The impact of EU emissions trading and the linking directive on the potential for Joint Implementation (JI) projects in six EU accession countries

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Abstract

There is an extensive potential for GHG emission reductions in the new EU member states and the EU accession countries by improving energy efficiency, investing in renewable energy supply and other measures, part of which could be tapped by JI. However, the EU Emissions Trading System (EU ETS) and especially the recently adopted "Linking Directive" is probably going to have a significant impact on this JI potential. Especially two provisions are important:

- The baseline of a project has to be based on the *acquis communautaire*, the environmental regulations of which are substantially higher than the Accession Countries' existing ones.
- Projects, which directly or indirectly reduce emissions from installations falling within the scope of the EU ETS, can only generate certificates if an equal number of EU allowances are cancelled. JI is thus put into direct competition with the EU ETS.

In this paper we analyse the impact of these provisions first in theory and then country by country for six Central and East European countries that recently acceded the EU or are candidates for accession. As a result, we give an overview of the potential and the limitations of JI as an instrument for achieving emission reductions in the selected Accession Countries and provide important overview information to policy makers.

Introduction

The Clean Development Mechanism (CDM) and Joint Implementation (JI) are the so-called project-based mechanisms established by the Kyoto Protocol. Their aim is providing the countries that have adopted quantified greenhouse gas (GHG) emission limitation and reduction commitments, the so-called Annex B countries, with flexibility in achieving these targets. The idea is that emission reductions should be achieved where they are cheapest, e.g. in the former centrally planned economies of Central and Eastern Europe and in developing countries. By these mechanisms investments should be directed towards these countries, in order to reduce costs of GHG-mitigation and to promote technology and know-how transfer by foreign investment.

The basic principle is that countries or, the usual case, authorised private companies (the project developers) can register GHG emission reduction or biomass carbon sequestration projects as CDM/JI projects. After the project has undergone a procedure that is laid down mainly in the so-called Marrakech Accords, emission certificates equivalent to the amount of emissions reduced or CO_2 removed from the atmosphere are issued to the project developer. Annex B countries can buy these certificates and count them towards the emissions target (expressed as Assigned Amount Units, AAUs) they committed to in the Kyoto Protocol. CDM projects are carried out in non-Annex B countries, whereas JI projects take place in Annex B countries. The certificates generated by CDM projects are called Cer-

tified Emission Reductions (CERs), whereas those from JI projects are called Emission Reduction Units (ERUs).

In October 2004, the EU Council of Ministers adopted the so-called "Linking Directive" linking the EU Emissions Trading Scheme (EU ETS) with CDM and JI. The main purpose of the directive is to allow operators of installations covered by the EU ETS to use CERs and ERUs for their compliance. However, the Linking Directive also contains two provisions regulating the implementation of CDM and JI projects within the EU member states.

In the following sections the potential effects of these provisions are analysed first in theory and then country-by-country for six Central and Eastern European countries that recently acceded the EU or are candidates for accession. Since they are all JI host countries, the following will ignore the CDM.

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Methodological Note

The tables in the country study section list possible reduction measures for each country as indicated in the secondary literature surveyed. The corresponding reduction potential is indicated in million tonnes CO_2 equivalent per annum (Mt CO_2e p.a.). Details on the reduction measures will be made available in a forthcoming major paper on the same topic.

In order to improve comparability and interpretation we add for every measure the IPCC sector or subsector where emissions would be reduced. The IPCC (1996) has developed a classification for GHG emission sectors which is binding for all national GHG inventories. The sectors and selected subsectors are: 1 Energy; 1A Fuel Combustion (Sectoral Approach); 1A1 Energy Industries; 1A2 Manufacturing Industries and Construction; 1A3 Transport; 1A4 Other Sectors, 1A5 Other (Military); 1B Fugitive Emissions from Fuels; 1B1 Solid Fuels; 1B2 Oil and Natural Gas; 2 Industrial Processes; 3 Solvent and Other Product Use; 4 Agriculture; 4A Enteric Fermentation; 4B Manure Management; 4D Agricultural Soils; 5 Land-Use Change & Forestry; 6 Waste; 6A Solid Waste Disposal on Land; 6B Wastewater Handling; 6C Waste Incineration; 6D Other (to be specified); 7 Other.

However, since this classification addresses emission sources whereas our study focuses on the applicability of reduction measures, the comparability is limited. For example, we consider the JI applicability of renewable energy projects, but by definition renewable energies do not cause any emissions and the emission reduction takes place in another sector; typically in the energy sector 1A1.

We also have to note that the literature surveyed usually has to say very much about measures that could be taken to reduce emissions, but rather less about the quantities of emission reductions that could thus be achieved. Where the reduction potential has been quantified, the sources often do not indicate at which cost per tonne it could be achieved. Our results are therefore often qualitative rather than quantitative.

Technical analysis

PROJECT BASELINE

Content of the Linking Directive

To determine a project's climate benefit, the project developer has to establish a so-called "baseline", i.e. a reference scenario of what would most likely have happened in the absence of the project. In establishing the baseline, the project developer must demonstrate that the project would not have happened anyway. In the parlance of the climate regime, the project must be "additional". The climate benefit achieved by the project is constituted by the difference between the baseline emissions/sequestration and the actual emissions/sequestration of the project.

Baseline calculation has to take into account existing regulations, i.e. you cannot claim emission reductions for renovating a power plant if you are compelled to do so by law anyway. With their accession to the EU the Accession Countries will have to bring their national legislation in line with the so-called *acquis communautaire*, which is the total body of existing EU legislation. The Linking Directive inserted a new Article 11(b) into the emissions trading directive (ET Directive) which clearly states that JI projects in EU member states have to "fully comply with the *acquis communautaire*".

This provision has important impacts on JI projects, since in many parts the EU environmental legislation is much more demanding than the regulations which had previously applied in the Accession Countries. To this respect, three kinds of projects can be distinguished:

- projects which can no longer be carried out as JI projects because they have now become mandatory and are thus no longer "additional",
- projects which would still be additional, but they would now generate fewer ERUs because the baseline has been raised. This may make them commercially unviable,
- projects which are not affected because the *acquis communautaire* does not contain regulations which are relevant.

Acquis Communautaire Affecting the Baseline of Projects

The relevance of the respective provisions in the *acquis communautaire* depends on their scope (see below) and the category of legislation they represent (see Table 1). While prescriptive legislation by the EU will be effective uniformly all over the EU, flexible legislation and market-based instruments are subject to national implementation.

According to the Swedish Energy Agency (SEA 2002: 48f), the directives that are supposed to have the greatest impact on the baselines of projects are the Integrated Pollution Prevention and Control Directive (IPPC Directive), the Landfill Directive and the Large Combustion Plant Directive (LCP Directive). These directives have direct site-specific impacts. Conversely, other directives such as the Directive to limit carbon dioxide emissions by improving energy efficiency (SAVE Directive) or the Directive on the promotion of electricity from renewable energy sources are examples of flexible legislation setting frameworks or targets for national legislation. Since their impact is thus not di-

Table 1. Types of EU Legislation and their Impact.

Category	JI Impact
Prescriptive legislation establishing uniform minimum standards EU-wide.	Raises the baseline by making certain measures mandatory EU-wide. Projects will have to go beyond this standard to be "additional".
Flexible legislation imposing additional site-specific or national rules.	Raises the baseline by making certain state- or site-specific measures mandatory. Projects will have to go beyond this standard to be "additional", the impact will have to be determined for each concrete case
Voluntary and/or market-based instruments, such as feed-in tariffs or special grants for renewable energies.	Raises the baseline by making projects more profitable. Project proponents will need to show that this is still not sufficient to make their projects viable.

Source: Own illustration based on Nondek et al. (2002: 8).

Table 2. Transition Periods for Most Relevant Directives.

	IPPC Directive	Landfill Directive	Large Combustion Plant Directive
Czech Republic	None	None	Until 31.12.2007
Hungary	None	None	Until 31.12.2004
Poland	Until 31.12.2010	Until 01.07.2012, intermediate targets	Until 31.12.2017, intermediate targets
Slovak Republic	Until 31.12.2011	Until 2013	Until 31.12.2007
Bulgaria	Until 31.12.2011	None	Until 31.12. 2014
Romania	(2015)[1)]	(2017)[1)]	(2012)[1)]

[1)] *Romania's request, under negotiation*

Source: Compilation from Acts of Accession, Article 24; EU Commission 2004a: 93, 113; EU Commission 2004b: 100, 120; SEA 2002: 126, 129.

rectly due to EU Accession but depends on the national implementation (which may be rather soft), we decided to leave them out of the scope of this paper.

The *IPPC Directive* aims at reducing or eliminating the emission of harmful substances from industrial installations. For this purpose, it requires the use of the best available technology (BAT). As defined in the IPPC directive, "available" means already developed and possible to implement under economically and technically viable conditions. Availability is therefore a relative term that has to be examined by a regulator for each individual installation. The resulting requirements are laid down in the IPPC permit. As for JI projects, this means that measures at installations covered by the IPPC Directive must go beyond the requirements in the IPPC permit. However, Art. 26 of the ET Directive states that for installations covered by EU emission trading member states shall not impose emission limits for greenhouse gases covered by EU emissions trading and may choose not to impose requirements relating to energy efficiency in respect of combustion units or other units emitting carbon dioxide on the site. This provision substantially limits the IPPC Directive's potential impact on the baseline of JI projects, but an IPPC permit might also require measures with regard to other pollutants which might have an impact on GHG emissions.

The *Landfill Directive* includes two important provisions that affect GHG emissions: First, the Landfill Directive limits the amount of biodegradable waste that can be disposed in landfills. Second, from 2009 onwards the Directive requires the collection of landfill gas at all landfills in operation. Moreover, the collected gas has to be flared as a minimum. The Landfill Directive is thus an example of prescriptive legislation and additionality is limited to

- crediting in 2008,
- projects on closed landfills,
- projects on landfills in operation which utilise the collected gas for energy production instead of flaring it.

The *LCP Directive* limits emissions of SO_2 and NO_x at new and existing plants exceeding a capacity of 50 MW. Operators basically have two options: end-of-pipe solutions or fuel switch. In case of the former, JI potential will basically not be affected since efficiency and the fuel mix are not changed. In case of the latter, however, JI potential at the installation will be reduced significantly (SEA 2002: 48).

The Relevance of Transition Periods for Directives

However, the *acquis communautaire* does not immediately have its full impact on projects' baselines since Art. 11b.1 introduced by the Linking Directive takes into account the temporary derogations set out in the accession treaties. In various instances (see Table 2), transition periods cover part or even all of the first commitment period. This means that projects implementing measures demanded by the *acquis communautaire* will be able to generate ERUs during this time. One could therefore say at a first glance that JI potential will not or only partly be affected. However, there are probably many potential projects which would be viable if they could generate certificates over their whole lifetime,

Table 3. Types of Linkages between JI and the EU ETS.

Type	Description	Regulation (new Article 11(b) ET Directive)
1	JI projects with direct links to the EU ETS; i.e. project activities that are undertaken at installations covered by the EU ETS, e.g. the refurnishing or fuel switch in a power plant (above 20 MW).	ERUs may be issued if an equal number of EU Allowances is cancelled by the operator of the respective installation.
2	JI projects with indirect links to the EU ETS; i.e. project activities that have no direct link to installations covered by EU ETS but lead to emission reductions at such installations, e.g. the development of a wind park leading to the displacement of electricity from a power plant within the EU ETS or the improvement of energy end-use efficiency leading to a decreased withdrawal of electricity from a power plant within the EU ETS.	ERUs may be issued if an equal number of EU Allowances is cancelled from the national registry of the respective member state.
3	JI projects without links to the EU ETS; i.e. project activities reducing emissions at sources that are not connected to the EU ETS, e.g. renewable energy projects that are not connected to the national grid or projects in the agriculture or transport sectors.	Do not pose a problem and are therefore not regulated by the Linking Directive. ERUs may be issued without restriction.

but not if certificate generation is reduced or even totally cut off after some years, even if the period of (full) crediting is the whole first commitment period. On the other hand, there is the uncertainty about the continuation of the Kyoto Protocol post-2012. Due to this uncertainty it is generally unclear if projects will be able to generate certificates post-2012 and one can therefore probably assume that many investors and project developers will favour projects which are viable even if they generate certificates for a couple of years only. The conclusion therefore is that the expiry of transition periods towards the end of the first commitment period limits the theoretical JI potential, but the impact on what is actually going to be implemented is probably not as severe. If, however, there is no or only a short transition period, the impact will obviously be significant.

DOUBLE COUNTING OF JI PROJECTS AND EU ETS

The parallel implementation of JI projects in EU member states and of the EU ETS raises the so-called double counting issue. Without regulation, a JI project affecting an installation covered by the EU ETS could result in a) the issuance of ERUs and b) the freeing up of EU Emission Allowances, i.e. the reduction would be rewarded twice. In order to systematically approach the double counting problem three different types of JI projects in EU member states must be distinguished, as listed in Table 3.

The scope of "type 1" is substantial since the EU ETS covers the CO_2 emissions of all energy combusting installations with a thermal power of more than 20 MW (except hazardous or municipal waste installations) as well as a number of specific process installations in refineries, coke ovens, metal industry, mineral industry and pulp and paper industry. This means that almost the whole energy sector (IPCC sector 1A1) and the bulk of emissions from industrial energy use (IPCC 1A2) are covered. Some non-industrial installations (IPCC 1A4) also fall under the directive. The impact on JI is difficult to evaluate since now there is essentially a competition between financing emission reductions via JI and via the EU ETS. An installation operator has two options:

- Either she reduces her emissions herself as a result of which she will either not need to buy additional Allowances or even have a surplus of Allowances which she can sell,
- Or she agrees to have her emissions reduced by a JI project. This might be an attractive option if she herself cannot raise the necessary capital or if an external company can reduce emissions at her installation at a lower cost than she herself.

Obviously, which option is more economical depends on the concrete case.

Conversely, the Linking Directive specifically limits projects with indirect linkage ("type 2"). According to a personal communication from a member of the EU Commission, the Commission is currently elaborating a guidance on this issue. Member states will have to create a special reserve in their National Allocation Plans (NAPs) and ERUs can only be issued up to the amount of this reserve. From the analyst's point of view, this has the advantage that the maximum available JI potential can be exactly determined. However, the scope of type 2 projects is probably quite substantial. Deciding on the size of the NAP reserve is therefore not a trivial question.

Country Case Studies

In the following we give an overview of the GHG emission reduction potentials and their applicability for JI for each of the six analysed Central and East European states and discuss the country-specific impacts of EU accession on these potentials.

CZECH REPUBLIC

The Czech Republic has negotiated hardly any transition periods. The impact of the *acquis communautaire* is therefore quite severe. Most notably, projects in the energy and industry sectors are affected by both the LCP and IPPC Directives.

The draft NAP (Czech Republic 2004: 13) states that the Czech Republic considers JI to be very important and that the NAP for 2008-2012 is going to contain a reserve for indirect linkage. However, the Czech Republic does not seem to be too favourable towards projects with direct linkage. In the long run, the Czech Republic will consider restricting JI

Table 4. Overview of Reduction Measures in the Czech Republic.

Sector/Measure (IPCC sector in which the respective emission reductions are counted)	Reduction potential (Mt CO_2e p.a.)	Suitable as JI	Accession Impact
Conventional Energy Supply			
Rehabilitating and replacing existing plants, fuel-switch (1A1)	Not quantified	Unclear 1)	Severe
Renewables (1A1)			
Solar	0,3	Yes	Possibly
Wind	1.3	Yes (0.9 Mt)	Possibly
Geothermal energy, potential of 3 750-4 500 MW installed capacity	Not quantified	Yes	Possibly
Biomass	4.4	Yes (0.7 Mt)	Possibly
Hydro	1	Yes (0.6 Mt)	Possibly
District Heating and Buildings			
Improving energy networks (1A1)	0.23	Yes	No
Improvement of buildings and fuel-switch in individual boilers (technical / economic potential) (1A4)	18.1 / 8,9	Yes	Possibly
Industry			
Upgrading industrial processes (1A2)	1.5	Yes	Yes
Installation of gas-fired CHP (1A2)	5	Yes	Possibly
Capture and utilisation of methane from mining (1B)	Not quantified	Yes	Possibly
Waste Management			
Collection and use of landfill gas (6)	1.2	Yes	Severe
Transport			
Switch from road transport to rail transport (20%) (1A3)	0,02	No 2)	No
Replacement of diesel freight trains by electric trains (1A3)	0,01	No 2)	No
Use of biodiesel, e.g. in bus fleets (1A3)	0,17	Yes	No
Agriculture and Forestry			
Improve energy efficiency in agricultural buildings (1A4)	0,09	No 3)	No
Afforestation (5)	4-5	Yes	No
Total quantified potential (lower estimate)	28,12		

1) Sector has already undergone significant renovation
2) Problematic monitoring and assessment process
3) Projects too small

Source: Compilation from Czech Republic 2004b; EVA 2004a; Maly et al. 2002a; Nondek et al. 2001; US DoE 2004a; Wynne et al. 2004.

projects to activities that do not have any link with the EU ETS and supporting other projects by issuing AAUs.

In 2000, emissions from the covered installations totalled 89.03 Mt CO_2 (Czech Republic 2004: 18). The NAP does not give an indication which part of the energy and industry sectors is covered by the EU ETS. According to the Czech Republic's inventory data, in 2000 CO_2 emissions from fossil fuel combustion in the energy sector (1A1) amounted to 60.16 Mt, CO_2 emissions from fossil fuel combustion in manufacturing industries and construction (1A2) to 34.88 Mt and CO_2, amounting to a total of 95.04 Mt; emissions from industrial processes (2) added 2.25 Mt (Czech Republic 2001a: 92). Construction is not covered by the EU ETS and therefore distorts the picture a bit, but one can conclude that CO_2 emissions from energy production and industrial processes are covered to a very large extent. This is confirmed by the Regional Environmental Center for Central and Eastern Europe (REC 2004: 179) that states that 10 of the country's 12 coal-fired plants fall under the EU ETS. Given the statement in the NAP one can therefore conclude that the relevant JI potential in this regard has been removed by the EU ETS.

Due to the Landfill Directive, options at landfills are reduced to closed landfills and to energy production, but the literature surveyed does not quantify the potential. Such projects as well as projects utilising methane emissions in the mining sector for electricity production would probably be connected to the grid and thus be indirectly linked to the EU ETS. They therefore depend on the establishment of a sufficient JI reserve.

The options identified in the transport sector are not affected by the elements of the *acquis communautaire* discussed above, nor are they covered by the EU ETS. The situation regarding district heating and renewable energy projects will be discussed in the conclusions.

HUNGARY

In Hungary currently a draft NAP and a preceding document, called "Principles of the National Allocation Plan of Hungary" exist. According to the draft NAP (Hungary 2004: 13), CO_2 emissions from the activities covered by the EU ETS amounted to 30.52 Mt in 2002. According to Hungary's inventory for 2002, CO_2 emissions from fossil fuel combustion in the energy sector (1A1) amounted to 19.68 Mt, CO_2 emissions from fossil fuel combustion in industry (1A2) to 10.13 Mt amounting to a total of 29.81 Mt (UNFCCC 2004: 14, 18). CO_2 emissions from industrial processes (2) were at 2.44 Mt. One can therefore assume that more than 95% of the CO_2 emissions from these two sectors are covered by the EU ETS and that the bulk of the remaining installations are probably too small to be viable for JI. Moreover, Hungary has not negotiated a transition period for the IPPC Directive, which raises the baseline. The transition period for the

Table 5. Overview of Reduction Measures in Hungary.

Sector/Measure (IPCC sector in which the respective emission reductions are counted)	Reduction potential (Mt CO_2e p.a.)	Suitable as JI	Accession Impact
Conventional Energy Supply			
Rehabilitating and replacing existing plants, fuel-switch (1A1)	Not quantified	Yes	Severe
Renewables (1A1)			
Solar	0.3	Yes	Possibly
Wind	0.2	Yes	Possibly
Geothermal	1	Yes	Possibly
Biomass	3.6	Yes	Possibly
Hydro	0,26	Yes	Possibly
District heating and buildings			
Save 10 PJ p.a. by modernising district heating system (1A1)	Not quantified	Yes	No
Energy efficiency in buildings (1A4)	Not quantified	Yes	Possibly
Industry (1A2)			
Energy efficiency (1A2, 1A4, 1A5)	Not quantified	Unclear	Yes
Transport (1A3)			
None mentioned			
Waste Management (6)			
Landfill gas (6)	Not quantified	Yes	Severe
Agriculture and Forestry			
Lower number of livestock (4A, 4B)	Not quantified	No 1)	No
Introducing advanced practices (4)	Not quantified	No 1)	No
Afforestation (5)	Not quantified	Unclear 2)	No
Total quantified potential	5.36		

1) Problematic monitoring and assessment process
2) Strong national engagement in this sector

Source: Compilation from Hungary 2001; Maly et al. 2002b; REC 2004; US DoE 2004b; Wynne et al. 2003

LCP Directive runs till the end of the first commitment period, so that its impact on JI should be limited.

If there is potential in landfill gas, due to the Landfill Directive options would be reduced to closed landfills and to energy production. Reductions of methane emissions would not be affected, but projects using the landfill gas to produce electricity would probably be connected to the grid and thus be indirectly linked to the EU ETS. The generation of ERUs for the emission reductions resulting from this electricity production would therefore depend on the establishment of a sufficient JI reserve.

The situation regarding district heating and renewable energy projects will be discussed in the conclusions.

POLAND

According to the draft NAP (Poland 2004: 14f), total CO_2 emissions in 2001 were 317.8 Mt. Of these, emissions from combustion installations in the energy sector (1A1) accounted for 166.9 Mt and emissions in the processing industry (1A2) for 64.3, i.e a total of 231.2 Mt. CO_2 emissions from the installations covered by the EU ETS make up 68% of the total national CO_2 emissions, amounting to an average 219.77 Mt per year in the period 1999-2002 (Poland 2004: 20, 33). One can therefore conclude that only about 5% of the two sectors affected by the EU ETS are not covered and that the remaining installations not covered will probably be too small to be viable for JI. Conversely, due to the transitional periods granted the IPPC and especially the LPC Directive are not likely to have an impact on any remaining JI potential.

Since Poland negotiated a transition period till 2012 for the Landfill Directive, the impact on the JI potential, if there is any, should also be limited. If connected to the grid, using landfill gas for electricity purposes would entail an indirect linkage with the EU ETS. However, the draft NAP for the period 2005-2007 establishes a sizable reserve of 9.9 Mt to account for projects and "unidentified other sources" which may yet have to be included in the EU ETS (Poland 2004: 41). One can therefore assume that the reserve in the NAP for the period 2008-2012 will also be sufficient.

The situation regarding district heating and renewable energy projects will be discussed in the conclusions.

SLOVAKIA

According to the draft NAP (Slovak Republic 2004: 7), CO_2 emissions from the installations covered by the EU ETS in 2002 amounted to 26.69 Mt. The draft NAP does not indicate which part of the energy and industry sectors is covered by the EU ETS. According to Slovakia's inventory for 2002, CO_2 emissions from fossil fuel combustion in the energy sector (1A1) amounted to 12.8 Mt, CO_2 emissions from fossil fuel combustion in industry (1A2) to 14.23 Mt amounting to a total of 27.03 Mt. CO_2 emissions from industrial processes were at 3.47 Mt, (UNFCCC 2004: 15, 19). One can therefore estimate that almost every installation of the two sectors affected by emissions trading fall under the EU ETS. Moreover, Slovakia is planning to introduce a complementary national emissions trading system from 2008 onwards which is going to cover part of the installations not covered by the EU ETS (Slovak Republic 2004: 8). One can therefore conclude that nearly all the theoretical JI potential in the energy and industrial sector is going to be covered by one or the other form of emissions trading.

Slovakia also clearly states that emissions trading is the preferred policy instrument and that JI projects should rather focus on sectors not covered by emissions trading and on

Table 6. Overview of Reduction Measures in Poland.

Sector/Measure (IPCC sector in which the respective emission reductions are counted)	Reduction potential (Mt CO_2e p.a.)	Suitable as JI	Accession Impact
Conventional Energy Supply (1A1)			
Switching from coal to gas	60-80	Unclear 1)	Severe
Limit thermal and electric energy losses in transmission to below 20%	Not quantified	Yes	Severe
Rehabilitating 20 GW of installed capacity	Not quantified	Yes	Severe
Renewables (1A1)			
Solar	Not quantified	Yes	No
Wind power up to 1 300 MW installed capacity	2.5 Mt	Yes	No
Geothermal, technical potential 200 to 1.512 PJ p.a.	Not quantified	Yes	No
Biomass, technical potential about 4 000 MWe installed capacity	Not quantified	Yes	No
Renovating or building 1 000 small hydro plants with total capacity of more than 200 MW	1.25	Yes	No
District heating and buildings			
Modernising distribution networks, converting heat-only boilers to CHP, fuel-switch (1A1)	Not quantified	Yes	No
Thermal modernisation of blocks of flats, replacement and additional sealing of windows, changes of the current building thermal protection standards or expanding renewable energy sources (1A4)	8	Yes	Possibly
Industry (1A2)			
"Introduction of climate policy instruments" (NC3)	24	Unclear	Yes
Improving Boilers	Not quantified	Yes	Yes
Energy efficiency	Not quantified	Yes	Yes
Waste Management (6)			
Landfill gas (6)	Not quantified	Unclear 2)	No
Transport			
Decreasing the motorisation growth rate, decreasing mobility, decreasing the economy's transport intensity and decreasing the unit emissions of cargo transport (1A3)	3	No 3)	No
Agriculture and Forestry			
Improving agricultural practices, such as rationalising fertiliser use, increasing humus content in soil, biogas and biofuels (4 & 1A4)	Not quantified	No 4)	No
Afforestation (5)	3 Mt by 2020	Yes	No
Total quantified potential (lower estimate)	98.75		

1) Switch from coal to gas part of government's long-term strategy, liberalisation of energy market will strengthen competitiveness of gas
2) Utilisation of collected gas for power generation supposed to entail negative costs.
3) Monitoring problematic
4) Projects too small

Source: Compilation from EVA 2004b; Maly et al. 2004c; Poland 2001; SEA 2002; REC 2004; US DoE 2004d; Wynne et al. 2003

non-CO_2 greenhouse gases. This probably means that Slovakia is going to be very reluctant to approve JI projects at sources which are directly covered by emissions trading. As for projects which are indirectly connected to emissions trading, the draft NAP for 2005-2007 contains no reserve for JI, though this might change for the period 2008-2012. But for the moment one must probably conclude that projects will indeed be restricted to sources not connected with emissions trading and to non-CO_2 greenhouse gases. In this context, it probably does not even matter that the transition period for the LCP Directive ends in 2007 already.

As for renewables for electricity, one can assume that a large part of this potential will be connected to either form of emissions trading. Availability for JI therefore depends on the establishment of a JI reserve in the NAP for the period 2008-2012.

As for district heating, even if one can conclude from the Polish case (see conclusions) that district heating boilers are mostly not covered by the EU ETS, they might be covered by the complementary system.

BULGARIA

Bulgaria will accede to the EU not earlier than 2007. The NAP will not be developed before that time. One can assume that a significant share of emissions from the energy and industrial sectors is going to fall under the EU ETS and thus will not be available for JI, but the data surveyed does not allow for a concrete estimate. Conversely, since Bulgaria negotiated a transition period till 2011 for the IPPC Directive and until 2014 for the LCP Directive, their impact on the JI potential in the energy and industrial sectors is probably going to be limited, especially when considering that best "available" technology will probably mean a relatively low standard in Bulgaria's case.

Due to the Landfill Directive, JI potential at landfills is restricted to closed landfills and utilisation of landfill gas for energy purposes, but no figures for the corresponding emission reduction potential are available. Moreover, if the energy generated from landfill gas displaces energy from sources within the EU ETS, the viability of projects depends on Bulgaria's establishing a sufficient reserve for indirect linkage in its NAP.

Table 7. Overview of Reduction Measures in Slovakia.

Sector/Measure (IPCC sector in which the respective emission reductions are counted)	Reduction potential (Mt CO_2e p.a.)	Suitable as JI	Accession Impact
Conventional Energy Supply (1A1)			
Increased use of combined cycles	0.8	Unclear 2)	Severe
Fuel switch from coal to gas	Not quantified	Unclear 2)	Severe
Renewables (1A1)			
Increasing solar energy from 163 to 326 TJ	1)	Yes	Possibly
Increasing biomass from 2 to 9 to 10 to 18 per cent	1)	Yes	Possibly
Increasing geothermal energy from 102 to 229 MWt	1)	Yes	Possibly
Increased treatment of animal excrements to biogas up to 20 per cent	1	Yes	Possibly
Solar, technical/market potential	14/1	Yes	Possibly
Wind, technical potential 605 GWh p.a., market potential 150 GWh p.a.	Not quantified	Yes	Possibly
Geothermal, technical potential 8 424 TJ p.a., market potential 4 355 TJ p.a.	Not quantified	Yes	Possibly
Biomass, technical/market potential	30/2.2	Yes	Yes
Hydro, technical potential	8.3	Yes	Possibly
District heating and buildings			
Decrease of energy consumption by 30 per cent through thermal insulation of buildings (1A4)	0.8	Yes	Possibly
Install 320 MW new CHP capacity in buildings (1A1)	Not quantified	Yes	Possibly
Industry (1A2)			
Modernisation of small industrial power plants	Not quantified	Yes	Possibly
Install 480 MW new CHP capacity	Not quantified	Yes	Possibly
Increase use of combined cycles	0.74	Yes	Possibly
Waste Management (6)			
Landfill gas	0.1-0.12	Yes 3)	Possibly
Increasing amount of waste waters from which nitrogen is eliminated	0.2	Yes	No
Transport (1A3)			
Improvements in public transport	0.3	No 4)	No
Agriculture and Forestry			
None mentioned			
Total quantified potential (lower estimate)	16.34		

1) Total: 1.9
2) Energy sector already undergoing major refurbishment and shift from coal to gas
3) Already exhausted by Dutch JI project
4) Monitoring problematic

Source: Compilation from Energy Centre Bratislava / EREC (2004); Maly et al. 2002d; SEA 2002; Slovakia 2001; US DoE 2004d

The situation regarding district heating and renewable energy projects will be discussed in the conclusions.

ROMANIA

Romania will accede to the EU not earlier than 2007. The NAP will not be developed before that time. But given that the largest 25 thermal-electric power plants account for 95% of fossil-fuel generating capacity (US DOE 2004f), it seems likely that a huge part of the energy sector is going to be covered by the EU ETS. The potential emission reductions at power plants and processes in industry are also supposed to be significant, but here as well no figures are given. Again, a significant part of this potential might fall under the EU ETS.

Romania has requested the following transition periods: until 2012 for the LCP Directive, until 2015 for the IPPC Directive and until 2017 for the Landfill Directive. If these requests were granted, the country's JI potential would basically not be affected (EU Commission 2004b: 99f).

As for landfill gas, Romania has requested a transition period till 2017 for the Landfill Directive. But still Government Decision No. 162/2002 introduced the obligation that from 2010 all operating as well as closed landfills will have to extract landfill gas and flare or utilise it, if the latter is economically feasible. From 2010, the JI potential in landfill gas is thus reduced to power generation in cases where it is not feasible without ERU revenue and would have to be assessed on a site-by-site basis. Such projects would probably be connected to the grid and thus be indirectly linked to the EU ETS. They therefore depend on the establishment of a sufficient JI reserve.

Cross-Cutting Impacts and Conclusions

Our analysis shows that potentials for reducing greenhouse gas emissions in Central and Eastern European countries are substantial. The largest and most cost-effective emission reductions can be found in the waste sector and in the power sector of the analysed countries. Further large potentials are in district heating systems, renovation of dwellings, and expansion of renewable energy.

However, the interplay of the introduction of the EU ETS in the countries acceding to the EU and the baseline and double counting provisions of the Linking Directive significantly reduces the JI potential in the Central and Eastern European countries:

Table 8. Overview of Reduction Measures in Bulgaria.

Sector/Measure (IPCC sector in which the respective emission reductions are counted)	Reduction potential (Mt CO_2e p.a.)	Suitable as JI	Accession Impact
Conventional Energy Supply			
One less lignite fired unit in TPP Maritza East 1 (1A1)	1)	No	No
Energy export kept at annual 4 200 Gwh (1A1)	1)	No	No
Units 3 and 4 of Kozloduy NPP decommissioned according to technological lifetime (1A1)	1)	No	No
No new power production units running on imported coal (1A1)	1)	No	No
Developing natural gas household network (1A4)	2)	Yes	No
Rehabilitation and upgrading of existing plants (1A1)	Not quantified	Unclear 3)	Severe
Small co-generation (1A1 / 1A2 / 1A4)	Not quantified	Yes	No
Fuel switching (1A1 / 1A2 / 1A4)	Not quantified	Unclear 4)	Severe
Renewables (1A1)			
New 100 MW HPP Tzenov Kamak	1)	No	Possibly
Doubling renewable capacity to 160 MW	1)	Yes	Possibly
Solar	Not quantified	Yes	Possibly
Wind, technical potential	4.5	Yes	Possibly
Geothermal, unexploited potential of 14 122 TJ p.a.	Not quantified	Yes	Possibly
Biomasss, technical potential 30 000 GWh, economic potential 3 000 to 7 500 GWh p.a.	Not quantified	Yes	Possibly
Large hydro, technical potential 15 TWh p.a.	54 in 2008-2012		Possibly
Increasing small hydro capacity to 180 MW in 2010 and 520 MW in 2020	13 by 2020	Yes	Possibly
District Heating and Buildings			
Rehabilitation of plants, expansion of CHP, rehabilitation of distribution networks (1A1)	0.25	Yes	No
Energy efficiency in buildings (1A4)	2)	Yes	Possibly
Industry (1A2)			
Energy efficiency, not further specified	2)	Yes	Yes
Replacement or rehabilitation of boilers	Not quantified	Yes	Possibly
Waste Management (6)			
Unspecified measures according to NC3	2)	Unclear	Unclear
Landfill gas	1	Yes	Severe
Transport (1A3)			
None mentioned			
Agriculture and Forestry			
None mentioned			
Total quantified potential	About 32		

1) Total: 6
2) Total: 10-15
3) Major refurbishment already underway
4) Shift away from coal does not seem to be politically feasible

Source: Compilation from Bulgaria 2002; EVA 2004c; Lako et al. 2003; SEA 2002; US DoE 2004e; Wynne et al. 2003

- This holds true especially in the *energy and industry sectors*, CO_2 emissions of which are almost totally subject to the EU ETS[1]. Even in those countries which have negotiated generous transition periods the fact remains that most emissions from these two sectors will be covered by the EU ETS. JI projects within the EU ETS are in theory still possible, but are in competition with the EU ETS. Moreover, the Czech Republic and Slovakia do not seem to be favourably disposed towards allowing such projects.
- JI potentials among the extensive potential for emission reductions in the *waste sector* are affected directly by the implementation of the Landfill Directive which renders most of the potential to be baseline.
- *Renewable electricity projects* connected to the EU ETS will depend on the establishment of sufficient reserves in the NAPs to be viable. The sources surveyed do not allow an estimate of which part of potential projects will feature indirect linkage. But one can assume that electricity generation projects which are large enough to be viable for JI will for the most part probably be connected to the grid. The same applies to landfill gas projects generating electricity, which in four of the countries considered is the only remaining JI option in the waste sector.
- *Energy efficiency projects* and smaller renewable energy projects typically do not reach critical size to be viable for JI. Their establishment will thus depend on instruments to bundle projects. If these succeed, they might make up a significant share of the remaining potential available for JI in the countries analysed.

1. With exemptions for process firing in the chemical industry.

Table 9. Overview of Reduction Measures in Romania.

Sector/Measure (IPCC sector in which the respective emission reductions are counted)	Reduction potential (Mt CO_2e p.a.)	Suitable as JI	Accession Impact
Conventional Energy Supply			
Improving efficiency or switching fuels from lignite to natural gas in electricity generation. (1A1)	Not quantified	Unclear 2)	Severe
Upgrading the natural gas network (1B / 1A4)	Not quantified	Yes	No
Upgrading the electricity network (1A1)	Not quantified	Yes	Severe
Increase number of cogeneration plants up to a capacity of 455 MW (1A1 / 1A2)	1)	Yes	Yes
Renewables (1A1)			
Solar, technical potential 60 PJ, 1.86 GWh per year from photovoltaics by 2010	Not quantified	Yes	Possibly
Wind, technical potential 3 000 MWe installed capacity, government target 200 MWe by 2010	Not quantified	Yes	Possibly
Geothermal, proven reserves 200 PJ	Not quantified	Yes	Possibly
Multiply biomass' share of total primary energy consumption by five	Not quantified	Yes	Possibly
Hydro, technical potential	20	Yes	Possibly
Finish 35 stalled large-scale hydropower projects with total capacity of 1 400 MW and realise small-scale hydro potential of 1 060 MW	4	Yes	Possibly
District heating and buildings			
Upgrading the district heating system (1A1)	10	Yes	No
Improve thermal insulation of all new flats supplied with heat from centralised sources, reduction of demand by 11.1 GWh per year and residence (1A4)	1)	Yes	No
Reduction of maximum hourly heat demand by 8 per cent for 100 000 existing residences and 28 per cent for another 100 000 existing residences. (1A4)	1)	Yes	No
Industry (1A2)			
Energy efficiency improvements at small boilers	Not quantified	Yes	Yes
Energy savings, potential 20% in cast iron production, 20% in steel production in electrical furnaces, 10-30% in ammonia production, 15-30% in sodium hydroxide production, 12-50% in the petrochemical industry and 25-45% in pulp and paper industry	Not quantified	Yes	Yes
Modernise installations	1)	Yes	Yes
Increase average energy intensity to 2.09 kg ce/$, with energy demand at 33.5 x 10^6 tce	1)	Yes	Yes
Waste Management			
Collect and utilise landfill gas (6)	3-4	Yes	Severe
Transport (1A3)			
Reduction of transport of goods as result of industrial restructuring	1)	No 3)	No
Increase fuel efficiency of vehicle fleet	1)	No 3)	No
Improve public transport	1)	Yes	No
Agriculture and Forestry			
Improve nutrition quality of animal feed (4A)	Decrease by 5-10% 1)	No 4)	No
Improve use of nitrogen fertilisers (4D)	Decrease by up to 25% 1)	No 4)	No
Reduce energy consumption in greenhouses by 3 per cent through modification and retrofitting (1A4)	1)	No 4)	Possibly
Optimise use of agricultural machines through unification of fields and re-organisation of activity and thus lower fuel demand by 15 per cent (1A4)	1)	No 3)	No
Modernise livestock farms in order to reduce electricity demand by 8 per cent, heat demand by 8 per cent and fuel demand by 10 per cent (1A4)	1)	No 4)	Possibly
Increase forest area from 100 000 to 190 000 ha and optimise structures (5)	1)	Yes	No
Total quantified potential	77		

1) Total: 40
2) Shift away from lignite does not seem to be politically feasible
3) Monitoring problematic
4) Project size too small

Source: Compilation from REC 2004; Romania 1998; SEA 2002; US DoE 2004f; Wynne et al. 2003

- Projects in *district heating* are considered to entail substantial emission reduction potential. According to REC (2004: 257), the situation in Poland is such that most boilers are below 20 MW and thus not covered by the EU ETS. JI potential should therefore not be much affected by the EU ETS, neither directly nor indirectly. Since the former socialist countries tend to be rather similar in their basic infrastructures, the same probably also holds for the other countries considered, except for Slovakia with its complementary emissions trading system.
- Projects in the *transport, agriculture and forestry sectors* do not seem to be affected by EU Accession.

Given that emissions from installations falling under the EU ETS account for 50% or even more of total national emissions and also taking into account the reduced JI opportunities in the landfill area, one can estimate that about half of the JI potential in the Accession Countries has been or will be removed by EU Accession. The data surveyed does not allow for a quantitative estimate. Interestingly, landfills seem to be the only areas that are directly impacted by the *acquis communautaire*. The other directives considered mainly address the energy and industry sectors, which are mostly removed from JI by the EU ETS anyway.

However, one should note that it was always clear that the Central and Eastern European countries were going to join the EU and thus would have to adopt the *acquis communautaire* and participate in EU emissions trading. Many of the *acquis communautaire*'s requirements have in fact already been implemented in the Accession Countries. Therefore, any hopes for JI that may have been dashed now – by the adoption of the Linking Directive – were rather false hopes to begin with. Moreover, from the environmental point of view the introduction of general high standards is vastly preferable to the implementation of individual projects with high standards while the general situation remains one of low standards.

On the downside, the displacement of JI in the energy and industry sectors by the EU ETS might perhaps backfire. It is as yet unclear in how far JI in general will contribute to technology transfer and efficiency improvements in the host countries, but it just might. Conversely, the current NAPs are very generous and it seems that the same will hold for the period 2008-2012. The EU ETS's stimulus for investments will therefore probably be limited. As a consequence, an instrument that might have contributed to increasing energy efficiency and emission reductions in the Accession Countries has been replaced by an instrument that at the moment seems rather likely not to contribute, unless allocation becomes much more stringent in the future.

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