterion assesses the ability of the project owner to influence the political will of government in the streamlining of the CDM project cycle. So, small NGO projects would score low while large parastatals/corporates would score high.
22. Possibility of leakage	-3 to +3	Leakage inside and outside, upstream and downstream of the project boundary must be identified. In the case of land-use change, projects should be scrutinised from a regional perspective to measure cross-border leakages. If this is likely to be high, as in the case of the introduction of technologies with high energy intensities in the manufacturing, transportation to the point of use, installation, maintenance, disposal or recycling, the project will score low or negative points. Projects that have no or low levels of leakage will score high on the points scale.
23. Sectoral spread household/ municipal/commercial/industry spread	-3 to +3	If the project is the only candidate in the sector, it scores high. If it is one of many it scores low – as do all the other candidate projects in the same sector. Sectors include, but are not limited to: bulk energy, stand-alone energy, industry, mining, commercial, household/ municipal, transport, agriculture and fishing, and so on.
24. Local/regional replicability	-3 to +3	If a successfully implemented project could easily be replicated in other regions within the same country (as domestic action), or regionally (sub-continentally) as another CDM project, this is desirable and would warrant a high score.
Subtotal		Depending upon national/local policy, this subtotal can be weighted against the sustainable development indicators.
TOTAL		Addition of all the individual qualitative assessments provides the number which when compared with other project scores can be used to attain a final ranking. Any failure to pass the eligibility criteria, additionality filters, negative scores on the social and/or environmental sustainable development criteria or other fatal barriers detected in the assessment will provide grounds for the exclusion of the project. In undertaking conservative assessments of the candidate projects, any high risks concerning project qualification or strong possibilities of unsuccessful implementation would provide sufficient grounds for project exclusion at this stage.

European Emissions Trading, JI and CDM

RELATIONSHIP WITH THE COMMUNITY EMISSIONS TRADING SCHEME

TIME SCALE OF THE DIRECTIVE

The Directive which establishes a Community GHG emission-allowance trading scheme in order to promote reductions of GHG emissions in a cost-effective manner was agreed politically in July 2003. The scheme will commence in 2005 and will be operational in phases. The first phase will occur between 2005 and 2007, followed by the second phase which will take place during the Kyoto compliance period of 2008 to 2012. Further five-year phases will follow in line with progress at UN level.

GEOGRAPHICAL COVERAGE

The scheme will cover the EU 15 and the ten Accession States joining the EU in 2004, and it is possible that other parties to the Kyoto Protocol outside the enlarged EU may link their domestic emissions trading schemes to the EU ETS.

INSTALLATIONS COVERED

The Community scheme covers direct sources of emissions from the energy industry and the manufacturing industry. It defines the scope and size of installations to be covered by the scheme; these are detailed in the table below[19]. From 2005, Member States can apply emissions trading to installations that are smaller than the capacity limits in the Directive (as long as this is specified under the national allocation plan), and during the second trading period Member States can include additional sectors to the scheme.

CATEGORIES OF ACTIVITIES REFERRED TO IN THE DIRECTIVE

ENERGY ACTIVITIES
Combustion installations with a rated thermal input exceeding 20 MW (except hazardous or municipal waste installations)
Mineral oil refineries
Coke ovens

PRODUCTION AND PROCESSING OF FERROUS METALS
Metal ore (including sulphide ore) roasting or sintering installations
Installations for the production of pig iron or steel (primary or secondary fusion) including continuous casting, with a capacity exceeding 2.5 tonnes per hour

MINERAL INDUSTRY
Installations for the production of cement clinker in rotary kilns with a production capacity exceeding 500 tonnes per day, or lime in rotary kilns with a production capacity exceeding 50 tonnes per day or in other furnaces with a production capacity exceeding 50 tonnes per day
Installations for the manufacture of glass, including glass fibre, with a melting capacity exceeding 20 tonnes per day
Installations for the manufacture of ceramic products by firing, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain, with a production capacity exceeding 75 tonnes per day, and/or with a kiln capacity exceeding 4 m^3 and with a setting density per kiln exceeding 300 kg/m^3

OTHER ACTIVITIES
Industrial plants for the production of
(a) pulp from timber or other fibrous materials
(b) paper and board with a production capacity exceeding 20 tonnes per day

19. *Annex I of the proposed Directive.*

GASES COVERED

During the first trading period only carbon dioxide will be included in the scheme, but in the second period Member States can include other gases from the basket of six greenhouse gases contained within the Kyoto Protocol (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride). It is estimated that the scheme will cover close to half of the carbon dioxide emissions from the EU.

ALLOCATION OF ALLOWANCES

Each Member State will develop a national allocation plan by 31 March 2004, stating the total quantity of allowances to be allocated for that period and how they are to be allocated.

The allocation plan must be based on objective and transparent criteria, including: consistency with the national targets under the Kyoto Protocol; no discrimination between companies or sectors; treatment of new entrants; accommodation of 'early action'; information on how clean technology is taken into account, as well as ensuring that the allocation plan goes through a period of public consultation. For the three-year period beginning 1 January 2005, Member States shall allocate at least 95% of the allowances free of charge. For the five-year period beginning 1 January 2008, Member States shall allocate at least 90% of the allowances free of charge.

PENALTIES

Operators must surrender sufficient allowances by 30 April of each year to cover their emissions during the preceding year; they will be liable for the payment of an excess emissions penalty if they do not.

Member States have to impose a penalty for the first three-year period of €40/tCO_2 equivalents emitted. For subsequent five-year periods, the penalty is fixed at €100/tCO_2 equivalents emitted.

'POOLING'

Operators of installations carrying out one of the prescribed activities will be allowed to form a 'pool' of installations from the same activity for the first three-year period and the first five-year period. A pool must have a trustee who takes on the responsibilities under the Directive on behalf of the pool members. However, allocations will be determined by installation, and the allocation to the pool will be the sum of the allocations to installations making up the pool.

LINKAGES WITH JI AND CDM

RECOGNITION OF JI AND CDM CREDITS

Credits generated by JI and CDM projects may be used in two ways. First, they may be used directly by Member State governments to meet their obligations under Kyoto and the EU 'bubble', as is the case in the Netherlands with the ERUPT and CERUPT tenders. Secondly, they may be used by companies to help meet obligations under the EU emissions trading scheme.

In July 2003, the European Commission presented a proposal for a Directive linking JI and CDM to the emissions trading Directive. According to the proposal, each Member State within the scheme may convert JI credits into allowances to be fungible with the Community scheme. An installation operator may generate or purchase ERU and apply to the national competent authority to convert the credits into allowances. These allowances would be in addition to those allocated in the national allocation plans. Allowances within the Community scheme may be traded without restriction and therefore there will be no restrictions placed at Member State level in recognition of JI credits converted into allowances in this way. The proposed provisions for the recognition of JI and CDM credits within the Community scheme are in line with the rules set out in the Kyoto Protocol and the Marrakesh Accords. They are described below.

CONDITIONS

VALIDITY OF ERU AND CER

ERU and CER may be exchanged for allowances during the period 2008-2012.

SUPPLEMENTARITY

There are two mechanisms by which the issue of supplementarity will be addressed: within the Community scheme and outside the Community scheme. Outside the scheme there is a separate proposal for a monitoring mechanism of Community greenhouse gas emissions and the implementation of the Kyoto Protocol, which requires Member States to monitor and report on the use of JI (and CDM) as a supplementary mechanism to domestic measures.

The requirements within the Community scheme have been proposed in order to harmonise the level of effort that is required by installations across the Community, whilst operationalising the Kyoto Protocol and Marrakesh Accords. For this reason the proposal provides for a review to take place when the number of CER and ERU converted for use in the Community ETS reaches 6% of the total quantity of allowances allocated by Member States.

DOUBLE COUNTING

In order to avoid the double counting of emissions from the installations covered by the scheme and to ensure consistency, the proposal requires that no ERU be issued for reductions that affect, either directly or indirectly, emissions at installations covered by the emissions trading Directive. Member States may not allocate any allowances to installations generating power from carbon-free sources or to installations consuming power, heat or steam (indirect emitters) for such consumption.

TECHNOLOGIES

The provisions required to avoid double counting have implications for certain technologies that are approved as JI projects within the countries covered by the emissions trading scheme[20], which are particularly relevant to JI projects in the Accession States. The conditions exclude greenfield renewable energy projects[21], nuclear facilities and demand-side energy efficiency. In addition, there are other activities and technologies that are specifically excluded from the generation of credits for conversion to allowances.

PROPOSED PROVISIONS TO AVOID DOUBLE COUNTING

Installations covered by the scheme	An installation covered by the scheme cannot gain credits under JI at the same time.
Carbon-free sources	Carbon-free sources will not be allocated allowances and cannot generate ERU for the conversion to allowances in the Community scheme.
Indirect emitters	Consumers of power, heat or steam that are not direct sources of emissions will not be allocated allowances and cannot generate ERU for the conversion to allowances in the Community scheme.

20. The double counting conditions only apply to those countries that are part of the Community scheme. For countries outside the scheme there will not be an issue of double counting and therefore these conditions will not apply. They will also not apply for projects covered by the CDM.

21. Installations that are considered to be direct sources of emissions may convert to renewable based fuels which may create a benefit realised either in the Community trading scheme or JI but not both (See the third condition in the table above) Such projects can be realised via JI only if they are started before 31 December 2004.

The first of these is nuclear energy which was specifically excluded in the Marrakesh Accords. The second is land use, land use change, and forestry (LULUCF) activities or "sinks". LULUCF activities are excluded from recognition since they can only store carbon temporarily so at some point it will be released into the atmosphere; therefore, they do not contribute to the Community scheme's goal of long-term emission abatement from energy and industrial processes. Furthermore, there are still uncertainties as to how to account for and monitor emission removal under the Kyoto Protocol. The proposal recognises the possibility to convert JI and CDM credits from hydro power plants. However, the review of the Community emissions trading scheme that will take place in 2006 should examine the extent to which large hydro-electric power production projects have been established that may have negative environmental and social impacts.

EXEMPTIONS FOR JI IN ACCESSION COUNTRIES

A provision has been set out that allows for the application for temporary exemptions in host countries for projects that fall within the scope of the Community scheme (activities set out in the table on p.41) and are approved in the Accession Country prior to their joining the Community scheme. This means that in the first ten Accession Countries joining the EU in 2004 and joining the Community scheme at the beginning of 2005, they may still approve JI activities that would not be allowed under the rules of the scheme until the 31 December 2004. These projects may continue to generate JI credits up to 2012 provided that the installations affected have been excluded from the national allocation plan.

A similar rule will apply to Accession Countries joining the EU after 2004; therefore, any JI project that is approved prior to the date of accession may still be granted exemption by the host country from the conditions set out by the Community scheme.

ANNEX I: JI – Portfolio of potential projects

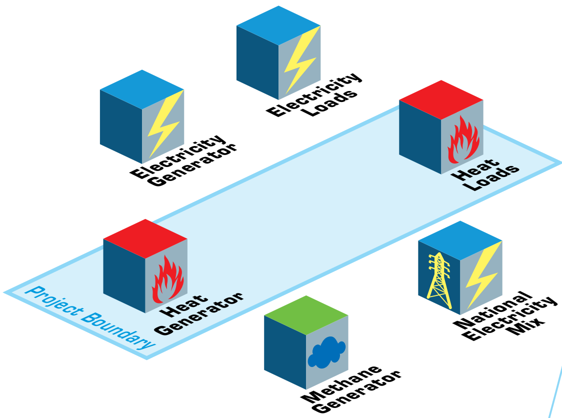
CZECH REPUBLIC
COMMUNITY ENERGY EFFICIENCY

PROJECT SUMMARY

As part of a regional energy programme in the South Bohemia region in the Czech Republic it is hoped that 1,000 biomass boilers, 1,000 solar panels and 1,000 double-glazed windows will be installed. The biomass boilers would replace individual coal fires, the solar panels would result in a 30% reduction in energy demand for hot water, and the windows would provide a 30% reduction in space-heating requirements.

PROJECT CLASSIFICATION H±

The boundary therefore includes the heat generation and heat loads.



BASELINE METHODOLOGY

In line with the recommendations developed on methodologies, a control group methodology is being used to calculate the emission reductions of the project. This is due to the fact that there are a large number of individual units to be assessed.

BASELINE SELECTION

The following criteria have been used to select the control group:

1. *Size – number of habitants/buildings*
2. *Types of buildings – single family houses, panel apartment buildings*
3. *Level of insulation*
4. *Level of heat consumption*
5. *Type of fuel used in the locality and the level of gasification in the area*

According to the criteria above, and to determine the baseline emissions for the project the municipality of Jilovice has been selected; it will be monitored throughout the course of the project to compare the performance of the installations.

When the projects go ahead a survey will be carried out on a sample in order to calculate the average emissions of households in Jilovice. Jilovice village will serve as an example of the households that have not implemented any of the selected energy efficiency projects. Present consumption in Jilovice can be calculated, and the other houses where the projects will be implemented will also be monitored through a survey. In addition, Jilovice will be monitored to test the assumptions in the baseline.

EMISSION REDUCTIONS

Emission reduction by the implementation of:

1,000 biomass boilers	*11,000 tCO_2 eqv/year*
1,000 solar collectors	*9,000 tCO_2 eqv/year*
1,000 windows	*5,000 tCO_2 eqv/year*

ESTONIA
BIOMASS CHP DISTRICT HEATING

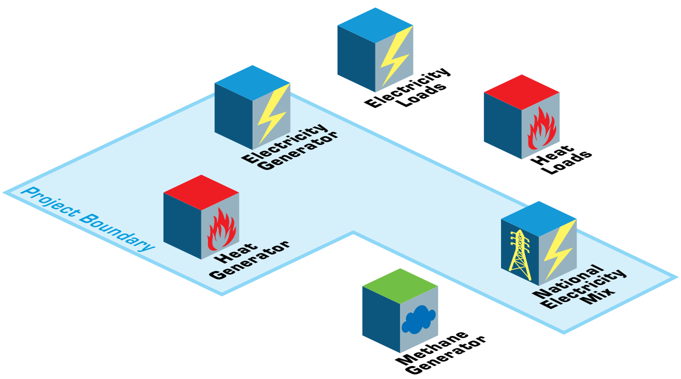
PROJECT SUMMARY

A 15 MWe/45 MWth CHP plant would be installed in an existing boiler house and district heating system. The CHP would operate as the base unit, and existing wood-fuelled 54.9 MW boilers would remain as the peak load or stand-by reserve units. During the coldest winters the existing gas-fuelled boilers would also be used as well as serving as stand-by units.

The project would produce its own power with increased wood waste biofuel consumption and resulting emission reductions compared with the existing fuel use of peat and oil.

PROJECT CLASSIFICATION
E+ AND H0

The boundary includes heat generation and electricity generation on to the grid; there is no change to the heat loads so these are not included.



BASELINE METHODOLOGY

A baseline analysis was carried out both for the national electricity grid (scenario analysis) and also for the CHP plant (investment analysis).

BASELINE SELECTION

In order to calculate the effects of the project, a baseline must be drawn up for the heat displacement from oil and peat as well as the displacement of electricity from the national grid. The project is classified as H0 and E+ and a baseline has been set out for each component. The following scenarios have been identified for the H0 component:

1. *Business as usual, the district heating system would operate as is but with some investment in refurbishments*
2. *Biomass CHP district heating without ERU, replacement of individual, mainly oil and wood (old technology) boilers by a biomass CHP district heating system (4 MW biomass boilers)*
3. *JI scenario, scenario 2 with ERU included.*

An investment analysis has been carried out on the three scenarios. The analysis showed that the investment has an IRR which may not satisfy an investor's hurdle rate for investment. A more detailed analysis of the business as usual and the costs of operating and maintaining the plant is needed to assess the project against the business as usual; this information is not currently available.

For the E+ component, a national baseline has been set up based upon the future plans of the national electricity company Eesti Energia, according to this analysis of the operation of the Balti Power Plant (1,350 kg CO_2/MWh).

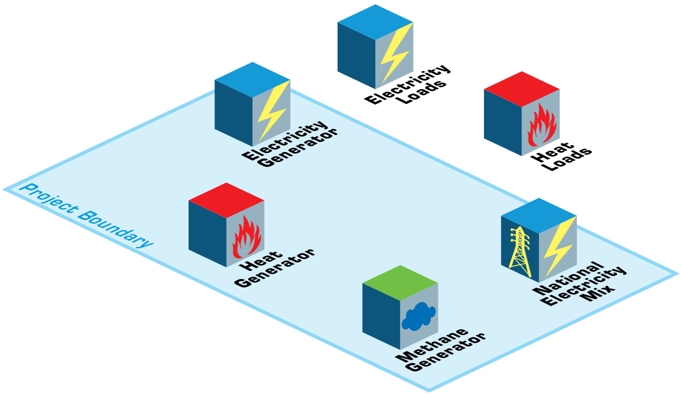
EMISSION REDUCTIONS

July 2004-2007:	*255,866 tCO_2 eqv/year*
2008-2012:	*346,564 tCO_2 eqv/year*
Total:	*602,430 tCO_2 eqv/year*

HUNGARY
LANDFILL GAS CAPTURE

PROJECT SUMMARY

The project would utilise leaking and partly flared methane from two landfill sites by installing CHP gas motors to generate heat (26.6 GWh) and electricity (37.1 GWh). This also requires an installation of a collection pipeline system and a connection to the grid and heating network.



PROJECT CLASSIFICATION
M-, H0 AND E+

The boundary includes heat generation into an existing district heating network, electricity generation on to the grid, and methane emissions from the landfill.

BASELINE METHODOLOGY

According to the guidance, an investment analysis was carried out for the methane and heat components of the project and a multi-project baseline was developed for the electricity sector.

BASELINE SELECTION

Four scenarios have been assessed for the methane component, as follows:

1. *Business-as-usual scenario, the exploitation of biogas potential is not implemented and the district heating system is unchanged*
2. *Heat-only scenario, heat-only boilers are installed in both landfill areas with the installation of collector systems, pipelines, etc.*
3. *CHP scenario without ERU, CHP is installed in both landfill areas, for heat and power production with installation of collector systems, pipelines, grid connection, etc.*
4. *The JI scenario, CHP is installed, carbon credits are generated; otherwise as above.*

It is not possible at the moment to make a direct comparison with the business-as-usual scenario; in fact, this scenario would have a negative cash flow and therefore from this information we can only ascertain the viability of the proposed project outside the scope of JI. In this case, the IRR is between 11% and 14%, which is currently thought to be far too low to be considered by any investor, particularly because of the risks that have been identified in terms of technical risks as well as those associated with the sale of heat and electricity. A detailed analysis of these risks would therefore need to be carried out in order to justify the selection of the BAU scenario as the baseline. In order to complete the baseline assessment, it would also have to be determined at what point Hungary would need to comply with the EU Landfill Directive and therefore capture the leaking gas – this could be done by monitoring other sites in Hungary.

The electricity sector baseline was set up using the ENPEP model which has also been used for the national emission scenarios for climate change strategy.

EMISSION REDUCTIONS

Emissions from the CHP: 22,955 tCO_2 eqv/year
Substituted emissions from the DH gas boilers: 4,966 tCO_2 eqv/year
Substituted emissions from the electricity fed into the Hungarian grid: 11,583 tCO_2 eqv/year
Avoided methane emissions from the landfill: 95,219 tCO_2 eqv/year
Total emission reduction: 86,063 tCO_2 eqv/year

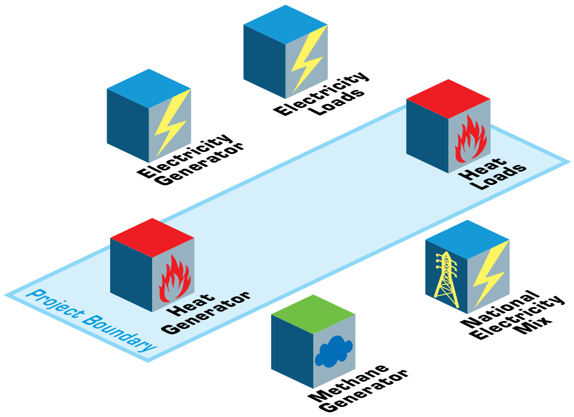
SLOVENIA
BIOMASS DISTRICT HEATING

PROJECT SUMMARY

The project would involve replacing mainly oil and wood boilers individually (on average five to 15 years old) with a biomass district heating system.

PROJECT CLASSIFICATION H+

The boundary includes heat generation and the new district heating network. The project is classified as H+ because the district heating system would provide heat to new customers and is not displacing an existing DH system.



BASELINE METHODOLOGY

A scenario analysis was carried out on the project as well as an investment analysis.

BASELINE SELECTION

The following scenarios have been identified for the town:

1. Business-as-usual scenario, existing heat generation in individual boilers
2. Biomass district heating without ERU, the project involves replacing mainly oil and wood (old technology) boilers individually with a biomass district heating system (4 MW)
3. JI scenario, scenario 2 with ERU (carbon financing) included.

The business-as-usual scenario has been identified as the baseline in the absence of any plausible alternatives. A scenario analysis was carried out and the following options were eliminated:

- Switching to gas is improbable or rather impossible because of the lack of gas supply (the nearest gas pipeline is 20 km away);
- Switching to coal is improbable for the existing oil boilers and for wood stoves (there is no such trend in Slovenia or in CEE); and
- Switching to oil might be a plausible option for coal and wood-fuelled units. However, neglecting the option of switching from wood to oil is a conservative assumption which underestimates emission reductions.

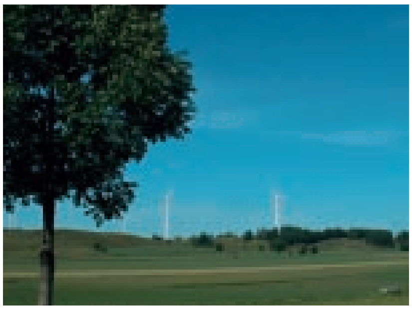
The investment analysis for the project gives an IRR of 6.5% for the project and 7.8% with the ERU revenues. From these results it is clear that this project is not at all attractive when seen from an economic perspective. It will not go ahead without additional incentives and, even with additional revenue from the ERU, the project does still not appear to be viable.

EMISSION REDUCTIONS

The emission reduction is calculated directly from the fuel consumption before and after project implementation. Fuel consumption before project implementation has been assessed by sending out questionnaires to staff in all public buildings, to all private companies and to 166 households.

Baseline emissions: 1,934 tCO_2 eqv/year
Project emissions: 415 tCO_2 eqv/year
Emission reduction: 1,519 tCO_2 eqv/year

POLAND
WIND FARM



PROJECT SUMMARY

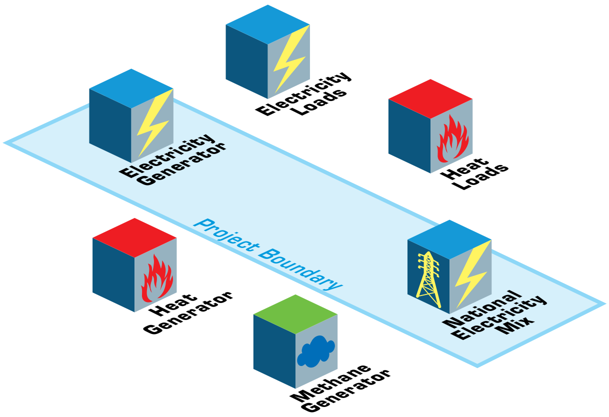
The project would install 11 clusters of 4.5 MW wind turbines (each consisting of 3 1.5 MW wind turbines) and one single 1.5 MW turbine.

PROJECT CLASSIFICATION E+

The project generates electricity only, which is fed into the national electricity grid.

BASELINE METHODOLOGY

In order to calculate the effects of the project, a multi-project baseline has been established for the electricity grid using the SAFIRE model.



EMISSION REDUCTIONS

Year	2008	2009	2010	2011	2012
Baseline emission factor t/GWh	884	872	861	853	845
Emission reduction tCO_2 eqv/year	94,600	93,300	92,100	91,200	90,400

VALIDITY OF JI PROJECTS IN THE CONTEXT OF THE COMMUNITY ETS

All projects may be valid in the context of the Community scheme provided that they are approved prior to 31 December 2004. Projects in the Czech Republic and Slovenia are well below the 20MW threshold of the Community scheme and do not interact with the electricity sector which will be covered by this scheme and therefore may generate ERU to be traded in the scheme.

The landfill project in Hungary is likely to be eligible for JI as methane is not currently covered by the scheme and the heat output is less than 20MW. However, there may be some issues of double counting for electricity production, and the displacement of electricity is unlikely to be valid.

Both the district heating project in Estonia and the wind project in Poland are not likely to be eligible in the context of the community scheme. Although the new CHP plant in Estonia is less than 15MW, the total output of the DH company is greater than 20MW and will therefore be covered as an installation within the scheme. The wind project is not eligible because of the double-counting provision for carbon- free sources that affect the emissions of installations covered by the scheme (i.e. the electricity sector). Both of these projects would need to seek approval for JI prior to December 2004.

ANNEX II: CDM – Portfolio of potential projects

The southern Mediterranean countries[22] have reached an important stage in the process of developing projects that are eligible for financing by the CDM. First, these countries identified the options for reducing the emissions of greenhouse gases, by preparing an initial national communication. Following this they developed portfolios of CDM projects, based on national priorities with regard to sustainable development. As we will see later, a large number of these priorities concern renewable energy.

This section presents a summary of the CDM projects portfolios for a selection of southern Mediterranean countries, namely: Algeria, Egypt, Morocco and Tunisia. The renewable energy projects in these portfolios have been emphasised in particular.

ALGERIA

Algeria[23] ratified the UNFCCC in 1993. Since then, many actions have been undertaken in the area of climate change, in particular the development and presentation of the initial national communication to the Seventh Conference of the Parties to the UNFCCC held in Marrakesh in November 2001, the creation of the national inventory of greenhouse gas emissions, and the creation of a national plan of action for reducing greenhouse gas emissions and coping with the harmful effects of climate change.

At the institutional level, Algeria has created a National Committee on Climate Change whose mission is to coordinate the activities related to climate change, and a Centre of Information on Sustainable Development and the Environment whose mission is to ensure that Article 6 of the UNFCCC is implemented. Algeria has also created a Scientific and Technical Committee with the mission of investigating the problems of climate change.

A portfolio of projects for reducing GHG emissions has also been developed; it includes seven projects, three of which concern renewable energy. The table below presents a summary of this portfolio.

As illustrated in the following table, almost half of the Algerian portfolio concerns renewable energy. The projects deal with the exploitation of the methane emitted by a landfill site, and the use of wind energy and solar PV energy in rural and Saharan regions of Algeria. These projects are explained in more detail below.

SUMMARY OF THE PORTFOLIO OF CDM PROJECTS IN ALGERIA

PROJECT	Initial investment (Million $ US)	CO_2 reduction (Million tCO_2)	Monetary value of CO_2 reduction (Million $ US) (1 tCO_2 = $5 US)
Collection and exploitation of the methane from the Oued Smar landfill site in Algiers	0.85	15	75.0
Wind farm to generate electricity at Adrar (Southern Algeria)	2.1	0.17	0.85
Solar photovoltaic and wind energy to pump water in rural areas	5.0	0.21	1.05
Integrated management in the Hodna rural basin	5.6	4.6	23.0
Planting of forest and fruit trees in urban zones	9.6	12.8	64.0
Improving energy efficiency in cement production in Algeria: pilot project at Meftah Equipements	5.0	2.1	10.5
Changing to LPG/NGV and developing control and maintenance programmes	27	1.0	5.0
TOTAL	**55.2**	**35.9**	**179.4**

PROJECT FOR THE EXPLOITATION OF METHANE AT THE OUED SMAR REFUSE DEPOT IN ALGIERS

This project aims to recover methane emitted at the Oued Smar refuse depot (produced by the solid municipal waste from Algiers) to produce hot water, steam and electricity. It consists of generating an output of 20 MW to produce hot water and heat for neighbouring industries (the dump has the advantage of being less than 500 metres from the industrial zones of Oued Smar and El Harrach), and to produce 6 MW of electricity.

During its life span, this project should reduce the emission of CO_2 by 15 million tonnes. Based on the rate of $5 per tonne of CO_2, the carbon credit is estimated at $75 million.

The main partners in this project are the local authorities and the Governate of Algiers, the National Agency for the Promotion and Rationalisation of the Use of Energy (APRUE), and the General Management of the Environment.

WIND FARM FOR THE PRODUCTION OF ELECTRICITY AT ADRAR (SOUTHERN ALGERIA)

This project involves producing electricity from wind energy by creating a wind farm that will generate 2.25 MW. On completion, this project will enable an annual production of 8 GWh, resulting in a reduced CO_2 emission of 6.6 thousand tonnes per year, i.e. 170,000 tonnes of CO_2 during the life span of the project (25 years). Based on a rate of $5 per tonne of CO_2, the carbon credits would be around $0.8 million which is more than 40% of the planned investment ($2.1 million).

The main partners in this project are the local electricity authorities (government and/or private), the Centre for the Development of Renewable Energy (CDER), and SONELGAZ.

SOLAR AND WIND ENERGY FOR PUMPING WATER IN RURAL ZONES

This project concerns water pumping using wind and solar energy. The sites involved are zones where water resources are under-exploited. Seven hundred pumps powered by wind energy, and 500 pumps powered by solar energy will be installed, which will reduce the emission of CO_2 by 8.2 tonnes per year, approximately 205 million tonnes of CO_2 during the life of the project. Assuming that 1 tonne of CO_2 is worth $5, the carbon credits will exceed $1 million. The CDM contribution to this project could represent 20% of the total investment ($5 million).

The main partners in the project are the High Commission for the Development of the Steppe, the Ministry of Agriculture, and the local authorities.

22. RAB 94/G31 (2002): Arrangements Institutionnels pour la prise en charge du processus Changement Climatique dans les pays du Maghreb. Projet PNUD/GEF ; RAB 94/G31 (2002): Implication des Opérateurs privés et publics dans les investissements liés au Changement Climatique au Maghreb. Projet PNUD/GEF.
23. RAB 94/G31 (2001): Portfolio of projects for reducing greenhouse gas emissions in Algeria, PNUD/GEF project.

EGYPT

Egypt[24] signed the UNFCCC in 1990 and the Kyoto Protocol in 1999. Since 1992, several actions have been undertaken in the area of climate change, in particular the preparation and presentation of the National Communication to the Convention in July 1999, and the creation of a national inventory of greenhouse gas emissions for the years 1990 and 1991.

At the institutional level, Egypt has created a department within the Egyptian Environmental Affairs Agency (EEAA) to handle matters concerning climate change. Similarly, an Interministerial Task Force on Climate Change was created in October 1977.

A portfolio of 22 GHG emission reduction projects was created. Four of these projects are in the area of renewable energy. The table on p. 53 presents a summary of this portfolio.

The four renewable energy projects concern the development of wind and solar power. Two of these were studied as part of the Euro-Mediterranean research projects (EU Fourth and Fifth Framework Programmes for RTD), the CDMED project (the 60 MW wind farm project), and IRESMED (the thermal solar power station). The projects are discussed in more detail below.

60 MW WIND FARM IN ZAAFARANA

The aim of this project is to build a 60 MW wind farm on the Red Sea coast. This project was selected and studied as part of the CDMED project, co-financed by the European Union's RTD Framework Programme. The pre-feasibility study indicated that this project could reduce CO_2 emissions by more than 148 thousand tonnes per year, making a total reduction of 3.7 million tonnes of CO_2 during the 25-year life span of the project. Assuming that 1 tonne of CO_2 is worth \$5, the carbon credits will be \$18.5 million. The CDM contribution to this project could represent 34% of the total investment (\$54 million).

The main partners in this project are the New and Renewable Energy Authority, and the Egyptian Environmental Affairs Agency

300 MW THERMAL SOLAR POWER PLANT INTEGRATED INTO AN ELECTRIC POWER STATION

The aim of the project is to substitute a combined cycle plant with a thermal solar power plant. This project was also selected as part of the European IRESMED project, co-financed by the European Union RTD Framework Programme. This project should reduce CO_2 emissions by around 184 thousand tonnes per year. This would mean a total of 4.6 million tonnes over the 25-year life span of the project. Assuming that 1 tonne of CO_2 is worth \$5, the carbon credits will be around \$23 million. The CDM contribution to this project could represent 9.5% of the total investment (\$240 million).

Once again, the main players for this project are the New and Renewable Energy Authority, and the Egyptian Environmental Affairs Agency.

SOLAR WATER PUMPING (TOSHKA)

The aim of this project is to install solar-powered water pumps in the Toshka region in the south-west of the country to meet the region's irrigation needs. This project will reduce CO_2 emissions by around 146 tonnes per year, making the total of 3,650 tonnes of CO_2 over the 25-year life span of the project. Assuming that 1 tonne of CO_2 is worth \$5, the carbon credits will be around \$18,250. The CDM contribution to this project could represent 2.8% of the total investment (\$0.65 million).

The main partners in this project are the New and Renewable Energy Authority, and the Egyptian Environmental Affairs Agency.

24. EEAA (2002): Egypt's strategy on CDM, CDM pilot projects pipeline. National Strategy Study (NSS).

PORTFOLIO OF EGYPTIAN CDM PROJECTS

PROJECT	Initial investment (Million $ US)	CO_2 reduction (Million tCO_2)	Monetary value of CO_2 reduction (Million $ US) (1 tCO_2 = $5 US)
Wind farm 60 MW	54	3.68	18.39
Thermal solar power plant	240	4.55	22.76
Solar water pumping system	0.6	0.0036	0.02
Solar food drying	2	0.1566	0.78
Electrification of the Cairo to Alexandria railway	355	1.93	9.66
The Alexandria Metro	687	1.06	5.31
Nile cargo development	174	2.92	14.60
NGV in urban transport	12.3	0.24	1.18
Energy efficiency programme in Zenotex Dyers	1.1	0.18	0.89
Exploitation of natural gas in the steel industry	4.0	0.36	1.81
Cogeneration in the Beni Suef Cement Co.	8.3	0.58	2.90
Cogeneration in the Industrial Investment Co (chemicals)	0.3	0.02	0.08
Cogeneration in Mohm (metallurgy)	0.3	0.03	0.17
Cogeneration in the Egypt Air Hospital	0.3	0.005	0.03
Raw materials from organic waste	1	34.6	172.91
Cogeneration in Misr Elmonifia (textiles)	1.6	0.08	0.42
Organic digestion of solid waste	40	11.7	58.20
Afforestation programme	0.473	0.0002	0.01
Afforestation in Al Arish	0.653	0.03	0.16
Channel erosion control	0.151	0.02	0.13
Coastal erosion control by dune stabilisation	0.170	0.0001	0.01
Tree plantation along the Cairo to Asouan motorway	0.274	0.04	0.20
TOTAL	**1, 583.521**	**62.12**	**310.6**

SOLAR FOOD DEHYDRATION

The aim of this project is to use solar power to produce heat in order to dehydrate food harvests, in particular fruit and vegetables. The best site was selected for this project in the Toshka Valley in Upper Egypt. This project will reduce CO_2 emissions by around 6,263 tonnes per year, making the total of 156,575 tonnes of CO_2 over the 25-year life span of the project. Assuming that 1 tonne of CO_2 is worth $5, the carbon credits will be $782,875. The CDM contribution to this project could represent 39% of the total investment ($2 million).

The main partners in this project are the New and Renewable Energy Authority, and the Egyptian Environmental Affairs Agency.

MOROCCO

Morocco[25] signed the UNFCCC in 1992 and ratified it in 1995. Morocco also ratified the Kyoto Protocol in January 2002.

Since the Rio summit, many actions have been undertaken in Morocco in the area of climate change, in particular the development and presentation of the initial national communication to the Seventh Conference of the Parties to the UNFCCC (COP7) held in Marrakesh in November 2001, the creation of a national inventory of greenhouse gas emissions, the carrying out of a study on the vulnerability of Morocco to the impact of climate change, as well as a study on the reduction of GHG emissions, and organising the COP7 in Marrakesh from 29 October to 9 November, 2001.

At the institutional level, within the Department of the Environment Morocco has created a Department of Climatic Change whose mission is to implement the recommendations of the UNFCCC and the Kyoto Protocol. A National Committee for Climate Change, bringing together the representatives of the principal organisations dealing with the problems of climate change, has also been created. A National Scientific and Technical Committee on Climatic Changes has been created, as well as a Centre of Information on Sustainable Development and the Environment whose mission is to ensure that Article 6 of the UNFCCC is implemented, and that considerable effort is put into promoting public awareness and access to information, education and training in the area of climate change. The new Department of Climatic Change will provide the secretarial services for the National Committee for Climate Change and the National Scientific and Technical Committee on Climatic Changes.

A portfolio of four projects has been developed for the reduction of GHG emission, two of which are in the area of renewable energy. The table below presents a summary of this portfolio.

Half of the Moroccan portfolio concerns wind energy projects which are described below in detail.

SUMMARY OF THE PORTFOLIO OF CDM PROJECTS IN MOROCCO

PROJECT	Initial investment (Million $ US)	CO_2 reduction (Million tCO_2)	Monetary value of CO_2 reduction (Million $ US) (1 tCO_2 = $5 US)
Wind energy at Lafarge	9.6	0.81	4
Wind energy at Essaouira	59.4	4.90	24.5
Sugar refinery	37.6	0.35	1.75
Bain Maures	18.5	5.85	29.3
TOTAL	**125.1**	**11.9**	**59.55**

25. GTZ (October 2001) "Programme de protection du climat: MDP dans le cadre des énergies renouvelables au Maroc – Rapport final" Eschborn, Technische Zusammenarbeit (GTZ) GmbH. RAB 94/G31 (2001): Portfolio of projects for reducing greenhouse gas emissions in Morocco, PNUD/GEF project.

10 MW WIND FARM FOR THE NEW LAFARGE-MAROC CEMENT FACTORY AT TÉTOUAN

LAFARGE-MAROC, the largest cement company in Morocco, has a project to build a 10MW wind farm to produce power for its new cement factory at Tétouan in the Rif region. This project should reduce CO_2 emissions by approximately 33,000 tonnes per year, that is a total of around 8 million tonnes during the 25-year life span of the project. Assuming that 1 tonne of CO_2 is worth $5, the carbon credits will be around $4.1 million. The CDM contribution to this project could represent 43% of the total investment ($9.6 million).

The main partners in this project are the Ministry of Energy and Mines, the Ministry of Regional Municipalities, Environment, and Water Resources, the Centre for the Development of Renewable Energy (CDRE), the National Electricity Board (Office Nationale de l'Electricité (ONE), the LAFARGE group, and the private sector.

60 MW WIND FARM AT ESSAOUIRA

The proposal of the Moroccan National Electricity Board (ONE) is to construct a 60 MW wind farm near the town of Essaouira to supply electricity to the national grid. Preliminary studies for the project indicate an annual electricity production of 210 GWh and a reduction of CO_2 emissions of approximately 4.9 million tonnes during the 25-year life span of the project. Assuming that 1 tonne of CO_2 is worth $5, the carbon credits will exceed $24.5 million. The CDM contribution to this project could represent 41% of the total investment ($59.4 million).

The main partners in this project are the Ministry of Energy and Mines, the Ministry of Regional Municipalities, Environment, and Water Resources, the Centre for the Development of Renewable Energy, the Office National d'Electricité, and the private sector.

TUNISIA

Tunisia[26] signed the UNFCCC in 1992 and ratified it in 1993, along with the Kyoto Protocol in June 2002. For many years now Tunisia has been working in the area of climate change, in particular on the following items: the presentation of the initial national communication to the Seventh Conference of the Parties in November 2001 in Marrakesh, the national inventory of GHG emissions for the years 1994 to 1997, and updating the energy-related GHG inventory for the year 2000, studies on the reduction of GHG emissions for the energy, forest, agriculture, and waste sectors, and studies on the vulnerability of the Tunisian coast relative to increased sea levels.

At the institutional level, Tunisia created the National Committee on Climate Change within the Ministry of Agriculture, Environment and Hydraulic Resources in 1992 to coordinate climate-related activities. This committee was renamed the Focal Structure on Climate Change, in 2001. In addition, an information centre on climate change and renewable energy was created within the National Agency for Renewable Energy, responsible for implementing Article 6 of the Convention and actions to promote public awareness and access to information, education and training in the area of climate change.

Similarly, a portfolio of projects was created in Tunisia comprising eight options for reducing GHG emissions selected from the 47 that were mentioned in the national communication document. Of the eight selected, three involve renewable energy.

As the table shows, and as will be explained in detail later, almost half of the Tunisian portfolio projects involve renewable energy, namely wind power, biogas development, and efforts to strengthen the solar-powered water heater market.

DEVELOPING THE USE OF WIND FOR ELECTRICITY GENERATION

The aim of this project is to install 155 MW in three sites situated in northern Tunisia. The sites are: Jebel sidi Abderrahmène, where two 50 MW plants will be constructed, Metline (30 MW), and Kechabta (25 MW). These sites were selected and studied in the MED2010 project, co-financed by the European Union under the Fifth RTD Framework Programme. The three sites will

PORTFOLIO OF CDM PROJECTS IN TUNISIA

PROJECT	Initial investment (Million $ US)	CO_2 reduction (Million tCO_2)	Monetary value of CO_2 reduction (Million $ US) (1 tCO_2 = $5 US)
Cogeneration	34.5	1.36	6.8
ESCO	24.0	3.70	18.5
Wind power	155.0	8.20	41.0
Biogas	4.8	0.30	1.5
Solar water heating	11.7	0.50	2.5
Freight hubs	6.0	1.20	6.0
Energy-efficient public lighting	0.8	0.808	4.0
Low-consumption lamps	1.2	0.179	0.9
TOTAL	238	16.247	81.2

be operated during the current decade, and will reduce CO_2 emissions by around 8 million tonnes over the next 20 years. Assuming that 1 tonne of CO_2 is worth $5, the carbon credits will be $41 million. The CDM contribution to this project could represent 26.4% of the total investment ($155 million).

The main partners in this project are the Ministry of Industry and Energy, the Ministry of Agriculture, Environment and Hydraulic Resources, the National Agency for Renewable Energy (ANER), the STEG, and the private sector.

DEVELOPMENT OF BIOGAS TECHNOLOGY IN TUNISIA

The aim of this project is to generate electricity using methane produced from farm produce waste, farm animal waste, and waste recovered from household-refuse depots. The plan is to install a generation capacity of 7 MW distributed as follows:

- 1 MW in cattle farms
- 2 MW in farm produce industries
- 4 MW in household-refuse depots

This project should reduce CO_2 emissions by around 322,000 tonnes over the next ten years. Assuming that 1 tonne of CO_2 is worth $5, the CDM contribution to this project could represent 31% of the total investment.

The main partners in this project are the Ministry of Agriculture, Environment and Hydraulic Resources, the National Environment Protection Agency (ANPE), the National Agency for Renewable Energy (ANER), and the STEG.

STRENGTHENING THE SOLAR WATER HEATER MARKET

The aim of this project is to set up a financing mechanism based on a revolving fund in order to promote the widespread use of solar water heaters in the residential and tertiary sectors. The project would enable the marketing of 280,000 m^2 of solar panels, and the reduction of CO_2 emissions by 800,000 tonnes between now and the year 2011. What this means for the financing scheme is adding a 20-year credit line for Tunisia, with a grace period of seven years at an attractive interest rate of 2.5% per annum. The CDM contribution would involve paying the interest, amounting to some 6.4 million dinars.

The main partners in this project are the Ministry of Industry and Energy, the Ministry of Agriculture, Environment and Hydraulic Resources, the National Agency for Renewable Energy (ANER), and the private sector.

26. Ezzedine Khalfallah "La maitrise de l'Energie en Tunisie : Réalisation et Perspectives de Développement" Agence National des Energies Renouvelables (ANER). RAB 94/G31 (2002): Portefeuille de projets d'atténuation des émissions de Gaz à Effet de Serre en Tunisie. Projet PNUD/GEF.

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** Non Annex I Mediterranean countries (N.B. Turkey is an observing country)*

*** Annex B countries: countries that are undergoing the process of transition to a market economy*

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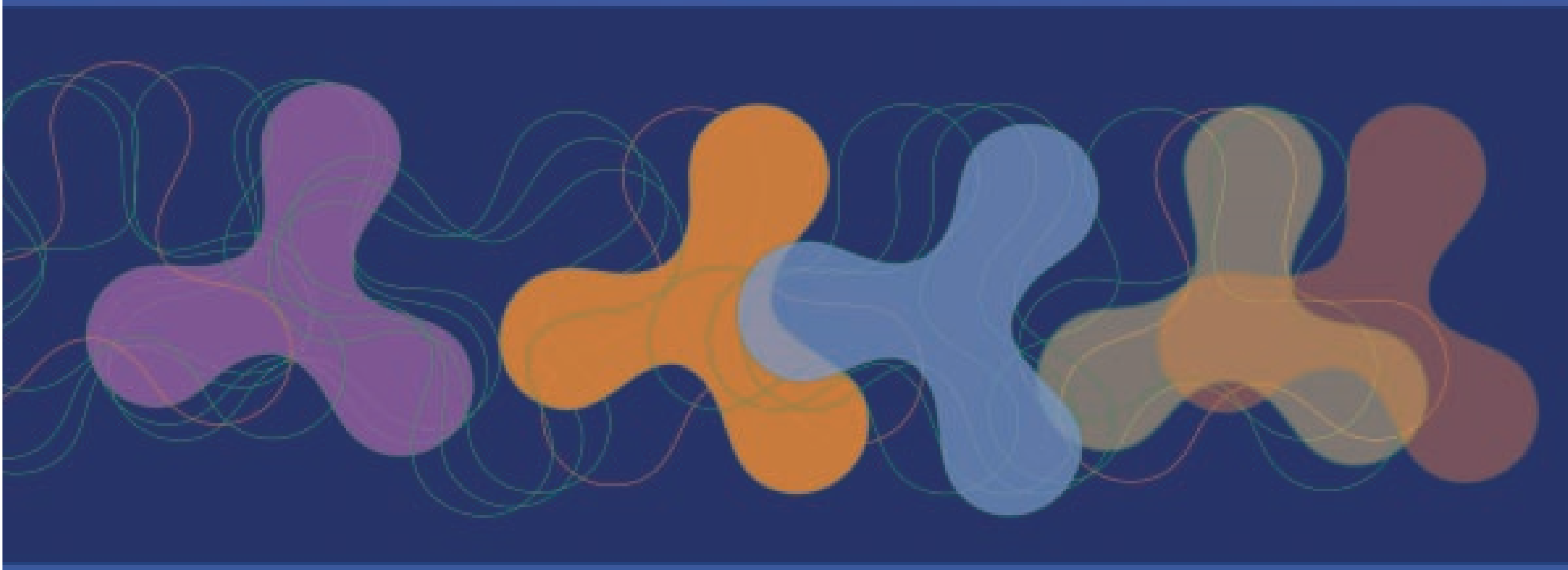
The Kyoto Protocol establishes two project-based flexible mechanisms, Joint Implementation and Clean Development Mechanism, which provide opportunities for both the European Union and its Eastern and Southern neighbouring countries.

On the one hand, they enable a reduction in the cost of achieving greenhouse gas emission reduction targets in the EU and, on the other, they provide incentives for the penetration of new energy technologies into transition and developing countries.

Based upon European research results, this brochure highlights some methods and options for the successful development of Joint Implementation and Clean Development Mechanism projects, dealing specifically with renewable energy technologies in Central and Eastern Europe and in the Mediterranean area.



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