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Editor's note

Adapting adaptation

So far, climate policies have generally focused on mitigation rather than adaptation. This was based on the argument that it is better to deal with the cause of the problem than with its consequences. However, it is now increasingly recognised that climate change is already underway and that this typically hurts vulnerable countries which generally contributed little to both past and current GHG emissions.

At the same time, it is increasingly recognised that climate policy without serious action in the developing world will be insufficiently effective. This was also the outcome of the August UNFCCC-meeting in Accra, where the need for much more climate-friendly and REDD action in developing countries, with support from industrialised countries, was clearly stated.

Combining these two aspects makes it obvious that the KP-successor will require a stronger and more convincing focus on adaptation than the KP itself where the Art. 4.4 adaptation facility has thus far triggered only little resources for adaptation in developing countries. Similarly, other initiatives have generated limited adaptation resources.

For adaptation support to become much more substantial, a number of issues must be addressed.

First, how many resources will be needed for adaptation in developing countries? A number of studies have revealed a range of 'guesstimates' of adaptation transfers needed, *e.g.*, World Bank (2006), UNDP (2007), OXFAM (2007), UNFCCC Secretariat (2007), WWF (2008), *etc*. On average, 'guesstimates' broadly range from USD 30-70 bn annually (some even higher). Figures will increase by some tens of billions per year (according to WWF) if serious progress in halting tropical deforestation would be made. Very substantial needs, indeed.

Second, how could such resources be collected? Part of these resources will need to be covered by domestic resources of the vulnerable regions themselves, but a considerable part needs to be provided by the industrialised world. This could take place either through specifically earmarked public budgets, or probably via multilateral/international funds, which can be filled with resources based on GHG credit taxation, auctioning of emission allowances, or otherwise.

Third, how will adaptation transfers relate to ODA? This is a tricky issue, because several ODA programmes implicitly already contain adaptation elements: *e.g.* agricultural projects/programmes supporting farmers to introduce drought resistant crops, water management systems in delta's, *etc*. Also, emergency relief programmes can sometimes be seen as adaptation support 'avant la lettre'. So, part of an adaptation commitment can be absorbed in ODA programmes without undermining the overall size of ODA funding. However, other parts of adaptation support will probably require additional funding that could easily amount to 0.1 – 0.3% of Western countries GDP.

Fourth, under what conditions will adaptation support be provided? It seems obvious that support will only be provided if the need for it is clearly demonstrated. However, this seems to be a weak spot, because the current source of information on developing countries' adaptation needs is generally rather poor. In addition, as far as the LDCs are concerned, their so-called NAPAs (National Adaptation Programmes of Action) often focus on immediate and fairly general needs rather than on future adaptation needs. Moreover, there is no consistent overview or 'master plan' yet of the total LDC adaptation needs.

In conclusion, many aspects of a comprehensive adaptation strategy still need to be sorted out. If adaptation transfers are an important element in enhancing the chances of success of the Copenhagen-agenda, this file will need a considerable push forward in a relatively short time frame. This will not be easy, especially not in times of credit crisis and likely recession, but yet it seems an important priority.

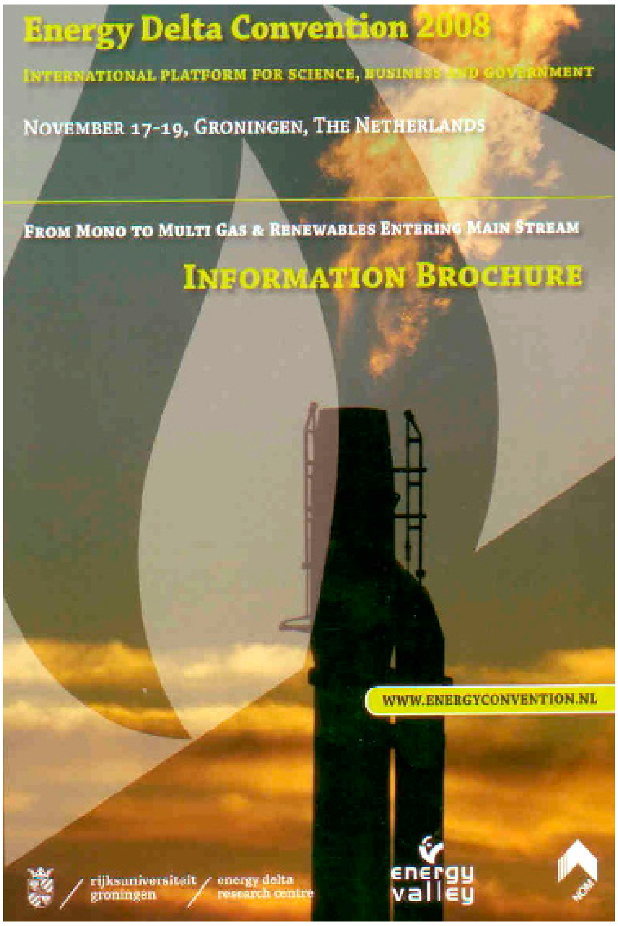
Catrinus Jepma, Chief editor

In this issue

1 Editor's note
2 Post-2012 at ECD2008
3 JI for Post-Kyoto World
5 Accra: improvement to CDM
6 Market Mapping for technology transfer
9 In memory of Bernhard Schlamadinger
10 Clean Energy Investment as TT
12 Supercritical coal plants
15 Books, studies and reports
16 JIQ Meeting Planner

Post-2012 Climate Policy Side-event Hosted at Energy Delta Convention Groningen 2008

On 17-19 November of this year, the 2008 edition of the Energy Delta Convention (EDC 2008) will be held in Groningen, the Netherlands. EDC 2008 will focus on the growing importance of renewable energy in the mainstream energy mix and the role of natural and green gas in a sustainable energy future.



The following keynote speakers will address the Convention:

- **Mr Jeremy Rifkin**, President of the Foundation on Economic Trends and author of 'The Hydrogen Economy';
- **Ms Claudia Kemfer**t, Humbolt University of Berlin, Germany;
- **Ms Robert Dixon**, Head Energy Technology Policy Division, IEA, Paris, France;
- **Mr Peter Kalas**, Former Minister of Environment in the Czech Republic; currently advisor to CR Prime Minister;
- **Mr Marcel Kramer**, CEO N.V. Nederlandse Gasunie;
- **Mr Nebosja Nakicenovic**, Vienna University of Technology & IIASA, Vienna, Austria.

As ECD2008 will be held two weeks before COP-14 in Poznan (Poland, December this year), a side-event will be organised to discuss the actual status of Climate Protocol negotiations and to explore **Sustainable Energy Policies within a Post-2012 Climate Policy Context** (18 November, afternoon).

According to the IPCC, GHG emissions would have to be reduced by 50% below 1990 levels by the year 2050. Also according to the G-8, by 2050 global CO_2-eq. emissions should be reduced by half. This reduction must be achieved against the backdrop of an expected doubling of global energy demand during the next 25 years.

As an illustration of the impact that this recommended GHG abatement action could have for global energy systems, the IEA has developed a least-cost pathway to reach a –50%-CO_2 emission target between 2005 and 2050. This pathway would involve an annual investment in: 30-35 coal-fired plants (500 MW) equipped with CCS, 1-20 CCS gas-fired plants (500 MW), 24-32 nuclear plants (1,000 MW), hydro capacity (13,000 MW), 30 – 100 biomass plants (50 MW), 3,000-14,000 on-shore wind turbines (4 MW), 775-3,750 offshore wind turbines (4 MW), 50 – 130 geothermal power units (100 MW), 115 – 215 million m^2 solar photovoltaic panels, and 45 - 80 concentrating solar power plants (250 MW).

As a consequence of this least-cost pathway, around 19% of the required CO_2 emission reduction will be achieved through CCS, 6% through nuclear energy, 21% through renewables, 7% through power generation efficiency and fuel switching, 11% through end-use fuel switching, 12% through end-use electricity efficiency and 24% through end-use fuel efficiency.

With its large group of policy, research and business experts in the field of sustainable energy policies and technologies, EDC2008 offers an ideal opportunity to discuss the role of the above-mentioned different energy technologies in reaching the goal of halving the CO_2-eq emissions as recently recommended by IPCC and G-8.

Further information about EDC2008 can be found at:
www.energyconvention.nl
email: info@energyconvention.nl

Joint Implementation Strategies for a Post-Kyoto World

Position Paper by the Joint Implementation Action Group

Introduction

In the post 2012 regime, the contribution of JI will be a crucial. This paper sets out the position of the **Joint Implementation Action Group** (**JIAG**), a consortium of JI practitioners which are currently developing JI projects representing more than 100 Mt GHG emission reductions. It is essential that JI is strengthened to create incentives to reduce GHG emission in a wide range of sectors, to maximize its potential as project finance mechanism, and to create incentives to reduce GHG emissions for a broad range of actors.

JI deserves significantly more emphasis in international negotiations on mechanisms for tackling climate change. Our purpose is to help policy-makers understand the importance of JI and advise on practical solutions for best structuring the JI mechanism in the post-2012 period. We will demonstrate some of the common fallacies and myths surrounding JI which have diminished the degree of international attention and priority of the mechanism. Finally, we outline the background against which a reformed JI would operate and the steps required to realize the full potential of the mechanism after 2012.

JI is essential to a cap-and-trade system

A project-based mechanism linked to a cap-and-trade system opens up the possibility to achieve cost-effective emission reductions in sectors and regions not covered by domestic emissions trading or other policy measures and also functions as a carbon price "safety-valve" (by allowing the inflow of cheaper credits into the cap-and-trade scheme). In the future, more and more countries and sectors are expected to commit to GHG limitation and reductions, and hence the role of JI will be gradually increasing over time while the role of CDM will be diminishing.

The importance of JI as a supplementary mechanism to national or international cap-and-trade schemes is significant and can be summarised as follows:

- JI helps to promote innovation. Project based mechanisms are suitable for the discovery of new ways of reducing emissions: new, innovative methodologies can be developed and tested in a private and voluntary environment. As time is of essence in the challenge of reducing anthropogenic GHG emissions, it is essential to support mechanisms which promote innovation and technology deployment.
- JI is not restricted in scope. Project-based mechanisms are valuable tools to explore the emissions reduction potential of sectors and areas not generally targeted by emission trading schemes. Whereas a trading scheme is by definition limited in scope, a JI-like mechanism does not need to be. Even before regulators get round to creating rules for non-covered sectors, with the appropriate market incentives, JI can lead the way in cutting GHG emissions, complementing reduction efforts taken in covered sectors and contributing to overall cost-efficiency of the system.
- Project-based mechanisms emphasise positive incentives rather than penalties. Trading schemes and standard-setting tend to be based on penalties in order to make non-compliance less rewarding. This creates a natural resistance and slows down implementation as traditional, conservative, industrial companies grapple with the new operating environment. In contrast, project-based mechanisms are seen as sources of funding which are attractive to business and entrepreneurs. This makes them politically popular and means more reductions can take place sooner. It creates an opportunity cost in principle on any GHG emissions released outside the boundaries of an emissions trading scheme.

The advantages of JI

JI has a number of built-in design advantages that allow the mechanism to be simple while transparent which arise from being a project-based mechanism within a capped environment:

- Guaranteed environmental integrity makes JI sound. Emission reductions achieved through JI are underwritten by AAUs, which makes environmental integrity of JI automatic and safeguarded not solely by the inherent characteristics of the project, but by the objective accuracy of the compliance mechanism – the national inventory and the size of the overall reduction commitment (provided the host country's assigned amount has been duly and fairly established to provide for the country's commitment to limit/reduce GHG emissions and not just for "hot air").
- JI is localised and hence more simple and nimble. JI does not require a centralised body for the approval of methodologies and projects. As

long as the country remains in compliance with established international requirements, it is free to adopt its own JI projects approval procedure as well as calculation, monitoring, and verification methods thus making the entire JI process simple. At the same time, an international mechanism similar to the current Track II, though further developed and improved, can provide a fall-back option in case host countries do not qualify for the local verification of GHG emission reductions achieved by the JI projects or where they decide to defer the administration of the mechanism to the international level.

Smashing the myths

The use and promotion of JI as a flexibility mechanism to achieve reliable and cheap emissions reductions has been subject to several misplaced criticism and objections:

- *JI is not compatible with a cap-and-trade system*. While we appreciate the intention of some national governments and the EU Commission to create economy wide cap-and-trade schemes, it will take years if not decades before there is a full, leak-free coverage by emission trading schemes of all sectors. In the meantime, there will be plenty of uncapped sectors and some sectors, such as forestry and agriculture, are even intentionally left out by some regulators because they are considered as not suitable for entity level emission trading. JI can help to overcome this problem and could actually speed up GHG emission reductions outside the cap-and-trade scheme: ambiguity about whether or not a sector or GHG will be included in future cap-and-trade schemes (*e.g.*, N_2O emissions) may lead some polluting industries to wait for their full allowance allocations before implementing emission reduction activities. Moreover, even in capped sectors many opportunities can be still found for JI, especially when it comes to indirect emissions not covered by the cap.
- *GIS is a more efficient mechanism than JI.* While much discussed among intergovernmental organisations, NGOs, and academics, Green Investment Schemes (GIS) are difficult to be implemented in practice. Project-based mechanisms in contrast create direct economic interest at those entities where the actual reduction potential is and can be implemented without creating new and bureaucratic institutions and regulatory structures. This is a substantial advantage of JI over GIS.
- *JI is an offset mechanism*. Other than the CDM and offsetting practices in the non-regulated market, a transfer of an ERU from a JI project goes hand in hand with the cancellation of an AAU in the host country. This means that as long as the national inventory system is accurate and properly working, JI does not allow more GHG emissions within the agreed cap under which it is implemented. JI does not lead to an increase in the size of the overall cap.

JI after 2012: building on previous experience

- *Ensuring continuity.* A post-Kyoto international framework should regulate the transfer of CDM to JI for projects that have been approved as CDM project activities before 2012 in a country or sector which operates under an international emission reduction target after 2012. There should be a regulation that reductions can be claimed until the end of the project crediting period. This would also encourage non-Annex I governments to take upon themselves reduction targets while keeping the benefits of JI projects. To simplify this transfer the crediting period of JI and CDM projects should be harmonised.
- *Preparing for the new players.* The goal of Copenhagen 2009 is to stimulate as many countries as possible to make economy or sector-wide binding GHG emission reduction commitments. This means that the JI spectrum will increase considerably in terms of new participants among project developers and investors. Ultimately, such developing countries as China, India or Brazil are likely to join. Thus, it is vital to be ready with a robust project-based mechanism for these countries to be able to release the financing of emissions reductions at a scale that is wider and deeper than CDM.
- *Expanding the scope.* First, domestic GHG abatement projects can complement cap-and-trade systems to promote emission reductions outside these systems. Currently, domestic (or "unilateral") JI projects are not allowed as two Annex I Parties have to be involved in each JI project. The expansion of JI projects to domestic projects will provide a strong incentive to local investors to invest in reductions of GHG emissions. Second, efforts could be deepened further by designing programmatic and sectoral JI schemes. In sectoral approaches, a sector would get a specific emission reduction target, whether it is a specific or absolute target. A JI mechanism could complement a sectoral target by providing a further incentive to reduce emission below the agreed sectoral target.

What needs to be done?

In order to fully explore the potential of JI in the post-2012 period and enhance its role as a supplementary and cost-effective project-based tool working within a capped environment, *JIAG* has developed concrete proposals for reform JI. The proposals offer potential to significantly strengthen and enhance the mechanism and are summarised in a legal background paper (see **http://www.global-carbon.com/en/157/news.html** (English) and **http://www.global-carbon.com/ru/157/news.html** (Russian)).

They address, among others,

- the harmonisation of crediting under JI and CDM to a uniform 10-year crediting period to allow for a smooth graduation of projects from CDM to JI;
- the allocation of AAU allowances in support of transiting CDM projects;
- improvement of effectiveness and efficiency by promoting transparency and securing the process for project participants, converting the JISC in a permanent body and creating appeal and review processes of JISC decisions;
- shifting the focus on additionality and environmental integrity from a financial perspective to an environmental one;
- supporting the expansion of sectoral, programmatic and domestic JI.

To discuss this further contact any of the following persons in JI Action Group (JIAG)

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'Accra' Suggests Improvements to CDM for Post-2012 Protocol

At the 6th meeting of the Ad-hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP, Accra, Ghana, 21-27 August of this year) discussed several proposals for including the CDM in a post-2012 climate regime. The AWG-KP-6 was a preparation for the upcoming COP-15 in Poznan (Poland, 1-10 December next).

The report by the AWG-KP working group which considered possible improvements to the flexibility mechanisms with a view to their potential inclusion in a post-2012 Protocol, can be found in the document **FCCC/KP/AWG/2008/L.12** (date: 27 August 2008) can be downloaded from the unfccc.int Internet site. The document contains an overview of elements related to inclusion of the flexibility mechanisms in the post-Kyoto Protocol text and summarises which implementation options have been proposed.

For the CDM the following elements were discussed:

- Inclusion of other LULUCF activities, such as reducing emissions from deforestation and degradation, restoration of wetlands and sustainable forest management/land management. A cap for such newly eligible LULUCF activities is considered.
- Inclusion of CCS, which seems to be a completely open question, but which is considered.
- Inclusion of nuclear activities, where it is discussed to allow new nuclear facilities under the CDM.
- Sectoral CDM projects, which contain activities defined at the sectoral level (the COP-MOP shall define modalities and procedures).
- Sectoral crediting of emission reductions below no-lose targets. In such cases a host country sets a sectoral target and if the emissions remain below the target, the surplus can be traded; there would be no sanction if emissions surpass the target.
- Crediting of emission reductions based on nationally appropriate mitigation actions in non-Annex I Parties.
- Increased use of standardised baselines, by pre-approving parameter and procedures, which could be a step further from the present use of approved consolidated baseline methodologies per project category.
- Positive or negative lists of CDM project activities in relation to assessing the additionality of GHG emission reductions by possible projects. Waiving the additionality assessment would support particular project types (*e.g.* high sustainable development contribution, small scale projects), whereas a negative list would exclude "doubtful" projects from the CDM *a priori.*
- Include co-benefits, next to the GHG emission reduction, as criterion for the registration of CDM projects. This could vary from the obligation to demonstrate such co-benefits (*e.g.* sustainable development benefits), to giving preferential treatment to project that shows co-benefits.
- Some project types could receive more CERs than actual reduction of GHG emissions through multiplication factors; this could make some projects, *e.g.*, those with strong co-benefits, more actractive than others.

Technology Transfer Aspects: Mapping Markets for Technologies

This article summarises some of the findings from EU-funded research activity ENTTRANS using the market mapping technique to explore in detail technology transfer networks in developing countries. It is based on the report *"Promoting Sustainable Energy Technology Transfers through the CDM: Converting from a Theoretical Concept to Practical Action"* and a journal paper currently being submitted.

ENTTRANS

What is really being transferred?

Most people assume that technology transfer means that a technology is installed in another country and commissioned by the company technicians, the operators are given some short training and that is the end of the problem. Somehow, it will function with minimal further support and others will automatically buy more of the same so replicating the technology and transferring into the market system. Many failed projects in developing countries are testament to the fact that hardware is only part of the technology transfer process

This is clearly recognised in the IPCC report on Methodological and Technological Issues in Technology Transfer (IPCC, 2000). This defines technology transfer in terms of a set of processes "covering the flows of know-how, experience and equipment, for mitigating and adapting to climate change amongst different stakeholders such as governments, private sector entities, financial institutions, NGOs and research/education institutions."

Consequently, the term technology transfer refers to the hardware, the transfer of knowledge and the social processes and support systems needed to make the transfer successful. Different types of knowledge are needed such as technical scientific knowledge and also the practicality of the technology to make it work under a range of circumstances. When an organisation is involved in the transfer, then knowledge associated with the organisation procedures is needed. For the host developing country, there are similar knowledge requirements but there also needs to be an ability to interface with the transferring organisations and to understand the market systems in the country.

The social networks and support systems in the host country provide the skills and expertise needed to adopt and replicate technology transfers through the supply chains and manufacturing base in the host country technology supported by the institutional capacity and legal frameworks. For the technology innovation to be successful, especially at the small-scale level, it is also important to engage the local community from the start to be able to deliver the benefits needed.

With such a complex process the IPCC emphasises that there is no fixed prescription for enabling technology transfer. To be successful over the long term any transfers must be planned with local stakeholder involvement and based on the country context as well as the technology scale and type.

Market mapping

Mapping the market is a relatively new approach which was devised by Albu and Griffith (2005) in the context of extending a sustainable livelihoods framework for small-scale poor farmers in developing countries. They considered that, although the sustainable livelihoods approach was powerful in considering some of the key constraints, objectives, and drivers for communities, it did not address the issues of developing markets for the local sustainable livelihood activities. The technique has since then successfully been applied to a number of developing country situations (Griffith and Edwards, 2006) with the main aim of creating networks to support the development of the markets for improved co-ordination and innovation. Independently, the *International Potato Centre* in Peru developed a similar participatory market-chain approach (PMCA) (Bernet *et al.*, 2005). These two ideas

IPCC, 2000 - Bert Metz, Ogunlade Davidson, Jan-Willem Martens, Sascha van Rooijen en Laura Van Wie Mogrory (eds.), *Methodological and Technological Issues in Technology Transfer*, Cambridge University Press, UK, pp. 432.

Albu, M. and A. Griffith, 2005. *Mapping the Markets: A Framework for Rural Enterprise Development Policy and Practice,* Practical Action report http://practicalaction.org/?id=mapping_the_market

have subsequently been amalgamated in the work of Albu and Griffith (Almond and Hainsworth, 2005).

In the ENTTRANS study, the process of technology transfer was explored further through a Market Mapping exercise to characterise the nature of the market within which the technology must compete. This is not usually considered in terms of technology transfer, but is crucial for successful transfer and it fosters a key element in successful transfer: the formation of social networks of market actors involved in the transfer process. The exercise is designed to allow the market players to interact and examine their market system in a way which normally does not occur. The aim is to generate the impetus for a market network actively looking to maximise the efficiency and equity in the market.

Albu and Griffiths (2005) describe market mapping in terms of three elements:

- the business enabling environment;
- the market chain; and
- the market supporting services.

For the *market chain*, the main economic actors in the market chain are identified and can include primary producers, importers, traders, and so on.

The *business enabling environment* should include the critical factors and trends shaping the market and the operating conditions such as infrastructure, policies, and institutions. The purpose is to identify the trends affecting the business environment and to identify who has the power in the market and who is driving change. This can then provide information on whom to lobby and help determine opportunities for action.

Supporting services are the business and extension service providers supporting the market chain. The purpose is to identify the needs for services and who the users are. This gives insights on what can be done in terms of supporting services to make the market more efficient. Such services are myriad but can include financial services, quality control, technical expertise and market information services, *etc*.

Market mapping involves a process of identification of market stakeholders, identification of incentives for engagement by these stakeholders in the technology diffusion process and then a series of meetings with stakeholders to generate a detailed map of the system in which they operate to identify opportunities to increase the efficiency of the operation of the market and opportunities for development and co-operation. The main aim of the overall process is to foster the creation of a *network of market actors* able to carry this forward into the future and deal with new problems and make changes as required.

The insights into the system gained in the process are the basis for future development and can give some indication of the directions for supporting activities for technology transfer.

Under ENTTRANS, only initial market mapping workshops could be undertaken in Chile, China, Israel, Kenya and Thailand during June-October 2007. The main aim of the workshops was to explore the existing market systems into which a new low-carbon technology would be introduced, *e.g.* through the CDM. An example of a market maps generated with stakeholders in Thailand is given in Figure 1 (next page).

Taken together, the insights from the initial market maps in the five case-study countries show that the enabling business environment and the support services along with the links can provide an initial picture of the complexity of the system and also of the areas where blockages can occur and which need to be examined and corrected where possible in order to enable the full technology transfer opportunities ('blockages' is preferred as term over 'barriers' as it may be better to consider the transfer of technology as an integrated whole system, and to view barriers as blockages or inefficiencies in that system). It

Griffith, A. and J. Edwards, 2006. *An Action-research on PMCA Applications in Bangladesh, Sudan, Peru, Sri Lanka, Zimbabwe*, Working Document, Practical Action, July 2006, http://practicalaction.org//?id=marketchain_report.

Bernet, T., A. Devaux, O. Ortiz, and G. Thiele, 2005. *Participatory Market-Chain Approach*, BeraterInnen News 1/2005, Lindau, Switzerland, available through www.afiar.ch.

Almond, F. and S. Hainsworth (eds.), 2005. *Beyond Agriculture - making markets work for the poor*, Proceedings of an international seminar, CPHP, March 2005, London, UK.

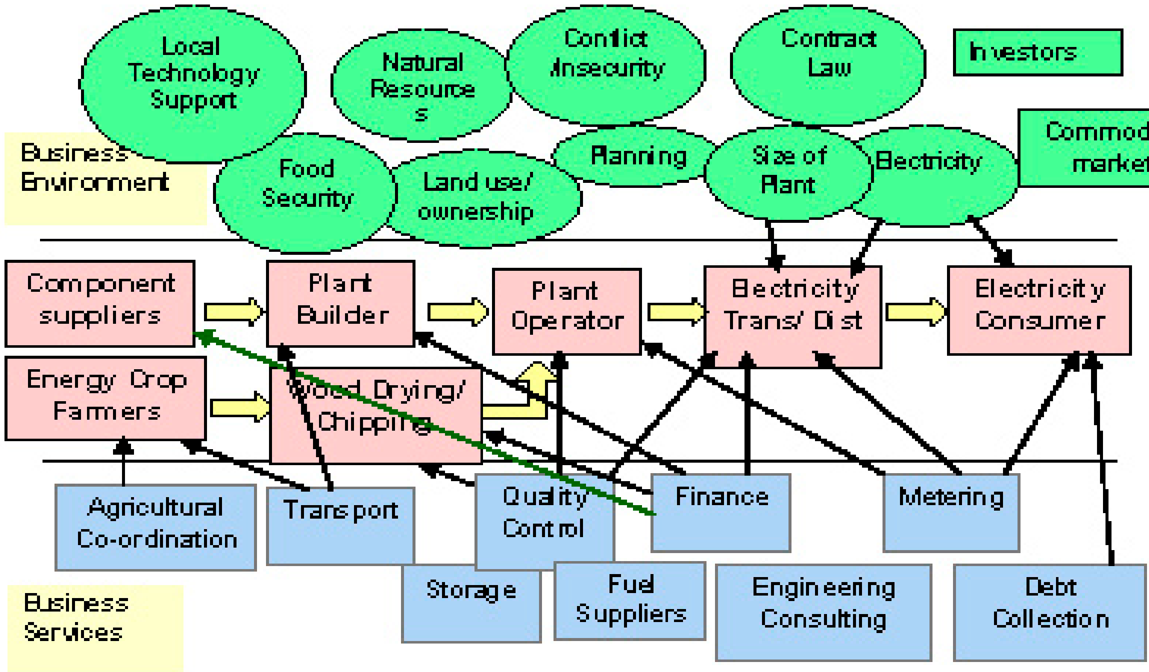

Figure 1. Thailand: Group 1 Market Map for Biomass based large scale Technology for electricity production

is also clear that the maps from different countries have some elements in common for the market chain, enabling business environment and support services but also that country conditions are important and the type of technology and its size.

These insights are a first step in elaborating the complexity and key activities for successful transfer. The creation of a market network is needed to explore the system further for the country and technology specific opportunities and blockages.

Conclusion

The concept of market mapping has been applied by the ENTTRANS study as a tool to explore the implementation chain for the low-carbon technologies. It can be applied both in industrialised and in developing countries, but for the purpose ENTTRANS it has been used in five developing countries.

Through market mapping insight can be gained in who the market actors are, how the implementation of a technology is supported or blocked by legislation, customs, enforcement of laws, incentives, energy culture, *etc.*, and what services are available in a country to support the technology implementation. Some of the elements of the market mapping approach can be found in Technology Transfer programmes. For instance, the UNFCCC Expert Group on Technology Transfer (EGTT) has a strong focus on the enabling environment, which they define "government policies that focus on creating and maintaining an overall macroeconomic environment that brings together suppliers and consumers in an inter-firm co-operation manner (UNCTAD, 1998a. TD/B/COM.2/33)" (EGTT, 2008).

In addition to this enabling environment focus, the market mapping approach would provide clear insights in the market chain and support service issues related to technology transfers. This would especially be beneficial for small-scale technology transfer projects, which tend to have a bigger market chain and more support service requirements. Consequently, focussing on the enabling environment may imply an emphasis on mainly large-scale electricity supply energy technologies.

Finally, market mapping for low-carbon technology transfers would be fully in line with the IPCC (2000) report as the technique covers know-how flows amongst different stakeholders within the countries concerned and aims at creating market networks for streamlining implementation chains for sustainable energy technologies.

EGTT, 2008. *TNA overview*, available at: http://ttclear.unfccc.int/ttclear/jsp/index.jsp?mainFrame=../html/TNAOverview.html accessed on 28-01-2008.

In Memory of Bernhard Schlamadinger

In the course of the past ten years, Bernhard Schlamadinger was a regular contributor to *JIQ*, mostly to our Discussion Platform. He always wanted to fuel the debate: to learn from other experts' answers to his thoughts. On 28 August of this year, Bernhard Schlamadinger passed away at the age of 40.

Bernhard was a specialist in forestry and land-use issues, in particular on the accounting of carbon sequestration. When JIN was involved in the organisation of a workshop for the European Commission in 2001 on possible synergies between certification of carbon sequestration through forestry and certification of sustainable forest management, we invited Bernhard as a keynote speaker. When we presented a draft Workshop Conclusion on the final day, many participants promised to send their suggestions and comments by email for the final text. Eventually, back home, only three people responded; Bernhard was one of them.

When Bernhard sent his contributions to *JIQ*'s discussion platform, we usually had two problems: they were too long to fit on one *JIQ* page, but at the same time one page of *JIQ* was usually to short to explain the new concept that Bernhard proposed. When rereading his contributions now, it becomes clear that he was often ahead of policy developments.

The red thread through Bernhard's contributions was pragmatism. For instance, his contribution in June 2004 was about "Pragmatic Approaches to Estimating GHG Emissions and Removals in AR projects." In the article, two of Bernhard's favourite themes were discussed. First, he recommended specific methodologies for small-scale afforestation and reforestation (A/R) projects. Bernhard belonged to an early group of forestry specialists who believed that small-scale forestry projects under the CDM would need to be treated differentially in order to reduce their transaction costs and effectuate their relatively strong contribution to sustainable development. Second, Bernhard advocated default values in order help standardise carbon accounting procedures for A/R projects: "…carbon stock changes may be estimated with reasonable accuracy through default sequestration factors by species and site types."

In 2006, Bernhard (together with Neil Bird and Tracy Johns) delivered an article to *JIQ* about dealing with emissions from deforestation in developing countries. The article suggested, among others, to combine REDD with the international carbon market because of potential scale of the latter. It was another returning theme in Bernhard's contributions: carbon markets.

It would be wrong to describe Bernhard Schlamadinger's carreer as forestry-related only. His intellectual interest was much broader than that. Actually, Bernhard was one of the first people to raise a yellow flag when he concluded that the EU ETS would not stimulate investments in renewable energy projects in non-ETS sectors.

The above is just a reflection of Bernhard's contributions to *JIQ*. As a person and a professional, Bernhard will be deeply missed by his family, friends, and colleagues, and so will he be missed by the *JIQ*.

On behalf of the *JIQ* editors,

Catrinus J. Jepma and Wytze van der Gaast

Clean Energy Investment as Technology Transfer

By Aaron Cosbey

Recent work by the International Institute for Sustainable Development finds cause for concern in the lack of attention paid to domestic barriers to clean energy investment, and potential to invigorate the technology transfer talks.

Crisis of development vs crisis of environment

Investment in clean energy infrastructure and technologies is critical to both development and climate change goals. On the development side, for many in developing countries the issue is basic needs; 2.4 billion people still use traditional biomass for cooking and heating, 1.6 million women and children die each year from exposure to the resulting indoor air pollution and 1.6 billion people worldwide have no access to grid electricity. Energy needed to feed rapid economic growth in urban centres is also significant. The IEA's World Energy Outlook (WEO) estimates a need for USD 22 trillion in new energy investment between 2005 and 2030, over 60% of which is in developing and transition economies.

In some sense, the WEO investment figures are better understood as warning than as a projection: if these torrential flows of new investment do not materialise – and there is no guarantee that they will – then we will have a crisis of development.

On the other hand, if they materialise in the manner of business as usual then we will have a crisis of environment. WEO's reference case – the scenario that involves USD 22 trillion of investment – results in a 57% increase in CO_2 emissions by 2030. Even the WEO's best-case scenario – the Alternative Policy Scenario – results in a 27% increase between 2005 and 2030.

These figures stand in alarming contrast to the needs. The IPCC estimates that to have even a 50% chance of making a stabilisation target of 2°C global temperature increase, global emissions will have to peak by 2015, and be reduced from year 2000 levels by 50 – 85% by 2050. In other words, even the WEO's most optimistic projections take us forcefully in the wrong direction.

Flurry of activity, funding and political capital

These stark facts are behind the flurry of activity, funding and political capital being directed at the challenge of clean energy technology. The World Bank recently approved two Climate Investment Funds, one of which is focused on clean energy technology, and a recent pledging meeting netted commitments of USD 6.1 billion over three years. Regional development banks and individual donor countries are also active in supporting investment in energy infrastructure and technology to address climate change concerns.

Technology transfer as investment problem

The related theme of technology transfer is also attracting an increasing amount of attention. And while the issue of technology transfer has been a negotiating item since the inception of the UNFCCC and, in fact, before, it now occupies a prominence in the negotiations for a post 2012 regime that has not been seen heretofore. As a result, negotiators are searching energetically for ways in which to give effect to their technology transfer obligations under the UNFCCC, the Kyoto Protocol and the Bali Action Plan.

In the area of clean energy investment the two agendas come together. The problem of technology transfer can be seen as essentially an investment problem; not enough investment is taking place in transformative technologies that will both provide clean new sources of energy. Successfully addressing the barriers to clean energy investment, making host countries more attractive for that investment, is essential for technology transfer.

What sorts of barriers? Investors, both foreign and domestic, consider a number of factors when making decisions on clean energy investment. At the general level, investors are wary at the absence of such things as political and macroeconomic stability, educated workforce, adequate infrastructure, functioning bureaucracy, rule of law and a robust finance sector.

There are also barriers that are specific to clean energy investment. These include a lack of clear guidance on future energy policy, monopoly structures for existing producers with lack of purchase agreements or feed-in tariffs for independent producers, lack of fiscal incentives for clean energy production, weak environmental regulation and enforcement, subsidies for conventional energy sources, and a domestic financial sector that has little experience with new technologies.

These types of domestic barriers were found to be significant in country case studies in Nigeria, Ukraine and Kazakhstan, commissioned by IISD as part of its Clean Energy Investment project. The specifics differ fundamentally from country to country, a function of the many factors that shape national energy policies. However, the basic story remains the same, and is repeated in study after study. That being the case, any efforts on clean energy investment that do not address domestic barriers will be hamstrung from the outset.

Other types of policies may also be useful, of course. Options include reform of, or purchases of, intellectual property rights (IPR); support for demonstration projects; and support for the incremental costs of best available technology. But initial research has cast some doubt on whether IPRs are a major issue for investors in the clean energy context, and demonstration projects are only useful for technologies at a certain phase of development.

Substantial gaps

Support for incremental costs has promise, but this is where the limitations of public budgets become obvious. The IEA's Energy Technology Perspectives describes an ambitious scenario for halving GHG emissions by 2050, hitting the bottom range of the needs as estimated by the IPCC. It involves incremental investment of USD 27 trillion in non-OECD countries. If we assume that the World Bank's Clean Technology Fund will reach USD 10 billion over three years, and that 100% of it will be directed to clean energy infrastructure in non-OECD countries, and renewed annually until 2050 at those levels, it would cover less than 0.6% of those incremental investment needs. Even if we assume a 10:1 leverage for other sources of funding we are still an order of magnitude away from what is needed. Clearly private investment will have to fill some substantial gaps.

This leaves us with the question: how can governments, Multilateral Development Banks (MDBs) and Intergovernmental Organisations facilitate clean energy investment at the needed levels? The best they can do is to act as facilitators and catalysts for larger flows of private sector resources. Part of the answer, of course, is cooperation on research, development and diffusion, and other initiatives to accelerate the commercialisation of new technologies.

National-level conditions

But that is only part of the answer. They also need to help improve national-level conditions for clean energy investment, removing barriers that prevent the uptake of even those technologies that are already mature and viable. This is a natural role for governments, MDBs and aid agencies in the pursuit of both development and environmental benefits. It is therefore surprising that in all the activity related to clean energy investment and technology transfer there has not been more attention paid to this challenge. Part of the problem is that this sort of reform is inherently more difficult than project financing.

Reform of the CDM

How might the ongoing climate change negotiations reflect these realities? One way is through the talks on reform of the CDM, where agreement on CDM status for nationally appropriate measures might cover aspects of energy sector reform in developing countries. Another is through greater emphasis in the technology transfer and financing discussions on mechanisms to address domestic barriers to clean energy investment. The World Bank Clean Investment Funds are set to expire in 2012, on the assumption that the post-2012 climate regime will carry on their work. If clean energy investment is to flow at the levels needed, it will have to do better than that.

Results of IISD's Clean Energy Investment Project are available at:
www.iisd.org/climate/energy/investment.asp.

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ENTTRANS

Supercritical Coal-Based Steam Power Plants

The EU-funded research activity ENTTRANS describes energy technologies that could contribute to GHG emission reduction. JIQ briefly describes these technologies in a series of articles. The background description for this article has been prepared by ENTTRANS partner Kunming University of Science and Technology (KUST, China).

Introduction

Producing electricity in coal power plants can take place through conventional coal combustion, advanced coal combustion, coal gasification, and combined gasification and combustion in hybrid cycles. Conventional coal-fired plants (pulverized fuel or PF) typically have an efficiency of 36 to 38%. Technical developments have now resulted into 'supercritical' PF (SPF) power plants, operating at high temperatures and pressures and at significantly higher efficiencies (up to 45%). Even higher efficiencies can be expected in ultra-supercritical (USC) power plants, operating at very high temperatures and pressure.

SPF is increasingly being adopted and in most industrialised countries SPF plants have become commercially viable. Presently, over 400 SPF plants are in operation worldwide, including a number in developing countries.

CO_2 savings from SPF could be very significant. The efficiencies of older PF plants are only around 30%, with the OECD average being around 36%. A one percentage point increase in efficiency reduces CO_2 emissions by around two percent. Upgrading or replacing older plants with new and commercially viable SPF plants operating with efficiencies of up to 45% can therefore yield very significant CO_2 reductions – from 10 to 25%, depending on specific circumstances.

In PF boilers, coal is first milled into a fine powder in a pulveriser and then blown into the combustion chamber of a boiler. The hot gases and heat energy from the combustion process convert water in tubes lining the boiler into steam. This high-pressure steam is passed into a steam turbine to produce electricity. In PF plants typically 30-35% of the energy in one unit of coal is transferred into electricity. The remaining energy is used in the generating process or released as heat from the plant.

Status of the technology

PF stations have been in use for over 60 years and they are the main form of coal-fired power generation around the world, with widespread use in both developed and developing nations. Over the years, the PF technology has been improved to reduce emissions of pollutants and to increase plant efficiency. SPF is an example of such an improvement.

A next improvement would be the ultra-supercritical PF technology which applies advanced steam cycles. In a following step, within approximately ten years, advanced ultra-supercritical steam cycle technology could be developed with a very high efficiency and at acceptable cost. Within the EU, the project *AD 700* is carried out as a co-operative R&D programme involving 39 companies from 12 Member States.

The attainment of steam conditions of 375 bar/ 700°C or higher depends on the successful development and deployment of some components manufactured from nickel-based alloys, including superheaters, headers, pipework, steam chests, rotors and turbine casings. Nickel is a very expensive commodity and hence further developments and optimisation of high temperature steels are also required to maximise their use and minimise the cost of their application. For all these materials, major developments are required in fabrication techniques to identify appropriate weld procedures, obtain code approvals and carry out component demonstrations in plant environments.

Other material development issues relate to corrosion resistance (both high and low temperature) and improvements in wear properties in the milling and PF transport system. These improvements would enhance

Figure 1. The Avedore power plant in Denmark - appr. 50% efficiency, based on ultra-supercritical steam cycle

the technology's reliability. Next to specific hardware developments, the use of advanced control methodologies (*i.e.* expert systems, condition monitoring) can also lead to improved plant performance.

In developing countries with a high coal consumption, such as China and India, SPF technology transfers could take place by the sale of equipment, licensing, joint ventures, co-operative production, subcontracting of the manufacture of components, and co-operative research and development. Possible forms of co-operation between industrialised and developing countries in this context could be selling licenses to developing countries, mounting joint ventures, and establishing co-operative production.

At a basic level, technology transfer consists of hardware (*e.g.* power generation units or flue gas desulphurization units) and knowledge of operation and maintenance of the technology. In addition, a country like China, for example, is developing its domestic design and manufacturing knowledge and skills for efficient coal-based power production technology. The purpose of this kind of technology transfer is to gradually develop domestic manufacturing capability.

However, taking China as an example, a number of implementation barriers to these technology transfers and implementation can be identified:

- **Complex administrative procedures:** In China, the State Development and Planning Commission (SDPC, responsible for approving new power plant projects) and the State Economic and Trade Commission (SETC) are the most powerful government agencies in terms of applying for and receiving approval for clean coal technology projects. Their work could be supported by information (through documents, workshops, demonstration sites) about the technological development, technical and economic features, and advantages and disadvantages of a technology. The application process would also become easier if it contained a feasibility study report with favourable financing arrangements such as a soft loan or a grant from international organisations.
- **Low institutional capability:** The lack of collaboration between design institutes, research institutes and manufacturers is an important barrier to international technology transfer. In addition, China's state-owned manufacturing enterprises have not developed commercial or innovative skills and there is a lack of market pressure on Chinese enterprises. With the deepening of economic reform and system restructuring, however, all state-owned enterprises and research institutes are expected to accelerate the process of upgrading management and technology in order to improve competitiveness.
- **Environmental emission controls**: In China, environmental regulations have in the past put insufficient pressure on creating a demand for clean coal technology hardware and services. However, with the present rapid economic development in China and the need for improvement of living conditions, environmental policy has been given a higher priority and rules are becoming more stringent.
- **Financial issues:** Lack of finance is often an important barrier to clean coal technology transfer. In the case of SPF this barrier could be reduced by: offering soft loans, capital subsidies or grants; incorporating the costs of pollution in the economics of plants, so that cleaner plants acquire a more favourable economic position; and manufacturing the SPF equipment in China where production costs are lower. However, the latter requires technology and knowledge transfer, as was mentioned above.
- **The maturity of the technology:** Since power companies will only apply mature technologies, it is crucial that at least two reference plants of the same or comparative size are already operational in the same region. For newly developed technologies, this requires one or two demonstration projects of relevant size and parameters.
- **The issue of intellectual property:** Gradually, the move to commercialise state-owned enterprises is strengthening respect for intellectual property rights, which also implies that companies in China will have a lower incentive to share information with each other. This could hamper the spinning off of new technologies such as SPF.
- **Lack of collaboration with foreign firms:** Through establishement of joint ventures between Chinese and foreign firms or involving technology licensing agreements a wider exchange of knowledge, expertise and experience could be facilitated for managing technological change. Joint ventures are attractive because they give both sides a stake in the future success of the product or service concerned, and allows them to build up trust.

Financing requirements

Table 1 on the next page shows how costs and efficiency could develop for different plant types relative to subcritical PF (index value = 1). The Table shows that SPF plant costs are comparable with subcritical PF boiler technology. However, overall economics are more favourable because of the increase in cycle efficiency. In a typical case, fuel costs account for 60-

Table 1. Efficiency and cost of advanced systems

	Subcritical PF	Supercritical PF	Ultra-SPF	IGCC	PFBC
• Efficiency % (low-heating value basis at ISO conditions)	1	1.05	1.13	1.13	1.10
• Total capital cost/kWe	1	1	1.04	1.28	1.12

Source: Scott and Nilsson, 1999.

80% of the total operating cost of a PF power plant. In the example above, an increase in cycle efficiency from 38% to 46% would result in an annual coal saving of 300,000 tonnes (17%). At a nominal coal cost of € 45/t coal, this would represent a saving of around € 15 million per year. This saving can more than offset the slightly higher capital cost of SPF technology.

Economic performance is also influenced by other factors, such as plant availability, flexibility of operation and auxiliary power consumption. Its operational flexibility makes SPF more favourable than subcritical PF plants. The SPF boiler design is inherently more flexible than drum designs due to fewer thick section components, which allows increased load change rates.

Future market potential and the CDM

Many countries (including EU member states) are (heavily) dependent on coal. The use of clean coal technologies such as SPF can reduce the environmental impact of the increase in coal use. This can be achieved in SPF coal fired boilers, cyclone boilers, circulation fluidised bed combustion, IGCC and hybrid systems. The lower CO_2 emission factor for natural gas compared to coal brings a substantial reduction in GHG emissions when coal is partially replaced by natural gas. Natural gas can be used with coal by reburning, confining, and integrating a gas turbine to form a high efficiency combined cycle plant. Combined with other technologies, such as combined cycle technologies, CO_2 capture and storage (CCS), coal gasification, *etc.*, SPF can become more efficient and could even lead to zero-emission plants when combined with CCS.

The stimulation of SPF plants in developing countries could partly be supported through the CDM. In September 2007, the CDM EB, at its 34th meeting, decided to make supercritical coal-fired power plants eligible under the CDM. When the business-as-usual practice in a country is subcritical coal-based power plants, the introduction of supercritical power plants would ceteris paribus reduce GHG emissions.

However, there has been concern about including modern coal-based plants under the CDM umbrella as this would imply competition with renewable energy technologies in developing countries. The final decision of the CDM EB, which took the shape of approving a supercritical coal-plant methodology for baselines and monitoring (approved consolidated methodology 13 – ACM0013), is directed to greenfield fossil fuel plants (*e.g.* new plants, no retrofits of existing plants), and could thus also include natural gas-fired plants. However, in order to limit the applicability of the methodology and the scope for these projects, it was decided that the methodology can only be applied in those countries which generate more than half of the electricity using coal or natural gas. In practice, this limits this type of CDM projects to China, India, and South Africa.

Moreover, within these countries the number of projects is also limited since the baseline for the GHG emissions in the absence of a CDM coal-fired plant (or gas) project must be determined using the data of the 15% most efficient coal-based (or gas-based) power plants. Therefore, if 15% of the most efficient coal-based power plants are CDM projects, then a new CDM coal-based power plant can only generate credits if it increases its efficiency even further so that it can reduce GHG emissions below the benchmark or baseline.

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This paper addresses the potential role of developing countries in global GHG mitigation efforts. The paper specifically provides an analysis of the model of No-Lose Sectoral Targets for developing countries. According to this model, developing countries could adopt voluntary sectoral emission reduction targets. In case a country reduces emissions beyond these targets, then it could sell this extra reduction on an international carbon credit market. On the other hand, surpassing the target would not have consequences for a country. The paper also discusses implementation aspects of such a model in actual practice.

Flues, F., A. Michaelowa, K. Michaelowa, 2008. UN Approval of Greenhouse Gas Emission Reduction Projects in Developing Countries: the political economy of the CDM Executive Board, University of Zürich and ETH Zürich, Switzerland.
This paper provides an econometric analysis of the hypothesis that decisions of the CDM EB are politicised. The analysis is based on 1,000 CDM projects and 250 baseline and monitoring methodologies discussed by the CDM EB thus far. The results suggest that political-economic variables have an impact on the final CDM EB decisions. This hold in particular for decisions on projects that are far less transparant than those on CDM accounting methodologies. The paper also states that with rising numbers of methodologies and projects, CDM EB decision making has become stricter over time.

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Ellerman, A. D., 2008. The EU Emissions Trading Scheme: Prototype of a Global System?, The Harvard Project on International Climate Agreements, Harvard Kennedy School, USA.
This paper starts with signaling that although any future global system is likely to be very different from the EU ETS, there are many similarities from which a future global climate policy regime could learn. The paper addresses some of the key conditions that need to be fulfilled for a successful emissions trading scheme. One aspect is the existence of a central governing body. For the ETS, this has been the European Commissions, but for an international regime such an overarching body is lacking. Second, in order to increase the participation of countries in a system, there need to be side-benefits in order to make it more attractive to agree a global emissions trading scheme. Third, the paper discusses how the EU ETS has dealt with issues of harmonisation, differentation and stringency, and what could be learned from that for a global emissions trading scheme.

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Bosetti, V. C. Carraro, and M. Tavoni, 2008. Delayed Participation of Developing Countries to Climate Agreements: Should Action in the EU and US be Postponed?, Nota di Lavoro, 70.2008.
This paper analyses the cost implications for climate policy in developed countries if developing countries are unwilling to adopt measures to reduce their own GHG emissions. The paper discusses a range of scenarios ranging from delayed action by developing countries (by 30 years) to simultaneous action by both developed and developing countries. The paper shows that delayed participation of developing countries could result in economic inefficiencies of between USD 10-25 trillion. In addition, the paper also finds a clear impact of developing countries' mitigation measures timing on the deployment of low-carbon energy technologies.

Contact: valentina.bosetti@feem.it.

Cosbey, A., J. Ellis, M. Malik and H. Mann, 2008. Clean Energy Investment: project synthesis report, International Institute for Sustainable Development.
This paper addresses clean energy investments as an environment and development challenge. The authors identify four elements to a succes scenario in which energy technologies make a substantial contribution to sustainable development. First, massive new investments are needed globally in clean energy. Second, a transformation is needed of existing energy supply infrastructures. Third, a long-term collaborative efforts by governments is needed to foster revolutionary new clean energy technologies and to help commercialise promising existing immature technologies. Fourth, a focus is needed on end-use energy efficiency and conservation measures, as well as absolute reductions in consumption. For each of these four elements, the paper discusses obstacles and opportunities at both the domestic and the international level.

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The **Joint Implementation Quarterly** is an independent magazine established to exchange the latest information on the Kyoto mechanisms and emissions trading. *JIQ* is of special interest to policy makers, representatives from business, science and NGOs, and staff of international organisations involved in the operationalisation of the Kyoto mechanisms, including emissions trading.

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Abbreviations

AAU	Assigned Amount Unit
AIJ	Activities Implemented Jointly under the pilot phase
Annex A	Kyoto Protocol Annex listing GHGs and sector/source categories
Annex B	Annex to the Kyoto Protocol listing the quantified emission limitation or reduction commitment per Party
Annex I Parties	Industrialised countries (OECD, Central and Eastern European Countries, listed in Annex I to the UNFCCC)
Annex II Parties	OECD countries (listed in Annex II to the UNFCCC)
non-Annex I Parties	Developing countries
CCS	Carbon Dioxide Capture and Storage
CDM	Clean Development Mechanism
CDM EB	CDM Executive Board
CER	Certified Emission Reduction (Article 12 Kyoto Protocol)
COP	Conference of the Parties to the UNFCCC
DOE	Designated Operational Entity
DNA	Designated National Authority
ERs	Emission Reductions
ERPA	Emission Reduction Purchase Agreement
ERU	Emission Reduction Unit (Article 6 Kyoto Protocol)
EU ETS	European Union Emissions Trading Scheme
EUA	European Union Allowance (under the EU ETS)
GHG	Greenhouse Gas
IET	International Emissions Trading
ITL	International Transaction Log
JI	Joint Implementation
JISC	Joint Implementation Supervisory Committee
KP	Kyoto Protocol
LULUCF	Land Use, Land-Use Change and Forestry
MethPanel	Methodology Panel to the CDM Executive Board
MOP	Meeting of the Parties to the Kyoto Protocol
PIN	Project Information Note
PDD	Project Design Document
SBSTA	UNFCCC Subsidiary Body for Scientific and Technological Advice
SBI	UNFCCC Subsidiary Body for Implementation
UNFCCC	UN Framework Convention on Climate Change

JIQ Meeting Planner

21-22 October 2008. Climate Change and Business, Kiev, Ukraine
Hosted by Point Carbon
Contact: www.pointcarbon.com/events/climatechange08/1.937350

22 October 2008, Second International Workshop on Sectoral GHG Emission Reduction Potential, OECD Paris, France.
Organised by the Government of Japan.
Contact: email: Hiroaki_teshima@env.go.jp

22-24 October 2008, 43rd meeting of the CDM Executive Board, Santiago, Chile
Contact: http://cdm.unfccc.int/EB/043/index.html

12-14 November 2008. Carbon Market Insights Americas 2008, Washington, D.C., USA
Organised by Point Carbon and the Pew Center on Global Climate Change
Conctact: www.pointcarbon.com/events/cmiam08/1.934587

17-19 November 2008, CDM Business Opportunity in Africa, Cape Town, South Africa.
Organised by the Carbon Markets Africa, with involvement of Camco, Tüv, TFS Green.
Contact: http://www.greenpowerconferences.com

1-12 December 2008, The United Nations Climate Change Conference, Poznań, Poland - COP 14
The conference will include the 29th sessions of the Convention's subsidiary bodies - SBSTA and SBI - as well as the 4th session of the AWG-LCA and the 2nd part of the 6th session of the AWG-KP.
Contact: http://unfccc.int/meetings/cop_14/items/4481.php

10-12 March 2008, Climate Change: Equity between Nations and Regions, Copenhagen, Denmark
Organised as a session for the upcoming Copenhagen Science Congress on Climate Change: global risks, challenges, and decisions (10-12 March 2009).
Contact: J. Timmons Roberts and Coleen Vogel at jitrobe @wm.edu or http://climatecongress.ku.dk/