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Editor's note

About a year ago, Arcadis and JI Network (JIN) published a report on domestic offsets. The report had been commissioned by the Netherlands Ministry of Housing, Spatial Planning and Environment, and was aimed at exploring opportunities within the Netherlands for GHG emission reduction in non-ETS sectors to be traded on the ETS market.

The study was carried out against the backdrop of a government policy not to allow JI projects in the Netherlands (since 2006) but looked forward to a post-2012 context with EU energy and climate policies focussing on reducing GHG emissions, increasing energy efficiency and increasing use of renewable energy technologies.

The basic idea of domestic offsets is attractive. Similar to how policy makers were attracted by the JI concept in international climate policy, domestic offsets offers a role for the market to provide incentives for emission reductions efforts.

Domestic offsets, however, is not an easy concept. First, emission reduction projects need to go through the usual accounting processes of calculating GHG emission reductions. The contributions in this issue about CDM experience and ways to move forward show that GHG accounting can be complex. Second, domestic offset projects do not necessarily contribute to complying with the host country's Kyoto Protocol commitments. Domestic offset emission reductions sold to foreign partners as credits are accompanied by an equal transfer of AAUs from the host to buying Member State.

Domestic offsets neither benefits from the present ETS market situation with prices floating around EUR 15 per ETS allowance, which is largely due to the economic slow-down. Extra supply of, e.g., domestic offset credits could cause a downward preasure on ETS prices.

Nonetheless, interest in domestic offsets is growing. First of all, the EU Energy and Climate Package of December 2008 contains a direct reference to a project mechanism for emission reductions achieved in non-ETS sectors within the EU for trade on the ETS market (see contribution by Von Unger and Hoogzaad on 'Article 24a' in JIQ April 2010). So, there is a political context.

Second, several EU Member States have undertaken activities in the field of domestic offsets (e.g., France, Germany, Portugal) and recently Ireland and Denmark published tenders asking for input for domestic offsets analysis in these countries and identifying project opportunities in non-ETS sectors.

Third, despite the accounting complexities and need for making domestic offsets compatible with other existing national and international policy measures, it could, as a market mechanism, be more effective than governments estimating subsidy levels which would make a technology project just sufficiently profitable. It would also cover the problem in, e.g., built environment projects that modalities and procedures formulated by the central government are sometimes difficult to enforce by local governments.

One example of the increasing interest in domestic offsets is that thirteen institutes have joined the Non-ETS Offsets Network (NEON) since its establishment early this year. The main goal of NEON is to explore possible strategies, so that domestic offsets can support overall EU energy and climate policies. Furthermore, the network aims at gathering and evaluating available information on similar schemes globally, in order to come up with practical policy proposals and guidance for designing and implementing domestic offset schemes.

NEON has just published its first newsletter online. If you are interested in receiving the NEON newsletter and take part in domestic offsets discussions, please register your name and e-mail address to NEON's website at http://www.jiqweb.org/index.php/domestic-offsets.

Furthermore, the NEON group is open to suggestions and welcomes any input.

The JIQ Editors

In this issue

CDM Programmes of Activities: A Bridge towards New Market Mechanisms?

by Christof Arens*, Thomas Forth**, and Dr. Silke Karcher**

Five years ago, at the Montreal Climate Summit, Parties to the UNFCCC kickstarted the inclusion of Programmes of Activities (PoA) into the CDM. The basic idea was to open the CDM to previously untapped small and micro sources of GHG emissions. However, the CDM Executive Board (EB) has registered only three PoAs so far and the pipeline is growing slowly. In this article, barriers hampering the development of PoAs are described, a new guidebook with programme blueprints is presented and the connection of PoAs and possible future markets mechanisms is analysed.

PoAs now allow the use of CDM carbon finance for a large number of small, individual measures that each alone cannot carry the CDM transaction costs. These comprise, for example, efficient household cookers, solar-powered water heating systems, energy-efficient equipment, machinery or motor vehicles, the use of biogas in agriculture, and energy-efficient buildings. A vast potential for these decentralised activities can be found in rural regions in Africa, East Asia and the Pacific Region. Therefore, many hope that PoAs can also help changing the unbalanced geographical distribution of CDM projects so far.

PoAs enable project developers to cluster single project activities into programmes of a variable size. Further activities can be added at any time after registration of the overarching programme. A further advantage of this is that operators of the activities within the programme (CDM Programme Activities – CPAs) need not become project particitpants, the co-ordinating entity only must enter the CDM project cycle. This makes managing the Programme far easier, especially when compared to standard CDM project bundles. The simplified rules of the latter, moreover, are tied to certain emissions thresholds, whereas these do not exist for PoAs.

While the EB has developed a comprehensive set of PoA modalities and procedures by now, PoA development today is hampered by various factors, including institutional, regulatory as well as financial barriers.

Obstacles and barriers

Most EB guidance was developed based on the experience with conventional single-activity CDM projects. This led to a number of rulings not matching with the needs of large incentive schemes. For example, PoAs were allowed to use only one baseline and monitoring methodology per PoA, while for certain programmes this requirement proved too restrictive. The rules to prove additionality of PoAs took a long time to develop and the additionality requriements are still not fully clear as of today.

Another issue is how to deal with activities which were included wrongly into a programme. The current rules state that if a single project activity was added to a PoA in error, the corresponding credits have to be paid back by the designated operational entity that verified the emissions reduction. Validators have repeatedly complained that this causes unbearable liability risks for them. They claim the type of error is not properly defined and the time frame to identify such errors is far too wide.

Institutional capacity on the part of the host countries is a further barrier. Banks, energy agencies and utilities are quite often not used to managing, for example, large scale demand side energy efficiency programmes. Moreover, host country designated national authorities (DNA) are still not familiar enough with the current PoA framework.

Financial risks for the programme co-ordinator, however, remain the most important issues. The co-ordinating facility has to bear all the costs ranging from development, implementation, to operation of the Programme. Moreover, the first activities usually require seed funding in order to begin an incentive programme while at the same time, revenue from CERs is only one source of income. Banks are quite often hesitant to provide loans to PoAs as they have no experience with PoA funding and risk profiling appears difficult for them.

Reforming PoA Guidance

At its 47th meeting in 2009, the EB reformed the rules for PoAs. It is now possible for Programmes to use more than one methodology, provided the combination of the methodologies has been approved by the EB. On the question of additionality demonstration, the EB

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ruled that the start date of single activites must not lie prior to the validation of the overarching Programme. Yet, the question at which level additionality is to be demonstrated (programme or activity level) is still unclear. The Board will discuss this issue again at the oncoming session at the end of July of this year.

Moreover, many methodology-related problems remain. For example, PoAs replacing petroleum lamps with solar-powered lighting can use methodology AMS I. A. for the calculation of the baseline, this methodology requires the use of historical energy consumption figures for the lamps to be replaced. These data, however, are not available in many CDM host countries and conducting a survey is a time-consuming and expensive exercise.

In addition, the provision to combine methodologies still has its pitfalls: all activities within a PoA must use the methodology combination consistently. Thus, a PoA for small-scale hydropower plants in rural regions where an electricity grid exists in some areas (AMS I.D applicable) but not in others must submit and request registration of two different PoAs.

What is more, DOEs are still having problems with the guidance on erroneous inclusion of a specific activity to the PoA. They argue that their liability risks remain uncontrollable: for example, the EB can put a CPA under review even many years after its inclusion to the PoA, and a review of one CPA can cause a review of all other CPAs as well. Many validators, therefore, demand that their liability is to be limited to the first issuance of CERs for the activity in question.

Support facility for programme developers

A couple of support programmes have been initiated since the start of PoAs in order to support project developers. The PoA Centre Germany is a support facility initiated by the German Environment Ministry offering a wide range of services. The Center, established as part of the Ministry's CDM/JI-Initiative, aims at developing a portfolio of eligible PoAs, for which it is soliciting programme proposals. It offers advisory, structuring and assessment services for programme proposals as well as financing and grants to cover the preparation of programme concepts, project design documents (PDDs) and monitoring plans. Furthermore, the Center offers its know-how to help with programme implementation and can assist with marketing CER stemming from PoAs.

Inter alia, the Center has developed the *PoA Blueprint Book*, which contains sample programmes to aid potential Programme developers. It provides blueprints for six typical sectors: replacing lightbulbs with energy efficient lighting, replacement or reconditioning of household cookers, biogas plants for rural households, solar-powered hot water supply, industrial boilers and energy efficient building modernisation. A brief background is given on each sector along with information on methodological requirements, design options and financial issues. The second edition of the blueprint book was presented to the public at the Carbon Expo fair in May 2010. It features three additional case studies, two chapter on methodologies for small scale hydro and efficient chillers for industry.

The blueprint is available for download at: **www.kfw.de/carbonfund**

Private actors vs. need of (public) seed money

A look at the global PoA pipeline shows a certain abstinence of the private sector. Only very few companies or private organisations are active here. Mostly, financing institutions working on PoAs are preparing the ground for PoA activities in close co-operation with host country organizations, sometimes with support of Annex I country DNAs. Especially, unilateral PoA initiatives are very rare.

Experiences gained during the first 18 months of the PoA Support Center at KfW demonstrate clearly the limits of economical attractiveness of most PoA project types which have been supported so far: in its PoA BluePrintBook, KfW explains transparently under which conditions certain project types could be deemed economical feasible by taking "break even point" and "Internal Rate of Return (IRR)" as simple indicators.

Depending on the national circumstances, baseline determination plays a crucial role in determining the rate of annual CER returns. Only with a relatively high baseline an attractive IRR can be achieved with a manageable number of installations per CPA. In this narrow sense, most cases in KfW's project pipeline could be considered as economically feasible, although certainly not marketable in the sense that these projects could be driven by private companies' interest.

Therefore, one of the main conclusions in these early years of the programmatic CDM is the need for 'seed funding'. In most cases, the PoA coordinator cannot pre-finance the incentive at the beginning of a programme. He needs to look out for external funding from carbon buyers, which to date is rarely provided by private sector actors.

Limited economic incentives are not the only problem for making PoAs attractive for the private sector. Apart from the fact that only few companies are familiar with the CDM project cycle, the reliability of the PoA co-ordinator and the still existing restrictions of methodologies for the application in the programmatic CDM activities are additional barriers for involving the private sector. Most notably the PoA co-ordinator needs sufficient in-house capacity and regional acceptance to guarante a cost-efficient and effective programme performance through a centralized management structure and the integration of monitoring procedures in the normal business.

At this stage of the PoA development, institutional carbon buyers still have the function to implement lighthouse projects featuring as many project types as possible and to set up PoAs in as many countries as possible. Once this will be achieved, it becomes relatively easy for the private sector to add new CPAs to the existing PoAs. For the future development of the programmatic CDM, one should keep in mind that it will be difficult to get private companies to engage in the so far untapped sectors for the CDM, especially the buildings sector and the transport sector respectively. Therefore, seed money from government or multilateral institutions will continue to be needed to pave the way for these kinds of programmes.

NAMAs and other new flexible mechanisms

PoAs are not just a new and innovative option within the existing CDM. They are also the key to geographic regions and economic sectors where the classic CDM could not take root. Besides, they point beyond the CDM, being the first step towards the broader mechanisms leaving behind project levels, which will be needed in the future and which are currently discussed.

While the classic CDM is most successful in newly industrializing countries and large industrial or electricity generation projects, large numbers of PoAs are being developed in Africa (17%) – compared to 2% only for regular CDM projects. The broader use of PoAs expected to follow increasing stakeholders' familiarity with the approach will therefore help to reduce the geographical imbalances in offset project distribution.

Widespread use of PoAs would also move the carbon market from focusing on large single projects to viewing whole sectors and their potentials, especially in the untapped building and transport sector. This corresponds to the shift of the international debate on mechanisms from the CDM to so called "sectoral mechanisms" or Nationally Appropriate Mitigation Actions (NAMAs) in developing countries according to the Bali Action Plan.

However, the sectoral approaches and NAMAs so much en vogue recently have two severe shortcomings: neither is there a clear definition, nor is there, more discouraging even, any consensus about the financing of these activities. Thus for the time being it remains unclear how the provision of the Bali Action Plan (BAP) that NAMAs should be "supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner" shall be fulfilled.

In this regard, PoAs have the potential to pave the way in two respects:

- First, they are a prototype for sectoral activities which are measurable, reportable and verifiable. By broadening the approach – e.g. allowing the use of several methodologies and different methodology combinations in the CPAs of one PoA . PoAs can on the material level be most that is now discussed as sectoral approaches.
- Second, a functioning financing system is in place already, allowing to develop sectoral approaches that can be financed as PoAs as a no regret strategy. In an integrated approach, the ambition of PoAs can be enhanced by using below "BAU" baselines and more importantly by supplementing PoAs with other policy measures. An example would be PoA financed renovation of existing buildings, supplemented by obligatory energy efficiency standards for new buildings.

In the long run, climate policies worldwide will probably adopt a combination of emissions trading with other sectoral policies. MRVable policies will have to be complemented by other policy measures, such as educational campaigns, where mitigation cannot be quantified. PoAs can pioneer mobilizing the mitigation potentials of non-industry sectors such as agriculture, households, and transport.

In sum, PoAs and their legal framework need to be further developed and optimized. The slow start of Programmatic CDM should not prevent further efforts and investments into this project type. This applies even more as PoAs are ideal to address the current challenges of the carbon market: the programmatic CDM can open up new sectors, cover underrepresented geographic regions and pave a step-by-step way into the future of climate protection mechanisms.

Towards a More Standardised Approach to Baselines and Additionality under the CDM*

by Daisuke Hayashi, Nicolas Müller, Sven Feige and Axel Michaelowa[1]

Narrow applicability conditions

The Clean Development Mechanism (CDM) has been a success in both the number of projects and the amount of emission reductions it has mobilised. On the other hand, an increasing number of stakeholders are calling for a reform of the CDM for further improvement of the mechanism. Of particular concern is the cumbersome procedure of baseline setting and additionality testing. The baseline defines the emission level that would have existed under a business-as-usual (BAU) scenario, while a project is additional if it would not have happened in the absence of the revenue from sales of Certified Emission Reductions (CERs). In order to operationalise these concepts, complex methodologies and procedures have been introduced to the CDM.

CDM methodologies often have very narrow applicability conditions and require cumbersome data collection. Also, the bottom-up methodology development process requires significant time and effort from project developers, and does not necessarily provide developers with incentives to develop widely applicable methodologies. The additionality testing approach – especially barrier analysis – is not objective enough.

Reduce inconsistency of decisions

There is a lack of clarity and guidance on additionality testing, leading to inconsistent application of the test among project developers. In order to facilitate project development, to increase the environmental integrity of the CDM and reduce inconsistency of decisions on project registration, a greater use of standardised methodologies has been proposed.

This builds upon a trend to introduce elements of standardised approaches in approved CDM baseline methodologies and should help to further standardise the current complex and often subjective process of baseline setting and additionality testing. Standardised approaches could address many of the criticisms levelled at the CDM, but they also need careful implementation and regulatory oversight in order to ensure the environmental integrity of the CDM is maintained.

A performance standard approach consists of the "comparison of performance against peers based on a set of criteria". Performance standards can be used for determining either baselines, or additionality, or both. Baseline emissions could be derived from a set of similar installations. Project additionality would be deemed to exist if a level derived from a set of similar installations is beaten. The development of a standardised approach is divided into two broad processes. Firstly, it has to be decided which performance indicators will be used to determine the performance standard. Secondly, the threshold level for the selected indicators has to be decided, which specifies the baseline and/or the level that has to be beaten to show additionality of a project.

Harmonisation of methodological approaches

Though it is a relatively new instrument under the CDM, the performance standard approach has already been widely used throughout the world for comparison of energy and/or emission performance of companies. The key technical aspects that are critical to the success of the standardised approach are: (1) level of aggregation, (2) data requirements, (3) stringency level, and (4) updating frequency. The level of aggregation is further differentiated in the following four dimensions: process, product, time and space.

The experience gained with the existing performance comparison initiatives worldwide shows some convergence in methodological approach. First, performance standards are commonly set on a product or service-specific basis. Second, separate performance standards are usually set for new and existing installations. On the other hand, key differences are observed in the treatment of technological differences and the choice of stringency level of performance standards. US initiatives have tried to assess additionality using a standard emission rate, specifications on technology or practice, or a market penetration rate threshold. However, the reliability of this approach has not yet been evaluated independently. Though experience to date already gives important insights, further harmonisation of methodological approaches is required for wider application of standardised approaches to the CDM.

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* This is a summary of the paper by Hayashi D., N. Müller, S. Feige, and Michaelowa A. (2010). Towards a more standardised approach to baselines and additionality under the CDM <http://www.perspectives.cc/Publications.971.0.html>

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Performance standards have also been used in CDM methodologies, though only on a relatively limited scale. The existing methodologies based on performance standards have focused on sectors where a large body of data is already available (e.g., power, aluminium, cement sector). Detailed disaggregation by product type is not common. On the other hand, nearly half of the methodologies using performance standard approaches differentiate performance standards by technology or fuel type. The temporal threshold is commonly set as "most recent five years". The spatial boundary is normally the host country or the power grid. The stringency of performance standards is typically set as the average of the top 20% of performers. Performance standards are normally updated only at the renewal of a crediting period, i.e., every seven years. In terms of additionality testing, approaches similar to the US approaches exist in approved CDM methodologies. Furthermore, one CDM methodology uses an emission-rate based performance standard explicitly for additionality demonstration.

Credible stringency level

Choosing a credible stringency level for performance standards based on the right set of peers plays a decisive role in the effectiveness and efficiency of the standardised approaches. This requires, among other things, a balanced choice of the aggregation level of a performance standard, an in-depth assessment of the key parameters that would influence the additionality of projects in a sector, and detailed technical and economic analysis of technology options available in the sector. There is a large body of objective data available that can inform decisions on these technical aspects. Also essential is regular updating of performance standards in order to reflect autonomous technological progress over time.

CDM performance standards are feasible, but require an improvement in data collection, the early set up of adequate institutions, and the development of specific approaches to the choice of performance indicators and stringency levels for the selected indicators. Substantial international upfront financing is required for necessary data collection. Approaches for indicator choice and proposals regarding stringency levels could be developed by a Standardised Approach Coordinator (SAC), with the CDM Executive Board (EB) taking the final decisions on the standardised approaches. As setting of performance standards will require between one and four years, parties should immediately agree on this approach to make it operational by 2013. Development of standardised approaches will be complex and need to be tailored to each sector. Industrial expertise has to be harnessed, but gaming of the indicators by industry interests needs to be avoided.

In general, sectors amenable to standardised approaches produce outputs or services similar in their nature and in their production processes. Sectors ideal for standardised approaches would tend to be highly concentrated, with limited geographical factors affecting the level of GHG performance, and already have a large amount of data available for assessing relative performance. Therefore, standardised approaches are likely to be a suitable instrument for large, homogeneous sectors. For other sectors not amenable to standardised approaches, alternative approaches (e.g., default values) have to be considered as a fall-back option.

Environmental effectiveness

The environmental effectiveness of standardised approaches depends primarily on their level of stringency. The more stringent a performance standard is, the more likely that non-additional projects will be weeded out, but at the same time fewer projects will be able to beat the performance standard. Setting the "right" level of performance standards requires a high degree of confidence in the efficiency or carbon intensity distribution curves of BAU projects. Where this is not possible, alternative approaches (e.g., project-specific additionality tests or credit discounting) would need to be pursued.

Cost-effectiveness is strongly influenced by the number of performance standards to be established. An important trade-off exists between the simplicity and the stronger investment incentives for low-emission technologies given by a single standardised approach using a single performance standard, and the opportunities for performance improvement by high-emission technologies provided by performance standards differentiated by technology. In order to make the approach workable, performance standards should be set in a product or service-specific, technology-neutral manner. However, stringency levels for baseline and additionality should be differentiated between new and existing installations, possibly differentiating according to vintage classes, so that sufficient incentives for improvement are given to existing installations.

Voluntary option

If the standardised approach becomes a voluntary option, project developers would have a choice between a presumably stringent performance standard and a project-specific baseline. This would provide positive incentives for exploring new CDM opportunities, leading to an improved distribution of CDM projects. If introduced as a mandatory instrument, however, distributional impacts are likely to depend on the stringency of performance standards. The shift of the baseline development burden from project developers to a dedicated body, as well as standardisation of the baseline, would likely encourage the participation of underrepresented countries, e.g., least-developed countries (LDCs). Importantly, the use of fall-back options (e.g., default values for baseline setting) could mobilise further projects in underrepresented regions and project-size categories.

The host country's ability to provide the appropriate data for performance standard calculation is key to institutional feasibility. Furthermore, the capacity to monitor, report and verify emissions and activity data for the relevant sector and its installations needs to be developed in order to make performance standards credible and enable updating at regular intervals. Possible financial support from the surplus of the CDM EB, and multilateral or unilateral support programmes, could be provided to help build institutional capacity.

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Linking Joint Implementation projects to White Certificate schemes

By Vlasis Oikonomou*

Energy efficiency is a well-established option to decouple economic growth from the increase in energy consumption. Furhtermore, it can reduce greenhouse gas (GHG) emissions by cutting the amount of energy required for a particular amount of end use energy service. EU Member States have to take into account the EU Directive (EC 2006a) on the promotion of efficiency in energy end-use and energy services which suggests a non-binding 9% energy efficiency improvement spread over 9 years. Finally, the EU Action Plan for energy efficiency sets much higher targets at the level of 20% energy efficiency improvement by 2020, almost 390 Mtoe (million tonnes of oil equivalent) saved, given the existing potentials for such actions (EC 2006b). In order to close the gap between achieved and required efficiency improvements new policy instruments are considered by policymakers.

A relatively new policy instrument is the White Certificates (WhC), whose basic idea is that specific energy saving targets are set for energy suppliers or distributors who must fulfil these requirements by implementing energy efficiency measures among their clients within a specific time frame. The fulfilment of this target is acknowledged by means of (White) certificates. Energy suppliers or distributors, who surpass their targets, can sell their unused energy efficiency equivalents in the form of WhC to suppliers/distributors who have implemented fewer measures than according to their target. Thus far, WhC systems have been implemented in Italy, the UK and France and are currently being considered in Poland, albeit with different design characteristics and ambition levels. Furthermore, there are other countries that have implemented similar schemes to WhC, although without the certificate trading component, but merely dealing with obligations to energy suppliers or distributors for energy efficiency. The main actors in a WhC scheme , as shown in Figure 1, are:

- The regulatory authority, which plays the principal role in distributing the obligations among the participants and issuing the certificates;
- Suppliers and the distributors of gas and electricity, who have an obligation, set by the regulatory authority, to save a certain amount of energy within a specified period. To this end, suppliers have to promote specific energy efficiency projects to end users. Suppliers and distributors receive WhC and can trade them on the market in order to

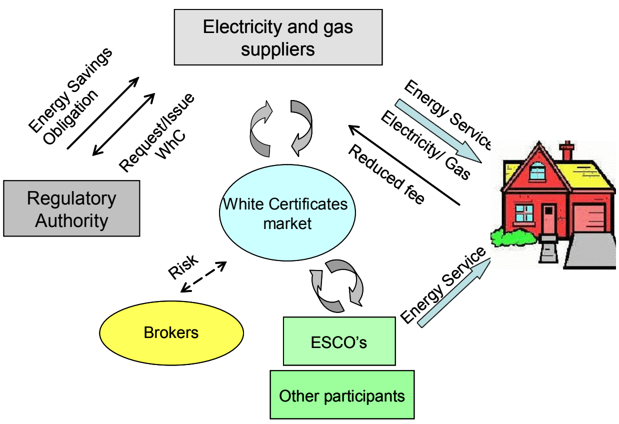

Figure 1. Functioning of a White Certificate market

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comply with the obligation. Alternatively, they can purchase respective amount of WhC from other suppliers or third parties;

- Energy service companies (ESCOs), which are companies that offer to reduce a client's energy cost, often by taking a share of such reduced costs as repayment for installing the energy efficiency measure and financing its upgrades. They do not receive an obligation, but they are allowed to claim and sell WhC after performing energy saving actions. In the same category of these market players fall also energy efficiency providers, installers and other businesses dealing with energy efficiency;
- "Other participants", which are entities that do not receive an obligation but can purchase and sell WhC, providing thus the necessary liquidity in the market. Examples for such entities are brokers and financing institutions, which facilitate the transactions and reduce the risk of the investments, while speculating on the price of WhC and receiving a commission from the transaction costs. The eligibility and the role of these entities differ among the existing WhC schemes. Their role is foreseen in the UK and French WhC scheme.

Other policies that could also address energy efficiency, in the sphere of climate policy, the concept of Joint Implementation (JI) has been at the center of climate policy making since its inclusion in the United Nations Framework Convention on Climate Change (UNFCCC) in 1992. The basic idea of JI is that industrialized countries can achieve their greenhouse gas (GHG) emission reduction commitments partly via emission reduction projects on the territory of other countries where marginal abatement costs are relatively low. In the same line, there is a plethora of such instruments that can act in parallel, such as Voluntary Agreements, energy taxes, subsidies for energy efficiency and others.

An issue that is often not taken into account is that policy instruments could 'compete' with each other and reduce each other's effectiveness, but could also mutually enforce their effectiveness if combined well. The interaction of policies, or their compatibility, is therefore an important aspect to look at in the policy design stage. Departing from these two instruments, Oikonomou and van der Gaast (2008)[1] have demonstrated that an integrated JI and WhC scheme for energy efficiency projects in the built environment can be complementary, provided that JI credits are aimed at fungibility with WhC within a country. Furthermore, both instruments refer to the same policy context, which facilitates a common design in terms of target setting. Both WhC and JI can be used as trading mechanisms, meaning that JI Emissions Reduction Units (ERUs) can be converted to WhC under a pre-specified conversion rate.

Integrated scheme

An integrated scheme of JI and WhC (which maintains the obligatory element of WhC for energy savings and has a voluntary component for JI) can be complementary and enhance energy efficiency improvement as it reduces CO2 and primary energy use support both energy and environmental goals. This takes place through allowing installations under a WhC scheme to achieve their obligations by implementing more cost-effective energy efficiency projects in another country. Within the scope of the integrated scheme, main participants are electricity and gas suppliers, which implement energy efficiency projects to the non-energy intensive (mainly households and tertiary) sectors. Eligible parties without obligations can be Energy Service Companies (ESCO's), installators and building companies that can invest in energy efficiency projects abroad (or domestically) in collaboration with local building companies and receive hence ERUs (similar process to electricity and gas suppliers).

All market parties could be eligible for trading certificates, which would increase market liquidity, but which could also jeopardize actual energy efficiency actions when low-price ERUs are included in the scheme which do not originate from energy efficiency actions. In this hybrid scheme a niche in the JI market is created, where prices could be higher than the overall carbon market price; after all energy suppliers can only purchase energy efficiency based credits and compare their price with their domestic energy efficiency projects' costs instead of the price of other ERUs.
The trading commodity (WhC) can be expressed in MWh (MegaWatt hours) saved per ton CO2 reduced, based on a steady or variable conversion rate. Energy efficiency projects can be financed through an increase in electricity and gas tariffs and from selling WhC. In order to reduce windfall profits, electricity and gas suppliers that opt for JI projects should receive only a percentage (or not at all) of governmental subsidies (from JI tenders) as project financing. Furthermore, a prerequisite for eligibility of converting ERUs into WhC if they originate only from pre-approved activities (modalities and procedures under the Kyoto Protocol) in the field of energy efficiency in the built environment.

[1] Oikonomou, V. and van der Gaast, W. (2008). Integrating Joint Implementation projects for energy efficiency on the built environment with White Certificates in the Netherlands, *Mitigation and adaptation strategies for Global Change,* 13(1), 61-85.

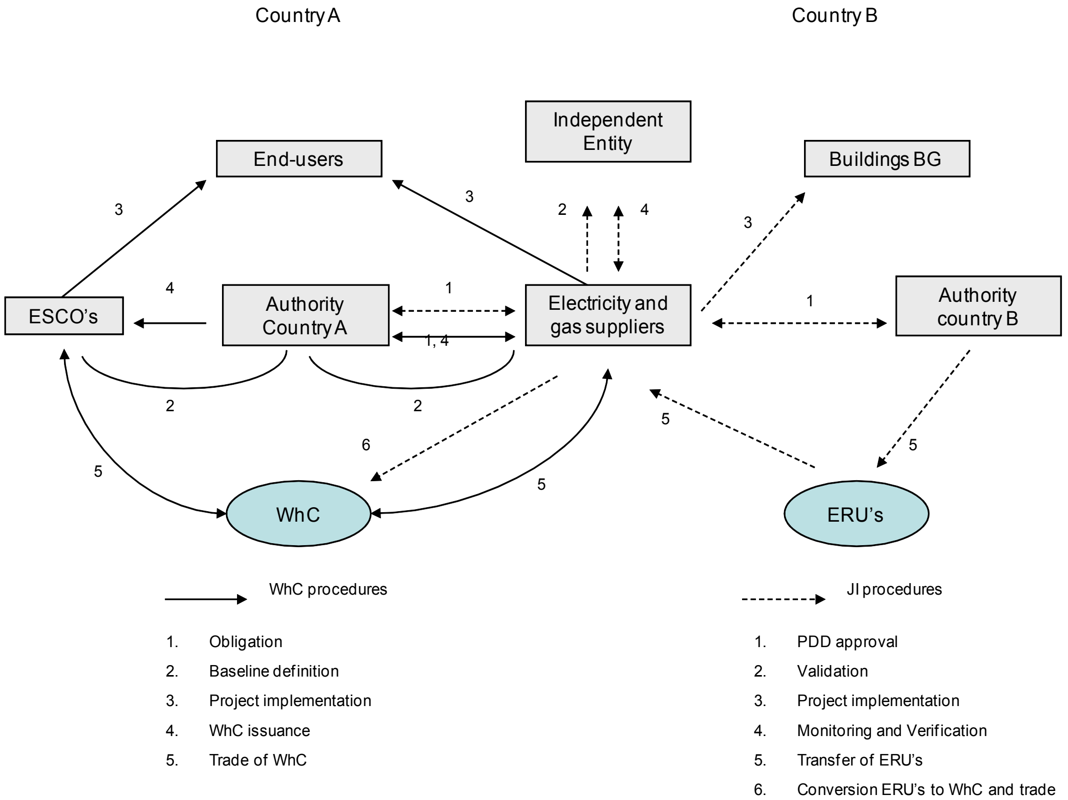

Figure 2. Functioning of an integrated WhC/JI scheme

Market functioning of the integrated scheme
Departing from the current situation on WhC and JI mechanisms, a possible WhC/JI scheme is presented in Figure 2: the WhC scheme has a national scope within country A and JI projects for energy efficiency improvement are subsidized by country A and implemented in country B (Track 1). Initially, authorities of country A assign energy efficiency targets to electricity and gas suppliers. In order to comply with their targets, the latter face three options: implementing energy saving projects focused on domestic end-users, purchasing WhC, and implementing energy saving projects in country B. The eventual choice depends on marginal costs and timing of each option, since costs per specific technology differ in each country and credits may not be delivered at the same time (i.e. ERUs could either be contracted through a forward contract with future delivery after realisation of the emission reduction, or transferred on a spot-market basis when realised).

If suppliers opt for fulfilling their obligations through domestic actions, they present their envisaged energy savings from projects to the national authorities and, if approved, they can implement the projects. Subsequently, they receive WhC, which they can use for their compliance or can sell to other parties. If they cannot meet their target by the end of a specific period they receive sanctions (possibly in the form of fixed penalty) that function as a ceiling price of WhC (assuming that the system does not require paying a penalty and still make up for the deficit). ESCOs and other market participants can also implement energy saving projects, following the same procedure as suppliers, but with a main difference that they do not have commitments and would only participate on a voluntary basis; they would be able to sell their realised energy efficiency gains in the WhC market.

When electricity and gas suppliers opt for JI energy saving projects, they have to submit a Project Design Document for approval to both countries' authorities (including validation of the project plan). When the project is approved, electricity and gas suppliers in collaboration with domestic or host country ESCOs and other market parties can proceed with project implementation. After an agreed period, an accredited independent entity monitors the actual emission reductions (or energy use improvement of the building) on the basis of which country B authorities can issue ERUs to the partners. The total emissions reduced are subtracted from the Assigned Amount Units (AAU) of country B under the Kyoto Protocol and added to country A's AAU. These extra AAU compensate for the energy efficiency improvement not taking place domestically. Electricity and gas suppliers can hence import ERU's and convert them up to a predefined percentage to WhC under a conversion rate.

Electricity and gas suppliers must demonstrate with this transaction that ERUs originate from a realized energy efficiency project in country B. After converting credits, suppliers can sell their surplus of

WhC and finance partly their investments for energy efficiency, while exploiting incentives for further project implementation domestically. Furthermore, they can also avoid implementing energy efficiency investments since they acquire extra WhC (originating from JI projects) for the next period, provided that banking is allowed. We acknowledge that more complex procedures might in fact be required for the functioning of the whole scheme, but we present a rather simplified version where transaction and administrative costs can be kept relatively low.

Effectiveness

In terms of effectiveness, an integrated WhC/JI scheme can be ranked highly, since a direct or indirect obligation to energy suppliers under WhC can guarantee that energy efficiency targets can be achieved. Furthermore, the provision of JI projects can stimulate further actions from the part of suppliers and market players and therefore enhance the dynamic effectiveness of the hybrid scheme. Two targets can be achieved simultaneously with no overlapping whatsoever: reduction of GHG emissions and energy efficiency. GHG emissions can be reduced due to import of ERUs, which can be used as WhC or kept as ERUs that fulfil the Kyoto Protocol targets of the Netherlands under the form of AAU's. A hybrid scheme can also assist security of energy supply in the host country since by enhancing energy efficiency in end-use sectors, peak loads can be reduced and an average relative reduction of electricity and gas demand (given a business as usual scenario) can be expected.

Efficiency

An integrated WhC/JI scheme can be quite efficient in terms of achieving targets set for both instruments, depending of course on the target level. More specifically, electricity and gas suppliers can reduce their overall compliance costs through opting in for voluntary actions. Parallel to the mandatory WhC obligation, which in theory can reduce costs through financing energy efficiency investments by selling WhC, suppliers can make use of cheaper options abroad.

Transaction costs can be high because information acquisition and fees for external parties (independent verifiers, consultants, etc.) in addition to time costs (given that JI procedures can be time intensive) can increase these costs. Nevertheless, effects of learning curves can reduce these costs over time. Double crediting, i.e. when two credits are generated from one single action of emissions abatement, can be prevented by ensuring, via a monitoring mechanism, that an ERU which has been converted to a WhC is not valid anymore for any other use.

A WhC/JI scheme can furthermore adapt to price signals from exogenous market changes, namely price of oil, electricity, gas, renewable energy and other fuels. An increase in fuel prices can be incorporated into the price of WhC, under a cost carrying over market mechanism, and certificate market can adapt their prices according to the increased marginal cost and scarcity.From a policy implementation perspective, a hybrid scheme based on a design as proposed in the previous sections does not incur extra administration costs since relevant and existing bodies can undertake same roles for both policies. Our estimation is based on a baseline that both policy instruments stand-alone are designed in such a way that keep administrative costs as low as possible.

A fundamental outcome is that an integrated scheme of WhC with JI for energy efficiency projects in the built environment can be complementary and generate an added value in energy efficiency. Nonetheless, despite the positive outcome of the feasibility assessment of the hybrid scheme, it is noted that contrary to the even mixing of GHG in the atmosphere, which makes the location of GHG abatement measures irrelevant for their effectiveness, energy efficiency measures have mainly an effect on the site where they are carried out. This implies that energy efficiency measures carried out abroad and translated into WhC for use domestically replace energy efficiency improvements within the country that would have been carried with domestic action only. Still, if policymakers take into account these issues, an integrated WhC/JI scheme could provide the proper stimulation in the market towards energy efficiency and GHG reduction.

Biomass Energy Plants - Environmental compatibility and external costs assessment at global, regional and local scale

By Enrico Brizio and Daniele Russolillo[1]

In many areas of Europe, particularly in northern Italy, air quality ranks high on the daily agenda's of environmental decision makers. Consequently, for institutes involved in applied environmental research it is important to produce robust hypotheses and scenarios in order to give decision-makers a coherent and clear framework within which informed decisions can be taken.

Concentrations of particles (PM_{10}), nitrogen dioxide (NO_2), and ozone measured at the ground level are permanently above quality standards, which can have strong and worryingly negative health effects. The concentration of PM_{10} is only partly due to primary emissions of particles. Secondary particles (derived from NOx, SOx, NH_3 and VOC) account for 60-70 % of total PM concentration (Giugliano & Lonati, 2005). Some European studies (De Leeuw, 2002) report that 88% of emitted nitrogen oxide (NOx) become particles within the atmosphere. For sulphur oxide (SOx), and ammonia (NH_3, mainly agricultural sector) these percentages are 54 and for 64, respectively.

Another strong environmental critical issue is nitrate contamination of surface and ground-water resources, which is mainly due to the use of fertilizers and the land-spreading of animal manures. As far as specific emissions of NOx are concerned, Figure 1 shows the comparison between the most frequent renewable energy technologies (the four at the top of the plot) and some fossil fuel energy plants (natural gas turbines and reciprocating engines). These data are taken from existing plant performances, so their reliability is very satisfying.

As one can easily observe, biomass energy plants, unless they are equipped with efficient abatement devices, generally cause two to three times (but possibly up to hundred times) more NOx emissions than traditional natural gas-based energy plants.

Similar observations can be made for particle emissions from solid biomass combustion and volatile organic compound (VOC) due to biogas or vegetable oil burned by engines. At the same time, it is very difficult to impose abatement systems (e.g., catalytic oxidation, selective catalytic and non-catalytic reduction, air/fuel staging, etc.) to avoid these emissions. First of all, these systems are relatively expensive, and, second, renewable energy plants usually undergo very rapid authorizing procedures so that the authorization analysis often does not cover all environmental aspects.

Nevertheless, emissions from renewable energy plants could be counterbalanced by means of cogeneration and replacement of existing and conventional thermal plants. Unfortunately in some countries (Italy is among them) cogeneration with an effective usage of the heat is often disregarded due to subsidies mainly aiming at electricity production. For instance, in Italy the most common of them are renewable energy certificates – so called green certificates – and feed-in tariffs of 280 Euro/MWh for systems up to 1 MW of power capacity. Consequently, all focus is on power production and consequently the emission balance could become strongly negative at the regional/local scale.

This critical state of air quality illustrates the potential trade-off between air quality policies and low GHG emission policies. An interdisciplinary approach with an integrated assessment seems to be the only way to understand this trade off and to take into account technological issues, emission scenarios and economic and financial issues from both the private and public point of view. This enables a full implementation of externalities in the analysis.

However, it is important to underline that such a unique model of analysis is not yet available. Especially when cogeneration or any other multi-product energy

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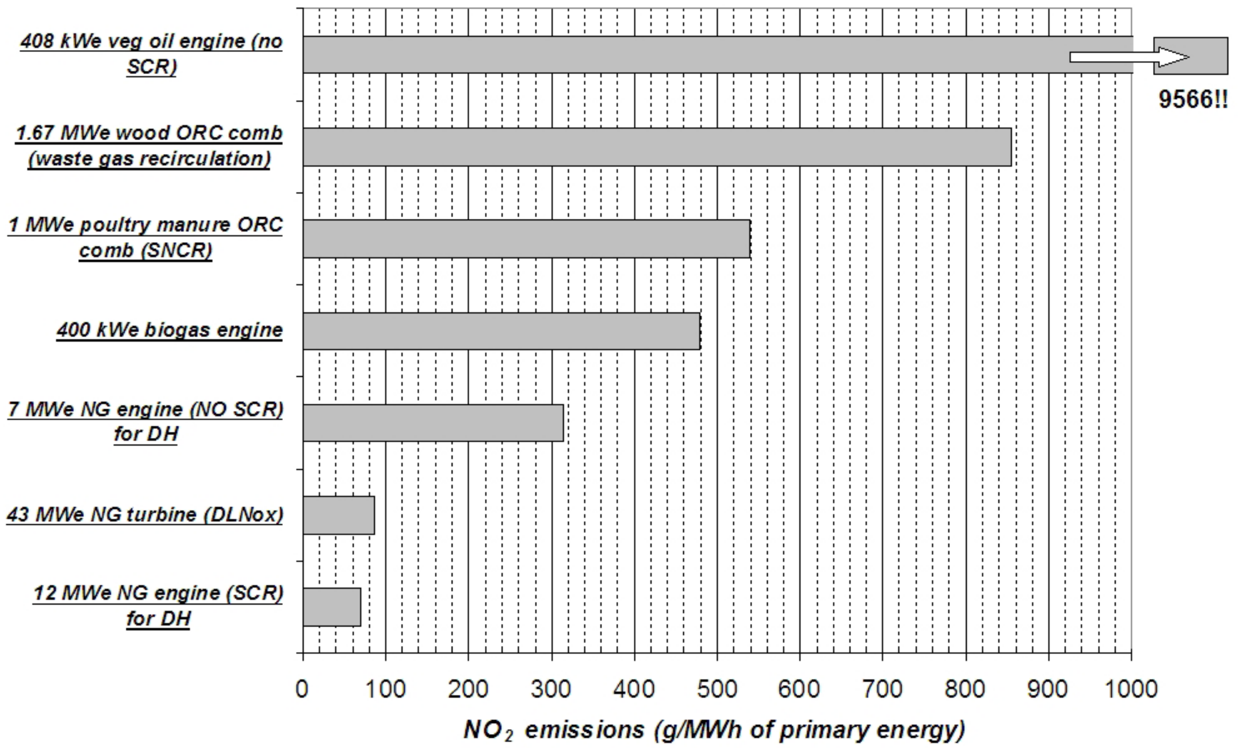

Figure 1. NO_2 emissions for fossil and biomass energy plants

system is in place, the allocation of private costs and environmental externality is not straightforward and might be considered arbitrary (World Bank, 2003).

In this article, we discuss two case studies which show some specific aspects of how to deal with the above trade-off: anaerobic digestion for biogas production and poultry manure combustion in a district heating system. The analysis usually starts from the assessment of the local availability of the bio-fuel taken into consideration, followed by an analysis of the energy demand (both electrical and thermal) and an assessment of best available techniques for both the energy production system and the chain of abatement system for airborne pollutants.

When the technological framework is ready, the integrated technical-economic analysis starts, taking into consideration the private and social costs and benefits associated to the life cycle of the energy system. In our analysis usually two different discount rates are applied to the private and social cash flows in order to calculate the net present values and other indices for each one of them: in the following case studies the discount rate is 5% for discounting direct market costs and benefits and 3.5% for discounting external costs and benefits during the plant lifetime.

Case study: anaerobic digestion/biogas

Anaerobic digestion (AD) of animal manure can be an answer to odour nuisance but it is ineffective with respect to the nitrogen content of digested materials. Due to obvious economic drivers, manure is often digested together with energy crops such as maize, triticale and sorghum in order to increase the volatile solid content and thus biogas production (with higher energy quality coming from higher methane yields).

Within anaerobic digesters, a large part of nitrogen contained in proteins is hydrolyzed to ammonium ion (NH_4^+) and dissolved ammonia (NH_3) that can be volatilized. Moreover, the nitrogen content of the mixture to be digested strongly increases with the use of energy crops. This way, the nitrogen amount to be managed along with digested materials can be much larger than that in primary manure and it is surely more suitable for volatilization. Based on emission factors it is possible to assess that at least 34% (±11%) of nitrogen contained in the digested materials is emitted as NH3-N from the storage and land-spreading (almost 15%). We should also consider NOx emissions coming from the internal combustion engines that recover the energy from the biogas production (≈500 g NO_2/MWh of primary energy).

The emissions from a standard AD plant digesting manure and energy crops (50/50 by weight) can be also seen as a specific emission of secondary particles around 4 g/kWh_{el} due to energy production from AD,

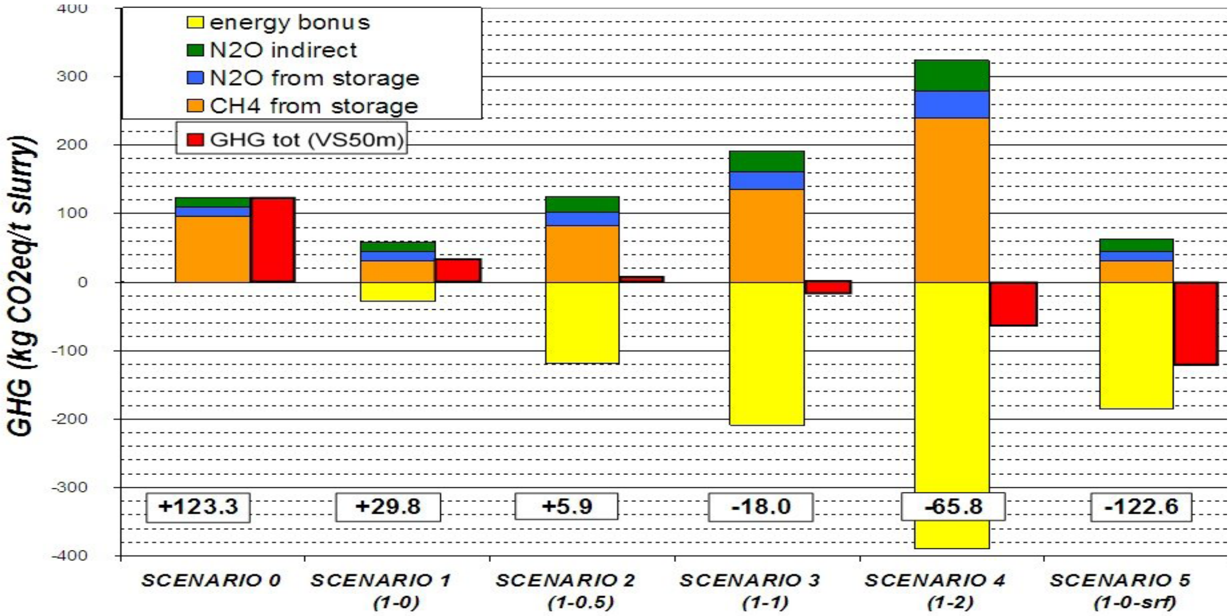

Figure 2. GHG balance
SCENARIO 0: manure as usual (storage+land spreading); SCENARIO 1-4 (anaerobic digestion of manure and maize): in brackets t manure/h – t maize/h fed to digesters; SCENARIO 5: anaerobic digestion of manure alone (1 t/h) and combustion of poplar wood from SRF cultivated instead of maize in the same area required by scenario 3 (1 t of maize/h)

whereas the average secondary particle emission factor at the national level in EU can be much lower (e.g., in Italy it is equivalent to 0.85 g/kWh_{el}).

As far as the GHG balances are concerned, the post-methanation potential and N_2O emissions from the storage of digested materials should be considered. Taking into account the efficiency of removal of volatile solids of AD (often lower than 50%), the methanation potential found through several experiments and consistent emission factors for N_2O, a proper GHG balance can be developed as reported in Figure 2.

The figure points out that bad co-digestion of manure and energy crops (when energy crops represent from 30 to 70% of feedstock) causes indirect GHG emissions (400 ± 67g CO_2-eq./kWh_{el}), mainly due to CH_4 releases from the storage of digestate that might nullify the "bonus"[2] and make AD less attractive. Furthermore, it should be said that this GHG balance neglects the emissions of CH_4 and N_2O from the biogas engine, as well as methane releases from digesters and pressure valves and CO_2-eq. emissions related to cultivation and transport of energy crops; these contributions would even worsen the reported overall GHG balance.

Case study: combustion of poultry manure and district heating

Nowadays, direct combustion of poultry manure can be supported by reliable technology solutions, producing combined heat and power in an efficient way (overall efficiency up to 80%). Emissions of GHGs can be reduced by:

a using residual heat for district heating system, thereby replacing existing conventional boilers,
b reducting of ammonia, nitrogen dioxide and methane releases from the storage and spreading of poultry manure, and
c producing electricity from a renewable fuel.

The ash from the combustion is stable, sterile, easier to handle and transport. It is also more marketable as an organic fertiliser than conventional poultry litter.

Next to the environmental benefits, it is also important to take a look at the profitability of this case study. Taking the technology of organic rankine cycle (ORC)[3] as an example, our calculations show that an internal rate of return could be reached of 13.5% (assuming a technical lifetime of the project hardware of 20 years). The project's pay back time would be seven

2 due to avoided CO_2 emissions.
3 In our case study the ORC grate firing combustor burns 3.500 kg/h of poultry manure (6 MWth in), producing 6.000 MWh_{el} and 10.700 MWh_{th} per year (the thermal energy is addressed to a district heating network serving up to 1.000 households localized in northern Italy) and the system is equipped with spreader stoker, waste gas recirculation, SNCR, multi-cyclone, spray-drier (lime) and fabric filters.

years. Please note that an average price has been associated to the selling price of heat (in Italy in fact district heating is not regulated by the national energy authority, solely dedicated to electrical energy and natural gas), so better financial results could be easily achieved using larger prices in the model. The investment costs of an ORC system, including best available techniques for reduced pollution, amount to 6.5 million euro.

It must be noted though that the above calculations have been strongly influenced by the Italian feed-in tariff (280 euro/MWh_{el} or 13 million euro of cumulated incentives during15 years, which is the current time-limit of this kind of incentive in Italy).

Using the ExternE methodology (Bickel P. et al., 2005), external costs have been calculated on the basis of pollutant concentration at the ground level, exposed population in the studied areas, exposure-response functions and health impact monetization. The overall balance turns out to be strongly positive (also at the local scale) because of the large reduction of ammonia emissions which avoids secondary particles generation and GHG release.

In our calculation, we did not consider the benefit from the reduction of odours and the decrease of nitrogen in the groundwater. These benefits can be calculated through an hedonic price associated to the real estate (assuming an increase of the rents due to less odour) in the nearby areas (EC DG Regional Policy, 2008) or through a local survey to measure citizens' willingness to pay in order to get rid of the negative externality.

Finally, the social benefits of the case study across the project lifetime have been estimated at 43 million euro - i.e. monetized avoided emissions. Comparing this value with the cumulated national feed-in tariff (13 million euro) shows a very interesting benefit-to-cost ratio of this incentive policy.

Conclusion

Biomass energy plants are strongly encouraged by European and national legislations but their effect on air quality could be negative, in particular for highly compromised areas such as northern Italy. As a matter of fact, specific emissions of NOx, PM and VOC from biomass energy plants can be larger than those of fossil fuel plants (in particular for natural gas fired systems) and the situation gets worse when thermal energy from biomass energy sources is not recovered. As a result, energy efficiency is thus not maximised and existing (conventional) thermal energy systems are not substituted.

Moreover, energy plants such as anaerobic digesters can cause strong increases of ammonia and indirect GHG emissions, leading to reduced environmental sustainability. Technology solutions to ensure the compatibility of biomass energy plants do exist but their application is often hindered by the structure of public subsidies and by the technical legislation that is not always suitable to take into consideration the environmental impacts at a global and regional/local level.

Nonetheless, in the second case study we have shown that a really positive effect of subsidies is possible: this brings hope to the possibility to design sound and robust environmental and energy policies (and incentives) aimed at achieving the challenging targets defined at European and international level for the next decades. Last but not least, biomass plants may be considered relevant case studies for so-called domestic offsets schemes, of which a specific option (non-ETS offset projects) is currently the main focus of the European-wide NEON network whose first policy brief was presented in the April 2010 issue of JIQ.[4]

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4 JIQ, "*Offering flexibility and finacing opportunities for innovative technologies through Non-ETS Offset schemes,*" Vol.16 No.1 April 2010, page 5 <http://jin.wiwo.nl/images/stories/JIQmagazine/2010apr.pdf>

Reports

Docena, H. (writer-researcher) and N. Bullard (editor), 2010. The Clean Development Mechanism Project in the Philippines: Costly, Dirty, Money-making Schemes, Focus on the Philippines Special Reports, No. 3.

An evaluation of existing CDM projects in the Philippines as of June 2009 raises questions as to whether the scheme is in fact undermining its own purported aims. According to the authors, most of the "credits" being generated will go to projects that further exacerbate climate change and compromise sustainable development, enriching large conglomerates that are expanding extractive and fossil fuel-intensive activities, in pursuit of objectives that could otherwise be achieved through more effective government regulation and community action. Rather than allowing governments and communities to embark on a just transition towards a more sustainable path, the authors conclude that the CDM is rewarding government ineptitude and supporting the very agents that contribute to climate change—while allowing rich countries to continue avoiding the reductions necessary to mitigate climate change.

A PDF copy of this report can be downloaded from: http://www.focusweb.org/books/cdmphilippinesreport

Oikonomou, V., A. Flamos, S. Grafakos, 2010. "Is blending of energy and climate policy instruments always desirable?", Energy Policy, 38(8): 4186-4195.

In this paper the authors present an application of the Energy and Climate Policy Interactions (ECPI) decision support tool for the qualitative ex-ante assessment of ten (10) combinations of energy and climate policy instruments addressing energy end users. This tool consists of four (4) methodological steps, where policymakers set preferences that determine the outcome of policy instruments interactions. Initially, interacting policy instruments are broken down in into their design characteristics, referring to parameters that describe functions of each instrument. Policymakers can express in a merit order the significance they attribute to these characteristics when designing a policy instrument. Evaluation criteria for assessing these instruments individually are used and policymakers can assign weights on them expressing their preferences. An overall assessment of combined policy instruments based on these steps have illustrated policy interactions added value per criterion and overall. The user of the tool takes useful insights as regards the most preferable combinations of policy instruments, the less preferable ones and those who are conflicting.

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Oikonomou, V. 2010. Interactions of White Certificates for energy efficiency and other energy and climate policy instruments. PhD Thesis. University of Groningen, The Netherlands

The EU energy and climate policies are implemented in an already policy crowded environment and interactions of these instruments take place. We test White Certificates for energy efficiency improvement in the end-use sectors. A core lesson is that when evaluating ex-ante instruments, a variety of economic and technological methods must be applied. Due to the innovative character of White Certificates evaluations should focus not only on the effectiveness and efficiency of the scheme, but on several other criteria which express the political acceptability and socioeconomic effects. White Certificates can make effective use of market forces, overcome market barriers towards energy efficiency, and we expect that under certain preconditions, it can be integrated with other policy instruments and allows to achieve cost effectively multiple environmental objectives.

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Sippel, M. and A. Michaelowa, 2009. Does Global Climate Policy Promote Low-Carbon Cities? - Lessons learnt from the CDM, ETH Zurich CIS Working Paper No. 49.

An increasing proportion of greenhouse gas emissions is produced in urban areas in industrializing and developing countries. Recent research shows that per capita emissions in cities like Bangkok, Cape Town or Shanghai have already reached the level of cities like London, New York or Toronto.

Based upon a survey of projects under the Clean Development Mechanism (CDM) of the Kyoto Protocol, the authors find that only about 1% of CDM projects have been submitted by municipalities, mostly in the waste management sector. This low participation is probably due to a lack of technical know how to develop CDM projects and an absence of motivation due to the long project cycle and the limited "visibility" of the projects for the electorate.

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Abbreviations

AAU	Assigned Amount Unit
Annex A	Kyoto Protocol Annex with 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
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
EGTT	Expert Group on Technology Transfer
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
JI	Joint Implementation
JISC	Joint Implementation Supervisory Committee
LULUCF	Land Use, Land-Use Change and Forestry
PIN	Project Information Note
PDD	Project Design Document
SBSTA	Subsidiary Body for Scientific and Technological Advice
SBI	Subsidiary Body for Implementation
TNA	Technology Needs Assessment
UNFCCC	UN Framework Convention on Climate Change

JIQ Meeting Planner

10-12 August 2010, Sydney, Australia
6th Australia - New Zealand Climate Change & Business Conference
Contact: http://www.climateandbusiness.com/index.cfm

16 August 2010 - 20 August 2010, Fortaleza, Brazil
Second International Conference on Climate, Sustainability and Development in Semi-Arid Regions (ICID II)
Contact: http://ictsd.org/i/events/59501

23-24 September 2010, Moscow, Russia
Carbon Markets in Russia and Ukraine Conference.
Contact: garry@c5-online.com, +44 2078786941, www.c5-online.com

28-29 September 2010, Chicago, Il, USA
Carbon TradeEx America
Contact: http://www.carbontradeex.com/carbon-tradeex-america.aspx

29 November - 10 December 2010, Mexico
16th Conference of the Parties (COP 16)/ 6th Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP 6)
Contact: http://unfccc.int/meetings/unfccc_calendar/items/2655.php

8-13 May 2011, Linköping, Sweden
World Renewable Energy Congress (WREC) 2011 hosted by Linköping University, Sweden
Contact: info@wrec2011.com, www.wrec2011.com.