ANALYSIS OF THE DANISH JI AND CDM PROJECTS

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Abstract

The Danish government's strategy from February 2003 "*A Cost-effective Climate Strategy*" signified a change in Danish climate policy. Instead of focusing on domestic CO_2 reductions, a considerable effort was made to use the so-called flexible mechanisms from the Kyoto Protocol, i.e., Emissions Trading, Joint Implementation (JI) and Clean Development Mechanism (CDM). Accordingly, the Danish government has allocated a total of € 150.000 for purchasing CO_2 credits from CDM and JI projects in developing countries and in East- and Central Europe, respectively.

The background for this shift in focus was the expectation that the use of the flexible mechanisms could be carried out at much lower costs than CO_2 mitigation activities in Denmark. Another argument used by the government was, that an extensive use of the flexible mechanisms would lead to a considerable transfer of capital and know-how from the industrialised countries to the countries, where the projects would be carried out.

The present report contains an analysis of 33 Danish JI and CDM projects, 12 of which have been analysed thoroughly. The projects have been assessed using a range of different parameters such as additionality, contribution to sustainable development in the host country, transparency, and technology transfer.

The overarching conclusion of the report is that there has been too much focus on purchasing CO_2 credits at low prices, and this has influenced the Danish project portfolio. This is further augmented by the fact that the Danish activities seem to be a mere continuation of earlier projects, which were carried out under the Danish environmental support, however without receiving CO_2-credits in return. As such, it seems that the CDM and JI approach is biased towards purchasing CO_2 credits at favourable prices rather than ensuring high quality projects.

In addition, the analysis points towards a number of critical aspects in relation to the Danish climate mitigation activities, among others, a lack of focus on sustainable development, low or lacking technology transfer, and a low contribution to CO_2 emission reduction in general. Furthermore, the access to information regarding the Danish JI and CDM transactions has been insufficient.

The report concludes that if Denmark is going to contribute to a trustworthy and long-term solution to the global climate change problem, it is of utmost importance to focus on the quality of the projects. This is only possible, if the actors on the market prioritise to develop high quality projects, having a positive effect with regard to the atmosphere as well as within the host country. State financed actors like Danida and DEPA should represent front runners by setting a high standard for projects for the private actors to follow.

Some of the Danish projects represent very good pilot projects with a technological speeding effect, which will hopefully result in local or national initiatives, and thereby supporting a long-term development within the country. The Danish government should strengthen this effort and focus more on CDM and JI projects that contribute to a sustainable development within the host countries instead of merely pursuing low prices.

Preface

In February, the Danish government announced a new climate strategy for Denmark. '*A Cost-effective Climate Strategy*' broke with many years of progressive Danish energy and climate policy in favour of a significant focus on applying the flexible mechanisms as articulated in the Kyoto Protocol. Subsequently, the Danish government earmarked around € 150.000 for purchasing CO_2 credits from projects in developing countries as well as in East- and Central Europe.

The background for this shift of focus was the expectation that the use of the flexible mechanisms could be carried out at much lower costs than domestic action. The government argued that an extensive application of the flexible mechanisms, in addition to the lower costs, would lead to a considerable transfer of capital and know-how from the industrialised countries to the countries, where the projects would be carried out.

However, the governments' narrow focus on economy overlooked the potentials for CO_2 reductions in Denmark as well as the long list of socioeconomic benefits by accomplishing these reductions domestically. Accordingly, the Danish 92 Group decided to investigate the governments' use of Joint Implementation (in East and Central Europe) and Clean Development Mechanisms (in developing countries) projects. The present analysis has been conducted by Dina Aaager Zimling, The Ecological Council, and Mette Nedergaard, WWF Denmark.

1. Introduction

The Intergovernmental Panel on Climate Change (IPCC) has estimated that the global emission of greenhouse gases has to be reduced by 60-80 percent in 2050 in order to avoid dangerous climate changes. Such a reduction necessitates that all human induced emissions have to be reduced to an absolute minimum within a period of 50 years. The use of fossil fuels in the modern world has to be converted into renewable sources of energy in order to minimise the CO_2 emissions, and all unnecessary emissions of methane (CH_4), Nitrous Oxide (NO_2) and industry gases must be eliminated.

Such redistribution on a global scale requires forethought. Investments in new technology today have to be secured in the future in order to avoid drawbacks tomorrow.

The commitments in the Kyoto Protocol in the period 2008-2012 represent merely an initial step forward, which have to be followed by new commitments that can ensure a long-term effort. It in this perspective the Danish endeavours must be seen.

Background

The Danish government's strategy "A Cost-effective Climate Strategy", dated February 2003, represented a change in Danish climate policy; from a focus on domestic CO_2 reductions to applying the flexible mechanisms in the Kyoto Protocol, that is, Emissions Trading, Joint Implementation (JI) and Clean Development Mechanism (CDM). On this occasion, the government introduced an upper level of € 16 as the tolerable costs per tonne of reduced CO_2. Thus, Danish projects cheaper than € 16 should be carried out whereas more expensive initiatives are being replaced by purchasing CO_2 credits from CDM and JI projects, where a more favourable price is expected. Subsequently, the government has allocated some € 150.000 for purchasing credits from CDM and JI projects.

The objective with the present analysis is to clarify:

- Whether the commenced project activities will ensure that Denmark fulfil the commitments of reduction under the Kyoto Protocol
- The quality of Danish JI and CDM projects and if added value is introduced by Danish project activities
- If the focus on JI and CDM is the optimal solution for Denmark

A two-pronged analysis has been carried out with the overall analysis of the Danish approach focusing on:

- The entire project portfolio
- Transparency in the administration
- The projects' contribution to Denmark's Kyoto commitments
- Economy

The second part of the analysis consists of a more detailed review of selected projects in order to assess whether the international requirements of additionality and sustainability have been fulfilled. This part of the analysis will also consider the consequences of the Danish approach in the host countries.
Finally, the analysis will take into account the Danish focus on the application of CDM and JI from a global perspective.

Greenhouse gases
The Kyoto Protocol includes a number of greenhouse gases where CO_2 by far is the largest contributor to global warming. For the sake of convenience it has been decided internationally to convert emissions of all gases to CO_2 equivalents when emissions are reported. In the following, CO_2 is being used as the general term for CO_2 equivalents.

Additionality
The international requirements concerning the additionality of JI and CDM projects are decisive for that the application of the project mechanisms contributes to reducing the emission of greenhouse gases to the atmosphere. The additionality requirement defines that the generated amount of CO_2 reductions must exceed what would otherwise have been the case that is, comparing with the 'business-as-usual' scenario. Unless this condition is fulfilled, JI and CDM projects will lead to increased emissions and there will be no effect with regard to the atmosphere.

A baseline reflecting a scenario for the most probable development is used to assess the additionality of the projects. The difference between the amount of CO_2 emission reductions in the baseline scenario and a scenario where the given project is carried out is equal to the amount of CO_2 credits being generated by the specific project. This situation is illustrated in figure 1.

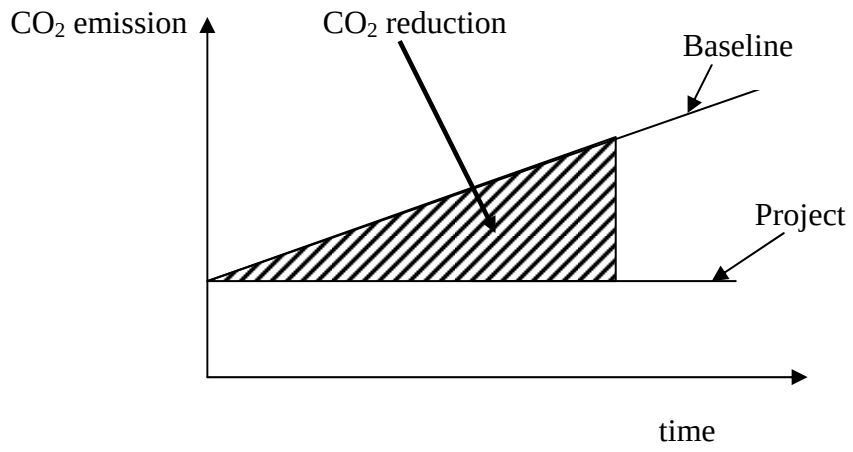

Figure 1: Illustration of how to estimate the CO_2 reduction from JI and CDM projects

The international standards[1] for assessing additionality of a project include five steps. The first step concerns the setting of the baseline scenario. As mentioned, this is determined as the most probable natural development and has to fulfil the regulation in the host country as well as meeting the involved actors' demands to return of investments.

The following four steps in the additionality analysis concern the verification of whether the project is additional when comparing with the baseline. In this situation, the requirements to the project are that they:

[1] The standards are elaborated for CDM projects. As of now, there are no official standards for JI projects. However, it is expected that these will be developed and will be comparable to the CDM standards.

1. Cannot be economically advantageous (otherwise it is a likely baseline scenario)
2. Are subject to one or more barriers
3. Have to deviate significantly from general practice
4. That the CDM registering contributes to overcoming the identified barriers

These standards have to ensure that projects that would otherwise have been carried out, the so-called free riders, will not be approved because they do not contribute to a global reduction of greenhouse gases.[2]

International requirements for CDM projects' contribution to sustainable development
According to the Kyoto Protocol, CDM projects have to contribute to sustainable development in the host country. However, this requirement is not compulsory for JI projects. Owing to political impediments during the negotiations, no formal rules exist in order to effectuate this. The individual host country determines whether the project fulfils the requirements from the Kyoto Protocol. The CDM Executive Board, which approves CDM-projects world-wide, only calls for an official letter of approval from the host country.

The lack of formal requirements is reflected in the project portfolio in that the majority of the projects in the international pipeline with little if any sustainable development benefits. In order to strengthen the sustainable development objective of the CDM a range of NGO's and others have developed a number of analyses of and methodologies for including sustainable development benefits.

The projects in the present analysis are being assessed by means of the three most common criteria of sustainable development:
- local/regional and global environmental impacts
- social and development impacts
- economic and technological impacts

Table 1 provides an overview of the different aspects that are being emphasised in respect to sustainable development

Table 1: Aspects of sustainable development

Local/regional/global environment	Social sustainability and development	Economic and technological development
- Water quality and quantity - Air quality - Other polluters - Ozone layer - Soil conditions - Biodiversity	- Employment (quality of job and labour standards) - Every day of the poor (poverty reduction, equal sharing of and access to services) - Access to energy - Human and institutional capacity (rights, education, involvement and equality)	- Employment (quantity) - Balance of payment for a project - Technological liability (effect of replication, development of skills, institutional capacity, technology transfer, liability of the currency)

[2] The purchasing of CO_2credits from CDM projects results in that Denmark continues to emit CO_2 (equivalents) similar to the amount of credits that have been gained. If the project is not additional, the total transaction entails an increase in the global CO_2 emission.

2. The Danish Project portfolio

The Danish JI and CDM programmes were officially launched with the National Budget for 2004, which for the first time assigned funds for purchasing CO_2 credits. Up until now, agreements have been made regarding the purchasing of CO_2 credits from two CDM projects and five JI projects with a total amount of nearly 3 million tonnes of CO_2 in the period until 2012.

In addition a number of projects are in progress. Danish International Development Agency (Danida) is currently negotiating with partners in Thailand, Malaysia and South Africa on agreements on 11 different CDM projects and the Danish Environmental Protection Agency (DEPA) is currently elaborating additional projects in Russia and Ukraine. In total, there are presently 33 projects in the Danish project portfolio. Out of these, 7 agreements have been established, 13 are being negotiated, 5 are identified and 8 are yet to be determined. Thus, there are currently 20 projects that can be described as likely contributors to the Danish Kyoto Protocol commitment.

Table 2 provides an overview of the project portfolio

Table 2: Overview of the project portfolio

	Category	Status	Renewable energy	Efficiency of energy	Shift of fuel (fossil)	Methane accumulation	N_2O
Bulgaria	JI	Purchase agreement					1
Egypt	CDM	Purchase agreement	1				
Estonia	JI	Purchase agreement	1				
China	CDM	Identified		3			
Malaysia	CDM	1 Purchase agreement 5 negotiated	3			3	
Moldavia	CDM	Unclarified				1	
Poland	JI	Purchase agreement				1	
Romania	JI	2 Purchase agreements	2			(1)	
Russia	JI	Identified		1	1		
South Africa	CDM	1 negotiated 3 unclarified	2			2	1
Thailand	CDM	Negotiated	7				
Ukraine	CDM	Unclarified				3	

Out of the 33 identified projects, 16 are based on the application of renewable energy, which is encouraging. The entire range of renewable energy projects are estimated to contribute to a long-term switch-over of the energy sector and thereby to transfer and application of new technology in the host country. By this, the projects achieve a significant replication potential. This does, however, limit the projects' additionality over time and thereby Denmark's chances for implementing these project types on the long-term.

The 8 methane-projects and the two NOS-projects do not have similar positive impact in the host country. In the worst case, the projects create perverse incentives so that the host country or the

local project holder decline to take advantage of the natural technological development, because of the risk of missing the opportunity of selling CO_2 credits if carrying out the emission reductions themselves.

The three district heating projects in China similarly have a significant replication potential. The projects introduce a fundamental modernisation by appliance of efficient district heating technology in a country with an extensive, old-fashioned and inefficient district heating sector.

The two projects in Russia concern energy efficiency of power stations and thus cannot be said to contribute to solving the global climate issues in the long-term.

The technology applied in the Bulgarian project is a catalyser (a filter) that is being installed in order to minimise the NOS-emission from a fertilizer plant. This kind of technology is neither to be defined as renewable nor energy conserving.

Estonia utilises wind power, the 'Rumania I' geothermal energy and 'Rumania II' biomass for the production of energy. These three projects are categorised as renewable energy. For the projects in Poland and Ukraine the methane capture from landfill sites are categorised as biogas, which is questionable in case of Ukraine since the methane is flared without using it for energy production.

The two projects in Russia both involve energy efficiency of power stations. 'Russia I' remodels two boilers to burn gas instead of oil and 'Russia II' implements more effective turbines. Fuel switch from one fossil fuel to another cannot be considered as renewable energy projects and an increased efficiency within the energy production should be regarded as sustainable technology.

Figure 2 provides an overview of the different sorts of projects and the likely emissions from the entire project portfolio.

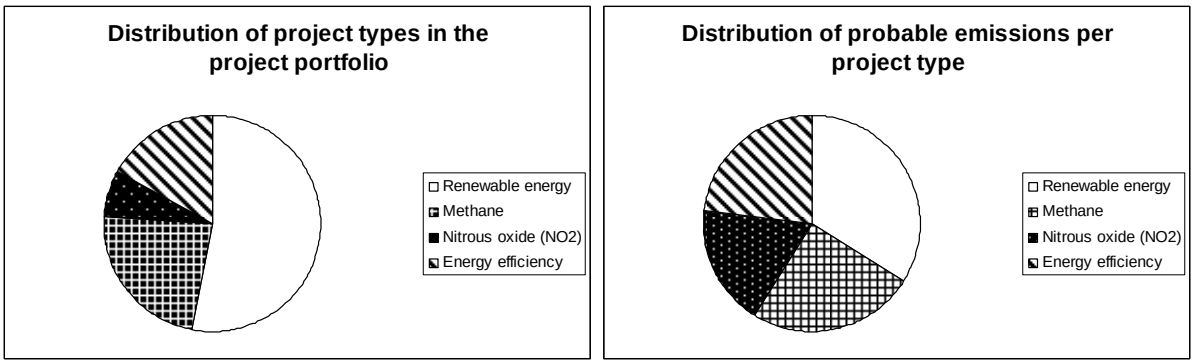

Figure 2: Projects and emissions from the total project portfolio.

The 8 unsolved projects illustrate on the one hand that it is complicated to develop and carry out JI and CDM projects. Secondly, they reveal that the host countries to an increased extent recognise that the noticeable difference in price between developing and industrialised countries does not necessarily have to benefit the latter.

3. The contribution of the mechanisms to the Danish Kyoto-commitment

The latest estimate from DEPA construes that Denmark has a deficit of 17.3 million tonnes CO_2 equivalents per annum in the period 2008-2012 in meeting the Kyoto commitment. This figure excludes the CO_2 credits from CDM and JI projects. DEPA anticipates that the credits from projects will contribute with reductions totalling € 600.000 per year.

At present, the 7 agreements on purchasing credits from CDM and JI projects are unable to meet Denmark's requirements under the Kyoto Protocol as they only contribute with a total of 3 million tonnes, equivalent to 0.6 million tonnes per year (comparable to 3.5 percent of the deficit).

The total contribution from the 20 projects, where an agreement has been settled or negotiations commenced, comes to an estimated 2.3 tonnes per year, comparable to 13 percent of the deficit. This amounts to app. 7 percent of the total reduction commitment as illustrated in figure 3.

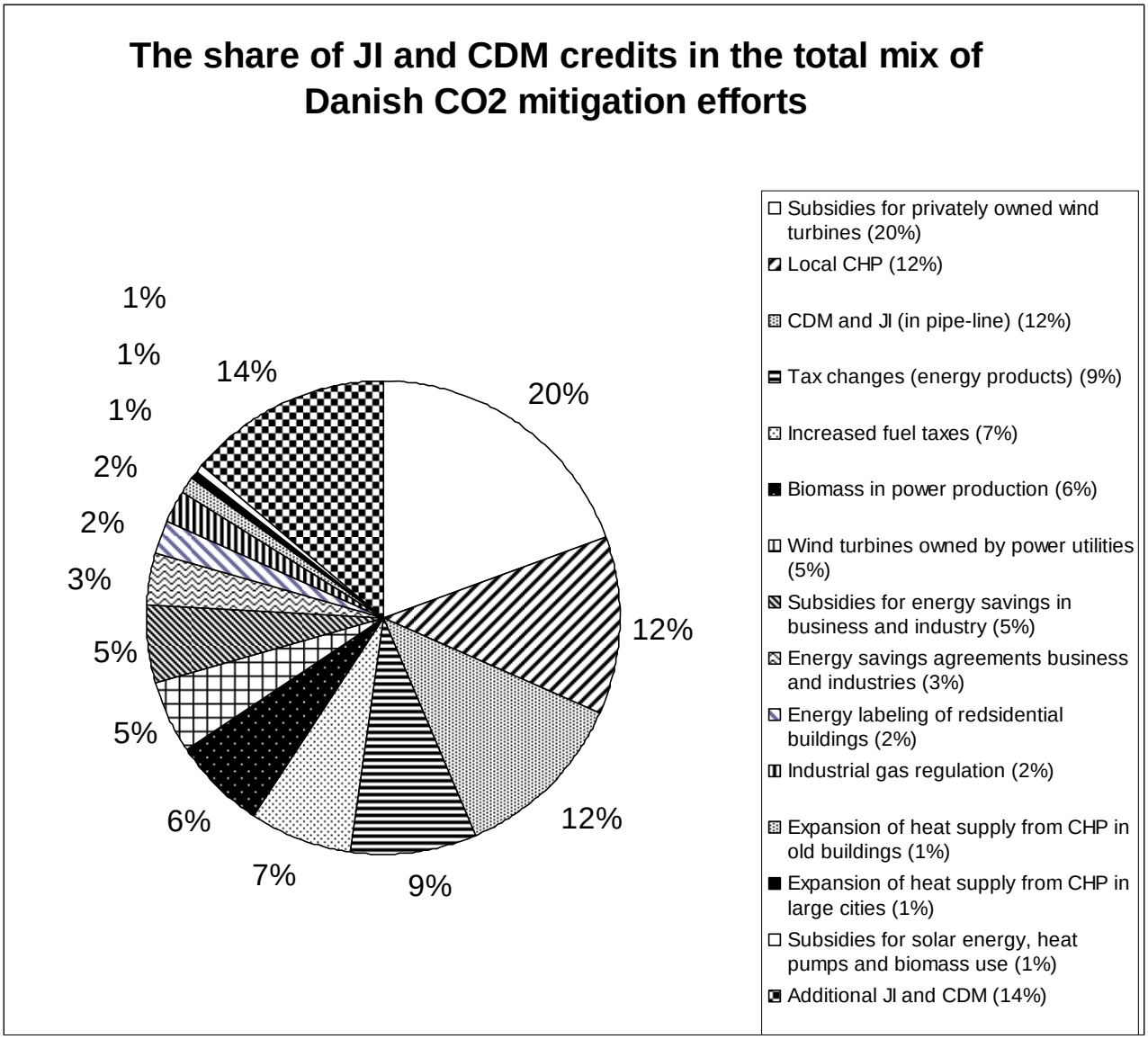

Figure 3: Danish CO_2 reduction initiatives

The figures above exclude credits from JI projects in the period before 2008, as the employment of these credits is only possible upon the beginning of a budget period. On the other hand, CDM projects can be used from year 2000. Figure 4 shows CO_2 credits from the different projects. As for the JI projects, the estimation is divided into credits in the budget period 2008-2012 and in the period up until 2008. In addition, one JI project in Poland generates credits after the budget period.

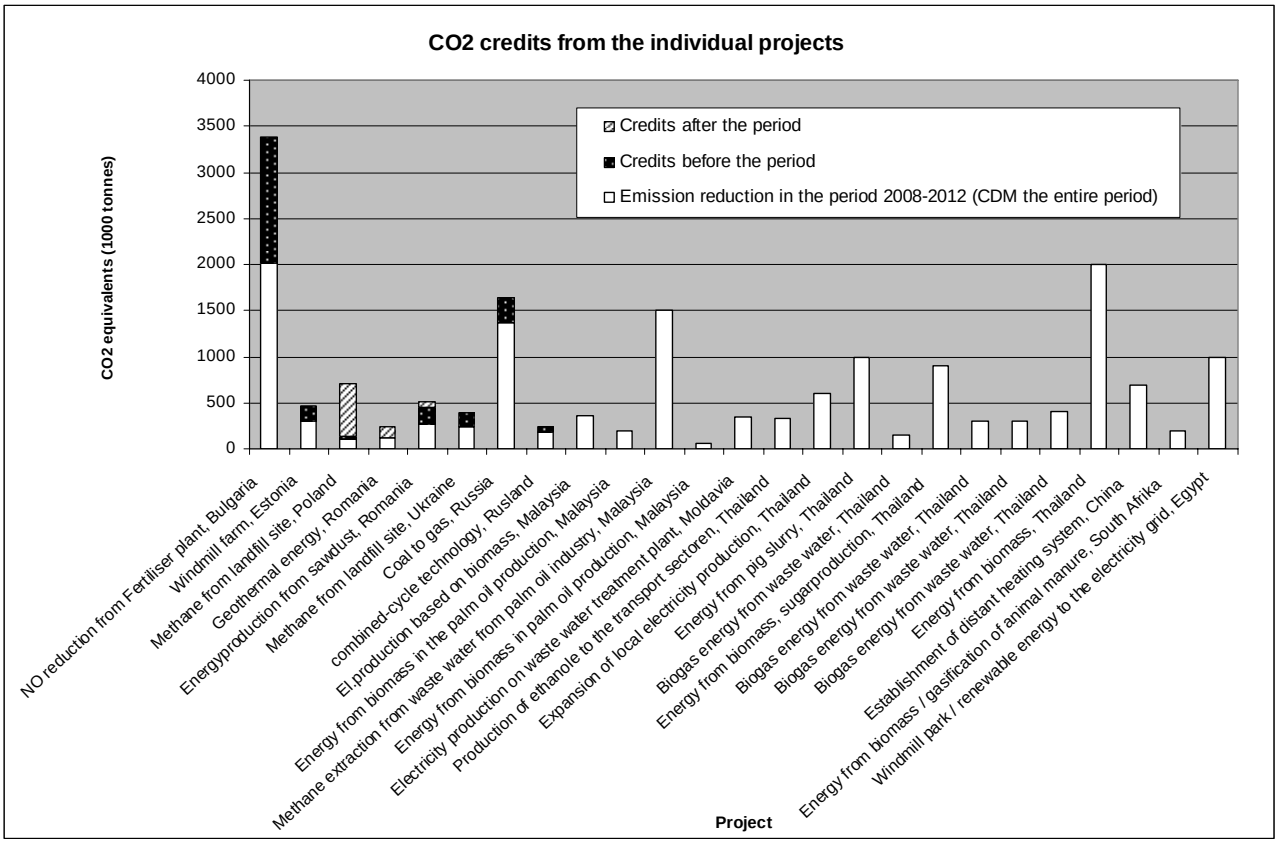

Figure 4: CO_2 credits from 20 expected projects

Besides this, DEPA has in several occasions entered into a contract on purchasing credits generated before 2008. This is made possible because the host countries have experienced a marked decline in greenhouse gas emissions due to the economic decline following the fall of the Berlin Wall. The mentioned countries all possess surplus quotas, as it is unlikely that they will come within reach of the 1990-level, which is the aim defined as the national commitment under the Kyoto Protocol. In other words, the economic decline is an advantage for the atmosphere. When Denmark purchase these quotas or credits, the Danish emissions are not reduced with the same amount as otherwise would have been the case. The purchasing of these reductions is therefore converted to a rise in emissions when comparing to the present global emissions. This is the reason why these credits are often termed “hot air” in the political debate.

The total contribution from the 33 projects in the project portfolio is in the range of 36 million tonnes. However, this figure cannot be directly compared with the deficit of 17.3 million tonnes as a portion of the 36 million tonnes are generated beyond 2012. It has not been possible to obtain the detailed data of this scenario.

4. Economy in the JI Danish CO2 mitigation efforts

The Danish government has allocated € 150.000 for purchasing of CO_2 credits from JI and CDM projects. The Ministry of Foreign Affairs (Danida) has the responsibility for purchasing credits in developing countries (the CDM projects) whereas the Ministry of Environment (DEPA) is in control of purchasing credits from Eastern Europe (JI projects). Around 5 percent of the assigned funds can be allocated for the administration of activities. In addition to the funds allocated to the direct purchasing of CO_2 credits, other funds are from Denmark's environmental assistance support programme are assigned to project identification and development in the host countries.

In 2004 a Danish CDM fund containing a total of around € 53 million was established in cooperation with the World Bank with the aim of investing in CDM projects. Danida, DEPA, as well as the companies Elsam and Elkraft, Maersk Oil and Gas, Aalborg Portland, and Nordjysk Elhandel have contributed to the fund. The objective of the fund is provision of CO_2 credits from JI and CDM projects to an average price of less than € 5,3 per tonne. Danida does, however, consider this difficult to achieve because of the development in price on the international CO_2 quota-market. A minor part of the fund (10-15 percent) is used for a contribution to the World Bank's Community Development Fund, which develops projects and purchases CDM credits from small projects in developed countries' communities. The fund has yet to identify specific projects. Finally, Danida makes use of funds from the so-called mixed credit programme for investment in CDM projects.

The Danish government has 4 types of costs in relation to purchasing CO_2 credits from CDM projects:

1. Purchasing of credits for a given price per tonne CO_2 equivalent
2. Costs related to project preparation (consultation, projects design, monitoring and validation)
3. Investment contributions via e.g. mixed credits
4. Administration costs

It has only been possible to get access to information of prices from the 5 agreements for JI projects, and it has therefore been difficult to assess the total costs associated with purchasing one tonne of CO_2 equivalents. As displayed in table 3, the prices are much lower than the governments' loft of € 16. The cheapest quota-price comes from the fertilizer plant in Bulgaria (€ 3.21) and so far the average price approximates € 4.5 per ton. The expenditures from the projects preparation are included in the prices.

Table 3: quota-prices and investments

JI projects	Country	Price per tonne CO_2-e	Project preparation
NO reduction from Agropolychim fertiliser factory	Bulgaria	€ 3,2 purchased € 3,9-5 optional	€ 66.700
Türisalu Windmill farm	Estonia	€ 5,5	€ 53.300
Zakopane methane and sludge utilisation from landfill and water treatment plant	Poland	€ 5	€ 26.700
Geothermal energy in Oradea and Beius	Romania I	€ 4,8	€ 53.300
Biomass energy – sawdust	Romania II	€ 4,04	€ 266.700
Kharkiv Oblast methane utilisation from landfill site	Ukraine	NA	€ 66.700
Amursk "from coal to gas"	Russia	NA	NA
Energy efficiency at Mednogorsk power plant	Russia	NA	NA

With reference to the discussions with the responsible actors in DEPA and Danida it is considered realistic that the Danish JI and CDM projects included in this analysis can be carried out within the governments' loft of € 16 per tonne CO_2. However, it is questionable whether the assumption of an average price of € 6.67 per tonne holds until year 2012, as the market is gradually expanding.

5. Transparency

It is the governments' policy that the Danish climate mitigation activities are to be prioritised in respect to cost-effectiveness; that is, the market and the existing conditions, including prices, determines the sort of investments that can be undertaken in order to fulfil the Kyoto commitment. The prerequisite for the market to instigate rational solutions is transparency in respect to the costs of the respective alternatives.

With the involvement in JI and CDM projects, Denmark contributes to the establishment of a new international market for trade in CO_2 credits. The precondition for this market to contribute to a trustworthy climate mitigation effort in respect to reducing the global emissions of greenhouse gases is that the involved actors can work out the principles of the market. Transparency and access to information is of utmost importance for the market to function, as seen in the case of other markets and trade associations.

The transparency and access to information in the Danish CDM and JI transactions is currently not functioning optimally, neither in respect to assessing the cost-effectiveness of the efforts nor in regard to contribute to a well-functioning and reliable international market.

The access to information on specific JI projects is generally acceptable, however information on prices are not available presently, with the exception of various documents in the Parliament.

There is no transparency in regards to the administration of the Danish CDM projects and further activities relating to CDM. Danidas website presents a general introduction to the CDM ventures but no specific information on the projects. Neither are these to be found on the websites of the local embassies in the involved countries. It is notably difficult to access information regarding the economy of the projects.

As a minimum, the following information should be accessible in order to assess the application of JI and CDM in the Danish climate strategy.

- A list of projects (in progress and in the pipeline) with reference to host country, status, total amount of credits, period of credits and quota-price.

For every project following information should be accessible:

- project document/description including an analysis of additionality
- contribution to sustainable development as well as costs related to project preparation, validation and approval and, if necessary, contribution to investment

6. The Danish approach to CDM

The responsibility for the development of CDM projects and the purchase of credits lies within Danida. Initially, CDM projects were established in the former Danced[3] countries: Malaysia, Thailand and South Africa. Later, Indonesia, China, Moldavia and Egypt have been added to the list of CDM partner countries. The embassies in the partner countries are responsible for project development, approval and negotiation of contracts with the host countries and involved actors.

Danida has yet to publish a strategy as well as criteria for selection of CDM projects apart from the existing ruling that nuclear power and sinks projects are not eligible under the Danish CDM programme. Neither has Danida developed any particular guidelines or specifications as to how the CDM projects contribute to sustainable development, including the involvement of local communities in the host country. By and large, Danida's overall objective of integrating poverty concerns in the development aid is not met in the CDM projects.

Danish CDM projects activities

Danida has a project portfolio of 23 impending CDM projects. Table 1 provides an overview of the Danish CDM projects. Of the 23 projects, 14 concern the utilisation of different types of renewable energy. Three projects are based on fossil fuels (in China), five projects capture methane from landfill sites and water treatment plants (Malaysia and South Africa) and one project subtracts industrial gas from a fertiliser plant.

[3] Danced: Danish Corporation for Environment and Development, a funding programme for environmental assistance to selected developing countries.

Table 4: CDM project portfolio (Source: Danida)

Project title	Host country	Project type	Status	Credits until (year)	Total credits (tonnes)
Kunak	Malaysia	Renewable energy/biofuels	Negotiating	2012	0,22
Lhumut	Malaysia	Renewable energy/biofuels	Purchase agreement	2012	0,20
Golden Hope – several units	Malaysia	Methane extraction	Negotiating	2012	1,5
Jendarata	Malaysia	Renewable energy/biofuels	Negotiating	2012	0,06
2 projects	Malaysia	Methane extraction	Identified	2012	2,9
Ratchasima	Thailand	Renewable energy/biofuels	Negotiating	2015	0,9
Ratchaburi	Thailand	Renewable energy/biogas	Negotiating	2015	1,0
Surat Thani	Thailand	Renewable energy/biogas	Negotiating	2015	0,15
Korat Tapioca	Thailand	Renewable energy/biogas	Negotiating	2015	0,3
Chachong Sao Tapioca	Thailand	Renewable energy/biogas	Negotiating	2015	0,3
Garbon Gigantic	Thailand	Renewable energy/biogas	Negotiating	2015	0,4
Thai Agro	Thailand	Renewable energy/biomass	Negotiating	2015	2,0
Khon Kaen	Thailand	Renewable energy/biofuels	N/A		0,33
Additional projects	Thailand	Renewable energy/biomass/biogas		2012-15	0,6
Hou Ma	China	Energy efficiency/distant heating	Awaiting official approval of baseline	2015	0,75
Harbin	China	Energy efficiency/distant heating	Under preparation	2015	5,5
Changchun	China	Energy efficiency/distant heating	Under preparation	2015	0,55
Zafarane	Egypt	Windmills	Purchase agreement	2012	0,6
Mondi	South Africa	Renewable energy/biomass	Suspended	2015	5,0
Biotherm	South Africa	Renewable energy/Biogas	Negotiated	2012	0,2
Omnia	South Africa	Industrial gas	Suspended	2015	4,5
2 additional projects	South Africa	Methane accumulation and renewable energy	Suspended	2012	2,6
Chisinau	Moldavia	Methane accumulation	Suspended	N/A	0,35

Due to lack of access to comprehensive project descriptions it has only been possible to analyse 5 projects in detail. These are as follows:

1) Kunak: energy production based on biomass in Malaysia

The project in Kunak, Borneo, provides new capacity to the energy production at Kunak palm oil plant based on waste products from the palm oil industry. The additional energy is exported to the regional electricity net and thus replaces electricity based on oil.

2) Ratchasima: energy production based on biomass in Thailand

The projects increases the existing energy production with 34 MW based on waste from the sugar production at Ratchasima sugar plant in Thailand. The project reduces CO_2 emission, as the produced electricity is delivered to the energy net where it replaces electricity produced on fossil fuels.

3) Khon Kaen: ethanol production in the transport sector in Thailand

The project establishes the production of ethanol for the transport sector. The ethanol is produced from sugar cane molasses and is expected to be mixed with petrol in the measure 1:10. The CO_2 reduction is generated from the reduced utilisation of petrol in the transport sector.

4) Hou Ma: efficiency of heating supply in China

The project establishes a modern district heating system in Hou Ma city with the utilisation of excess heating from Hou Ma energy plant. The project replaces central heating, creates a less extensive district heating net and reduces individual heating in the domestic sector.

5) Moldavia: Energy production based on methane decrease

The project in Moldavia converts organic waste in sludge to methane from a waste water treatment plant. Subsequently, the methane is utilised for the production of electricity. The project reduces CO_2 emissions or emission of CO_2 equivalents through the reduction of methane and by substituting electricity produced elsewhere.

The specific project analysis includes the projects' additionality and contribution to sustainable development in the host countries.

Additionality

Danida (and DEPA) has estimated that all projects are environmentally additional, that is, the projects generate less CO_2 emission than would otherwise have been the case.

However, the five projects above do not fulfil all requirements according to the international procedures for additionality analysis, as illustrated in table 5. This has partly to do with the circumstance that the projects are still in the approval process, owing to, *inter alia*, lack of documentation and a need of analyses of baseline-selection.

The Kunak project in Malaysia is a so-called small-scale, i.e. less than 15 MW electricity. Special simplified rules apply to these projects.

Table 5: assessment of the projects' fulfilment of the international requirement of additionality

Project	1. step	2. step	3. step	4. step	5. step
Kunak	Fulfilled according to special rules				
Ratchasima	Insufficient	Fulfilled	Fulfilled	Fulfilled	Fulfilled
Khon Kaen	Insufficient	Fulfilled	Fulfilled	Fulfilled	Fulfilled
Hou Ma	Insufficient	Not applied	Not documented	Not documented	Not documented
Chisinau	Fulfilled	Not documented	Not applied	Fulfilled	Fulfilled

The four analysed projects in China, Malaysia and Thailand are estimated to be additional when comparing to the business-as-usual development, but it should be considered carefully for how long a period the projects will be additional. Due to the relatively low costs associated with CO_2 reductions as well as the considerable replication potential in the host countries, these projects make up a significant potential, which the host countries are likely to exploit themselves at the stage where they make some sort of commitment to reduce the global emission of greenhouse gases.

The situation is more complicated in regard to the project in Moldavia. On the one hand it seems likely that there is a lack of economic capacity in the city of Chisinau, which is required to modernise the waste water treatment plant and that the atmosphere benefits from the project. However, the approval of the project will introduce a significant economic incitement to fail to resolve the misdeeds of the past in order to maintain the possibility of selling CO_2 credits. Thus, the potential of replication in the host country is the opposite as there is an incitement to continue the CO_2 emission.

The additionality analyses identify 5 different types of barriers, which are displayed in table 6.

Table 6: identified barriers in the 5 CDM projects.

	Economic	Financial	Legislation	Knowledge and tradition	Technological
Kunak		x	x	x	
Ratchasima		x	x		
Khon Kaen	x		x		
Hou Ma	x		x	x	x
Chisinau	x				

The identified barriers in China and Moldavia are most likely plausible as the lack of capital is a common observation in these countries, especially in relation to investments in public and semi-public facilities. Likewise, the economic barrier in relation to the distribution of petrol combined with ethanol seems plausible. In both cases, alternative solutions have been identified as prescribed in the international guidelines.

The financial barrier arises when the respective companies do not see the economic incitement in investing in the particular project type. The investment has to compete with other investments in the key business of the company. This does not necessarily imply that the projects are not economically attractive in a broader perspective, i.e. in relation to established power suppliers, which typically have more long-term demands for profit. This option has not been analysed as an alternative. The projects in Thailand and China describe that the lack of regulation, requiring the particular technology or solution, as a barrier. The lack of regulation is not necessarily a barrier. The characteristic barrier for small decentralised electricity-generating projects such as Ratchasima and Kunak (or Lumut) is that there is a lack of regulation ensuring that the producer has the opportunity to sell the produced electricity to the regional or national electricity net. In Thailand as well as Malaysia there are specific regulative frameworks enabling decentralised electricity production. The issue is that the price received per unit electricity produced is too low to ensure the profitability required by a private investor.

Similarly in China, it is possible and legal to utilise excess heating from power plants as district heating systems. However, neither the energy sector's organisation nor the planned economy has encouraged this.

Four CDM projects are partly financed through the arrangement for mixed credits (China and Egypt). Denmark has previously contributed to earlier stages of Zarfrana windmill project in Egypt through the arrangement for mixed credits without purchasing credits. It is therefore questionable whether or not the project is additional. Danida should be able to document that the project would not have been carried through by the use of mixed credits without revenues from CDM credits.

Distant heating projects in China
There is a number o fold-fashioned and inefficient distant heating systems in China, thus a significant potential for modernising and utilisation of heating from the production of electricity can be identified. However, this type of projects requires substantial amounts of capital, which necessitates massive investments from the public administration, as these are typically in possession of the systems. An obvious scheme would be that the Chinese government introduces legislations on utilisation of excess heating from the electricity production as well as technical specifications for modernising the distant heating supply. However, it is estimated that these measures alone will not be sufficient in order to overcome the economic barrier.

Application of biomass in Malaysia
The demand for electricity in Malaysia is growing at a faster rate when comparing with other places in the world, and for this reason a demand for expanding the capacity can be identified for the coming years. The Malaysian government is aiming at a share of renewable energy totalling 500 MW. At the same time, the government has launched a programme in order to promote small renewable energy units' contribution to the electricity grid. The utilisation of waste from the palm oil production comprises a significant and so far unexploited potential for renewable energy in Malaysia.

Kunak as well as the 2 other biomass projects constitute obvious and affordable possibilities for CO_2 reductions. The government has set up the legal frameworks for the exploitation and the only barriers seem to be the lack of knowledge concerning the existing possibility and probably also higher investment costs, which will be surmounted by the generated CO_2 reductions. This type of project will rapidly be part of a business-as-usual scenario.

The projects have the potential of expanding the development of small biomass-based electricity generating units in Malaysia, and thereby in the long-term perspective contribute to a shift in the burning of fuel and increase the number of actors in the electricity sector, thus avoiding monopoly. As such, the project contributes to environmentally sustainable development.

The projects introduce new options for revenues in the palm oil sector, which in it self constitute a threat to the nature. In particular, Borneo's rainforests can come under pressure. Although the project will generate more jobs, the local communities' benefits are limited, as the economic gain is confined to the company. The Kunak project does not seem to have the potential of contributing to the local community's opportunities to initiate new projects that can support the area economically and thereby increase the living standards.

Application of biomass/biofuels in Thailand
The Thai Government has set the goal of reaching an 8 percent share of renewable energy. Furthermore, the government has initiated a programme for enhancing decentralised production of electricity, so that individual producers can sell their electricity to the grid. There are however no legislations in this respect.

The electricity sector in Thailand is very centralistic and obvious local potentials for renewable energy are often overlooked. At the same time, the utilisation of local resources is in line with the governments' recent decentralisation reform, where the administration of resources, including energy, falls under the municipality.

The Ratchasima project and the remaining projects in Thailand, support the governments' plans of decentralisation as well as the increased utilisation of renewable energy in the energy production. The possibility of economic contributions from the profits of CO_2-reductions has minimised the economic barrier, that otherwise seemed to exist. Thereby, the projects contribute to environmentally sustainable development.

However, it should be expected that this type of projects within a short while will form part of a basis scenario for the electricity production in Thailand, owing to the significant options for using biomass.

Local, regional and global environmental impacts

As the only one of the analysed projects, the project in Moldavia has, undergone an environmental screening, which concludes that the negative impacts of the project are insignificant, thus eliminating the need for a thorough assessment.

An environmental screening has not been carried out in Malaysia as renewable energy projects in Malaysia are exempt from prior screenings. However, the Kunak project is located in a sensitive natural habitat on Borneo where the biodiversity is already under pressure. Thus, a screening could have ensured that any unforeseen negative impacts of the project would have been identified.

In Ratchasima, Thailand, it has been estimated that the environmental impacts are minimal, as the capacity for sugar production is not increased. The factory is ISO 14000 certified and all environmental impacts are recorded. In the Khon Kaen project there is no information of environmental impacts.

According to the project document in China, the project contributes to the following positive environmental impacts:

- improved air quality
- reduced emission of greenhouse gases
- reduced transport of coal
- locally reduced noise pollution
- less use of space for heating production

Danida does not anticipate that the project will imply negative impacts on the environment. However, an internationally approved screening could have confirmed that this scenario.

Social and developmental impacts

Job creation is the only sustainable development benefit mentioned in the project descriptions. The projects in Khon Kaen and Kunak are expected to create jobs in the province and thus minimise the increased tendency of migration to the city.

Danida's general principles of poverty integration in development projects in countries have not been taken sufficiently into consideration. Thus, none of the projects relate to the question of poverty alleviation, local aspects of poverty such as more equitable access to natural resources (energy, water, land, etc.), increased access to service, balance the differences in income, etc. Neither have the projects been designed so as to increase the local communities' capacity through the establishment of organisation, involvement in environmental issues, education and increased occupational options for women.

Economic and technological impacts

With respect to the economically sustainable development generated by the projects, only the project in China can be labelled as contributing to the local community in a positive way. This is the case as a more efficient distribution of heating will benefit the citizens through lower costs of heat supply. Kunak, Ratchasima and Khon Kaen primarily contribute to private organisations.

In particular Hou Ma and Khon Kaen create jobs and thereby economic activity in the local districts. However, new jobs from the remaining projects are estimated to be inconsiderable as these projects concern the use of already existing amounts of waste.

The projects in Thailand and Malaysia introduce new technology to the local districts and enable the use of local energy resources. In this manner, the need for imported oil products is minimised and the balance of payments is improved.

In addition, a considerable potential exists for replication of these project types. The four projects in China, Malaysia and Thailand contribute to long-term switch to are more efficient and sustainable of energy resources, and thus to an environmentally sustainable development. On the contrary, the

project in Moldavia contains very limited prospects for the future as it concerns the amendment of earlier misdeeds.

Involvement of local communities

An element of the international aspect of sustainable development concerns the involvement of local communities where the projects are carried out. Numerous examples show that it has been far too easy for big international investors, including development banks and organisations, to carry out projects with negative consequences for local communities. Local hearings and enquiries early in the project stage can circumvent conflicts and create awareness of negative impacts before they arise.

The international standards for CDM projects require 30 days hearing period as part of the project validation, that is, immediately before they are approved. In practise, it will though be very difficult to influence the project at this late stage in the project design unless very serious impacts are encountered. Secondly, the hearing is carried out using the internet thus naturally excluding the majority of local communities and to some extent local NGO's, unless they specifically follow the international CDM discussions. As a consequence, practically no official requirements are in place that ensures the participation of local communities.

The so-called CDM Gold Standard contains additional requirements for the participation of local communities in order to guarantee that the projects as much as possible pay heed to local interests and needs and as well as minimising the negative impacts.

Table 7: the 5 Danish projects' status on integrating local communities

Project	Community involvement
Kunak Malaysia	A hearing has been held in Malaysia with the participation of local authorities and government units. The civil society, including local NGO's, has not been consulted.
Ratchasima Thailand	A public hearing has been conducted on October 2002 with 300 participants. Comments and suggestions gathered are not available for the public.
Koen Khan Thailand	No information exists about a public hearing
Hou Ma China	No information exists about a public hearing or comments gathered.
Moldavia	A public has yet to be conducted, due to, among others, a lack of relevant procedures and requirements in Moldavia. However, a hearing is being planned.

It should be pointed out that an international development agency like Danida should be obliged to make an effort to ensure support from the local community. As it appears from the above table, this aspect has hitherto not received sufficient attention in the process of project identification and development.

Consequences for the host countries

The entire range of projects initiated in China, Thailand and Malaysia seem to bear evident potential, or what is termed "low-hanging fruits", in the host country. The use of biomass waste represents one of the cheapest and most evident options for renewable energy solutions, and this would be number one national priority for mitigation in Thailand and Malaysia. The high occurrence of district and central heating in China makes the modernisation and application of excess heating an obvious alternative and thus a large potential. Apart from reducing CO_2

emissions, this sort of effort would also enhance the efficiency of the energy supply, reduce the local air pollution and significantly improve the level of comfort in the involved residences.

However, this would also imply that the additionality of the project is limited in time because these project types would be rendered as a business-as-usual scenario along with employment of the potential. Thus, the benefit of the Danish investments lies primarily in contributing to the host country's capacity to exploit the benefits. On the other hand, this would exclude future Danish investments on the present economic conditions, as the host countries would probably refuse to sell the credits at such low prices. Presently, the market for CO_2 credits from CDM projects is subject to strong competition and this would increase the price.

Another issue with "low-hanging fruits" is the risk of leaving the host country with more expensive options when the time comes for them to take on mitigation responsibilities. For the countries in question, this is probably soon to become the reality. Thus, the cheap CO_2 credits purchased by Denmark can lead to more costly reductions for the host country. This behaviour may diminish the potential of reaching serious commitment of reductions in the future. Even though it makes sense to carry out the reductions sooner rather than later, the resolute focus on low prices runs the risk of delaying the solution of the long-term problem.

An issue in relation to harvesting "low-hanging fruits" carries with it the evident risk of establishing the so-called perverse incentives, that is, the possibility of capitalising CO_2 quotas from CDM projects removes actors' incentives of investing in modern technology as part of a natural technological development. As an example, the prospect for the 2 projects with decentralised biomass-based electricity production is that they can foster a development of new technology so that this becomes part of a business-as-usual scenario. The contribution from CDM-quotas discourages the actors from following this trend in the sector, as the possibility of selling quotas from the project vanishes.

This is particularly an issue in relation to the project types seen in Moldavia, as these eliminate the economic incentive for hindering methane emissions from waste water treatment plants in the future.

7. The Danish approach to Joint Implementation

The objective of the Danish Joint Implementation (JI) programme is primarily to purchase cheap credits and establish agreements on projects with a significant potential for reducing emissions of greenhouse gases. But for several of the projects an additional emphasis is put on e.g. stability with the project host (as in Bulgaria) or that the project has the potential of being a 'turn-key'solution, as in the wind turbine plant in Estonia.

In the present analysis, the projects below will be examined. The analysis comprises a total of 8 projects, where a contract has been signed in the first five.

1) **NO reduction from Agropolychim fertiliser plant – Bulgaria**

The objective with the project is to reduce the emission of N_2O through the application of technology that converts N_2O to oxygen and nitrogen. More specifically, this is carried out by introducing a new catalyst bearing.

2) Türisalu Windmill farm – Estonia

The Türisalu windmill farm projects concerns the production of renewable energy through the establishment of 13 windmills with an individual capacity of 1.65 MW, totalling 21.45 MW

3) Zakopane methane and sludge utilisation from landfill site and water treatment plant – Poland

The objective of the project is to establish a system for the utilisation of methane from a landfill site and a system for treatment and recirculation of sludge, which subsequently utilises the produced methane.

4) Geothermal energy in Oradea and Beius – Romania I

The project is a "fuel switch"-project, replacing fossil fuels (oil and natural gas) with local geothermal energy in the cities of Oradea and Beius.

5) Biomass energy, sawdust – Romania II

The objective of the project is to convert sawdust into a valuable source of energy through flaring.

6) Kharkiv Oblast methane utilisation from landfill site – Ukraine

The objective of the project is to capture methane gas from the landfill site. It has yet to be decided whether the methane is to be flared or if it is to be utilised for the production of electricity and supply to the grid

7) Amursk "from coal to gas" – Russia I

The objective of the project is to reduce the CO_2 emission from the energy production at Amursk CHP-1 by modernisation and converting from coal to gas-based energy production, which is economically and environmentally superior

8) Energy efficiency of Mednogorsk power plant – Russia II

The project concerns the implementation of two modern gas turbines with the objective of reducing the utilisation of fossil fuels, and thereby the CO_2 emission, in the energy production in Mednogorsk, Russia

According to the Kyoto Protocol only CDM projects must contribute to sustainable development. By orienting the effort to include more than just the cheapest credits, Denmark could be promoted internationally by pointing out that the JI projects should be seen in a long-term development perspective for the Eastern European and Baltic countries.

Table 8: JI projects, project type and applied technology

JI projects	Country	Project type	applied technology
NO reduction from Agropolychim fertiliser plant	Bulgaria	Neither energy efficiency nor renewable energy	New catalyser technology for reduction of N_2O emission by Nitric Acid production
Türisalu windmill farm	Estonia	Wind – renewable energy	13 Wind turbines of 1,65 MW (total 21,45 MW)
Zakopane methane and sludge exploitation from landfills and waste water treatment plant	Poland	Biogas – renewable energy	New methane accumulation and exploitation of technology for production of electricity and heating, and a biogas motor
Geothermal energy in Oradea and Beius	Romania I	Geothermal – renewable energy	Geothermal device for extraction of 2 km deep reservoirs in the underground
Biomass energy – sawdust	Romania II	Biomass – renewable energy	Biomass boilers for burning of sawdust
Kharkiv Oblast methane exploitation from landfill site	Ukraine	Biogas – renewable energy	Methane accumulation technology for incineration to CO_2
Amursk "from coal to gas"	Russia I	Energy efficiency, by energy production	Redesign of boiler for incineration of gas instead of coal
Energy efficiency of Mednogorsk power plant	Russia II	Energy efficiency, by energy production	Implementation of modern gas turbines, exploiting the excess heating from the turbine to electricity production

Table 8 presents the eight JI projects and their project type as well as applied technology.

Additionality

Additionality is the term used to argue, that the project would not have been initiated without the trading of JI credits. . The arguments might differ, but the more common are poor economic profitability or lack of regulation, that is, without proper regulation on e.g. environmental concerns, a factory lacks the incitement to invest. Thus, the project is business-as-usual. The extent to which the technology is state-of-the-art is debateable, however the most important is that the technology is new in the host country so that technology transfer has been made.

Table 9 provides a general overview of the 8 projects analysed in respect to the different elements. As is appears, 5 out of the 8 projects are assessed as additional.

Table 9: overview of the 8 JI projects analysed

Country	Project type	Additionality	Baseline	Sustainable development	Environmental impacts	Local community involvement
Bulgaria	No	Unlikely	Yes	No	None	Via www
Estonia	Yes	Yes	Yes	Yes	None	Yes
Poland	Yes	Yes	Yes	Partly	None	Yes
Romania I	Yes	Yes	Yes	Yes	Ongoing investigation	Via www
Romania II	Yes	Yes	debatable	Yes	NA	NA
Ukraine	Yes	Yes	Yes	Partly	None	Planned
Russia I	No	Unlikely	Debatable	No	NA	NA
Russia II	No	Unlikely	Debatable	No	None	NA

According to the Bulgarian document (the PDD), the project claims to be additional as there are no laws or regulations stipulating that N_2O emissions should be reduced. In addition, the project would not have been carried out without the trade of CO_2 credits, as the owner has no gained such as optimising the production, which remains unchanged. The catalyser technology applied in the Bulgarian project is very swift[4] and easy to implement. It is therefore likely that the factory probably would have replaced or implemented the catalyser by its own means at some point. However, no international regulation exists in this area. The projects' additionality is rather dubious especially seen in the context that the factory has to disburse around € 20 million on environmental improvements in order to comply with EU standards within the next 7 years. By way of illustration, the catalyser costs in the range of € 266.700.

According to the project document for the wind turbine plant park in Estonia, the project claims to be additional as the wind turbine plant would not have been established without financial support. The EU directive 2001/77/EC stipulates that 5.1 percent of the entire utilisation of electricity has to come from renewable sources by 2010.

[4] One month

Table 10: different justifications for additionality

JI projects as countries	Lacking national legislation	Lacking international legislation	Not economically profitable	Lacking optimising of the process	Lacking national initiatives	Lacking exploitation of resources
Bulgaria						
Estonia						
Poland						
Romania I						
Romania II						
Ukraine						
Russia I						
Russia II						

The directive represents a significant challenge for Estonia with a share of renewable energy sources in 2000 merely around 0.2 percent. No efforts have been initiated in Estonia in order to develop economically profitable renewable energy projects that could increase the share of renewable energy in the country. However, such initiatives are should be underway, as Estonia has to comply with EU standards by 2010. In the future, similar projects will probably not be deemed additional as Estonia will have to commence its own investments in renewable energy, although it is not economically profitable under the existing economic conditions.

A new expansion of the landfill site in Zakopane, Poland, has been accomplished according to EU regulations and has been rather expensive for the Zakopane municipality. A gas facility will not prove economically profitable without support from the JI programme. The savings from utilising energy from the landfill are sufficient to outbalance the costs of investments, operation and maintenance. Consequently, no reductions in emission would have been observed without the JI project. The production of biogas from the landfill will also replace fossil fuels, as electricity and heating in Poland is often based on coal and natural gas. The same applies for the waste water treatment plant. There are no plans for introducing regulations of sludge and waste water treatment as this has not been prioritised in Poland's budget. However, Poland needs to comply with EU's regulations on the area by 2012. This has been accounted for in the baseline.

According to the Romania I document (the PDD), the project claims to be additional because the reduction of CO_2 emissions would not have been realised without the project. This is explained by the fact that no national initiatives are in place in order to spur the replace fossil fuels with geothermal energy. The project will not receive funding from other sources. It is however peculiar that the project has not been initiated by a Romanian company since it seems to constitute a profitable business for a Danish company. The drillings were commenced in advance by the Romanian government and it should be debated if a Danish company should reap the economic benefits of the Romanian governments' previous investments.

Although new biomass units have emerged in Romania in the past years, the PDD for the Romania II project claims that the project is additional, because sawdust and wood waste is still being illegally deposited in Romania instead of being applied as a source of energy. The argument is acceptable, as it makes good sense to use and unexploited biomass resource. Credits from using methane that would otherwise have been releases from the sawdust from the fermenting process, and subsequently trading them as credits is questionable in respect to the additionality, as it depends on where the sawdust is deposited and if it releases methane.

According to the PDD, the project in Ukraine claims to be additional, because the project would not have been carried out without extern funding since no economic profitability exists without trading of quotas. Concurrently, directives requiring reduction of methane from landfill sites are non-existent.

The original intention of the Russia I project was to construct a 210 MW power plant unit by Amursk power plant. This was the reason behind the construction of a 43 km long gas pipe. Subsequently, lack of investment capital caused Khabarovskenergo to decide to utilise the excess gas from the Komsomolsk power plant on the Amursk power plant. US$ 100.000 were invested in the extension of a gas pipe to the boilers 6 and 7 and other adjustments. Hardly any economic barriers were encountered. The current project with the same procedure for the boilers 9 and 10 is almost identical, however the argument for the projects' additionality is that economic barriers are always encountered in the planning stage. This argument seems rather questionable. The projects' economy has improved after the integration of boiler 9 and 10 and turbine 5 into one unit. The only concrete difference between boiler 5 and 6, and 9 and 10 is a slight difference in environmental friendly technology[5].

The Mednogorsk power plant in the Russia II project consists of 4 operative boilers. Three boilers were put into operation between 1946 and 1956 and the last one in 1990. The majority of the fuel used is gas and oil as a reserve. The present project concerns the implementation of two new efficient gas turbines and a 3.1 km pipe. A back-pressure turbine was installed back in 2003. Since the power plant by it self installed a new and more efficient turbine in 2003, it is difficult to accept that the new turbines should be additional. However, the projects document claims that the most significant barrier was the lack of capital, and that this had the potential of delaying the implementation.

The most significant argument in favour of additionality is that they are not economically profitable without the trade of JI credits (see table 10). In other circumstances, these projects are deemed additional owing to the lack of regulations on the area, nationally as well as internationally. It appears that in case of some of the projects directives are in place, but that they only have to be complied with in the future. Furthermore, some of the arguments presented regarding the additionality are, that no national initiatives have been made in order to exploit geothermal and biomass resources, or that it would not contribute to optimising the process in the Bulgarian fertiliser factory.

Sustainable development

Sustainable development has had a variety of definitions throughout time. The aspects of sustainable development displayed in table 11 are mentioned in the PDD of the 8 analysed JI projects.

In Bulgaria, no changes are made in the production process and therefore no economic gains or more jobs. There is a technology transfer component, as the producer of the catalyser is a Danish company. But since Agropolychim is one out of two fertiliser plants in Bulgaria, the potential for replication is negligible.

[5] For example NOx burners and gas recirculation

Table 11: Sustainable development contributions from the projects

JI projects as countries	Increased access to services	Reduced Import dependency	Increased employment in the local area	Research	Technology-knowledge transfer	Potential for replication of technology	Increased export
Bulgaria							
Estonia							
Poland							
Romania I							
Romania II							
Ukraine							
Russia I							
Russia II							

The Estonia project includes a technology transfer, as the wind turbine plant is projected to be one of the first large-scale wind turbine plants in the Baltic region. Additionally, the project has a positive impact on the local economy through tax income and new jobs. Moreover, the project can contribute to local research and thereby reduce the future price for wind power. The long-term perspective is export of green electricity to EU's electricity-market.

In Poland, 200 households, an adjacent hotel and administrative facilities will gain from the production in the form of electricity and heating. There are few similar projects in Poland capturing gases from waste water treatment plants. The technology transfer takes place between Viborg A/S to Zakopane municipality. Gas capturing from sludge is to be expanded to the entire Podhale region in 2006 and to Bukowina Tatrzanska in 2010. Theoretically speaking, replication to other municipalities is possible however this does not seem realistic without economic contributions. This might happen as part of other JI projects.

Romania is rich on geothermal resources with temperatures in the range of 100 °C. Owing to the lack of investment capital, theses resources have not been exploited hitherto. There is no support from the government and neither EU nor the Wold Bank has shown willingness to finance such a project so far. With the JI project in Romania as an example, the exploitation of geothermal energy could be replicated to other locations in the Oradea area or in Romania generally. The project Romania I is a joint venture project and the technology being implemented is more efficient than existing technology in Oradea and Beirus. Training of the operation personnel will be part of the implementation. In addition, the prices on heating and hot water are expected to decrease, thereby providing greater comfort to residents.

Fifty-six thousand tonnes of illegal sawdust is being dumped in Romania each year. The aim of the project is to demonstrate that wood waste can easily be converted from an environmental problem to an energy resource. Even before the beginning of the Tasca project ('Romania II') several villages have shown interest for the same type of project. Until now it has resulted in the selection of five out of twelve examined villages for future implementation. Exploiting biomass in Romania is a whole new technology, which has the potential of minimising import of gas and oil. Another benefit is that the relatively high prices on electricity and water will be reduced. Moreover, it is neither economically profitable for the state nor the electricity companies to invest in this sort of technology. In the project Romania II, there is a great potential for replication if the economic barriers are surmounted. The geothermal as well as biomass projects can function as pilot projects.

The landfill site in Ukraine receives waste from 1 million households. It has been suggested to increase the levy for disposal of garbage on the site, however no decision have been reached as of yet. It is not economically profitable to utilise methane for electricity production because of the low electricity price. Through the production of electricity by means of the alternative project, 10 kV can be attached adjacent to the landfill, which will minimise the costs by the grid connection. The project will provide some new jobs, however the majority of these will be in connection to the construction phase. In the long-term, only one or two persons will be employed with the operation and maintenance. Training of personnel will constitute a part of the contract for the first 2 years. The project contains elements of technology transfer as technologies for the utilisation of gas have not been introduced in Ukraine previously.

The two Russian projects concern energy efficiency in two types of power plants with the objective of delivering heat and electricity to the adjoining industry and nearby households. In the Russia I project, the boilers are being redesigned to burn gas instead of oil. The Russia II project concerns extracting heat from production of electricity to be used for additional electricity production. This will increase the efficiency by up to 40 percent. The two power plants are likely to be the only generators of energy in the area for the next 10 years. The projects do not contain elements of sustainable development.

By and large, the majority of the projects contain elements of technology transfer. It is impossible to establish a how many different criteria for sustainable development a project should contain in order to be accepted as a project with sustainable development benefits. As a minimum it should, though, be required, that projects contain technology or knowledge transfer at some level and at the same time increase the number of jobs in the area. However, this is only fulfilled by two of the projects investigated (see table 11). Probably the only project fulfilling the criteria for sustainable development is the wind turbine plant in Estonia, which contains technology transfer as well as increased employment and the potential of replication, as Estonia has the possibility of initiating similar projects. In the long term, the project will also contribute to research in the area of wind energy as well as export of green electricity to the EU market. The two projects in Romania have the potential for a similar replication of the technology and therefore have the potential of contributing to the development of Romania's in the long perspective. Likewise, the projects in Romania reduce dependency of imports and improved access to electricity for the citizens as a consequence of the reduction in price.

Environmental impacts

Environmental Impact Assessments (EIA) is used to identify the environmental impacts of projects. An EIA for JI projects is only necessary if required by the national regulation, or if environmental impacts have been pointed out subsequent to a hearing.

According to the Bulgarian project document, implementation of the project has no effect on the production of the adjacent environment, and therefore no environmental or social implications are anticipated. It is obvious that the fertiliser plant does not involve increased pollution subsequent to the installation of a catalyser. However, it is beyond question that the fertiliser plant will cause pollution in other areas, as it is preparing environmental improvements in the range of € 2 million over the next years. Concurrently, seen in a life cycle perspective, the plant produces fertiliser, which constitutes a potential source of pollution in the form of nitrate and phosphor run-off.

The wind turbine plant in Estonia is located next to a protected area. The impact on birds has been analysed, however no effect has been recorded. Furthermore, the establishment of wind turbine plants in Estonia does not require EIA.

The landfill site in Poland is likewise close to a protected area. It seems odd that a landfill has been located next to a protected area in the first place, if, as described in the project document, it is of utmost importance to keep the natural habitat unspoiled. EIA is however not necessary as waste water treatment plants do not have any significant[6] environmental impacts.

In the Romanian geothermal project, the environmental sustainability is regarded as high. However, the local Environment Protection Agency (EPA) has asked S.C. Transgex S.A. to conduct an EIA. Upon completion of the EIA, S.C. Transgex S.A. will receive an approval from the local authorities.

A number of environmental advantages are accredited to the Romania II, such as e.g. minimising the risk of seepage from illegally deposited sawdust to the ground water, reduced pollution of streams and less dead fish.

Besides the reduction of methane, the environmental advantages of the Ukrainian project are an improvement of the security in relation to explosions, reduced seepage of to the ground water and reduced obnoxious smells.

The environmental advantages of electricity produced from gas in Russia are that the energy consumption for transportation of coal is reduced and of NOx and SOx emissions decreases as goes for particle emissions as well. Russia intents to formulate their environmental regulation in accordance to the EEC countries, however, it is hard to predict what kind of standards Russia will introduce eventually.

Community involvement

The extent to which local citizens are being involved in the JI projects in the host countries differ considerably. The lion's share of community involvement has been conducted by local meetings and hearings. In some countries, information on the JI projects has only been made accessible through the internet.

Table 12: Involvement of local citizens

Country	Citizen involvement
Bulgaria	Via www
Estonia	Yes
Poland	Yes
Romania I	Via www
Romania II	NA
Ukraine	Planned
Russia I	NA
Russia II	NA

In Bulgaria, the local hearing has been conducted on the website of the Bulgarian Ministry of Environment. The point of dispute here is how many Bulgarians have access to the internet, and if they do, if they have been informed that the project is accessible on the ministry's website.

[6] A minor amount of noise from transportation of sludge

In Estonia, a local hearing took place back in 2002 with the participation of local landowners. Subsequently, local actors have to report to the local municipality if they have any additional critique,. Public discussions are announced in a newspaper approved by the local authorities.

In Poland, a hearing took place in 2004 and public support for the project was generated.

In the Romania I project, the consultation of actors will take place via the website of the Romanian Ministry of Agriculture and the Danish Ministry of Environment's website. The incoming remarks will be included in the final version of the PDD. The issue in Romania is equal to the one encountered in Bulgaria, namely the amount of people with access to the internet.

In the project document for sawdust project in Romania, no information on the local involvement is found. However, since various villages have shown significant interest some sort of information must have been generated to the public.

Ukraine has no procedures for local hearings. Therefore, a plan has been elaborated where actors are being identified and subsequently invited to a workshop. The actors will be informed about the project through a local publication and all actors are requested to contribute with critique as well as support.

In the two Russian projects, no information exists on involvement of local citizens.

Only Estonia and Poland have conducted local hearings. Ukraine is in the process of identifying local actors, before a workshop can be held. In Bulgaria and 'Romania I' the hearing is conducted on the internet and in 'Romania II' as well as the two Russian projects no information exists.

8. Denmark's use of CDM and JI in a global perspective

Instead of introducing new programmes, the Danish JI and CDM approach is a mere continuation of the former Danish Corporation for Environment and Development (Danced) and Danish Environmental Assistance to Eastern Europe (Dancee) activities. The approach is being applied in order to gain from earlier relations and know-how. However, the problem is that current JI and CDM projects mainly replace former Danced and Dancee activities, which were financed through the Danish environmental support, however without receiving CO_2-credits in return. Consequently, the JI and CDM approach is not supporting a reduction of greenhouse gas emission compared to a scenario with a continuation of the Danced and Dancee activities. Or put more directly, the approach does not lead to further emission reductions that benefit the atmosphere, and that would otherwise have been the case. The change in approach is essentially a political decision of cutting down the budget for Danish aid. It seems obvious that the only reason for continuing the activities within in the former Danced and Dancee countries has been to be able to purchase CO_2 credits at favourable prices.

The Danish International Development Agency (Danida) as well as the Danish Environmental Protection Agency (DEPA) have obviously been granted the mandate to purchase as many CO_2 credits as possible for the least amount of money. This mandate has clearly influenced the Danish project portfolio. In particular, the CDM projects are lacking focus on sustainable development. For an aid organisation like Danida, it should not be questioned whether or not sustainable development should be prioritised. However, the report shows that it has not been given much priority.

The Danish Government argues that the reason for investing a total amount of 150 million Euros in purchasing CO_2-credits is to assist in developing a market for JI and CDM projects. Until now, the market has been dominated by buyers that are simply pursuing credits at low costs with little or no concern for the environment of for sustainable development benefits. As a result, the international NGO society, lead by WWF, has developed a so-called “Gold Standard” for CDM and JI projects. The standard exclusively recognises renewable energy and energy efficiency projects as contributing to a long-term reduction of greenhouse gases.

If Denmark is going to contribute to a trustworthy and long-term solution to the global climate change problem, it is of utmost importance to focus on the quality of the projects. This is only possible, if the actors on the market prioritise to develop high quality projects, having a positive effect with regard to the atmosphere as well as within the host country. State financed actors like Danida and DEPA should represent front runners by setting a high standard for projects for the private actors to follow.

Danida and DEPA are far from a worst case scenario, although some countries have a higher standard than Denmark. The World Bank and the CDM/JI programme in the Netherlands have dominated the market for a long time. As regards these projects, both the additionality and the project outcome have been vague. Likewise, Japan strives to get low quality projects accepted by the international approval system, in order to influence the credit market. In the other end of the spectrum, Belgium applies the Gold Standard criteria in the approval of state financed projects, and Sweden declines to use CDM credits from state financed projects for compliance with national obligations under the Kyoto Protocol.

Although in a short-term perspective, that is, the first commitment period (2008-2012), it is macro economically feasible to purchase credits abroad, it will be far more expensive for Denmark to buy credits through CDM and JI projects in a long-term perspective.

In the end of the first commitment period (2012) the credits purchased by Denmark must be withdrawn from the market and used to verify compliance with the Kyoto commitment. By doing this, the effect of the credits in future periods ends.

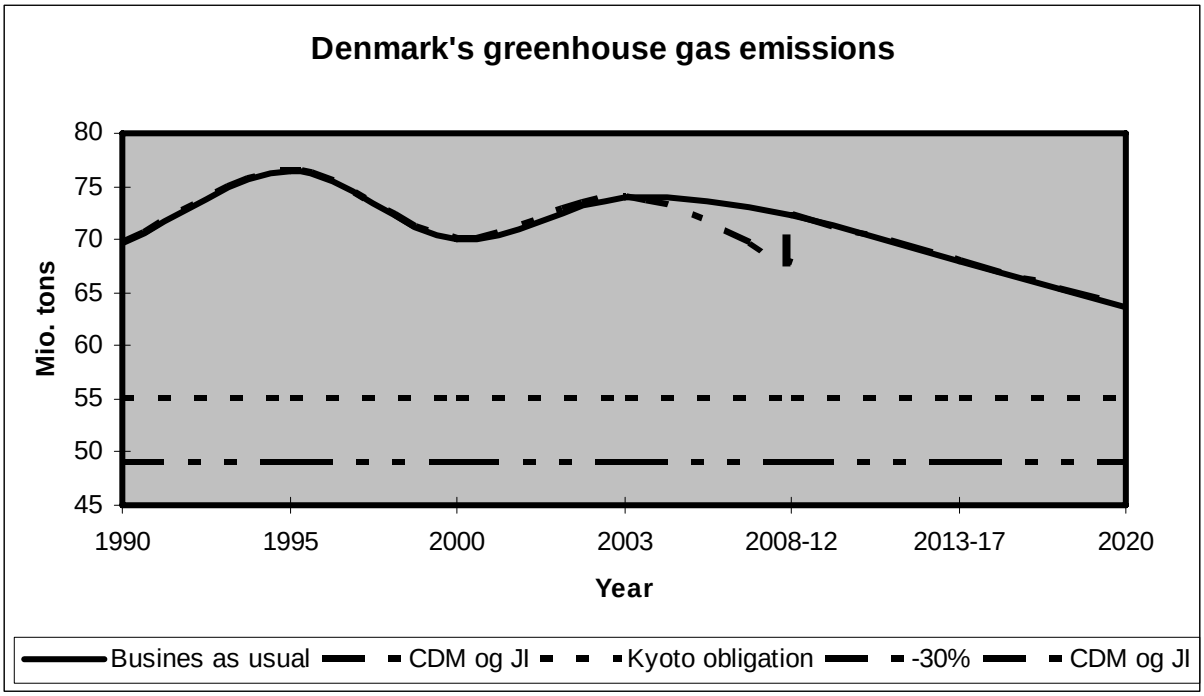

Figure 5: Illustration of the consequences of the use of CMD and JI

As shown above, by 2012 the Danish greenhouse gas emissions will be lower when using CDM and JI than in the business-as-usual scenario. When a second commitment has to be satisfied, e.g. with a reduction of 30 percent for the period 2013-2017, Denmark will initiate the emission reductions at the business-as-usual level, as the previous CDM and JI credits have been withdrawn to meet commitments in the first period. The amount to be reduced in a second commitment period therefore increases with the amount of the credits from flexible mechanisms used the former commitment period. In comparison, the effect of domestic activities would be static.

There is no doubt that new commitments regarding emission reductions will influence the prices on the market, simply for the reason that the demand increases. In a second commitment period, Denmark will be forced to purchase credits through CDM and JI, but at higher prices. The prices are expected to increase even further when developing countries agree to some form of commitments.

In a long-term perspective, it will not be macro economically feasible for Denmark to buy credits abroad. Even though a price of 6.7 Euro per tonne CO_2 can be achieved today, it is unlikely that Denmark will be able to continue to purchase credits at this price during the entire commitment period. It is expected that the price will increase during the period until at some point it converges with the prices of the internal emission trading system of EU at 20 to 30 Euros per tonne CO_2.

Besides this, domestic activities would in fact benefit the macro economy and as a result influence the GDP in a positive way. This has not been taken into consideration. Actually, the report *Danish action plan for a renewed effort - energy conservation and the market* outlines, that a reduction at 24 percent of the total amount of the energy consumption through energy conservation measures in Denmark in 2015 would be both macro and micro economically feasible. Transport is however not included, but according to the EU green book, a 20 percent reduction of the total EU energy consumption through energy conservation will be macro economic feasible in 2020, including

transport. This is a significant reduction, which is not being realised neither in Denmark nor EU. Denmark is spending tax-payers money to purchase credits abroad, instead of investing in domestic activities that would have benefited the macro economy at the same time as fulfilling the international commitments.

The reason why energy conservation activities are not being carried out is that they constitute minimal savings from a micro economic perspective compared to the difficulty of implementing the energy conservation equipment.

Consequently, buying credits through CDM and JI projects does not benefit Denmark's macro economy neither in a short nor long perspective. Therefore, a Danish involvement in the area of CDM and JI should as a minimum benefit the involved host countries and primarily focus on the projects contributing to long-term sustainable development in the host countries.

The existing commitments under the Kyoto Protocol only relate to 1 percentage of the total amount of the global CO_2 emissions at present (approximately 5% of the 1990 level). According to the recommendations of the Intergovernmental Panel on Climate Change (IPCC), the reduction must be in the range of 60-80 percent in 2050 in order to avoid global dangerous climate change. It is in this perspective that the Danish strategy should be seen. The perspective emphasises the importance of a flexible and robust long-term strategy.

Denmark's and other countries' lack of ambitions can be explained by the uncertainty of whether or not the Kyoto Protocol was going to be put into force. This doubt has now been eliminated. At the same time, global warming is more frequently used as an explanation to local nature- and weather changes. This demonstrates clearly the magnitude and actuality of the problem. The reasons for preparing a national climate strategy with focus on a long-term commitment are obvious. The experience of expanding renewable energy in Denmark shows that it is possible to be ambitious and at the same time develop and fit the systems without too much struggle.

JI and CDM are very important means, seen from a global point of view. The mechanisms can push forward a modernization, technology transfer, and sustainable development in many countries. However, it is necessary to prioritise these aspects higher than they are prioritised today. A focus on low prices alone results in projects which only fulfil the formal standard and only contributes to a long-term solution of the global climate problem.

Seen from this perspective, many of the Danish projects are very good pilot projects with a technological speeding effect, which will hopefully result in local or national initiatives, thereby supporting a long-term development within the country. The Danish government should strengthen this effort and focus more on CDM and JI projects that contribute to a sustainable development within the host countries instead of merely pursuing low prices.