Joint Implementation: a frontier mechanism within the borders of an emissions cap

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JOINT IMPLEMENTATION: A FRONTIER MECHANISM WITHIN THE BORDERS OF AN EMISSIONS CAP

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Based on specific projects rather than economy-wide emissions reductions, and driven by the demand from the installations covered by the European Union Emissions Trading Scheme (EU ETS), Joint Implementation (JI) turned out to be a largely private sector mechanism. Besides attracting private investors in GHG abatement projects, JI creates an opportunity for countries to exploit the arbitrage price spread between different carbon offsets: Emission Reduction Units (ERU), the credits issued from JI projects, trade with a premium of up to 50% over Assigned Amount Units (AAU), the country-level carbon allowances. Some countries, like for instance Ukraine, quickly realized the added value of JI and boosted its development, while in others, like Russia, JI lacked political support and efficient frameworks took time to be established.

According to the ERU supply forecasting model developed by CDC Climat Research, Annex I countries are expected to generate up to 356 million ERUs for the first Kyoto commitment period. Around 80% of these credits shall originate from Russia and Ukraine, and up to 70 million shall be generated from countries participating in the EU ETS. Within the EU, JI has been used as a "frontier mechanism": JI projects mostly explored abatement opportunities not covered by the scheme and, as highlighted by the case of nitrous oxide emissions from the production of nitric acid, played an important role in identifying abatement technologies and providing information to extend the scope of the EU ETS.

One of the most complex issues related to JI is the practice of additionality. The cases of France and Ukraine demonstrate that the stakes associated with additionality may differ depending on a country's compliance position. In Ukraine, additionality was not perceived as a significant economic risk due to a large anticipated AAU surplus, which, however, turns it into a threat to the environmental integrity of the mechanism – as is the case for the Clean Development Mechanism (CDM) – unless a stringent additionality screening is performed. In France, on the other hand, additionality was perceived as a threat to the treasury due to the uncertain compliance position of the country. In that case, additionality becomes more a matter of economic efficiency than environmental integrity.

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INTRODUCTION

The existing international climate regime, set up by the Kyoto Protocol, follows the principle of "common but differentiated responsibilities" (Kyoto Protocol, 1997): all countries commit to the reduction of greenhouse gas (GHG)[4] emissions, while the developed nations take the lead by setting binding emissions reduction targets. These targets are formalized as national GHG emission budgets consisting of Assigned Amount Units (AAU). In order to maximize the economic efficiency of GHG abatement, countries can choose to increase their budgets by purchasing AAUs from other developed countries through International Emissions Trading (IET), or carbon credits through two project-based offset mechanisms that were created under the Kyoto Protocol – the Clean Development Mechanism (CDM) and Joint Implementation (JI).

There have been numerous publications with regards to the CDM, while JI, with a few exceptions, remained out of scope of the researchers' interest, mainly due to its marginal share – until recently – in international carbon trade. However, the quantitative importance of JI is growing: by January 31st, 2012, the scheme had generated 119 million Emission Reduction Units (ERU) – that is 12% of the Kyoto offsets issued so far (UNEP Risoe, 2012), and this number is expected to reach 356 million – or around 20% of the Kyoto offsets – by April 30th 2013 (Figure 7). Moreover, the reform of the CDM and JI is currently underway and the new offset mechanisms – REDD+[5], bilateral agreements, etc. – are burgeoning, which requires consolidation of prior knowledge and experience.

In light of the Durban conference, it can be expected that more and more countries shall adopt GHG emission caps in the future and JI, as a project-based mechanism in a capped environment – that is in a country which has adopted a national cap on emissions, can provide a useful basis for new frameworks. With the end of the first Kyoto commitment period (CP1) approaching, it is high time to look back and re-evaluate the experience with JI and better understand the specifics of this mechanism. The goal of this report is to derive lessons from the theory and practice of JI that can be used in the future by policymakers and businesses.

The first part of the report examines the way JI works and how it differs from the CDM. The economic and environmental rationale behind it is discussed, making several hypotheses that are tested later.

The second part analyses the quantitative aspects of JI including its performance to-date and the outlook into the future. A model is developed in order to estimate the potential supply of carbon credits from JI projects by the end of the first Kyoto commitment period, accounting for under-delivery risk and country-specific contexts.

The third part examines the qualitative aspects of JI, namely the issues of environmental integrity, double-counting, perceived competition with domestic climate policies, as well as various ways the mechanism has been used so far. Several case studies are presented in this part, which helps derive lessons from experiences in different countries.

The research methodology is presented in appendices 1 and 2.

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[4] The GHGs covered by the United Nations Framework Convention on Climate Change (UNFCCC) are: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3) – the latter was added in December 2011. Since the greenhouse potential of each gas is different, in order to make them comparable, the amount of each gas is expressed in CO_2 equivalent (CO_2e).

[5] REDD+ extends the REDD (Reducing Emissions from Deforestation and Forest Degradation) mechanism by including sustainable forest management, conservation of forests and enhancement of carbon sinks.

I. Opportunities and pitfalls of Joint Implementation

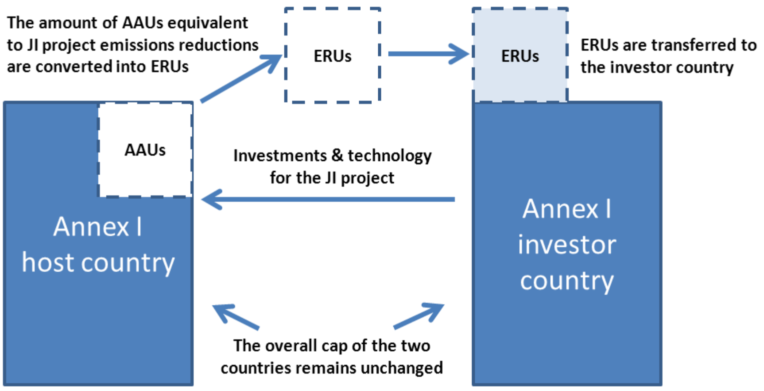
A. Background: the role of JI within the Kyoto Protocol

The Kyoto Protocol, which was adopted in 1997 and entered into force in 2005 with its ratification by Russia[6], is the first and so far the only attempt to tackle the issue of anthropogenic climate change at a global level. The Kyoto Protocol established GHG emission reduction targets for 37 developed countries and economies in transition – Annex I parties[7] to the UNFCCC – which pledged to reduce their total GHG emissions during the first Kyoto commitment period (2008-2012) by an average 5% compared to the 1990 baseline, although individual countries' commitments were differentiated. In order to help reduce the overall cost of meeting these targets, three flexibility mechanisms were introduced by Articles 17, 12 and 6 of the Kyoto Protocol respectively (Kyoto Protocol, 1997):

- *International Emissions Trading* (IET) allows Annex I countries to trade their Assigned Amount Units (AAU) – emission allowances that correspond to their Kyoto targets as a unit-based transaction.
- *Clean Development Mechanism* (CDM) allows the generation of Certified Emission Reductions (CER) from emission reduction projects hosted in non-Annex I (developing) countries. CERs can then be used by Annex I countries to offset part of their emissions, thus helping them to comply with their Kyoto targets.
- *Joint Implementation* (JI) allows Annex I countries to trade Emission Reduction Units (ERU) that are generated through emission reduction projects in other Annex I countries. ERUs can also be used for compliance under the Kyoto protocol.

As the name "Joint Implementation" suggests, the emission reductions from a JI project are supposed to be achieved "jointly" by two Annex I countries. Since both parties involved in JI are countries with emission caps, each ERU generated by a JI project has to be converted from one AAU of the host country, thereby maintaining the overall Kyoto emissions cap at the same level (Figure 1).

Figure 1 – JI scheme



Source: CDC Climat Research

JI enables investments into concrete emissions reduction projects, rather than trading an abstract amount of AAUs from one country to another in the ca se of IET. This feature represents the principal similarity of JI to the CDM that provides for investments into concrete projects in non-Annex I countries.

[6] In order for the Kyoto Protocol to enter into force, at least 55 Annex I countries, responsible for at least 55% of the GHG emissions of all Annex I countries in 1990, had to be covered by instruments of ratification. After the withdrawal of the US from the Kyoto Protocol, its ratification by Russia was decisive for reaching this threshold.

[7] Annex I refers to the annex to the UNFCCC, while Annex B refers to the annex to the Kyoto Protocol with Annex I countries that adopted quantified emission reduction or limitation commitments under the Kyoto Protocol. Both annexes are largely similar and include developed countries and economies in transition. JI can be used by Annex I countries, while the AAUs are assigned to the Annex B countries. In order to avoid confusion only the term "Annex I" will be used throughout this report.

B. Legal framework evolution

The Kyoto Protocol set up the general principles of the flexibility mechanisms – Article 6 for JI, Article 12 for the CDM and Article 17 for IET – while the technical details and procedures were further elaborated through subsequent climate negotiations. The most notable package of rules was established at the seventh Conference of the Parties to the Kyoto Protocol (COP7) in Marrakech, and is therefore often referred to as "Marrakech Accords" (Jung, et al., 2008). The COP7 established *inter alia* the Guidelines for the implementation of Article 6 of the Kyoto Protocol (UNFCCC, 2002), i.e. procedures for JI. These rules were confirmed at the first Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP1) at Montreal in 2005 which also saw the creation of the Joint Implementation Supervisory Committee (JISC) – the UNFCCC body in charge of supervising the mechanism (UNFCCC, 2006).

Two tracks

There are two possible procedures, known as JI Tracks, for the development of JI projects.

JI Track 1, often referred to as a simplified procedure (Elsworth, et al., 2010), allows a country to determine JI project proposals, verify emission reductions and issue ERUs without the international oversight of the JISC. Under Track 1 a country is free to establish its own JI procedures, which creates a risk of discrepancy between different countries' levels of stringency with regards to the determination of JI projects and the issuance of ERUs. In practice however, most countries showed the willingness to chime with the Track 2 procedures including the use of independent auditors for determination of projects and verification of emissions reductions. The third part of the report will present *inter alia* the differences in the Track 1 procedures established by Russia and Ukraine.

JI Track 2 involves international oversight by the JISC over the determination of JI projects, the verification of emission reductions and the issuance of ERUs. Independent auditors accredited by the JISC, the Accredited Independent Entities (AIE), determine whether a candidate JI project meets the requirements set out by Article 6 of the Kyoto Protocol as well as the guidelines for implementation of this article (UNFCCC, 2006) and verify its emission reductions. As an oversight body, the JISC can request a review of the determination of a JI project or of the verification of emission reductions thus adding an extra layer of international scrutiny.

JI Track 2 was initially envisaged to be used for economies in transition that were expected to have difficulties in establishing "national systems" and achieving eligibility to Track 1 in a timely manner. Nevertheless, most countries, including Ukraine and Russia, were eligible to Track 1 as early as 2008 (UNFCCC, 2011b), Russia being the fourth country in the world to connect to the International Transaction Log (ITL, the UNFCCC registry for emission trading credits such as AAUs, CERs and ERUs) after Japan, New Zealand and Switzerland (UNFCCC, 2011a).

In order to qualify for Track 1, a country has to submit to the UNFCCC its national JI procedures and indicate the Designated Focal Point (DFP)[8] in addition to meeting a set of eligibility requirements (UNFCCC, 2006), namely:

a) It is a Party to the Kyoto Protocol;

b) its assigned amount has been calculated and recorded;

c) it has in place a national system for the estimation of anthropogenic GHG emissions;

d) it has in place a national registry;

e) it has submitted the most recent required inventory of its GHG emissions to the UNFCCC;

f) it submits the supplementary information on the assigned amount to the UNFCCC.

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[8] DFP is responsible for the approval of JI projects in the host country.

All criteria are assessed yearly by a team of experts accredited by the UNFCCC. Provided that the basic requirements demonstrating a country's ability to make transfers out of its carbon registry – i.e. criteria (a), (b), and (d) – are fulfilled, a Party can issue and transfer ERUs under Track 2.

A failure of the national system (criterion c) is the most frequent cause of temporary ineligibility to Track 1. Cases of failure of the national system include inability to perform certain functions by the national system, inconsistency between the submitted inventory and the relevant IPCC guidelines and an apparent lack of expertise, availability or coordination in the inventory team. As of January 2012, four countries – Croatia, Romania, Ukraine and Lithuania – were suspended from JI Track 1 (UNFCCC, 2011b).

As of January 31st, 2012, there were 277 registered Track 1 projects – with 106 million ERU issued – and 37 registered Track 2 projects – with 13 million ERU issued – (UNEP Risoe, 2012). The development of Track 2 was impeded due to three main factors:

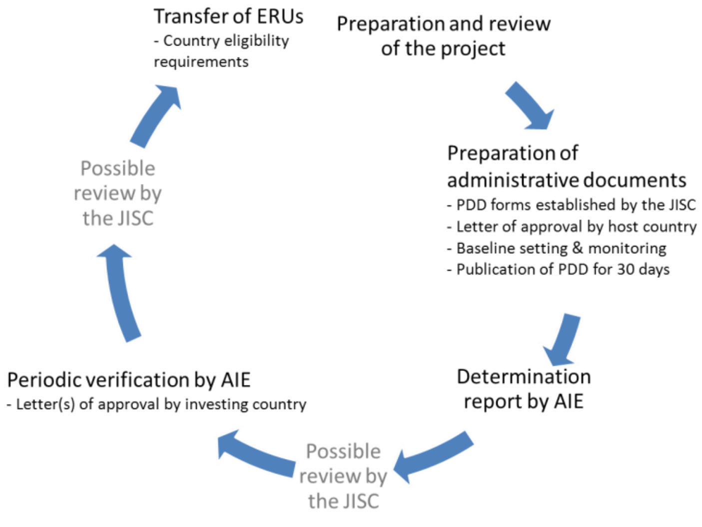
- Project developers perceived Track 2 procedures as more time consuming and risky – due to additional oversight by the JISC – without any added value compared to Track 1;
- fees for processing the verification reports[9] that did not apply to Track 1 until 2011;
- lack of AIEs: [10] in 2010 there were only four of them (JISC, 2010).

In order to tackle the issue of AIEs, the JISC adopted the revised procedures aimed at simplification of the accreditation process and streamlining it with that of the CDM (JISC, 2011b p. 2). Regarding the fee, the new provisions allow the JISC to charge a Track 1 registration fee of USD 20,000 for each large-scale project and USD 3,000 for each small-scale project (JISC, 2011a)[11].

Project lifecycle

The JI project lifecycle is fairly similar to that of a CDM project (Figure 2).

Figure 2 – JI project lifecycle



Source: adapted from World Bank, 2007

[9] Track 2 projects have to make an advance payment for the processing of their verification reports in the amount based on their annual expected emission reductions: USD 0.10 for the first 15,000 tCO_2e and USD 0.20 for any amount in excess of 15,000 tCO_2e (JISC, 2011a).

[10] AIEs had to be accredited separately, even if they had already been accredited for the same tasks under the CDM.

[11] According to Provisions for JI SSC projects, there are three types of small-scale projects (JISC, 2009): "(a) renewable energy projects with a maximum output capacity of up to 15 MW, (b) energy efficiency improvement projects which reduce energy consumption on the supply and/or demand side, by up to 60 GWh per year, (3) other projects that result in emission reductions of less than or equal to 60 Kt CO_2e"

the main stages including: the preparation of the Project Design Document (PDD), its determination by the AIE, the monitoring of emission reductions, the verification of the monitoring reports by the AIE, the issuance and transfer of ERUs.

Unlike the CDM EB, which has a Methodology Panel dedicated to the validation of methodologies, the JISC relies on AIEs for checking the baseline setting and monitoring approach of a project together with the project itself. JI projects may choose to employ one of the following options with regards to the approach for baseline setting and monitoring (JISC, 2011c):

- a JI specific approach developed according to JI guidelines;
- a methodology approved by the CDM EB;
- a JI specific approach that was already approved for similar determined JI projects.

Regarding the additionality demonstration, projects are allowed to choose one of the following approaches (JISC, 2011c):

- proving that the baseline was set conservatively and that the project is not part of the baseline scenario;
- employing a JI specific approach that was already used by determined projects;
- using the "tool for the demonstration and assessment of additionality" approved by the CDM EB.

These provisions highlight the tendency towards a "case law" for JI Track 2, i.e. a JI specific approach, once used in a determined and registered project, can be cited as a precedent and thus be allowed for use in the future.

Under Track 1, procedures may vary from country to country, although most countries – especially the EU member states – foresee similar procedures to that described above. Examples of the evolution of country-specific frameworks in Russia and Ukraine are presented in the third part of the report. In a longer term perspective the JISC recommends the establishment of a single JI track that would combine the simplicity of procedures with international transparency (JISC, 2011d).

Post-2012 uncertainty

Being a mechanism for the capped environment – that is in a country which has adopted a national cap on emissions, JI is exposed to the uncertainty related to the post-2012 climate regime. The COP17, that took place in Durban in December 2011, saw an agreement on the continuation of the Kyoto Protocol into the second commitment period (CP2) until 2017 or 2020, eliminating the risk of a "gap" period.[12] However, Annex I countries are yet to set their emissions reduction commitments by May 2012 and adopt them at the next COP in Doha in the late 2012 (Morel, et al., 2011), leaving them with tight deadlines. Establishing the AAU budgets for the second commitment period is crucial for the issuance of ERUs from JI projects. Should Annex I countries fail to adopt their Kyoto targets before 2013, there will be a period when ERUs cannot be issued. At its meeting in September 2011 the JISC recommended the CMP to allow either post-2012 issuance of ERUs from the surplus AAUs remaining from the first commitment period or the issuance of ERUs that will be later deducted from the future commitments (JISC, 2011d). These steps were proposed to deal with the anticipated gap between Kyoto commitment periods, but they can also be used as a transition measure in case Annex I countries will delay establishment of their AAUs beyond 2012.

It is worth mentioning that the Article 24a of the EU ETS Directive provides for a possibility to develop an offset instrument, which could substitute JI. Such an instrument could help tapping into emission reductions in sectors not covered by the EU ETS even if the second Kyoto commitment period does not take place (Unger, et al., 2011).

[12] The "gap" period referred (before the COP17) to the possible gap between the two commitment periods in the absence of the international agreement.

Besides uncertainty with the quantitative targets, three major countries announced their unwillingness to participate in the CP2. Russia – potentially the largest JI host country – so far has not committed to the CP2 making the continuation of its JI projects unlikely, unless the government reviews its decision[13]. Japan – one of the biggest buyers of Kyoto offsets – also announced non-participation in the CP2, while Canada decided to withdraw from the Kyoto Protocol completely in order to avoid the costs related to non-compliance with its emissions reduction targets for the CP1.

The uncertainty regarding the post-2012 climate regime, which was reduced but not fully eliminated at the COP17 in Durban, is one of the factors that hindered investments in JI projects.

C. Environmental integrity

The environmental justification of the JI mechanism, similar to other offset mechanisms, rests on the observation that GHGs have a global impact on the climate, as they mix uniformly in the atmosphere. Thus the geographical locations of both emission sources and projects for emissions reduction are irrelevant to their impact on the global climate. Offset projects may have other consequences than the reduction of GHG emissions, and some of their impact may be very local, such as social co-benefits to local communities or local ecological improvements. However, this research will focus primarily on GHG emission reductions, since that is the main objective of flexibility mechanisms such as JI.

As far as environmental integrity is concerned, it is important to differentiate between three main mechanisms to trade the allowances or credits assigned under the Kyoto Protocol among Annex I countries:

- *International Emissions Trading (IET)*, i.e. a country directly purchasing AAUs from another country. In the absence of tight emission caps it is hard to verify the nature of the emission reductions, which might make the direct AAU trading dubious from the environmental point of view. Some countries – mostly Eastern Europe – obtained large amounts of assigned units, which allow them to remain in confortable AAU surpluses (Appendix 5) even while increasing their GHG emissions. This is a result of the contraction of their economies that followed the collapse of the Soviet Union, which brought their GHG emissions far below the 1990 baseline (on which their AAUs had been based). These surpluses are often dubbed as “hot air” (Böhringer, et al., 2007), since they were attained without any targeted actions or climate policies.
- *The Green Investment Scheme (GIS)* was introduced in order to tackle the issue of large AAU surpluses. The idea underlying the GIS can be described as “greening the hot air”. Under the GIS, the revenues obtained by a country from the sale of its AAUs, have to be invested in domestic environmental projects, aimed at the reduction of GHG emissions (Tuerk, et al., 2011). The GIS is therefore supposed to link the surplus AAUs to tangible emission reductions, although not necessarily preserving the ratio of one AAU for one ton of CO_2e avoided.
- *Joint Implementation*, unlike IET or the GIS, requires investments into concrete GHG emissions reduction projects. This scheme delivers credits – the ERU obtained through the cancellation of allowances, the AAU – the origin of which can be tracked through a serial number. Unlike simple IET or even GIS, JI ensures that each carbon credit corresponds to one ton of CO_2e avoided.

An important issue concerning the environmental integrity of JI is the concept of additionality. Similar to the CDM, a JI project is supposed to yield GHG emission reductions that are additional to those that would otherwise occur (Kyoto Protocol, 1997). It is, however, important to understand the difference between the CDM and JI in this respect. The additionality criterion is crucial for the environmental integrity of CDM projects, since they generate new carbon credits, thus increasing the overall emissions cap of Annex I countries. In contrast, JI projects generate ERUs that are converted from AAUs, so that the total cap remains unaltered.

[13] Both business and NGOs are lobbying for reconsidering Russian position with regards to the second commitment period.

Thus, the question of additionality treatment depends on the initial allocation of emissions rights. For Annex I countries with tight caps and fully committed to meet them, the additionality requirement in JI is not be as important as in the CDM from an environmental perspective. The stakes associated with additionality are further discussed on the examples of France and Ukraine in the third part of the report.

D. Economic rationale: private sector involvement and spillover benefits

The underlying idea behind the JI mechanism and the whole concept of carbon markets in general, is based on the classic Ricardian principle of comparative advantage[14]. Similar to conventional markets, which allow countries to obtain mutual economic benefits from international trade, the market for carbon credits is supposed to redirect investment flows between Annex I countries in order to ensure the achievement of GHG emissions reduction targets at the lowest overall cost. For example, certain countries and sectors may provide cheaper abatement opportunities compared to others. In a Ricardian sense, such countries or sectors should exploit their comparative advantage at "producing emission reductions" and trade them for other goods or services. The third part of the report provides examples of countries such as Ukraine which abode by this type of analysis, and examples of other countries such as France which initially took a different perspective.

At the first glance, the JI mechanism might appear more complex than IET for a comparable economic benefit, namely a carbon unit. However, there are several important differences that make JI more economically attractive compared to simple AAU trading.

First, in the long-term perspective JI fosters the transfer of the most efficient clean technologies and know-how, thus contributing to capacity building and increasing the long term climate change mitigation potential of the host country (World Bank, 2007). This is particularly important for countries with transition economies, such as Russia, Ukraine and other Eastern European countries that need to boost innovation in order to modernize their economies.

Second, JI provides the framework for transferring the incentive from country to project – that is often company – level. Thus, JI enables not only the countries but also the enterprises, which have mastered green technologies in a given sector, to capitalize on their expertise and to provide their know-how for projects in other countries for a profit. Such specialization helps maximize mutual economic gains from the international carbon trade under the Ricardian principle of comparative advantage (Leguet, 2011).

Third, investing in a concrete project with a pre-defined perimeter makes it easier for a foreign investor to evaluate and hedge investment risks. The financing structure of JI might allow projects to obtain upfront capital investments through the forward sale of the expected ERUs (see section III.F). However, such arrangements have not become a common practice, as the payments are usually processed against the delivery of the ERUs and the investor has to first raise funds somewhere else in order to launch the project. It can also be argued that the incentive created by the potential sale of ERUs could help implement the abatement measures earlier than in the absence of JI making them "additional". Indeed, the countries with transition economies might lack sufficient capital to immediately implement even economically attractive measures (Korppoo, et al., 2008).

Finally, as a bottom-up mechanism, JI "activates the search function" of the private sector, providing information on abatement technologies and filling in the gaps in the existing climate policies (Geres, 2010). In the third part of the report, these implications of JI are tested on the example of the nitrous oxide emissions from the production of nitric acid.

[14] The theory of comparative advantage was first put forward by David Ricardo in his book "On the Principles of Political Economy and Taxation" (1817). Ricardo argued that the free trade enables countries to achieve economic gains through specializing in the industries where they have comparative advantage in production costs.

E. JI and the EU ETS: an arbitrage opportunity

JI was initially designed as an instrument aimed at helping Annex I countries achieve their Kyoto targets. Indeed, before 2005 the only significant investors were the Dutch Government and the World Bank (O'Brien, 2011). The emergence of the EU ETS – the emissions trading system between the very installations responsible for GHG emissions within the EU – quickly led to JI evolving into a mechanism that largely involves private sector. The link between the EU ETS and Kyoto offsets is regulated by the so-called "Linking Directive" (Directive 2004/101/EC, 2004). Under this directive the installations covered by the scheme may surrender carbon offsets generated by CDM and JI projects – CERs and ERUs (but not AAUs) – up to a limit set by each country's National Allocation Plan (NAP). The aggregated limit for the use of Kyoto offsets is close to 1.4 billion tons of CO_2e that is around 14% of the overall emissions cap of installations covered by the EU ETS for the period of 2008-2012 (Elsworth, et al., 2010).

Besides the quantitative limit on the use of Kyoto offsets in the EU ETS, several qualitative restrictions apply to both CER and ERU credits (Directive 2004/101/EC, 2004):

- Carbon credits generated by nuclear facilities are not eligible;
- carbon credits generated by land use, land-use change and forestry (LULUCF) projects are not eligible;
- large hydro-power projects (exceeding 20 MW) have to comply with international environmental and social regulations under the World Commission on Dams to be eligible.

Further qualitative restrictions will enter into force as of the beginning of the third phase of the EU ETS (2013-2020) banning the following types of credits:

- carbon credits from projects involving the destruction of HFC-23 and N_2O from the adipic acid production;
- carbon credits from projects registered after 2012 in countries other than Least Developed Countries (LDCs).[15]

The use of Kyoto credits from CDM and JI projects under the EU ETS is therefore subject to qualitative and quantitative restrictions which do not apply to European Union Allowance Units (EUA)[16]. This, together with a higher perceived delivery risk for CERs than EUAs, explains most of the difference between the prices of these assets (Mansanet-Bataller, et al., 2010). Since ERUs have similar status under the EU ETS as CERs, it can be concluded that the same factors – uncertainty related to restrictions under the EU ETS and delivery risk – explain the lower price compared to EUAs (Appendix 3). ERUs, however, are traded with a slight discount versus CERs. This spread could previously be explained by low volumes of issued ERUs and hence lower liquidity compared to CERs. However, with the growing issuance in Russia and Ukraine the spread can be expected to tighten.

Linking Kyoto project-based mechanisms to the largest regional emissions trading system resulted in the increased demand and, hence, higher prices for ERUs compared to AAUs. Given that the United States, which were expected to become the major buyer of surplus allowances, failed to ratify the Kyoto Protocol, that Canada abandoned its Kyoto targets[17] and that the EU *de facto* does not purchase surplus AAUs from Russia and Ukraine (although does some from other EU countries), the only major buyer of AAUs is currently Japan. This results in a demand that is very low compared to available surpluses and much more concentrated than the demand for ERUs from the EU ETS that involves hundreds of companies in the scheme. Besides, ERUs, being linked to the EU ETS, are liquid enough to justify standard contracts on carbon exchanges, such as BlueNext and ECX, while AAUs are not listed on these exchanges. Hence

[15] In case of a new international agreement, the EU ETS will accept credits only from those countries that have ratified it. This provision, however, would not amend the limitation to credits from LCDs for projects registered in 2013 onwards, as it is explained on the website of the Commission (see question 14 at http://ec.europa.eu/clima/policies/ets/linking/faq_en.htm)

[16] EUAs are carbon units that are assigned or auctioned to installations under the EU ETS.

[17] Canada officially announced its withdrawal from the Kyoto Protocol in December 2011

the liquidity for AAUs is very low. A good illustration is the latest auction in Slovakia, which took place in October 2011 and ended with no bids despite the fact that the AAUs were "greened", i.e. backed by the GIS, and the floor price was 5.4 euros (Szabo, 2011), i.e. significantly lower than the price of ERUs, which averaged 7.2 euros in October 2011 (Table 1). It was also reported that by October 2011 AAUs were traded as low as 4 euros (Szabo, 2011).

The above-mentioned factors explain that the market price of EUAs is higher than ERUs, which are in turn more expensive than AAUs, although theoretically they all represent the same underlying asset – the right to emit one ton of CO_2e. The qualitative features that influence the price of the three types of carbon assets are summarized in Table 1.

Table 1 – Comparison of carbon assets[18]

	AAU	ERU	EUA
Supply	Fixed	Variable	Fixed
Demand	Low and restricted	High and restricted	High and unrestricted
Uncertainty	High	High	Low
Perceived delivery risk	Low	Medium	Low
Liquidity	Low	High	Very high
Compliance	Kyoto	Kyoto and EU ETS	EU ETS
Average price (October 2011)	EUR <5.4	EUR 7.2	EUR 10.3

Source: CDC Climat Research

While the spillover effects of JI, such as the technology transfer and capacity building, represent long-term benefits, the difference in prices and liquidity of ERUs compared to AAUs provides an immediate arbitrage opportunity for the economies of Annex I countries that implement JI projects. Thus, it can be concluded that linking JI to the EU ETS provided an extra economic stimulus for launching GHG emission reductions projects in sectors or countries not covered by the trading scheme.

II. Joint Implementation in numbers: past and future

A. Performance to date

As of January 31st, 2012 there were 314 JI projects registered excluding PoAs[19]. Their GHG emissions reduction potential for the first Kyoto commitment period based on their PDDs is 330 $MtCO_2$e. So far 221 projects have issued 119 million ERUs compared to 3,812 projects registered and 852 million CERs issued through the CDM (UNEP Risoe, 2012). There are several factors that explain this picture:

- Later start of crediting for JI – 2008 against 2000 for the first CDM projects;
- the emergence of the EU ETS, which limited the potential of JI in the EU;
- slow rollout of JI in Russia – potentially the largest ERU producer – against fast launch of the CDM in China and India;

[18] Since there is no organized trade of AAUs and the deals take place over-the-counter (OTC), it is difficult to estimate the price, however, it is clear that the price for AAUs is much lower than for CERs and ERUs. In the table above the price of AAUs is estimated based on the last AAU tender in Slovakia that had a floor price of EUR 5.4 and ended with no bids, indicating that the market price is below EUR 5.4. The numbers for ERU and EUA are average non-weighted spot prices from BlueNext.

[19] JI Programme of Activity (PoA) is a framework for implementing small-scale replicable projects – JI programme activities (JPAs) – in order to achieve the economies of scale. By January 2012 there were 12 PoAs registered (all in Germany) in two sectors: energy efficiency and biomass energy (UNEP Risoe, 2012).

- absence of large-scale GHG abatement opportunities through the destruction of HFC-23 in Annex I countries compared to non-Annex I.

Given the factors above as well as the fact that the Annex I countries' GHG emissions (excluding the US) are lower than those of non-Annex I countries – 7.5 Gt CO_2e against 9.8 Gt CO_2e in 2005 (World Resources Institute, 2012) – the quantitative performance of JI appears comparable to that of the CDM.

Project registrations

JI aims to encourage investments in emission reduction projects in Annex I countries and in economic sectors where marginal abatement costs are the lowest. The research of GHG abatement cost curves, conducted by McKinsey, shows that there are many more economically attractive emission reduction opportunities in countries like Russia, Poland and the Czech Republic than, for instance, Germany and the United Kingdom (McKinsey, 2011). Indeed, by January 31st, 2012 the majority of registered JI projects were hosted in transition economies, with Ukraine, the Czech Republic, Bulgaria and Russia leading in terms of number of registered projects (Figure 3).

Yet, Western Europe also hosted some projects with France and Germany being the most active players. Interestingly, the majority of JI projects in these two countries are related to industrial N_2O destruction – the sector that will be included into the EU ETS starting in 2013 (Directive 2009/29/EC, 2009). Some JI projects in France and Germany are domestic offset projects where both the investor and the project are located in the same country, which highlights the efficiency of cross-sectoral carbon trade. Sometimes, as in the case of the French company Rhodia or in the case of some German project owners, ERUs are even surrendered by the same company that is involved in a JI project. These are interesting examples of companies tapping into all possibilities of emissions reduction within their business, no matter whether they have an obligation to reduce them under the ETS or not.

Most countries registered their JI projects under Track 1, with the only exceptions being Lithuania, which chose to follow Track 2, and Ukraine, which employed both tracks.

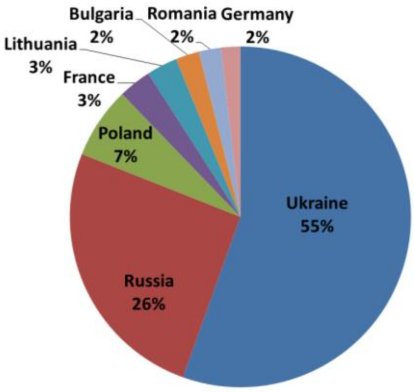
Figure 3 – Number of registered JI projects (as of January 31st, 2012)

**Germany hosts 12 JI projects and 12 PoA*
Source: UNEP Risoe JI Pipeline, February 2012

ERU supply

The ERU issuance grew rapidly in the past year: it jumped from 25 million ERUs by the end of 2010 to 119 million ERUs (cumulative) by January 31st, 2012 (UNEP Risoe, 2012).[20] Most of this increase came from the largest ERU supplying countries – Ukraine and Russia – that together accounted for more than two thirds of the cumulative ERU issuance by January 31st, 2012 (Figure 4). This share is twice bigger than their respective share in the number of project registrations. Conversely, the share of the Czech Republic is very small compared to the large number of projects registered, which is explained by the fact that most of these projects are small scale "bundled JI". Among the Western European countries, only France and Germany have issued significant amounts of ERUs.

Figure 4 – Cumulative issued ERUs by country (as of January 31st, 2012)



Country	kERU
Ukraine	63 518
Russia	29 217
Poland	7 789
France	3 556
Lithuania	3 354
Bulgaria	2 556
Romania	2 405
Germany	2 087
New Zealand	1 908
Hungary	1 321
Other	1 128
TOTAL	118 839

Source: UNEP Risoe JI Pipeline, February 2012

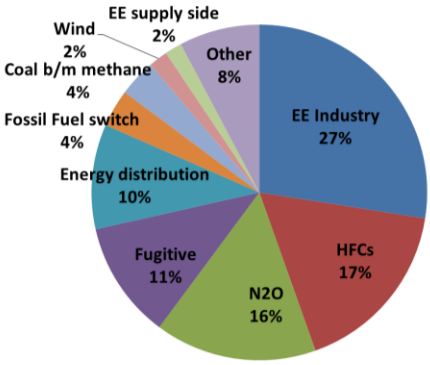
From the sectoral perspective, the leading project types in terms of issued ERUs are industrial energy efficiency, HFC-23 and N_2O destruction, energy distribution and fugitive (Figure 5). It is worth mentioning that the share of HFC-23 destruction projects – 17% of all issued ERUs – is considerably lower than in the CDM, where they add up to 46% of all issued CERs (Appendix 4). This asymmetry can be explained by the structural differences of the economies of Annex I countries compared to non-Annex I. 84% of global HCFC[21] production in 2010 took place in China and India (UNEP, 2011). One can also notice considerably lower share of renewable energy projects in JI compared to the CDM – 4% against 17% respectively (Appendix 4). This highlights the fact that many developed countries have other policies in place to support renewables, whereas non-Annex I countries use the CDM as one of the main instruments in this respect. Besides, in countries covered by the EU ETS implementing JI projects focused on renewables creates a risk of double-counting, which will be analyzed further in the third part.

An additional (to those discussed in the first part) environmental benefit of JI becomes visible from the sectoral breakdown of the projects: in many cases the GHG emissions are reduced "permanently" irrespectively of whether carbon crediting continue. For example, projects dealing with energy efficiency in industry or power sector often involve long-term investments in upgrading the equipment that cannot be reversed in case the crediting ceases, unlike for example in projects focused on HFC-23 destruction.

[20] Some countries chose not to provide public data on the ERU issuance from JI Track 1; therefore numbers for Germany, Romania, Hungary, Bulgaria, Czech Republic and Spain in this report might be lower than the real issuance. Based on the comparison of data from the JISC meeting (JISC, 2011e) – which are comprehensive as they come from the UNFCCC registry, the ITL – and the JI Pipeline database (UNEP Risoe, 2012), the information about around 10 million ERUs issued from Track 1 in the above-mentioned countries is not publicly available and therefore not accounted for in this report.

[21] The production of HCFCs (that are mainly used in refrigerants) is the main source of HFC-23 emissions.

Figure 5 – Cumulative issued ERUs by project type (as of January 31st, 2012)



Project type	kERU
EE Industry	32 650
HFCs	20 317
N2O	18 534
Fugitive	13 437
Energy distribution	12 002
Fossil Fuel switch	4 289
Coal bed/mine methane	4 258
Wind	2 191
EE supply side	1 949
Other	9 213
TOTAL	118 839

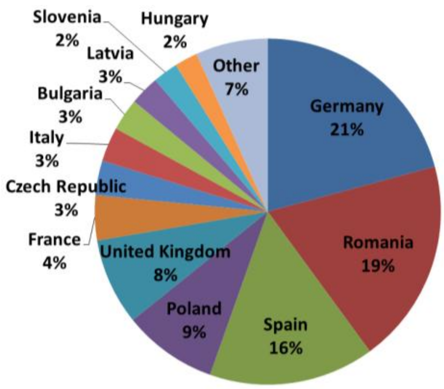
Source: UNEP Risoe JI Pipeline, February 2012

ERU demand

The main buyers of primary ERUs are the Netherlands, Switzerland and Denmark: more than 70% of all ERUs issued in 2008-2010 were contracted by entities from these three countries. The largest investors into carbon credits from JI projects are private companies, such as Vema, Vitol (Switzerland) and Global Carbon (the Netherlands) as well as the Danish Ministry of Climate and Energy (UNEP Risoe, 2012). Some companies buy ERUs for compliance, while others just for brokering or selling them on behalf of project developers.

Out of around 25 million ERUs issued in 2008-2010, 2 million ERUs were contracted by Japan, while the remaining 23 million, i.e. more than 90%, were surrendered by the installations under the EU ETS (Figure 6) compared to only 60% of issued CERs from the CDM. These numbers highlight that JI became a largely private sector offsetting mechanism for the EU ETS rather than an instrument for the Kyoto compliance for countries. This also demonstrates that despite being a relatively new type of carbon assets – first ERUs were issued in 2008 compared to the CDM that issued first CERs in 2005 – credits from JI projects managed to quickly find their way to the market. This can be explained by a good positioning of primary ERU buyers in Europe. Indeed, the investors from Switzerland or the Netherlands have a better access to compliance buyers covered by the EU ETS compared to, for example, domestic CDM investors in China. This is especially important since a large share of carbon trade takes place over-the-counter (OTC) and is only cleared on organized platforms[22].

Figure 6 – Countries where ERUs are surrendered under the EU ETS (2008-2010)



Country	kERU
Germany	4 865
Romania	4 480
Spain	3 617
Poland	2 061
United Kingdom	1 895
France	985
Czech Republic	754
Italy	752
Bulgaria	704
Latvia	645
Slovenia	549
Hungary	505
Other	1 580
TOTAL	23 392

Source: CDC Climat Research and CITL, November 2011

[22] About 60% of CER trade in January-November 2011 for December 2011 ICE Futures Europe was OTC.

B. ERU supply forecasting model

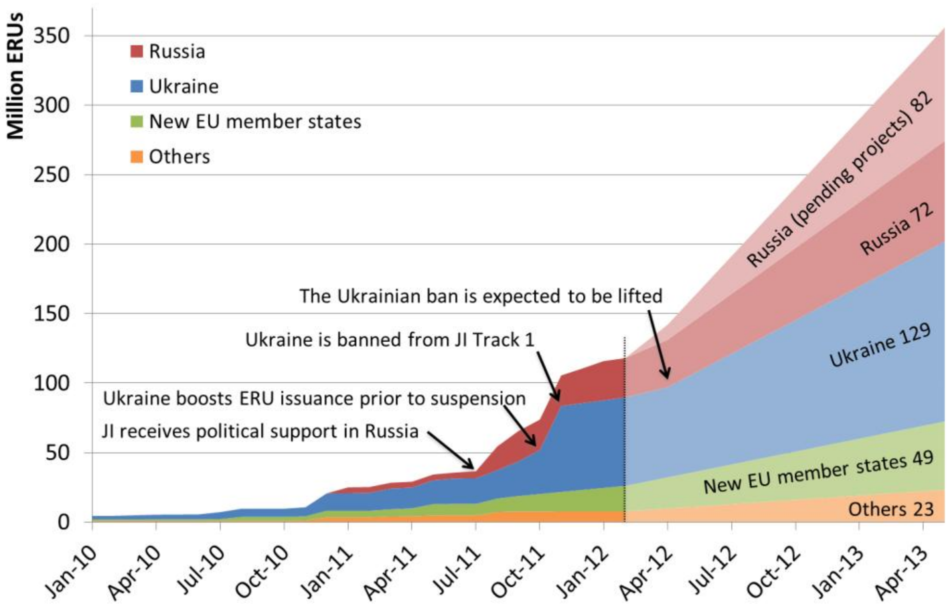
The past experience with the CDM and JI shows that the issuance of carbon credits rarely reaches 100% of the amount indicated in a project's PDD. There are different risks involved at each stage of the project, which might delay the issuance or affect its success rate[23]. In order to estimate the potential ERU supply by 30 April 2013 – the deadline for surrendering carbon units under the EU ETS Phase 2 – a forecasting model was developed. The model is based on a risk analysis following the method developed by CDC Climat Research for the CDM (Cormier, et al., 2012). As JI projects are fewer and less documented than CDM projects[24], some simplifications were necessary. Manual adjustments were also warranted for Russia, where due to the cancellation of the last JI tender, scores of projects are still pending at registration stage.

All input quantitative data are available from open sources: UNEP Risoe JI Pipeline database, UNFCCC JI projects database and national registries of carbon units. A detailed description of the model is available in Appendix 2.

C. Forecasting results and implications for the market

Based on the model described above the cumulated supply by 30 April 2013 is forecasted to reach 356 million ERUs (Figure 7). This is a considerable increase compared to the previous estimations (before summer 2011) of 205 million ERUs (Delbosc, et al., 2011 p. 16).

Figure 7 – Cumulative ERU issuance by January 31st, 2012 and forecast by 30 April 2013



Source: CDC Climat Research, February 2012

The growth of the ERU supply is expected to come mainly from Ukraine and Russia with the latter becoming the largest supplier of ERUs. By 30 April 2013 around 80% of total ERUs issued for the first Kyoto commitment period are expected to be delivered by the two largest ex-Soviet countries. The forecast for Russia has increased considerably compared to the estimations before summer 2011 – from 56 million ERUs (Delbosc, et al., 2011) to 154 million ERUs. This increase is explained by a recent

[23] As of 1 January 2012, 89% of projects with issuances issued their credits within 18 months after the project appeared on the UNFCCC website. The average issuance success rate – that is the actual amount issued over the amount expected in the PDD for the same verified period – was 92%.

[24] Annex I countries have an option to keep certain project-specific information confidential.

change in the political attitude towards JI and partial removal of administrative obstacles. However, half of this potential comes from projects that are not registered yet, making the issuance of additional 82 million ERUs uncertain. In the meantime the most active JI player to date – Ukraine – also boosted the issuance of ERUs and new project registrations prior to its suspension from JI Track 1 by the UNFCCC in October 2011 (UNFCCC, 2011d). The ban can be expected to be lifted[25] by spring 2012, thus not affecting the total ERU supply for the first Kyoto commitment period. The case studies of Russia and Ukraine, which analyze factors influencing the development of JI in these countries, are presented in the third part of the report.

Eastern Europe (excluding Russia and Ukraine) is expected to issue 49 million ERUs with a large share coming from Poland, Romania, Bulgaria and Hungary. Western Europe (mainly France and Germany) together with New Zealand is expected to deliver 23 million ERUs. The detailed forecasts by country are presented in Table 2.

Table 2 – Cumulative ERU issuance by January 31st, 2012 and forecast by April 30th, 2013

Host country	Million ERUs issued	Share	Million ERUs forecast	Share
Russia	29,2	25%	154,0	43%
Ukraine	63,5	53%	129,4	36%
Poland	7,8	7%	13,6	4%
Romania	2,4	2%	10,6	3%
Bulgaria	2,6	2%	9,5	3%
France	3,6	3%	8,9	2%
Germany	2,1	2%	8,7	2%
Hungary	1,3	1%	7,0	2%
Lithuania	3,4	3%	5,8	2%
New Zealand	1,9	2%	3,2	1%
Czech Republic	0,6	1%	1,8	0%
Sweden	0,0	0%	1,1	0%
Finland	0,2	0%	1,0	0%
Estonia	0,3	0%	0,8	0%
Spain	0,0	0%	0,5	0%
Total	**118,8**	**100%**	**355,9**	**100%**

Source: CDC Climat Research, February 2012

Until recently the offsets generated by JI projects were not considered to play an important role on the carbon market, since their volume was substantially lower than the volume of issued CERs. As seen from the analysis above, the latest developments in Russia and Ukraine changed the situation, boosting the ERU supply and considerably increasing its weight in the international carbon trade. The share of ERUs in the Kyoto project-based carbon offsets already reached 12% by January 31st, 2012, and is expected to grow further from 0% in 2008 and 5% in 2010 (UNEP Risoe, 2012) to 20% by April 30th 2013 as the carbon credits supply from the CDM is forecasted to reach 1.3 billion CERs according to CDC Climat Research. One has to note however, that this is not an unexpected increase, but a result of the issuance of ERUs that were previously delayed, e.g. in Russia.

The growing supply of Kyoto credits (CERs and ERUs) is putting additional downward pressure on the price for carbon credits, as the largest carbon market where they are traded – the EU ETS – is already suffering from an oversupply of allowances (Fages, et al., 2011) and as the volume of Kyoto offsets is drawing closer to the import limit (Bellassen, 2011). The uncertainty regarding the post-2012 climate regime, as well as the negative impacts of the Eurozone debt crisis are adding extra fuel to the fire of the bearish market trend.

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[25] Previously Greece and Bulgaria were in a temporarily non-compliance, but managed to restore it within six and seven months respectively.

III. Joint Implementation experience: case studies

A. Economics vs. politics: the case of Russia

Untapped potential of Joint Implementation in Russia

Russia's position with regards to the Kyoto Protocol has always been cautious, with the international climate agreement, adopted in 1997, being ratified only in 2004 arguably in exchange for the EU backing Russia's WTO bid. Paradoxically, Russia could potentially be the biggest beneficiary of the Kyoto Protocol, as it granted the third largest GHG emitting country with a vast amount of surplus AAUs, which occurred due to the economy contraction following the collapse of the Soviet Union. The AAU surplus is estimated at around 5.4 $GtCO_2e$ for the first Kyoto commitment period (Gray, et al., 2011).

Despite being a promising mechanism to capitalize on the country's AAU surplus and to attract foreign investments, JI did not really take off in Russia until the summer of 2011: by July 2011, only 5.5 million ERUs had been issued, compared to almost 25 million for its smaller neighbor, Ukraine (UNEP Risoe, 2012). The main reason lies in the lack of political support after the ratification of the Kyoto Protocol as well as willingness to keep the AAU surplus for the next commitment period. Reflecting the skepticism of then-President Vladimir Putin about the whole issue of climate change[26], the procedures established in 2007 by the Ministry for Economic Development hampered the roll out of JI in Russia. 125 projects with a total GHG emissions reduction potential of 240 Mt CO_2e entered the pipeline by 2009 (Gromova, 2011), and yet none of them got registered by that time.

In the beginning of Dmitry Medvedev's presidential term, along with the announcements on the need to foster innovation and treat the progressing "Dutch disease"[27], JI received some political traction as one of the tools that could assist in achieving these goals. In 2009 the largest bank in Russia – Sberbank – was appointed the operator of carbon units, while the Ministry for Economic Development together with the Ministry of Natural Resources and Environment were left with administrative functions (Government of the Russian Federation, 2009). This change resulted in the registration of first Russian JI projects through two tenders held by Sberbank in 2010.

Despite this development, the JI potential remained largely untapped due to several factors:

- The existence of quantitative limits for the amount of ERUs allocated under Sberbank tenders, made different projects compete against each other, which prevented scores of projects from being registered (Table 3). Indeed, only 32 out of 73 potential JI projects got approved under the first two tenders (Yulkin, 2011).
- The lack of visibility on the timing and limits of future tenders left investors and project developers with no means for planning their long-term strategy.
- The vague criteria governing the selection of projects – namely "energy and ecological efficiency, technical and financial capacity, economic and social impacts" (Ministry for Economic Development of Russia, 2009) – reputedly favored large-scale projects operated by oil and gas companies, as well as industrial giants.
- The unclear division of responsibilities between Sberbank, the Ministry for Economic Development and the Ministry of Natural Resources and Environment added an additional layer of uncertainty to the approval process. No single authority – such as the State Environmental Investment Agency in Ukraine – was created to govern JI in Russia, despite the idea being put forward as early as 2005 (Yulkin, 2005).

[26] Putin is the author of the famous quote that "Russians will need less fur coats" due to global warming (Giddens, 2010).

[27] The term "Dutch disease" was first introduced by *The Economist* to explain the industrial stagnation that followed the discovery and excessive exploitation of a large natural gas field in the Netherlands in 1960s (The Economist, 26 November 1977).

Table 3 – Results of the two JI tenders in Russia

Sectors	Projects submitted		Projects approved		Approval factor, %
	No. of projects	ERU 2012, t CO2-eq.	No. of projects	ERU 2012, t CO2-eq.	
Oil and Gas flaring	14	19 709 806	9	17 134 659	86%
Fuel switch	4	1 753 943	2	1 063 144	61%
Industry/EE	20	32 239 557	7	19 871 021	62%
Energy/EE	11	12 890 548	2	2 126 549	17%
Renewables/Biofuel	11	7 418 561	5	2 809 343	38%
Hydro	2	4 669 909	2	4 669 909	100%
Coal mine methane	1	1 100 000	1	1 100 000	100%
Landfill methane	4	7 665 323	1	958 868	13%
Industrial gas	6	18 337 744	3	8 788 405	48%
Total	**73**	**105 785 391**	**32**	**58 528 898**	**55%**

Source: Yulkin, 2011

ERU issuance boost

On 27 June 2011 President Medvedev announced that Russia needed to boost JI to take advantage of the mechanism before the end of the first commitment period of the Kyoto Protocol. The President also argued for a need to amend the legislation in order to simplify the procedures for projects approval and the issuance of ERUs.

The first results of the President's call appeared before long. Several large ERU issuances in July and August for a total of almost 17 million ERUs (Russian Registry of Carbon Units, 2011a) that caused an unusual spread – up to 0.5 euros – between the prices of CER and ERU (Appendix 3) put Russia in the headlines of carbon news in summer 2011. The issuance boost occurred right after President Medvedev's call to reignite the Kyoto mechanism, demonstrating that political support plays a crucial role in Russian JI. The latest issuances to two large HFC-23 destruction projects took place less than a week after the submission of their verification reports, which means that Russia is capable of issuing ERUs quickly, when there is political traction.

It is worth mentioning here that the two HFC-23 destruction projects increased their planned amount of emission reductions from 7.5 MtCO2e to 41.5 MtCO2e (Russian Registry of Carbon Units, 2011b). Since this amount exceeds the limit on ERUs under the first tender (when these projects were registered), extra AAUs that would be converted into ERUs were transferred to Sberbank. The two projects are also subject of controversy due to the potential conflict of interests. Reportedly, one of Sberbank's debtors is directly linked with these projects, giving the bank an incentive to issue ERU in order to ensure that the loans are paid back (Allan, et al., 2011).

Restarting registrations

At the same time, after almost a year of withholding JI registrations, Sberbank announced a third tender for new projects for up to 70 million ERUs. Besides its sheer size – the previous two were only 30 million ERUs each – the new tender is characterized by partial elimination of competition between sectors. During the first two tenders, projects from all sectors competed for the same limited amount of ERUs, which probably put certain types of reputedly less efficient projects, e.g. waste management or renewable energy, in unfavorable positions. In its third tender Sberbank introduced differentiation between three sectors: power, industrial processes and waste. Nevertheless, the vague selection criteria of the previous tenders were left unchanged.

The new tender attracted 70 applications for a total of 106 million ERUs (Sberbank, 2011). Half of the projects, corresponding to 64 Mt CO_2e emissions reduction potential, have not applied for JI scheme before (Zabelin, 2011), which demonstrates high potential for JI in Russia.

Sberbank also cancelled the floor price for ERU sales contracts. The minimum price of 10 euros per ERU, imposed by Sberbank until recently, was subject to controversy and resulted in several conflicts, the most notable leading to Denmark's withdrawal from its investments in Russian JI projects this spring (Danish Energy Agency, 2011a). The cancellation of the floor price is especially important in the current context of the bearish carbon market (Appendix 3).

New rules of the game

Finally, on 4 October 2011, the new legislation for JI procedures in Russia entered into force. The key amendments under the Decree #780 (Government of the Russian Federation, 2011) included:

- The official limit on the ERU issuances during the first Kyoto commitment period is set at 300 million.
- The tender procedure is substituted with a rolling-based call for applications. Most importantly that implies that there will be no more limits for project registrations except the overall limit of 300 million ERUs.
- The three-party Transfer Agreement between the seller, the buyer and Sberbank has to be signed before the issued ERUs can be transferred abroad. This controversial amendment grants the bank with a powerful lever to directly influence the sales of ERUs and the selection of buyers.
- The fees imposed by Sberbank for its services are limited at the level set for covering administrative expenses of the international oversight body, i.e. JISC.
- Revenues from the sales of ERUs have to be reinvested into energy efficiency and/or environmental projects – a unique combination of JI and GIS frameworks. This is also evidence that Russia is trying to use JI as a policy tool to channel additional investments into prioritized sectors.
- The legislation also sets precise time limits for each stage of the administrative process, theoretically making it more predictable. However, the previous experience shows that the timelines are seldom observed in Russia.

Meanwhile, besides the new JI legislation, amendments to the tax law were made, cancelling the VAT on ERU sales. This change eliminated the uncertainties related to taxation regime regarding the carbon units transferred outside Russia and granted them the exports status (Shapovalov, 2011).

Implications

The new regulations entered into force at the time when Sberbank was assessing the applications under the last tender. This created a legal discrepancy and eventually led to Sberbank cancelling its last tender and opening a rolling-based application window between October 17, 2011 and May 2, 2012 (Sberbank, 2011). The elimination of the tender system means that Russia could theoretically issue up to 300 million ERUs for the period of 2008-2012, although this limit is very unlikely to be reached. According to the ERU supply forecasting model, presented in the second part of the report, Russia is expected to deliver up to 154 million ERUs for the period of 2008-2012, which will possibly make it the third largest supplier of Kyoto offsets after China and India.

Although a considerable increase compared to the previous estimations, this amount is far from the full potential of JI in Russia, which was not realized due to the lack of political support and understanding of economic benefits of JI and inability to establish a transparent and efficient JI framework. Moreover, Russia, to the contrary of Ukraine, has not committed to the second period of the Kyoto protocol so far, making the possibility to issue ERUs for emissions reductions occurring after 2012 unlikely.

B. *Maximization of economic benefits: the case of Ukraine*

Similar to Russia, Ukraine has a large amount of surplus AAUs that is estimated at around 2.6 $GtCO_2e$ for the first Kyoto commitment period (Gray, et al., 2011). Interestingly enough, the two countries adopted totally different strategies with respect to JI. Unlike Russia that was struggling for several years until JI finally took off, Ukraine managed to maximize the potential of this flexibility mechanism and has become the largest supplier of ERUs. There are several factors that helped the country achieve this result:

- *Political support*. The economic advantages of JI and carbon trade in general were quickly understood by the government and businesses, which resulted in a strong political support and fast establishment of the first legal framework in 2006. It was clear that Ukraine would not be able to convert all its surplus allowances into ERUs, therefore the government decided to pursue all possible mechanisms to capitalize on the surplus, namely JI, GIS an IET. Experts estimated the potential of Kyoto mechanisms in Ukraine at 1.3 billion and 0.2 billion carbon credits for the Article 17 and the Article 6 of the Kyoto Protocol respectively (Chyzhenko, 2011).
- *Transparent framework*. In 2008 Ukraine created a dedicated administrative body – the National Environmental Investment Agency – which embraced all responsibilities related to JI procedures. This also encouraged the creation of a team of carbon experts and the accumulation of the expertise in one focal point. The system became simple and transparent, as project participants had to deal with a single governing body.
- *Investment incentives*. The established system with no artificial barriers, such as quantitative ERU issuance limits or prioritization by sectors, encouraged developers to submit all potential projects for the JI scheme. Moreover, a special procedure granting AAUs (from the first commitment period budget) to JI projects for “early reductions” – prior to 1 January 2008 – provided an additional incentive for developers to apply for JI. By the end of 2011 Ukraine issued 30 million AAUs using this scheme (State Environmental Investment Agency of Ukraine, 2012). The practice of “early AAUs” has also been employed by other countries with allowance surpluses, namely Bulgaria, Romania, the Czech Republic and Poland, but not Russia.
- *Independency of carbon business*. The ERU prices, quantities and other terms of contracts are not disclosed and parties involved in JI are free to negotiate it between themselves. On the one hand, this practice decreases transparency, but on the other – prevents dubious state interventions into carbon trade.

The above-mentioned factors helped create a favorable investment climate, which triggered strong interest in JI from the business sector. This resulted in rapid development of projects and growth of the ERU issuances. With 63.5 million ERUs issued by January 31st, 2012 (UNEP Risoe, 2012) Ukraine is currently the biggest player on the JI market.

Almost half of these ERUs were issued in the beginning of October 2011, causing an unusually large spread – up to 0.4 euros – between the ERU and CER prices (Appendix 3), as Ukraine boosted the issuance just before the ban of Track 1. The suspension of the international transfer of AAUs and ERUs from JI Track 1 was decided by the UNFCCC on 12 October 2011 as a result of failure of the national system[28] (UNFCCC, 2011c). As explained in the second part, the ban can be expected to be lifted in spring 2012, so that the total amount of ERUs issued for the first Kyoto commitment period will not be considerably affected. According to the ERU supply forecasting model, presented in the second part of the report, Ukraine is expected to deliver 129 million ERUs for the period of 2008-2012 (Table 2).

In the meantime Ukraine started negotiating with the EU regarding the eligibility of carbon credits generated by Ukrainian JI projects in the EU ETS after 2012 (Shyrkozhukhov, et al., 2011). The country is also working on a domestic carbon market, and received a first grant from the World Bank in order to finance the preliminary research and development on the necessary frameworks (State Environmental Investment Agency of Ukraine, 2011). This is another indication that Ukraine has adopted a long-term climate strategy.

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[28] The 2010 inventory review found that the Ukrainian national system failed to perform certain functions required by the UNFCCC guidelines. In particular, the Ukrainian inventory had been incomplete and lacking transparency for several years, and failed to improve based on the recommendations of previous reviews.

The case of JI in Ukraine is an example of a country maximizing the economic benefits of carbon market mechanisms, which pushed for the creation of favorable investment climate for JI and helped Ukraine become one of the leading suppliers of carbon offsets. In the absence of other GHG abatement incentives and policies Ukraine has welcomed all JI projects. This together with a large surplus of AAUs could potentially lead to a less stringent treatment of the additionally requirement as it will be discussed in the next section.

C. Economic or environmental additionality: the cases of France and Ukraine

In countries without comfortable AAU surpluses (Appendix 5) the question of additionality in JI is more an issue of economic efficiency than an issue of environmental integrity. Indeed, if such a country has too lenient an approach to additionality demonstration, it cancels an over-proportional amount of AAUs compared to the additional emissions reduced. Thus the country increases the economic burden of achieving its Kyoto targets as it has to make up for the AAU deficit through other policies and measures. The amount of GHG in the atmosphere is not affected by this misjudgment, but the finances of the country are.

One has to note that the additionality is tightly linked to the question of baseline setting, especially in industrial sectors. A country with AAU deficit would probably try to put in place domestic policies to regulate GHG emissions, while JI would be used as an additional tool. This would also lead to more ambitious benchmarks for the baseline setting compared to countries without such policies. A good illustration of this logic is the case of JI projects aimed at reducing nitrous oxide (N_2O)[29] emissions from the production of nitric acid (HNO_3).[30]

Having a forecasted AAU surplus of less than 0.5% for the first Kyoto commitment period (Appendix 5), France had to be stringent on additionality for JI. For many project types, this resulted in a CDM-like demand for case-by-case demonstration of additionality. In the case of N_2O emissions from the production of nitric acid however, France adopted an innovative approach based on rent capture. Ambitious benchmarks were established for baseline setting – 2.5 kg N_2O per ton HNO_3 produced in 2009-2011 and 1.85 kg N_2O per ton HNO_3 produced in 2012. At the same time, the only national regulation limited the emissions at the level of 7 kg N_2O per ton HNO_3, with another layer of regulations being applied on a regional level. For example the GPN Grandpuits N_2O abatement project (FR1000169) is subject to local DRIRE's (Directions Régionales de l'Industrie de la Recherche et de l'Environnement) limitation at the level of 4 kg N_2O per ton HNO_3 produced starting in December 2009. Thus the amount of N_2O emissions reduction achieved "between" the regional regulations and the JI benchmark could be accounted as a net contribution to the Kyoto compliance of France. Moreover, the French government applied the "90% rule" to all JI projects, whereby only 9 ERUs are issued for 10 tons of CO2e abated[31] (French Ministry of Environment, 2007) further tightening additionality. Stringent benchmarks and the "90% rule" both contribute to sharing the economic rent – the difference between market price and abatement cost – between the project developer and the government. The share of the government can be seen as an insurance provision against non-additional projects that would pass the additionality test.

Conversely, when countries with large AAU surpluses (Appendix 5) are concerned, there is no strong economic incentive to be stringent on the additionality requirement, as there is hardly any risk of non-compliance and the cost of not ensuring additionality is thus much lower than in a country of uncertain AAU position. In this case, lax treatment of additionality, similarly to the CDM, might jeopardize environmental integrity of the scheme. Indeed, the large surpluses of AAUs in Russia and Ukraine – 5.4 and 2.6 $GtCO_2e$ respectively (Gray, et al., 2011) – if converted into ERUs, could theoretically flood the

[29] One ton of N_2O has a greenhouse gas potential of 310 tCO2e.

[30] Nitric acid is mainly used in fertilizers. Production of nitric acid corresponds to the NACE code "the manufacture of fertilizers and nitrogen compounds" (Ecofys, 2009).

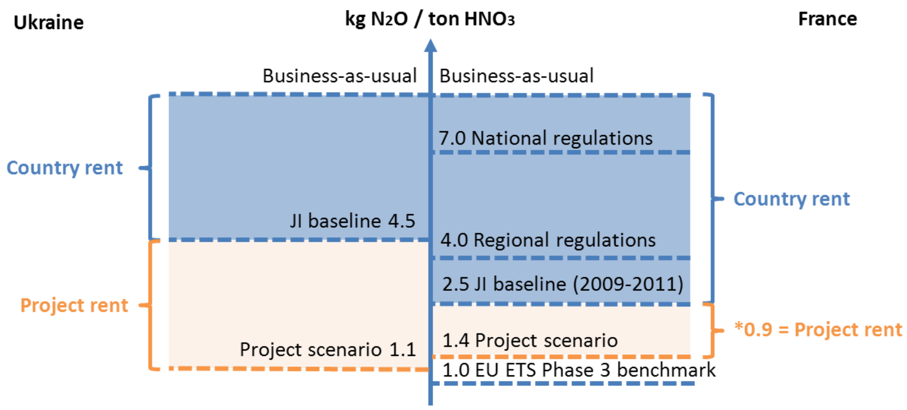
[31] China has employed the same scheme keeping up to 65% of CER revenues generated from HFC-23 and N_2O destruction projects and 2% of CER revenues from projects in prioritized sectors – renewables and energy efficiency. In the case of China however, it is a direct economic rent capture, in the form of yuans, rather than an indirect one, in the form of AAU.

market and prevent other countries from implementing truly additional emissions reduction measures, although this did not happen in reality.

In the case of N_2O emissions from the production of nitric acid the baselines for the Ukrainian JI project (UA1000225) are much less ambitious – 4.5 kg N_2O per ton HNO_3 produced – compared to the above-mentioned project in France. As it is explicitly mentioned in the PDD of the project there is no national legislation to limit the N_2O emissions from the production of nitric acid in Ukraine. Comfortable AAU position of the country together with the absence of any direct regulations enabled the JI project to set the least ambitious baseline possible, i.e. the conservative emissions factor of 4.5 kg N_2O per ton HNO_3 produced as defined by the IPCC. It is worth mentioning however that the same baselines are applied in the CDM (e.g. Project 1481: Liuzhou Chemical Industry Co., LTD N2O Abatement Project in China), so it can be argued that the level of additionality stringency is similar in both project mechanisms.

The comparison of the amounts of emissions reduction rent that is captured by the governments of Ukraine and France is schematically illustrated in Figure 8.

Figure 8 – Comparison of rent capture in JI projects UA1000225 and FR1000169



Source: PDDs

The case of reducing N_2O emissions from the production of nitric acid in France and Ukraine demonstrates how the Kyoto compliance position of a country affects its treatment of additionality in JI. It also shows how JI complements domestic climate policies as in the case of France or substitutes them as in the case of Ukraine.

D. Frontier mechanism: the case of nitrous oxide emissions in the EU

In some cases JI works as a "frontier mechanism", revealing or producing new information on GHG emissions and abatement costs, activating the "search function" of the private sector. This information is instrumental to the enlargement of the scope of cap-and-trade systems. N_2O emissions from the production of nitric acid are a good example of this, as they will be included into the EU ETS starting in 2013 (Directive 2009/29/EC, 2009). Currently there are 34 JI projects focused on reducing N_2O emissions from the production of nitric acid that are registered in the EU – mostly in France, Germany and Poland – with a potential to reduce emissions by 11 $MtCO_2e$ per year[32] based on the projects' PDDs (UNEP Risoe, 2012).

Under the Article 24 of the Directive establishing a scheme for greenhouse gas emission allowance trading within the Community (Directive 2004/101/EC, 2004), the Member States are allowed to voluntarily include into the EU ETS some of the sectors which are not mandatorily included. While France and Germany along with some other countries were implementing JI projects to reduce the emissions of N_2O,

[32] This figure represents a quarter of total N_2O emissions from the production of nitric acid in the EU that account for 41 $MtCO_2e$ per year. The nitric acid production in turn has the largest share – 21% – of GHG emissions from the chemical industry in Europe (Ecofys, 2009).

the Netherlands, Norway, Austria and the United Kingdom decided to make use of the Article 24 and include N_2O emissions from the production of nitric acid into the EU ETS.

Norway decided to allocate free allowances to the plants for 50% of average historical emissions of the last four years, whereas the Netherlands, Austria and the United Kingdom adopted a different approach. The three countries allocated free allowances based on historical emissions factored by the declining benchmarks measured in a ratio of kg N_2O per ton HNO_3 produced (European Commission, 2011). The benchmarks adopted are summarized in Table 4.

Table 4 – Benchmarks for the voluntary inclusion of N_2O emissions from the production of nitric acid into the EU ETS

kg N_2O/t HNO_3	Netherlands	Austria	United Kingdom
2008	1.7	-	-
2009	1.7	-	-
2010	1.5	1.5	-
2011	1.5	1.5	1.5
2012	1.3	1.3	1.3
New installations	0.12	0.12	0.12

Source: Commission decisions on applications to include additional gases from Member States (European Commission)

These benchmarks were set according to the European Commission's Integrated Pollution Prevention Control Reference Document (BREF) on the Best Available Technologies (BAT) for the manufacture of large volume inorganic chemicals, including nitric acid production. When examining the best available technologies, this document refers *inter alia* to installations where JI projects are implemented, for instance, the YARA Ambès N_2O abatement project FR1000148 (European Commission, 2007).

Thus it can be argued that JI indeed facilitated the development of innovative and efficient technologies to reduce N_2O emissions from the production of nitric acid and setting new industry standards. This was also confirmed by a study of Stockholm Environment Institute that concluded that the carbon market with its flexibility mechanisms was the key driver of technological innovation and development of N_2O emissions reduction projects that would not take place in the absence of JI and the CDM mechanisms (Kollmuss, et al., 2010).

The policy brief by the Non-ETS Offsets Project Network (NEON, 2010) suggests that when N_2O emissions are concerned, JI proves to be useful in:

- implementation and testing of all necessary monitoring methods at the installations prior to their inclusion into the EU ETS;
- evaluating the emissions reduction potential in order to set the benchmarks for the allowance allocation under the EU ETS.

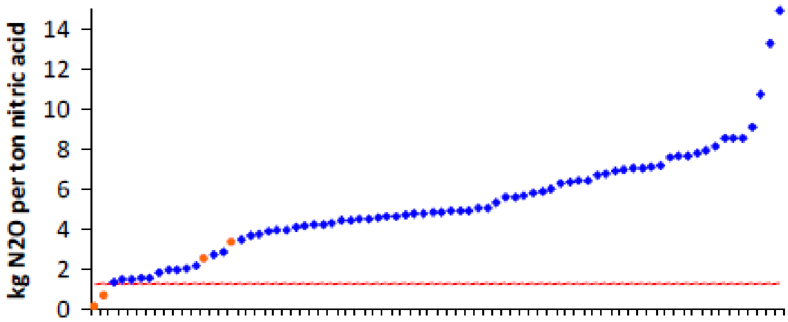
When the third Phase of the EU ETS (2013-2020) is concerned, the benchmarking principle implies a free allocation of allowances based on the average emissions of the 10% best performing installations in a given sector and auctioning the allowances that exceed the free allocation. Despite the fact that the European installations producing nitric acid are among the most efficient in the world, there are a lot of plants that have not implemented any abatement measures, whereas some installations managed to reduce their emissions dramatically thanks to the JI mechanism. The emission factors of installations thus vary drastically, which results in high emissions spread.

The research conducted in 2009 (Ecofys, 2009) resulted in a benchmark of 1.2 kg N_2O per ton of HNO_3 produced (Figure 9). This study however excluded 7 installations with the NSCR abatement technique.[33]

[33] According to the European Commission "Non Selective Catalytic Reduction (NSCR) technique is not approved in the reference documents (BREF) as Best Available Technology (BAT)" and was therefore excluded from the initial benchmark analysis (Ecofys, 2009).

The decision adopted by the European Commission with regards to determination of benchmarks for free allocation for the Phase III (Decision 2011/278/EU, 2011) included the correction of individual data points in order to account for additional GHG emissions not reflected before. The final benchmark was set at the level of 302 kg CO_2e per ton of HNO_3 produced which is equivalent to around 1 kg N_2O/t HNO_3.

Figure 9 – Benchmarking of N_2O emissions of nitric acid plants in EU27



Source: Ecofys, 2009

Blue and orange spots represent plants with two different abatement techniques. The orange line indicates the benchmark, i.e. the average emissions of the top 10% performing plants.

The analysis of the PDDs of 8 JI projects, which focus on N_2O emissions reduction from the production of nitric acid, showed that the average reference scenario was 1.1 kg N_2O/t HNO_3 for five German projects, 2.5 kg N_2O/t HNO_3 for two French projects and 1.5 kg N_2O/t HNO_3 for one project in Lithuania. The project scenario emissions were in some cases as low as 0.3 kg N_2O/t HNO_3.

Thus, it can be concluded that the ambitious benchmark for the EU ETS Phase III was achieved mainly thanks to JI projects that pushed the average performance of top 10% installations to 302 kg CO_2e per ton of HNO_3 produced. Apart from that, JI supplied the information on available abatement measures, monitoring methods, technology providers and cost estimations.

Improvements of national GHG inventories spurred by JI projects, although less documented, is another type of information improvements brought by JI. One example is the French JI project reducing N_2O emissions in croplands by introducing legumes in crop rotations. The science proving that this technique reduces emissions is fairly recent and is not reflected in the IPCC 1996 guidelines on which most inventories are based. The JI project pushed the French inventory to move to the 2006 guidelines – which include the more recent scientific findings regarding legumes – for the relevant part of the inventory 3 years in advance of the upgrade mandated by the Durban decisions[34]. Another upcoming French JI project reducing livestock methane emissions by changing livestock feed is also driving an effort to refine the inventory for livestock emissions.

E. Double counting issue: the case of renewables and energy efficiency in the EU

The interaction of JI with a domestic cap-and-trade system such as the EU ETS creates a risk of double counting. Two types of double counting should be distinguished (Jung, et al., 2008):

- *Direct*, i.e. when the project concerned is implemented at the installation that is already covered by the EU ETS. In this case the emission reductions would free up an equivalent amount of EUAs (or reduce the deficit) in addition to the ERUs issued, creating the double counting problem.
- *Indirect*, i.e. when the project concerned indirectly reduces emissions of an installation covered by the EU ETS. For example, a renewable energy project would supply additional electricity to the local grid reducing the demand from another installation covered by the EU ETS.

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[34] The Durban COP decided that annex 1 countries should used the 2006 guidelines starting with inventory year 2013 (2015 submission)

In order to address the issue of double counting, the Linking Directive stipulates that in case the ERUs originate from an installation already covered by the EU ETS, the issuance of new carbon credits should be mirrored by the cancellation of the equal amount of EUAs. In this case, there is virtually no incentive for installations to implement JI projects within the EU since the price of ERUs is lower than EUAs (Appendix 3). Theoretically, such JI projects might still make sense if the investor is willing to use the credits in a market where EUAs cannot be used and ERUs can, for example under the Japan's Voluntary Emissions Trading Scheme (JVETS) or for the compliance of an Annex 1 country. However, no example of such an approach was identified.

In the case of indirect double counting, countries within the EU ETS may choose to create a "JI reserve" – a set-aside amount of EUAs, which are progressively cancelled as ERUs are being issued. Most Eastern European countries created such JI reserves within their NAPs while, for example, Germany did not (Jung, et al., 2008) and ruled out double counting completely by legal requirement. The difference in the approach could be explained by the fact that most Western European countries have a system of incentives for renewables in place via other policies, e.g. feed-in tariffs, while Eastern Europe lacks such framework and relies on JI for supporting renewable energies.

Establishing JI reserves is important for allowing renewable energy projects for electricity generation (Mizerny, 2011). A good example of the support of renewable energy projects is Estonia, which established a JI "set-aside" of 0.95 million EUAs for 2008-2012 for its wind and biomass energy projects (European Commission, 2011). The reserve enabled to avoid the issue of double-counting and to successfully register several renewable energy projects and issue ERUs. This also shows how a country can use carbon credits to support certain types of projects in the absence of other incentives.

Poland is another example of a country that created a "set-aside" for approved renewable energy JI projects in the amount of 0.75 million EUAs for 2008-2012 (ibid.), two thirds of which have already been used. Additional "set aside" of 2.67 million allowances annually was created for new and planned JI projects that could cause double counting, i.e. renewable projects. The amendments of the Polish law[35] that entered into force in June 2011 simplified and clarified procedures for approval of such projects, giving projects focusing on renewable energy a possibility to be realized as JI.

It can also be noted that the "set aside" creates competition for JI projects, as it establishes a limit on the amount of ERUs that can be granted to projects in a given sector. This type of competition is similar to the one induced by the system of tenders that took place in Russia until October 2011 (see section A of this part).

The projects focusing on energy efficiency can also lead to double counting in case they concern electricity. Germany is currently hosting several JI Programs of Activities (PoA)[36] that provide incentives for installations and households to improve their energy efficiency. One example of such PoA is a project DE1000082: Active Climate Protection – CO2 Bonus natural gas (EWE, 2009). This project is aimed at providing monetary bonus for households to reduce their natural gas consumption through implementing a set of energy efficiency measures. The revised PDD of the project explicitly indicates that it concerns only gas consumption reduction and not electricity, since otherwise it would have resulted in double-counting. Converting EUAs from a JI reserve would have been an alternative solution that would also allow incentivizing reduction of electricity consumption under the JI framework, had Germany set such a reserve. Other PoAs include energy efficiency measures in combination with fuel switch to natural gas and/or biomass. Poland also hosts PoAs focused on energy efficiency – two projects are currently waiting for the Letters of Approval. They are however isolated from the EU ETS, which eliminates the risk of double-counting.

With the Phase III of the EU ETS (2013-2020), the issue of double-counting has been streamlined: the revised directive of 2009 calls for the end of "JI reserves" on December 31st, 2012. After this date, the

[35] Act on the emission trading system of 28th of April 2011 (Polish Journal of Laws no. 122, item 695)

[36] JI Programme of Activity is a framework for implementing small-scale replicable projects – JI programme activities (JPAs) – in order to achieve the economies of scale.

German solution will prevail, that is the interdiction of JI projects which have a direct or indirect impact on the emissions of EU ETS sectors.

F. Domestic policy through JI: the cases of the Czech Republic, New Zealand and Denmark

With 58 JI projects, the Czech Republic is currently the second biggest country in terms of number of JI registrations after Ukraine (Figure 3). However, its share of issued and expected ERUs is much smaller. With the exception of one N_2O emissions reduction project, all JI projects in the country are small-scale “bundled” activities in landfill gas and biomass energy sectors. One example of such approach to JI is the BTG Biomass Energy Portfolio (projects CZ1000034 to CZ1000047).

The project portfolio was developed for the Dutch Emission Reduction Unit Procurement Tender (ERUPT) in 2000-2002. The portfolio consists of 14 district heating projects that involve fuel switch, i.e. replacing old fossil fuel boilers with new systems that utilize biomass. The rationale to employ JI for these projects in the Czech Republic was that despite their high potential – the municipalities have access to vast amounts of unused biomass resources – their implementation was largely impeded by the shortage of financing. The State Environmental Fund – the main source of funds for such projects – could cover up to 80% of the investment costs depending on projects’ status, but the municipalities still required additional co-financing (Cmíral, 2003). JI provided for a possibility to obtain these supplementary funds via issuance and sale of carbon credits, while the large share of state investments ensured projects’ feasibility.

“Bundling” JI projects into a portfolio helped reducing transaction costs and achieve critical mass – the 14 projects are expected to generate 522 $KtCO_2e$ emission reductions for the period of 2008-2012 (UNEP Risoe, 2012). The Dutch government contracted the ERUs with 60% being prepaid before the beginning of the issuance (Remrova, et al., 2006) providing necessary funds to invest into new biomass boilers.

The JI biomass energy portfolio in the Czech Republic is an example of JI being used to finance domestic climate policies. The lack of funds for capital investments created significant obstacles in implementing the projects on the level of municipalities and the national government was unable or unwilling to provide sufficient support. In this situation, JI enabled municipalities to tap directly into foreign capital and removed the budgetary constraint. This case demonstrates that JI allows the financing of public policies aimed at emissions reductions through AAUs – converted into ERUs – rather than euros direct from the national budget.

With a functioning nation-wide ETS similar to the European one, New Zealand has been an active player on the carbon market since the ratification of the Kyoto Protocol in 2002. Long before the start of the first Kyoto commitment period in 2008, New Zealand created a special framework – Projects to Reduce Emissions (PRE) – to encourage early offset projects that could later be included into the JI scheme. Under this scheme New Zealand conducted two tenders – in 2003 and 2004 – which resulted in the registration of 34 projects with a total emissions reduction potential of around 10 $MtCO_2e$ (Ministry for the Environment of New Zealand, 2011). The selection of projects involved three main steps:

- First, the projects were divided into two groups depending on whether they contribute to the security of electricity supply, which was the government’s priority at that time (Jamieson, et al., 2005).
- Second, within each group the projects were ranked according to the ratio between the amount of ERUs requested for the first Kyoto commitment period and the amount of planned emission reductions since the beginning of a project until the end of 2012.
- Finally, the risks related to projects’ implementation were assessed with the most risky projects receiving a special tag that decreased their ranking.

The prioritization of the projects that contribute to electricity security defined the sectoral scope of the selected projects – they were all focused on renewable energy generation, namely wind, hydro, geothermal and landfill gas utilization. This raises the question of additionality of these projects, since the carbon part plays relatively minor role in revenues of the electricity generation projects, thus creating a very narrow room between a project that is economically viable without the carbon element and a project that is not viable even with JI (Jamieson, et al., 2005). If non-additionnal projects were approved, New

Zealand bears an additional cost to comply with its Kyoto targets through other policies (see part III.C). At the same time this system might have left some truly additional projects from other sectors out.

The ranking system encouraged early movers, since they could declare emission reductions prior to 2008, thus improving their ERU-to-emission-reductions ratio compared to projects that started later. For example, if a project, that started in 2007 and results in stable emissions reduction until the end of 2012, claims the maximum amount of ERUs amounting to the reduction achieved between 2008 and 2012, it would have a ratio of 5/6=0.833, while a similar project that started in 2005 would have a ratio of 5/8=0.625 and, hence, a higher rating. In order to further improve its ranking a project could also claim fewer ERUs than its actual emission reductions in 2008-2012. However, in reality most projects claimed 1:1 ratio for the compensation of the abatement during the first commitment period. Therefore the main driver that defined a project's final ranking was the project's start date rather than the amount of the ERU bid.

A joint study by the OECD and CDC Climat Research (Clapp, et al., 2010) analyzed *inter alia* two PREs focusing on landfill gas utilization in New Zealand that were later converted into JI. The research concluded that these domestic projects provided a valuable opportunity to learn and develop understanding of carbon markets among relevant actors. Besides it enabled the local authorities to receive additional funding to finance emission reduction projects.

Another interesting example of creative use of JI is Denmark. In order to tackle the emissions from sectors not covered by the EU ETS, the government launched a pilot domestic emission reduction mechanism based on the JI framework. In order to test the scheme, two pilot National Climate Projects were chosen from a number of applicants in 2011 (Danish Energy Agency, 2011b). Compared to the classic JI approach domestic projects in Denmark will benefit from:

- development of the PDD templates by the Danish Energy Agency, which considerably reduces the transaction costs of the application to participate in the scheme, as well as cooperation with the agency throughout the project life-cycle;
- guaranteed purchase of emission reductions until 2015 by the government at prices tied to the international carbon markets;
- a possibility to use programmatic approach to reduce transaction costs for small-scale projects, which could be especially useful for municipalities and sectoral organizations (although JI also allows for the PoA scheme).

The aim of the pilot scheme is to simplify, as far as possible, documentation requirements that increase transaction costs. In addition, the requirement that projects result in equal emission reductions on the national emissions inventory allows for more streamlined measurement methods. This means that there is no variation between project results and the impact on the national inventory.

The cases of the Czech Republic, New Zealand and Denmark demonstrate how a country can use the JI framework as a domestic climate policy instrument.

CONCLUSIONS

This report examined the implementation of the JI mechanism in different countries and outlined the key lessons learnt and observations that can be useful for policymakers and businesses in future design and operation of JI or similar market mechanisms. The research yielded the following conclusions:

- The environmental integrity of the JI mechanism largely depends on the careful allocation of allowances as well as political will. Countries with large AAU surpluses lack the economic incentive on their GHG budget and therefore tend to be less stringent on the additionality requirement.
- Conversely, countries without comfortable AAU surpluses have the embedded economic incentive to strike the right balance between additionality – without which they risk paying more than one AAU per ton of emissions reduction – and transaction costs, which may eliminate truly addtionnal projects.

Some countries, like France, capture part of the rent in order to compensate for the possible non-additional projects.

- More than two thirds of all ERUs are issued by Russia and Ukraine, but 90% are surrendered by installations within the EU ETS, confirming the hypothesis that JI evolved into a largely private sector mechanism.
- The model, developed by CDC Climat Research, provides a risk-adjusted forecast of the ERU supply for the first Kyoto commitment period. According to the model, Annex I countries are expected to generate 356 million ERUs from JI over the period of 2008-2012. Around 80% of these carbon credits are forecasted to originate from Russia and Ukraine, which will likely become the third and the fourth largest suppliers of UN-backed carbon credits (ERUs and CERs) respectively. The increase in carbon credits supply will likely put an additional downward pressure on carbon prices.
- The case of Russia demonstrated the importance of political traction in the development of JI. Lack of proper understanding of the benefits of the mechanism and inability to establish efficient administrative framework resulted in the under-exploited potential of emissions reduction projects through JI in Russia until recently. However, the political support that arrived in summer 2011 boosted JI, as Russia aimed at embracing the benefits before the end of the first Kyoto commitment period. According to the model developed in this report and the qualitative information obtained through the interviews, Russia is expected to generate up to 154 million ERUs over the period of 2008-2012.
- Unlike Russia, Ukraine understood the opportunities embodied in JI very early: strong political support and establishment of simplified and incentivizing JI procedures enabled the country to maximize its JI potential, however, possibly downplaying the additionality. According to the model developed in this report, Ukraine is expected to generate up to 129 million ERUs over the period of 2008-2012.
- Linking JI to the EU ETS resulted in an increased demand and liquidity for ERUs as well as in the large-scale involvement of the private sector in financing emissions reduction projects. Besides, the linking created a positive price spread between ERUs and AAUs, and therefore an additional financial incentive for countries to develop the JI mechanism. At the same time it limited the potential of JI in the EU to sectors not covered by the EU ETS. Besides, it created an issue of double counting for certain types of projects, such as renewables, which was solved via creation of the JI reserves of EUAs.
- Although the development of JI projects in the EU was limited, the implications of this mechanism are far-reaching: JI provided an opportunity for testing new clean technologies, estimating abatement costs, improving national GHG inventories and setting the benchmarks for emission reductions. The case of N_2O emissions from the production of nitric acid demonstrated how JI contributes to the establishment of ambitious allocation benchmarks for the Phase III of the EU ETS.
- The cases of the Czech Republic, New Zealand and Denmark highlighted that JI can also be used as an instrument for domestic climate policies and measures.

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APPENDICES

Appendix 1 – Research methodology

The methodology of the research included:

- Review of the existing literature in the field of carbon markets and specifically JI, including publications of research institutions, multilateral organizations and NGOs.
- Analysis of quantitative information obtained through the open-source databases, namely UNEP Risoe CDM/JI Pipeline, IGES JI Project Database, UNFCCC JI Database and national carbon registries.
- Interviews with carbon market players, as well as public sector officials involved in JI, which provided additional information about the experiences with JI, country-specific procedures and factors influencing the development of projects.

Appendix 2 – ERU supply forecasting model

The ERU supply forecast for each JI project is calculated based on Equation 1.

Equation 1

$$ERU\ supply\ forecast = \\ = ERU\ amount\ in\ the\ PDD\ x\ Issuance\ probability\ x\ Issuance\ success\ rate$$

Equation 2

$$Issuance\ probability = Status\ issuance\ probability\ x\ (1 - Probability\ to\ get\ bogged\ down)$$

Status issuance probability (from 0 to 1) estimates the probability that the project will issue ERUs based on its current status (Table 5).

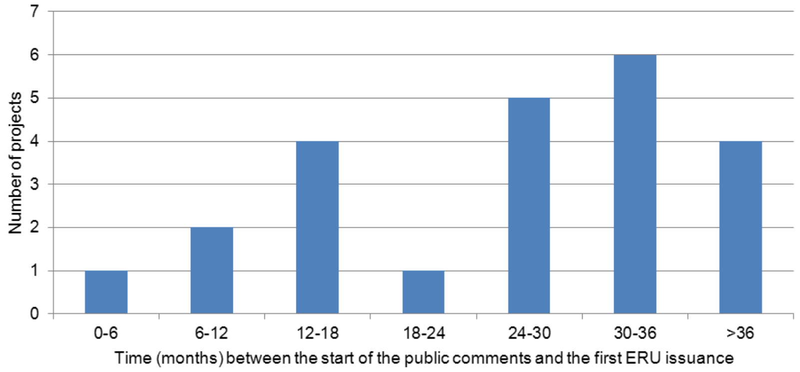
Table 5 – Status issuance probability

Status	Issuance probability	Comments
Registered and issued	1	The projects that have already issued ERUs are expected to continue issuing
Registered and not issued	1	All registered projects are expected to issue ERUs unless they are estimated to be bogged down
Registration requested	1	The projects that requested registration are very likely to get registered: historically all projects that reached this stage got registered, except one
At determination	0	The projects at determination are Track 2 projects that are unlikely to get registered. Out of 250 Track 2 projects in the pipeline only 30 have been registered with an average registration pace of 9 projects annually
Withdrawn / rejected	0	The projects that were withdrawn or rejected will never get registered unless they reapply for registration, in which case they will appear under a different status
Bogged down	0	A registered project is considered to be *bogged down* if it has not obtained its first issuance for too long. *Probability to get bogged down* (from 0 to 1) depends on the delay between the registration and the first ERU issuance.

Source: CDC Climat Research

For Track 2, available data do not allow to make a clear conclusion regarding the delay between the registration and the first issuance: projects may first issue ERUs more than three years after their registration (Figure 10). Therefore no registered project is assumed to be bogged down under Track 2.

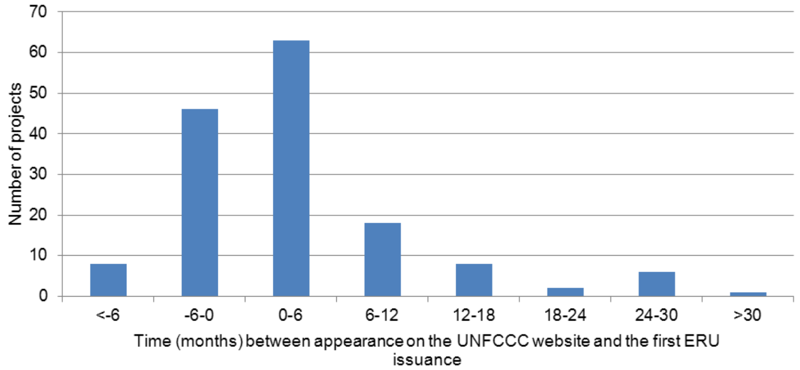
Figure 10 – First issuance delay (JI Track 2)



Source: CDC Climat Research, based on UNEP Risoe JI Pipeline database, January 2012

For Track 1, 89% of project issued ERUs within 12 months after the project appearance on the UNFCCC website and 94% of projects – within 18 months (Figure 11).

Figure 11 – First issuance delay (JI Track 1)



Source: CDC Climat Research, based on UNEP Risoe JI Pipeline database, January 2012

Given a possible delay in information exchange, the threshold is conservatively set at 18 months: a Track 1 project that has not issued any ERUs 18 months after its first appearance on the UNFCCC website is considered to be bogged down. The probability to get bogged down for Track 1 projects is thus estimated according to the Table 6.

Table 6 – Probability to get bogged down

Status and date of appearance on the UNFCCC website	Probability to get bogged down	Comments
Registered and issued	0	These projects are expected to continue issuing ERUs
Registered and appeared on the website less than 18 months ago	0.2	These projects have a 20% probability to get bogged down. This probability was calculated based on Equation 3
Registered and appeared on the website more than 18 months ago	1	These projects are considered to be bogged down and thus will not issue any ERUs

Source: CDC Climat Research

Equation 3

$$Probability\ to\ get\ bogged\ down\ \ for\ projects\ appeared\ less\ than\ 18\ months\ =$$
$$= 1 - \frac{number\ of\ projects\ with\ issuances}{number\ of\ projects\ with\ issuances + number\ of\ projects\ bogged\ down}$$

Projects that have already issued ERUs are expected to maintain the same level of issuance. Thus, for projects with issuances the *issuance success rate* is calculated in Equation 4.

Equation 4

$$Issuance\ success\ rate\ \ for\ projects\ with\ issuances\ = \\ = \frac{ERUs\ issued}{ERUs\ expected\ for\ the\ same\ period\ (based\ on\ the\ PDD)}$$

For projects without issuances the *issuance success rate* is calculated based on the host country and the type of project rates according to Equation 5.

Equation 5

$$Issuance\ success\ rate\ \ for\ projects\ without\ issuances\ = \\ = average\ country\ issuance\ success\ rate\ x\ 0.5 \\ + average\ type\ issuance\ success\ rate\ x\ 0.5$$

The weights of 0.5 for the country risk and the type risk are assigned based on the calculation of correlations between these two factors and the issuance success rate for projects with issuances as well as expert judgment. Two other factors, namely project size and JI Track, were also considered but excluded, since they are strongly collinear with the type and the country factors respectively.

In order to accommodate for the qualitative information obtained throughout the course of investigation, several assumptions were made:

- Despite the fact that there is a time lag between the end of the monitoring period and the actual issuance, it is assumed that the project owners will take it into account and submit their monitoring reports in time. This means that some of them might submit their reports a few months before the end of 2012 in order to secure the ERU issuance by 30 April 2013. This implies that they will lose the ERUs for these few months. Nevertheless, this amount will be negligible compared to the total ERU supply for the period of 2008-2012 and is therefore ignored in this analysis.
- Romania and Ukraine are currently suspended from the ERU issuance under Track 1 (UNFCCC, 2011f); however, it is assumed that the suspension will be lifted by spring 2012. Thus the total ERU supply for the period of 2008-2012 will not be considerably affected.
- Given the latest developments in Russia it is assumed that the country will register all potential JI projects that have applied for the last tender in August 2011. For more details regarding JI in Russia please refer to section A of the third part of the report.
- The two Russian HFC-23 destruction projects (RU1000201 and RU1000202) made changes in their PDDs increasing their projected emission reductions to a total of 41.3 $MtCO_2e$ against 7.5 $MtCO_2e$ planned initially (Russian Registry of Carbon Units, 2011b). The updated PDDs are used as a basis for the forecast.

Appendix 3 – Carbon credits spot price evolution

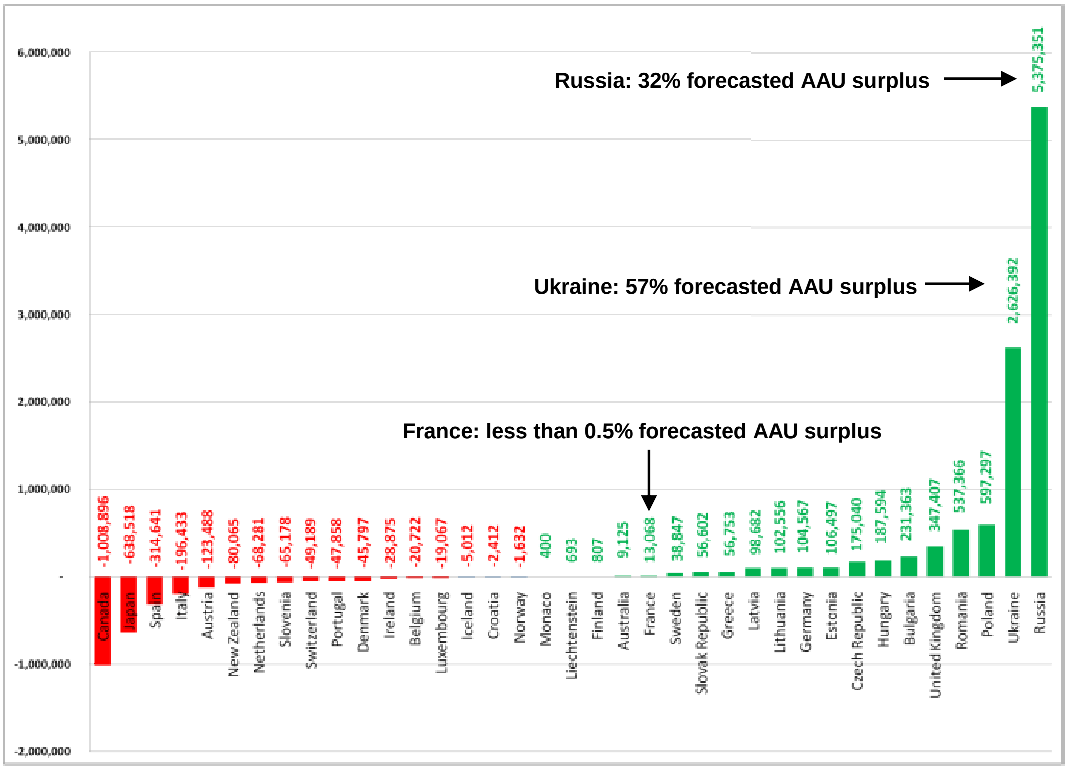
Source: BlueNext, January 2012

Appendix 4 – CDM and JI projects by type (as of January 31st, 2012)

Project type	kCER issued	Share in CDM	kERU issued	Share in JI
Biogas	0	0%	746	1%
Biomass energy	21 435	3%	1 458	1%
Cement	1 915	0%	567	0%
CO2 usage	10	0%	0	0%
Coal bed/mine methane	10 486	1%	4 258	4%
EE Households	56	0%	208	0%
EE Industry	1 730	0%	**32 650**	**27%**
EE own generation	36 844	4%	821	1%
EE service	6	0%	904	1%
EE Supply side	1 102	0%	1 949	2%
Energy distribution	316	0%	**12 002**	**10%**
Fossil fuel switch	26 995	3%	4 289	4%
Fugitive	8 584	1%	**13 437**	**11%**
Geothermal	2 300	0%	452	0%
HFCs	**388 481**	**46%**	**20 317**	**17%**
Hydro	71 996	8%	1 631	1%
Landfill gas	21 400	3%	1 676	1%
Methane avoidance	9 152	1%	0	0%
N2O	**189 803**	**22%**	**18 534**	**16%**
PFCs and SF6	1 134	0%	749	1%
Solar	144	0%	0	0%
Transport	359	0%	0	0%
Wind	**57 614**	**7%**	2 191	2%
TOTAL	**851 861**	**100%**	**118 839**	**100%**

Source: UNEP Risoe CDM/JI Pipeline database, February 2012

Appendix 5 – Forecasted AAU Positions for 2008-12 (Kt CO_2e)



Source: Gray et al., 2011

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