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Has Joint Implementation reduced GHG emissions? Lessons learned for the design of carbon market mechanisms

Anja Kollmuss, Lambert Schneider and Vladyslav Zhezherin

Stockholm Environment Institute
Linnégatan 87D
104 51 Stockholm
Sweden

Tel: +46 8 674 7070
Fax: +46 8 674 7020
Web: www.sei-international.org

Author contact:
Anja Kollmuss,
anja.kollmuss@sei-international.org
Director of Communications: Robert Watt
Editors: Elaine Beebe and Marion Davis

Cover photo: A steel plant in Ukraine with a coal waste heap in the background.
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Anja Kollmuss, Lambert Schneider

Stockholm Environment Institute – U.S. Centre

Vladyslav Zhezherin

Independent consultant

ABSTRACT

This study systematically evaluates the environmental integrity of Joint Implementation (JI) in the first commitment period of the Kyoto Protocol. Our analysis indicates that about three-quarters of JI offsets are unlikely to represent additional emissions reductions. This suggests that the use of JI offsets may have enabled global GHG emissions to be about 600 million tonnes of carbon dioxide equivalent higher than they would have been if countries had met their emissions domestically. Of the six largest project types assessed in more detail, we find only one – N_2O abatement from nitric acid production – had overall high environmental integrity. Our evaluation clearly shows that oversight of an international market mechanism by the host country alone is insufficient to ensure environmental integrity. The paper makes recommendations for the ongoing review of the JI Guidelines, for carbon markets generally, and for a new climate agreement.

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Introduction

Joint Implementation is one of two offsetting mechanisms under the Kyoto Protocol, along with the Clean Development Mechanism (CDM). It enables countries with emission reduction commitments under the Kyoto Protocol to generate Emission Reduction Units (ERUs) from greenhouse gas (GHG) reduction projects and transfer them to other countries. As of March 2015, almost 872 million ERUs had been issued under JI, about one-third of all Kyoto offset credits. This study systematically evaluates the environmental integrity of JI in the first Kyoto commitment period. Our analysis can directly inform the ongoing review of the JI Guidelines, and is also deeply relevant to discussions about carbon markets more generally.

Impact of JI on global emissions

Our findings indicate that use of JI may have enabled global GHG emissions to be about 600 million tonnes of carbon dioxide equivalent (tCO_2e) higher than they would have been if countries had met their emissions targets domestically.

In principle, offsets are a zero-sum game for the atmosphere. Buyers of offsets can increase their emissions by a corresponding amount above the target level, while emissions are reduced by that amount in the host country, keeping global emissions the same. If offsets come from non-additional or overcredited projects, however, using them will lead to an increase in global emissions relative to a scenario without the use of offsets.

The design of JI should, in theory, avoid that outcome. Under the Kyoto Protocol, each country with an emissions target receives allowances (called Assigned Amount Units, AAUs) equivalent to its total emissions budget for the commitment period. For every ERU it issues, a host country must cancel one AAU. Thus, if a JI project is overcredited or not additional, the host country would have to make up the difference and engage in more mitigation action.

However, in the first commitment period, several countries had emissions targets well above their BAU emissions, resulting in large AAU surpluses. In such cases, host countries can use surplus AAUs to cover their ERUs, and will not have to engage in additional mitigation action. Thus, non-additional or overcredited JI projects in those countries will lead to higher global emissions.

Our analysis indicates that at about three quarters of ERUs are unlikely to represent additional emissions reductions, and about 95% of the total ERUs were from countries with a significant AAU surplus. This suggests that the use of JI may have enabled global GHG emissions to be about 600 million tCO_2e higher than they would have otherwise been. The implications for the European Union's Emissions Trading System (EU ETS) are particularly serious. As of April 2015, more than 560 million ERUs had been used in the EU ETS. JI may therefore have undermined the EU ETS emission reduction target by about 400 million tCO_2.

Plausibility of additionality claims

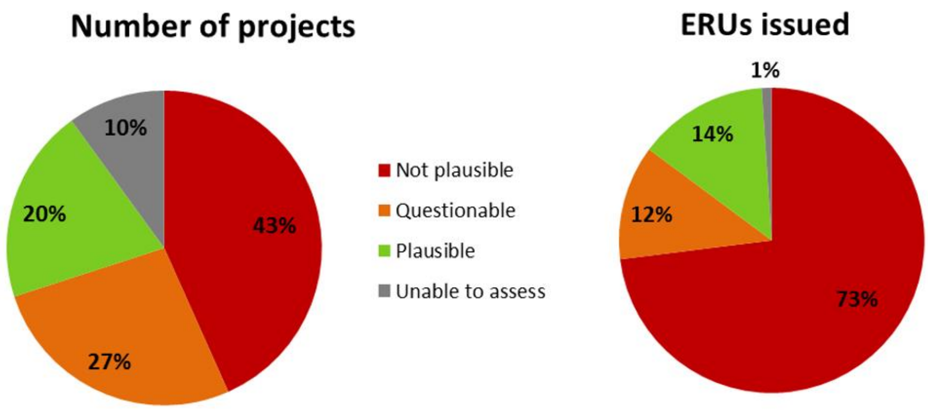
In a random sample of 60 projects, the additionality claims do not seem plausible for 73% of the ERUs issued and are questionable for another 12%.

We assessed the plausibility of additionality claims of JI projects through an in-depth review of the information available for a sample of 60 projects, drawn in a representative manner taking into account the host countries, project types and project scale. While this approach has clear limitations – it is a subjective judgment of the authors based on the limited information publicly available – it is based on a careful analysis applied in a consistent manner across projects, assessing the plausibility of the timeline of project implementation and registration under JI as well as the information on the main additionality tests used to determine additionality (investment analysis, barrier analysis, common practice analysis, reference to a comparable project). We used three broad categories to classify each project:

- "Plausible" means that based on the available information, the claims for demonstrating additionality seem plausible.
- "Questionable" means that the available information raises questions or doubts about the additionality.
- "Not plausible" means that the available information suggests that the projects are unlikely to be additional.

Figure ES-1 shows that for 43% of the projects and 73% of the ERUs the additionality claims were not plausible based on the available information.

Figure ES-1: Plausibility of the additionality claims of the sample projects



Data source: Random sample of 60 registered projects

Environmental integrity of key project types

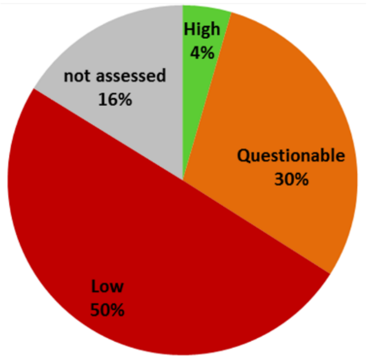
Of the six largest project types assessed in more detail, we find only one – N_2O abatement from nitric acid production – had overall high environmental integrity. For many JI projects, either additionality seems unlikely, or unrealistic assumptions are used that grossly overestimate the actual emission reductions. We find 80% of all ERUs come from projects types with questionable or low environmental integrity.

The environmental integrity of the six project types with the highest ERU issuance was also examined in more detail. These project types represent 84% of the ERUs issued and 53% of registered projects in the first commitment period. Figure ES-2 and Table ES-1 provide an overview of the results of our analysis.

Table ES-1: Environmental integrity of the six largest JI project types

<table>
<tr><th>Project types</th><th>Registered projects</th><th>Share of ERUs</th><th>Main countries</th><th>Overall envir. integrity</th></tr>
<tr><td>Spontaneous ignition of coal piles</td><td>78</td><td>26%</td><td>all in Ukraine</td><td>Low</td></tr>
<tr><td colspan="5">This project type avoids GHG emissions from uncontrolled fires from coal waste piles. Most JI projects extract coal from the piles, leaving bare rock which does not ignite; others extinguish the fires.
• Additionality not plausible: The timeline of project implementation shows that almost all projects were registered in 2012 but were implemented at least four years earlier. Additionally is usually demonstrated by long chains of reference to a similar project.
• Overcrediting likely to be very significant: Baseline emissions are overstated due to unrealistic assumptions. All coal waste pile JI projects together implicitly claim that they have produced around 30% of all coal in Ukraine. This is a highly unrealistic scenario.</td></tr>
<tr><td>Energy efficiency in industry and power production and distribution</td><td>164</td><td>23%</td><td>mainly Ukraine and Russia</td><td>questionable</td></tr>
<tr><td colspan="5">This project type includes a large variety of energy efficiency improvement measures in diverse sectors, such as large industrial facilities, and power and heat plants.
• Additionality questionable: Projects of this type are in many cases financially attractive without JI and JI may only have sped up implementation. The additionality claims do not seem plausible for the majority of projects, questionable for some, and plausible for a few.
• Overcrediting not assessed: Because of the wide variety of technologies and sectors that make up this project type, we were unable to assess the overall validity of emission reduction claims.</td></tr>
<tr><td>Associated petroleum gas (APG) utilization</td><td>22</td><td>14%</td><td>all in Russia</td><td>low</td></tr>
<tr><td colspan="5">This project type utilizes associated petroleum gas that would otherwise be flared at oil field operations.
• Additionality not plausible: The timeline of project implementation shows that most projects, accounting for almost 80% of ERUs, were implemented 6–9 years before their auditing and were registered even later.
• Overcrediting likely to be significant: The claimed reductions do not match Russia's GHG inventory data, suggesting overcrediting or inaccuracies in Russia's inventory: The JI projects implicitly claim that in their absence, Russian emissions from APG flaring in oil production would have increased well above any historical values observed since 1990.</td></tr>
<tr><td>Natural gas transportation/distrib.</td><td>32</td><td>10%</td><td>mostly Ukraine</td><td>low</td></tr>
<tr><td colspan="5">This project type involves reducing methane leaks from natural gas transportation and distribution or expanding natural gas networks in order to replace coal or oil.
• Additionality not plausible: The project starting dates of the 30 projects located in Ukraine were between 2003 and 2006, while most projects received their Letter of Endorsement only in 2012.
• Some overcrediting likely: The network expansion projects assume that they solely replace fossil fuels such as coal and heavy oil. But in rural areas newly available gas would also substitute biomass. The exclusion of the use of biomass may inflate the baseline emissions. For projects addressing methane leaks, the implied leakage rates in the absence of JI exceed historical emission rates reported in Russia's GHG inventory, which suggests that either in the absence of the JI projects Ukraine's emissions from this activity would have risen, or emission reductions claimed by the projects are overestimated.</td></tr>
<tr><td>Abatement of HFC-23 and SF6</td><td>4</td><td>7%</td><td>mainly Russia</td><td>questionable</td></tr>
<tr><td colspan="5">These projects incinerate HFC-23 and SF_6 waste gas streams in industrial facilities.
• Additionality plausible: In the absence of regulations or other policies, this project type can be regarded as likely to be additional because plant operators do not save costs or generate revenues from the installation of abatement technology.
• Overcrediting likely to be very significant: Two of the four projects initially implemented a conservative approach to calculate emission reductions. In 2011, safeguards to prevent perverse incentives were removed, leading to significant over-crediting. One project assumed a baseline emission rate by far exceeding common levels.</td></tr>
<tr><td>N_2O abatement from nitric acid</td><td>43</td><td>5%</td><td>EU</td><td>high</td></tr>
<tr><td colspan="5">These projects abate unwanted N_2O that is generated as a by-product in nitric acid plants.
• Additionality plausible: In the absence of regulations or other policies such as the EU ETS, this project type can be regarded as likely to be additional because plant operators do not save costs or generate revenues from the installation of abatement technology.
• Overcrediting unlikely: Ambitious emission benchmarks based on European regulations (1.4–2.5 kg N_2O/t nitric acid) were used in Western Europe except Sweden. Higher values (4.3–13.5 kg N_2O/t nitric acid) were used in Eastern Europe and Sweden.</td></tr>
</table>

Figure ES-2: Overall environmental integrity of project types by ERUs issued

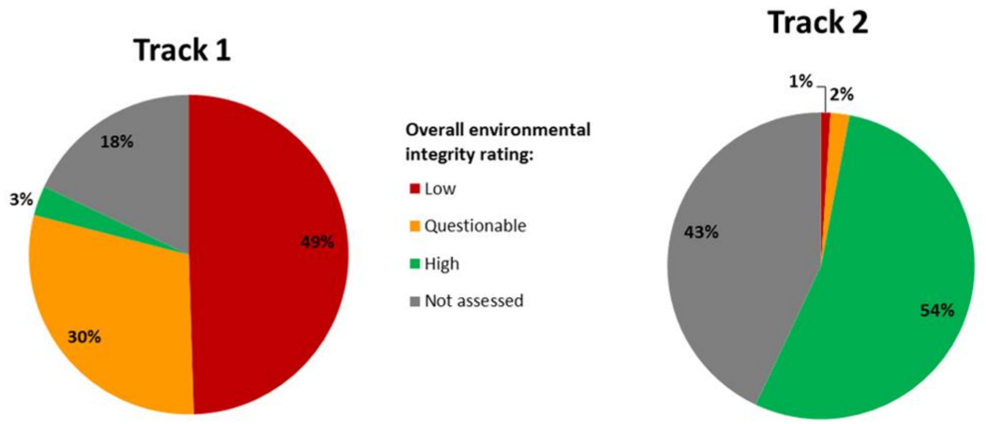


Data source: Evaluation of the largest six project types, applied to the portfolio of 642 projects registered as of March 2014.

Environmental integrity of Track 1 and Track 2

Under the current rules, JI projects can be implemented under two tracks. Under Track 1, host countries can largely establish their own rules for approving projects and issuing ERUs, without international oversight. The host country can determine whether it deems emission reductions as additional. Under Track 2, a UN body – the Joint Implementation Supervisory Committee (JISC) – reviews projects and requests for ERU issuance and accredits JI auditors. To date, 97% of ERUs have been issued under Track 1. Figure ES-3 compares the environmental integrity of projects under the two tracks (the fraction of ERUs from projects types we did not evaluate is shown in grey). The share of ERUs issued from project types with plausible environmental integrity was considerably larger under Track 2 than under Track 1.

Figure ES-3: Environmental integrity of project types each track, by ERUs issued



Source: Evaluation of the largest six projects applied to the portfolio of projects registered under Track 1 and Track 2 as of March 2014.

Accredited Independent Entities

Accredited Independent Entities (AIEs) have the key role of ensuring the compliance of the projects with JI requirements, including those related to environmental integrity. In many cases, they did not perform their auditing functions appropriately. Under Track 1, they had no incentives to do so, as appropriate oversight was not provided, and any non-performance had no consequences.

AIEs have the key role of ensuring the compliance of the projects with JI requirements, including those related to environmental integrity. The findings of the study call into question the ability of and incentives for the involved AIEs to perform their auditing functions appropriately. AIEs often failed to identify obvious mistakes, inconsistencies, questionable assumptions or claims, or changes to the project activity or monitoring plan. In many instances, validation and verification expert statements are very brief and do not specify how key requirements are assessed.

Most host countries rely on AIEs accredited under Track 2 to perform determination and verification functions under Track 1, but their performance is only monitored and assessed by the JISC for functions performed under Track 2. For this reason, AIEs did not have to fear sanctions if they did not perform their functions appropriately under Track 1. Moreover, the fact that JI project participants select and pay their AIE may create an inherent conflict of interest.

Bureau Veritas Certification Holding SAS audited by far the most JI projects. It performed project determinations and/or emission reduction verifications of 56% of all projects, which generated 78% of total ERUs. The popularity of Bureau Veritas increased towards the end of the commitment period, while the market share of other AIEs that were popular in the beginning went down. In our random sample, 77% of the projects determined by Bureau Veritas made additionality claims that were not plausible, and 17% had questionable claims, while only 12% of projects determined by other AIEs made implausible additionality claims, and 46% made questionable claims.

Differences among host countries

The four countries with the highest ERU issuances – Ukraine, Russia, Poland and Germany – registered 439 projects and issued more than 800 million ERUs, accounting for 94% of ERU issuance. An assessment of the project portfolio in each country indicates significant environmental integrity concerns for more than 80% of ERUs from Russia and Ukraine, whereas the environmental integrity was rated as high for 70% of ERUs in Poland and 97% in Germany.

Lessons learned for the design of crediting mechanisms

A key finding of our analysis is that crediting mechanisms need to be very carefully designed to ensure environmental integrity. In particular, our evaluation of the environmental integrity of JI offers the following insights:

- **Crediting mechanisms should adopt project cycle procedures which ensure full transparency and make all documentation publicly available.** Lack of transparency is an important concern in some JI host countries, where key project documentation, such as project design documents (PDDs), monitoring reports, and determination and verification reports are not available or incomplete for a number of projects. To avoid this problem, crediting mechanisms need rules and enforcement to ensure timely and complete reporting. However, it is important to note that transparency, though crucial for ensuring environmental integrity, is not enough by itself. One host country, Ukraine, ensured a high degree of transparency but nevertheless issued mostly ERUs of very questionable environmental integrity.
- **Only internationally accepted methodologies should be eligible for use:** Many projects applied their own, JI-specific approaches for additionality demonstration and the calculation of emission reductions. In many cases, these projects used inappropriate approaches, made unrealistic assumptions, or applied questionable values for key parameters, often leading to overcrediting and significantly higher emission reductions

estimates than if, for example, Clean Development Mechanism (CDM) methodologies had been applied. We therefore recommend that only internationally accepted methodologies that have undergone thorough review by experts and which were developed for specific and defined project types be used, and that any deviations from such methodologies, before or after registration, be assessed using appropriate regulatory oversight.

- **Auditors should be fully accountable for all their activities to the authority regulating the mechanism:** We recommend that crediting mechanisms adopt accreditation systems which continuously monitor the performance of auditors and which apply sanctions in the case of non-performance, including the suspension or withdrawal of accreditation. Merging the JI and CDM accreditation systems could further improve the oversight of the operations of AIEs.
- **Retroactive crediting should not be allowed:** Retroactive crediting of emission reductions has seriously undermined the integrity of JI. We recommend that current and future crediting mechanisms avoid any retroactive crediting and provide for procedures which ensure that projects must be approved or pre-approved (e.g. through a letter of endorsement) prior to the decision to proceeding with their implementation.
- **Investors should have reasonable certainty:** In several JI host countries, project developers faced considerable uncertainty as to whether their projects would ultimately be approved and ERUs issued. This uncertain environment may have favoured projects that did not rely on ERU revenues, thereby also negatively affecting the overall environmental integrity of the project portfolio. We recommend establishing a stable and predictable regulatory environment for crediting mechanisms.

Implications for the reform and future of JI

The ongoing review of the JI Guidelines offers an important opportunity to address the shortcomings identified with regard to the environmental integrity of JI. The planned merger of the two tracks could potentially strengthen the environmental integrity through more international oversight.

However, key issues which could continue to strongly undermine the integrity of JI have yet to be addressed. For example, the current draft JI Guidelines allow existing projects to continue issuing ERUs under the new guidelines without having their additionality reassessed. The threat that existing projects with low environmental integrity would continue undermining mitigation outcomes is real and significant and should therefore be weighed strongly. JI projects only had certainty about ERUs up to the end of the first commitment period. We therefore recommend that only existing projects which would stop operating without the incentives from JI should be able to continue receiving ERUs in the second commitment period.

The draft JI Guidelines furthermore propose different options for the length of crediting periods and their renewal. The issuance of ERUs is tied to the availability of AAUs from the same commitment period when the emission reductions occurred. It is unlikely that the Kyoto Protocol will be extended by a third commitment period, and JI may therefore not continue as a mechanism beyond 2020. Allowing for crediting periods that last beyond the end of 2020 could leave investors facing considerable uncertainty as to whether and how any reductions beyond 2020 could be credited. We therefore recommend that the revised JI Guidelines explicitly state that the crediting period ends at the end of the second commitment period.

Implications for market mechanisms under a new climate agreement

Countries are negotiating a new agreement under the United Nations Framework Convention on Climate Change (UNFCCC), to be approved at the Paris Climate Change Conference in December 2015 and become effective in 2021. As part of this process, each country is to submit its "intended nationally determined contribution" (INDC) under the agreement. Countries have also started to discuss how carbon markets could be incorporated into this new climate agreement.

Our evaluation clearly shows that oversight of an international market mechanism by the host country alone is insufficient to ensure environmental integrity, in particular for countries with a significant AAU surplus which had no incentives to ensure environmental integrity. A new regime could create situations similar to those experienced with JI:

- **Unclear ambition of INDCs:** If INDCs are set above business-as-usual (BAU) emissions, host countries would not have incentives to ensure environmental integrity of units transferred internationally. A key challenge is that future (emission) developments are rather uncertain. An INDC which appears ambitious from today's perspective could turn out to be easily achievable due to unforeseen developments, such as an economic recession, new low carbon fuels becoming available, or technological developments.
- **Absence of international accounting rules:** If countries with mitigation commitments do not account for units transferred to other jurisdictions, they could sell credits without having to engage in additional mitigation action if these credits lack environmental integrity. An internationally agreed accounting approach is crucial to ensuring that international transfer of units does not lead to double counting of emission reductions, and that host countries have incentives to ensure environmental integrity of units.
- **INDCs not converted into multi-year emission targets:** If countries with single-year targets (e.g. a 20% reduction by 2025) did not convert their target into a multi-year emissions target and were allowed to transfer units issued for years up to the target year, they would have no incentive to ensure the units' environmental integrity. Accounting of international transfer of units towards commitments should indeed only be possible if countries take on quantifiable, multi-year emission reduction targets.

Ensuring that INDCs are ambitious and converted into multi-year emission budgets, and agreeing on international accounting rules, is therefore critical to avoid that the experience with JI is repeated under a new climate regime.

While international oversight is important, we also note its limitations. Information asymmetry between proponents and auditors or regulators remains a major challenge that is difficult to address, even with international oversight. Furthermore, international oversight can only be effective if countries do not hamper the strengthening of a crediting mechanism's integrity. CDM and JI reform efforts under the UNFCCC have shown that often no consensus can be reached to address and rectify environmental integrity shortcomings.

A broader question that remains is what the scope and role of crediting mechanisms can be in the longer term. The experience with JI shows that in countries with ambitious caps, the potential of a crediting mechanism may be quite limited. The EU, for example, had to limit the eligible project types considerably in order to avoid double counting and overlap with the EU ETS and other climate policies. Given the reduced potential of crediting mechanisms in a world where most emissions are covered under other mitigation policies, and given the general challenges of ensuring environmental integrity for crediting mechanisms, the role of crediting mechanisms beyond 2020 may be rather limited.

1. INTRODUCTION

1.1 Purpose of this study

Joint Implementation (JI) is one of the two offsetting mechanisms under the Kyoto Protocol, together with the Clean Development Mechanism (CDM). It enables countries with mitigation commitments under the Kyoto Protocol, called Annex B countries, to generate and transfer Emission Reduction Units (ERUs) from greenhouse gas (GHG) abatement projects.

The CDM has been widely studied, but few analyses have been done for JI (Shishlov et al. 2012; Ukraine 2006a; Armenteros and Michaelowa 2003; Gaast 2002; Jackson 1995; Schmitz and Michaelowa 2005; Sterk 2008). In particular, an in-depth evaluation of its environmental integrity has not been done to date. This is a significant knowledge gap, given that the almost 872 million issued ERUs account for one-third of all Kyoto offset credits (from both CDM and JI) that had been issued as of March 2015.[1]

This study systematically evaluates the environmental integrity of JI in the first commitment period of the Kyoto Protocol (KP). It aims to answer the question: To what extent would emissions have been higher or lower without JI, keeping everything else constant? We assess how the current rules and governance arrangements have affected the environmental integrity of JI and what lessons can be learned for both the reform of JI and new market mechanisms.

Our analysis is directly relevant to ongoing carbon market discussions. First of all, JI rules are being revised; the current JI Guidelines are to be replaced by "Modalities and Procedures for JI", which are under consideration by the Subsidiary Body for Implementation (UNFCCC 2006b; UNFCCC 2014c). The study makes recommendations on how JI could be reformed.

Second, lessons learned from JI can provide vital insights for the design of future market mechanisms and accounting rules. Many countries have expressed support for continuing to use market mechanisms under the United Nations Framework Convention on Climate Change (UNFCCC), including the existing mechanisms CDM and JI, as well as a "new market mechanism" and a "framework for various approaches" (UNFCCC 2013b; UNFCCC 2012).

It is unclear whether or how carbon markets will be part of a post-2020 climate deal that countries aim to agree on at the Paris Climate Change Conference this December. As JI was implemented in countries with economy-wide mitigation targets, it can provide important lessons for market mechanisms under a new climate agreement, as well as for domestic mechanisms in countries with mitigation targets.

1.2 Research approach

The environmental integrity of an offsetting mechanism depends on both the environmental integrity of the projects for which units are issued and the way in which units are accounted – i.e. how they are issued, transferred and used towards meeting mitigation commitments (Prag, Hood, et al. 2011; Prag, Aasrud, et al. 2011; Prag et al. 2012; Schneider et al. 2015). Because JI projects are hosted by countries with economy-wide emission reduction targets, they differ from CDM projects in an important way. Using units from CDM projects that lack environmental integrity to help meet a mitigation pledge will always lead to an increase in global emissions, but this is not necessarily the case under JI. As we discuss further in Section 3, the global emissions impact of using ERUs from JI projects that lack environmental

[1] See: http://ji.unfccc.int/statistics/2015/ERU_Issuance_2015_03_31_1200.pdf [accessed 14 May 2015].

integrity depends to a large extent on whether the host country has a significant surplus of Kyoto allowances.

The environmental integrity of an offset project depends on whether the project is additional and the emission reductions are not overestimated.

Additionality refers to the question whether a project is implemented due to the incentives from JI. If the project would also have been implemented in the absence of JI, it is not considered additional. All the ERUs issued from such a project would be based on emissions reductions that would also have occurred in the absence of JI.

To ensure that ***emission reductions are not overestimated and ERUs are not overcredited***, several factors must be considered:

1. **Baseline emissions:** a baseline represents the assumed emissions level that would occur if the JI project had not been implemented. Because baseline emissions are based on a counterfactual scenario and assumptions, they are associated with considerable uncertainty. In order to ensure environmental integrity, baselines need to be based on robust data and a credible business-as-usual scenario, and then be quantified conservatively in order to avoid overcrediting.
2. Whether **project emissions** are quantified in an accurate or conservative way.
3. The way how potential **leakage effects**, i.e. indirect emission effects outside the project boundary, are addressed.
4. Whether the **length of the crediting period** is appropriate.
5. Whether the emission reductions are **measurable and verifiable** – i.e. whether the achieved emissions reductions can be measured, quantified, and independently verified with reasonable accuracy.
6. Whether the emission reductions are **attributable** to the mitigation activity. For some project types, this is easy to determine, e.g. when the GHGs in a tail gas stream can be directly measured before they enter a GHG destruction facility. However, for some project types it can be difficult or impossible to distinguish the emissions impact of the project from other changing parameters that affect emissions. This can be the case when emissions are influenced by several factors (such as fuel prices and availability) that make it difficult to attribute reductions to the incentives created by the offset programme.
7. Whether the reductions are **permanent,** or whether the potential non-permanence of emissions reductions is addressed in an appropriate manner.

The study primarily focuses on the assessment of additionality and the determination of baseline emissions, which particularly affect environmental integrity, but we also discuss other issues as relevant to specific project types or regions. Given the uncertainties noted above, and the limited availability of data, we cannot precisely determine whether projects are additional or the degree of any overcrediting or undercrediting. Instead, we discuss the likelihood of additionality and the range of overcrediting or undercrediting for different types of JI projects and countries.

Our analysis is based on an array of evidence: we evaluated relevant literature; interviewed stakeholders involved in JI; analysed the circumstances of particular project types through economic, sectoral, and policy evaluations, assessing differences between regions; and evaluated publicly available project documents. The latter was a key element of the study; we evaluated a random sample of 60 JI projects, drawn from all projects registered as of 1 April

2014 based on information provided by UNEP Risoe (2014). The UNEP Risoe database includes 604 registered projects (both under Track 1 and Track 2) and 38 registered Programmes of Activities (PoAs).[2] Rejected or withdrawn projects and projects that did not proceed to registration (i.e. projects at earlier stages of the JI project cycle) were not included. The sample was chosen in a representative manner based on the following criteria:

a. **Region/Host country**: To identify potential differences between host countries, the projects were clustered into four categories: Russia, Ukraine, other Annex I countries with economies in transition, and Annex II countries.[3]
b. **Track type**: To identify differences between tracks we used three categories: Track 1 projects, Track 2 projects, and projects that were initiated under Track 2 but later switched to Track 1. (See Section 2.2 for a definition of the tracks.)
c. **Project types**: To identify differences in technologies and project types, we clustered the projects into 12 categories (see Table 1).

We drew the sample in a way that the three categories above are representative with regard to the projects' estimated emission reductions in the first commitment period (CP1), until the end of 2012, as stated in the project design documents (PDDs). We used the estimated emission reductions – and not the number of projects – because we aim to assess the overall average integrity of ERUs which have or could be issued for CP1. We used the number of expected, not issued, ERUs in order to include projects which were registered but had not yet issued ERUs. A list of the projects in the sample is provided in Annex 2.

Table 1: Categorization of project types used to establish a random sample[4]

Project types	Registered projects	% of ERUs issued in CP1	% of ERUs expected in CP1 (according to PDD)
Spontaneous ignition of coal waste piles	78	26%	26%
Energy efficiency supply side	117	16%	19%
Associated petroleum gas utilization	22	14%	11%
Natural gas transportation and distribution	32	10%	9%
Other: non-CO_2	167	8%	8%
Energy distribution	47	7%	7%
HFC-23 abatement from HCFC-22	3	5%	4%
N2O abatement from nitric acid	41	5%	5%
PFC and SF6 reduction	7	4%	3%
Fossil fuel switch	17	3%	3%
Other: CO_2	81	2%	3%
Coal mine methane	28	1%	4%

Source: UNEP Risoe (2014)

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[2] The UNEP Risoe JI database does not include all registered projects. The JI section of the UNFCCC website (http://ji.unfccc.int) shows, as of 31 August 2014, 597 registered Track 1 projects and 51 projects with final determination under Track 2, a total of 648 projects. We used the UNEP Risoe database for sampling because it provides more data in tabular format that can be used for analysis. There are also JI projects with no ITL number, because they did not pay the registration fee, that are still listed on the UNFCCC website and marked as "registered" in the UNEP Risoe database. These projects were also included in the database from which we drew the sample.

[3] Annex II Parties under the UNFCCC consist of the Organisation for Economic Co-operation and Development (OECD) members of Annex I, but not the Economies in Transition (EIT) Parties.

[4] We used project types as defined in the UNEP Risoe database. Though the type definitions are not always precise, we used this database with its categorization because it enables the analysis of the whole array of JI projects.

The two project type categories “Other: non-CO_2” and “Other: CO_2” include a number of project types with relatively small emission reductions that were combined into these two categories (see Table 2).

Table 2: ‘Other: CO_2’ and ‘Other: non-CO_2’ project type categories

Project type	Number of registered projects	% of ERUs issued in CP1	% of ERUs expected in CP1
Other CO_2			
Agriculture: no tillage	7	2.5%	1.9%
Biomass energy	46	0.8%	1.2%
Hydro	20	0.7%	1.0%
Energy efficiency in households	12	0.3%	0.9%
Energy efficiency in service sector	23	1.7%	0.8%
Wind	43	0.7%	0.8%
Cement	4	0.5%	0.4%
Transport	4	0.0%	0.4%
Afforestation	2	0.5%	0.2%
Geothermal	5	0.1%	0.2%
Avoided deforestation	1	0.1%	0.0%
Total	**167**	**7.9%**	**7.8%**
Other non-CO_2			
N_2O adipic acid	3	1.8%	1.4%
Landfill gas	67	0.3%	0.7%
Methane avoidance	7	0.2%	0.3%
Agriculture	4	0.0%	0.1%
Total	**81**	**2.3%**	**2.5%**

Source: UNEP Risoe (2014)

The evaluation of the sample projects focuses on an analysis of the PDDs; in addition, other project documentation, such as monitoring reports, determination and verification reports, letters of approval, and ERU approval and issuance data were reviewed where available. The analysis is used to evaluate the environmental integrity of the projects and to assess JI rules that affect environmental integrity. Where possible, quantitative results are identified; otherwise qualitative approaches are used to estimate impacts.

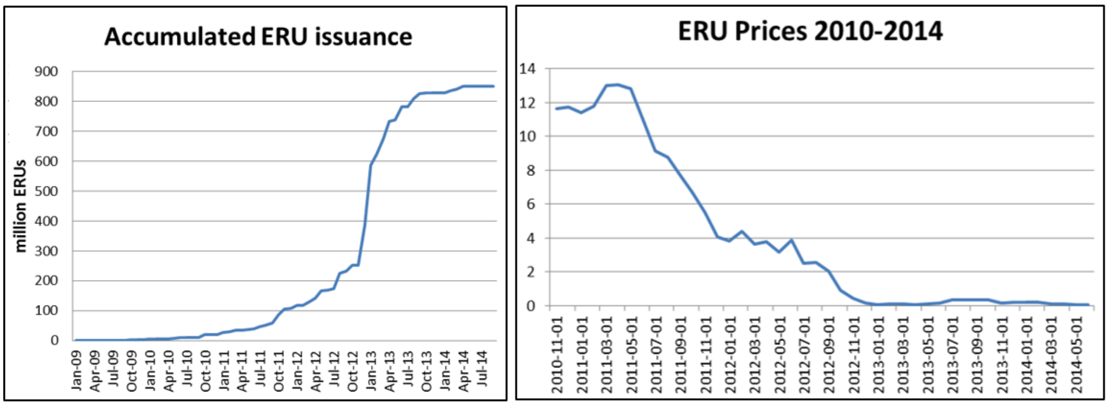
We also examine six project types in more detail, in order to compare their environmental integrity. The project types were selected by their share of ERUs; together they cover 82% of ERUs issued and 53% of the projects registered. The project type assessment includes economic aspects and sector-specific information, drawing upon the sample of JI projects, relevant literature, and structured interviews with market participants.

2. JOINT IMPLEMENTATION: AN OVERVIEW

Joint Implementation is one of three flexibility mechanisms established under the Kyoto Protocol to enable countries with binding GHG emissions targets to meet their obligations more cost effectively. JI is described in Article 6 of the KP (UNFCCC 1997). Under JI, one Annex I country can invest in an emission reduction activity in another Annex I country as an alternative to reducing emissions domestically.

The first host country approval for a JI project was given in 2000, to a Polish project. The first ERUs were issued in 2008. As shown in Figure 1, issuance of credits grew exponentially in the first few years before plateauing in 2013. Prices dropped from more than EUR 12 in 2010 to less than EUR 0.10 in early 2013, and have remained at well below EUR 0.50. This precipitous drop occurred because the supply of ERUs from JI and Certified Emission Reductions (CERs) from the CDM exceeded demand. The demand was limited due to various factors, including a cap on the use of ERUs and CERs in the EU Emissions Trading System (EU ETS), and less demand from EU governments for mitigation commitments in non-ETS sectors due to the economic slowdown. On the other hand, the supply of ERUs was much larger than expected, in particular when ERU issuance accelerated strongly in 2012.

Figure 1: Accumulated issuance and ERU prices



Data sources: UNEP Risoe (2014) and http://www.quandl.com/futures/ice-ecx-eru-emission-futures.

As of August 2014, there were 648 registered JI projects,[5] of which 496 have generated ERUs – almost 857 million in total. Ukraine and Russia account for more than 90% of ERUs issued. They also have the largest share of projects. Poland, Germany, France and Romania account for another 7% of ERUs (see Section 6). There are also significant differences by project type: some types, such as projects related to the ignition of coal waste piles, have generated large numbers of ERUs, while others types, such as wind power, have many registered projects but have issued far fewer ERUs (see Tables 1 and 2 in the previous section).

2.1 JI governance structures

Under the current JI Guidelines, projects can be implemented under two different tracks (UNFCCC 2006b). Under Track 1, host countries are responsible for all aspects of the project cycle, including the approaches for determination of additionality, quantification and verification of emission reductions, registration of projects, and issuance of ERUs. Hence,

[5] See: http://ji.unfccc.int/JI_Projects/ProjectInfo.html [accessed 17 October 2014].

under Track 1 each Party establishes its own procedures and requirements for projects and verification and has the responsibility to ensure the environmental integrity of the resulting credits. While some requirements differ between Parties, there are also many common elements. Under Track 2, some of these responsibilities are assigned to a UN body, the Joint Implementation Supervisory Committee (JISC), which has requirements and procedures that resemble, to a large extent, those of the CDM.

To qualify as a Track 1 host country, a Party has to meet the eligibility requirements listed in paragraph 21 of the JI Guidelines, which are related to the Party's ability to account for its emissions and carbon units while ensuring transparency (see Table 3). If a host country does not meet any of these requirements, JI projects have to be implemented under Track 2. Track 2 was intended to provide flexibility to Parties and project participants in case a Party is unable to meet Track 1 requirements. It was feared that compliance with the requirements related to the national GHG inventory and inventory system could be a big challenge for some countries. However, in practice the large majority of Parties have been continuously eligible to participate in both tracks. Parties that meet the Track 1 eligibility criteria may still elect to apply the Track 2 verification process.

Table 3: Requirements for countries' participation in JI and ERU transfer

Minimum requirements (common to Track 1 and Track 2)	**Additional requirements for Track 1**
1. Being a Party to the Kyoto Protocol 2. Having its assigned amount established for the relevant commitment period 3. Having in place a national GHG registry (carbon units registry)	4. Having in place a national GHG inventory system 5. Having submitted the most recent annual GHG inventory 6. Having submitted required supplementary information on its Assigned Amount

Source: UNFCCC (2006b)

JI Track 2 became operational in 2006, after the JISC was established. Track 1 took longer to start, since host countries had to be in compliance with Track 1 requirements and needed time to establish their national JI procedures and infrastructure. Many host countries used Track 2 as a model when they designed their national Track 1 rules.

Under both tracks a JI project has to be approved by the Parties involved, i.e. by the host country and at least one investor country (UNFCCC 1997). Many host countries implemented a two-step approval procedure: An initial project endorsement for which a basic description of the project idea is usually sufficient and which results in a Letter of Endorsement (LoE). This is followed by final project approval after the project design document (PDD) has been audited by a third-party auditor. Final project approval is expressed in a Letter of Approval (LoA) issued by both the host and the investor Parties. The host country LoA has to be issued before project registration, while an investor Party LoA can be obtained prior to the first ERU transfer at the latest.

The governance arrangements of Track 2 are defined in the JI guidelines (UNFCCC 2006b). Under Track 2 the JISC sets rules and procedures, oversees the project cycle and performs the accreditation and supervision of the third-party auditors, called Accredited Independent Entities (AIE). The latter perform the determination of PDDs and the verification of the emission reductions claimed by the project. The JISC may request a review both before a project is registered and each time before ERUs are issued. Three members of the JISC need to request such a review, otherwise the project determination is automatically deemed final (i.e. the project gets registered) 45 days after the AIE has submitted the determination report.

Likewise, verification of emissions reductions becomes final 15 days after its submission by an AIE, unless the JISC requests a review. The JISC reviewed nine projects out of 52 Track 2 determinations and rejected one of them. All 129 verifications were accepted by the JISC, and only one of them was reviewed.[6]

Under Track 1 the host country is solely responsible for project registration and verification of emission reductions. The main elements of national procedures of several selected host countries are further discussed in Section 6. Many host countries use AIEs accredited by the JISC in their national procedures to perform PDD determination and emission reduction verification under Track 1. Once a JI Track 1 project is registered by a host country, the project information is communicated to the UNFCCC Secretariat and the project is assigned a unique number by the International Transaction Log. Under both tracks, the issuance of ERUs is performed by the host country, since ERUs are obtained by the way of conversion of the party's AAUs or RMUs in its national registry.

Table 4: Bodies involved in JI Track 2 project procedure and their functions

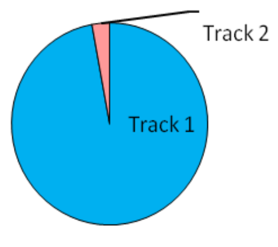
Function / step in the project cycle	Responsible body
Project endorsement (usually required)	Host Party's Designated Focal Point (DFP)
PDD determination	Accredited Independent Entity
Project approval	DFPs of host and investor Parties
Final determination (registration)	JI Supervisory Committee
Verification of emission reductions	Accredited Independent Entity
Final verification	JI Supervisory Committee
Issuance of ERUs	Host Party

Despite the fact that Track 2 was operational before Track 1, almost 90% of JI projects have been registered and 97% of ERUs have been issued under Track 1 (see Table 5). Many projects that were initiated under Track 2 switched to Track 1 once it became operational.

Table 5: ERUs and registered projects by JI track

Track	Number of registered projects	Share of registered projects	Total million ERUs issued	Share of ERUs issued
Track 1	597	92%	832	97%
Track 2	51	8%	25	3%
Total	**648**		**857**	

ERUs issued per track



Source: http://ji.unfccc.int.

2.2 JI rules and procedures on environmental integrity

This section gives a brief overview of the most pertinent JI rules on environmental integrity. As noted in the introduction, the JI rules are being revised, and the current JI Guidelines are to be replaced by "Modalities and Procedures for JI", which are under consideration by the Subsidiary Body for Implementation (SBI). Here we focus on the current rules, but the

[6] See http://ji.unfccc.int/JI_Projects/DeterAndVerif/index.html [accessed 22 October 2014].

December 2014 draft of the new "Modalities and Procedures for JI" is discussed in more detail in Annex 1.

We start with the rules as stated in the KP, followed by the JI Guidelines, which apply to both Tracks 1 and 2, and specific rules on Track 2 issued by the JISC.

Article 6, paragraph 1b, of the Kyoto Protocol requires that all JI projects have to be additional: "Any such project provides a reduction in emissions by sources, or an enhancement of removals by sinks, that is additional to any that would otherwise occur" (UNFCCC 1997).

The JI Guidelines reiterate the requirement of additionality for each track. Under Track 1 it is the sole responsibility of the host country to ensure additionality: "… a host Party may verify reductions in anthropogenic emissions by sources or enhancements of anthropogenic removals by sinks from an Article 6 project <u>as being additional to any that would otherwise occur</u> …" (UNFCCC 2006b; Annex, paragraph 23).

The JI Guidelines do not provide any further specific requirements to Track 1 projects except that a Track 1 host party is obliged to communicate to the UNFCCC Secretariat "its national guidelines and procedures for approving Article 6 projects, including the consideration of stakeholders' comments, as well as monitoring and verification" (UNFCCC 2006b; Annex, paragraph 20b). Track 1 procedures relating to environmental integrity of several host countries are considered in more detail in Section 6.

Under Track 2 an AIE has to check whether "the project would result in a reduction of anthropogenic emissions by sources or an enhancement of anthropogenic removals by sinks that is additional to any that would otherwise occur" (UNFCCC 2006b; Annex, paragraph 33b) and whether the project design document (PDD) includes "an appropriate baseline and monitoring plan" (UNFCCC 2006b; Annex, paragraphs 31c and 33c).

Proper baseline-setting is important because it affects the number of emission reductions being credited. The baseline scenario is defined in the JI Guidelines as "the scenario that reasonably represents the anthropogenic emissions by sources or anthropogenic removals by sinks of greenhouse gases that would occur in the absence of the proposed project" (UNFCCC 2006b, Annex, Appendix B, paragraph 1). The JI Guidelines further define that the baseline shall be established "on a project-specific basis and/or using a multi-project emission factor" (UNFCCC 2006b, Annex, Appendix B, paragraph 1). The JI Guidelines further require the baselines to be established in a transparent manner based on conservative assumptions, taking into account uncertainties, relevant national and/or sectoral policies, circumstances and developments (UNFCCC 2006b, Annex, Appendix B, paragraph 1).

The JISC further developed more specific Track 2 rules on additionality, baseline setting, monitoring, and accreditation of auditors. The most important documents are the "Guidance on Criteria for Baseline Setting and Monitoring" (the initial version was adopted in 2006 (UNFCCC 2006a), Version 03 was adopted by JISC 26 in 2011(UNFCCC 2011b); the "Joint Implementation determination and verification manual (UNFCCC JISC 2009); and the "Joint Implementation Accreditation Standard" (UNFCCC 2010).

According to the "Guidance on Criteria for Baseline Setting and Monitoring", project participants can select one of the following approaches for baseline setting and monitoring (UNFCCC 2011b):

a) Develop their own methodology in accordance with the JI Guidelines: A JI specific approach can build on selected elements of CDM methodologies or elements of approaches already taken in comparable JI projects. Under this approach a baseline shall be identified by listing and describing plausible scenarios on the basis of conservative assumptions and selecting the most plausible one.

b) Use a methodology approved by the CDM Executive Board: When a CDM methodology is used, its most recent version has to be applied in its totality and strictly followed.
c) Use an approach already taken in a comparable registered JI Track 2 project.[7]

The additionality of the project can be demonstrated by using one of the following approaches (other approaches can be proposed too):

a) Use a project-specific approach: Demonstrate that the project scenario is not part of the conservatively identified baseline scenario, and that the project will reduce emissions below the baseline by providing relevant traceable and transparent information.
b) Refer to a comparable project: Demonstrate the same approach for additionality proof which already has been taken in a comparable registered JI Track 2 project. In this case the project participants do not need to provide project-specific additionality demonstration (UNFCCC 2008).
c) Apply CDM Additionality Tool[8] in its most recent version.

The JISC rules also specify how project boundaries have to be set and how leakage should be addressed. The project boundary has to be clearly defined in the PDD and encompass all significant GHG emissions that are reasonably attributable to the project and under control of the project participants. Leakage has to be taken into account when it is projected to exceed 1% of the project emission reductions or 2,000 tonnes of CO_2 equivalent (CO_2e), whichever is lower (UNFCCC JISC 2009; paragraph 32).

Under JI rules, projects may have begun construction or implementation before the start of CP1 – as early as 2000 – but ERUs are only granted for reductions occurring during the commitment period (UNFCCC 2006b). The crediting period can start as soon as the project begins generating emission reductions, but not earlier than the beginning of 2008, since ERUs are sourced from AAUs that are tied to the commitment period of the Kyoto Protocol.[9] Unlike under the CDM, ERUs can be issued retroactively for the period from 2008 before project registration (so-called "retroactive crediting").

The JISC rules allow the crediting period to extend beyond 2012, subject to host country approval. However, it is noted: "The status of emission reductions or enhancements of net removals generated by JI projects after the end of the first commitment period may be determined by any relevant agreement under the UNFCCC" (UNFCCC 2009, paragraph 19). The issuance of ERUs for emissions reductions that occurred after 2012 will only be possible once countries have AAUs for the second commitment period; see Annex 1.12.

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[7] A project can be considered comparable if it uses the same emission reduction technology in the same host country, the time span between the starting dates of the projects is less than five years and the relevant regulatory framework has not changed over this time, and the difference in scale of activities does not exceed 50%

[8] See: "Tool for the demonstration and assessment of additionality" approved by the CDM Executive Board https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf/history_view [accessed 17 September 2014].

[9] Some countries – Bulgaria, Czech Republic, Poland, Romania and Ukraine – established schemes which granted AAUs to project developers for reductions prior to 1 January 2008, with the view to incentivizing early action and enhancing the attractiveness of JI (Shishlov et al. 2012).

3. WHEN DOES THE ENVIRONMENTAL INTEGRITY OF JI PROJECTS MATTER?

In principle, offsets are a zero-sum game for the atmosphere. The purchase of offset credits allows the buyer country to increase its own emissions by a corresponding amount above its target level, while emissions are reduced by that amount in the host country. The net result is the same global emissions as would occur in the absence of offsets. But this only holds true under a number of conditions, which we discuss below.

JI differs from an offsetting mechanism such as the CDM, as JI projects are located in countries with economy-wide emission reduction targets under the KP (Annex B countries). If ERUs from JI projects that lack environmental integrity are used for compliance they can but do not necessarily have to lead to an increase in global GHG emissions. To avoid double counting, a host country has to give up a Kyoto emissions permit – called Assigned Amount Units (AAUs) or Removal Units (RMUs) obtained for carbon sequestration activities – for each ERU it issues.[10] In this way the overall emissions budget of Annex B countries remains unaffected by the issuance of ERUs and the emissions reductions achieved through a JI project are only counted once. If the JI host country did not convert a Kyoto emission permit – an AAU or RMU – to issue ERUs, the same emission reduction would be reflected in both an ERU issued and the host country's emissions inventory (which is used as the basis for accounting to fulfil its own obligations under the KP).

However, whether overall emissions from these countries are affected or not, depends on several circumstances and assumptions. Below we explore the circumstances and assumptions that determine the answer to the question: ***Would global GHG emissions be higher, lower, or the same in the absence of JI, keeping everything else constant?***

3.1 Is the JI project additional, and are emission reductions correctly credited?

Whether a JI project is additional, and whether an additional project is undercredited, overcredited or correctly credited can have different impacts on global GHG emissions.

In principle, the environmental integrity of JI projects does not influence total global GHG emissions. Consider a hypothetical example: A country has an emissions budget of 10,000 AAUs and would emit 12,000 tonnes without a mitigation target (business-as-usual emissions). It therefore has to either reduce domestic emissions by 2,000 tonnes, or purchase units from another country. JI projects are implemented in that country. The country converts 1,000 of its AAUs and issue 1,000 ERUs to those projects. It now has 9,000 AAUs remaining. The 1,000 ERUs are used for compliance by another KP country with a reduction commitment. We consider two cases:

a) **The JI projects are additional:** The projects have actually reduced emissions by 1,000 from BAU, to 11,000 tonnes. The country has 9,000 remaining AAUs. To meet its target, the country has to engage in mitigation actions (or buy units) to reduce its emissions by 2,000 tonnes – just as if the projects had not occurred.
b) **The JI projects are not additional:** In this case, the country's BAU emissions would remain at 12,000 tonnes. The country has 9,000 remaining AAUs. To meet its target, the country has to engage in mitigation actions (or buy units) to reduce its emissions by 3,000 tonnes – 1,000 more than if the JI projects had not occurred.

[10] Under the Kyoto Protocol, each country with a reduction obligation receives an emissions budget (initial assigned amount) that is calculated the following way: baseline emissions x years in the commitment period x reduction target expressed as fraction of baseline emissions (e.g. 80% of 1990 emissions by 2020).

> Thus, although the JI projects were not additional, the issuance of the 1,000 ERUs (and their use by another country to meet KP obligations) will be compensated for by the host country's further reductions.

In both cases above, global GHG emissions are the same with or without JI. If a country issues ERUs from non-additional or overcredited projects, it will lose AAUs without achieving emissions reductions and it will have to engage in more mitigation action to compensate for the lost AAUs.

3.2 Does the host country have a surplus of AAUs?

The above considerations do not hold true if a country has a (significant) surplus of AAUs.[11] Such an oversupply can build up if the target is unambitious – i.e. higher than the projected business-as-usual (BAU) emissions. Oversupply can also be created if the country engages in more mitigation than what is required by its target. If a target is ambitious, however, such overachievement will be transient and will not lead to a build-up of surplus. In a cap-and-trade system that has a long-term oversupply problem, on the other hand, cancelling of allowances would not lead to immediate additional mitigation by covered sources, because it would simply remove some of the built-up surplus.

If the country has sufficient surplus, it can issue ERUs to non-additional or overcredited JI projects without having to engage in more mitigation action, because it will still have enough AAUs to cover its emissions. If ERUs from non-additional or overcredited JI projects in a country with an oversupply are used for compliance by the buyer country, global emissions would therefore increase. Section 3.4 explains the impacts under different circumstances and assumptions, Section 9 estimates the impact on overall global emissions from JI.

For the purpose of our analysis, we consider a country to have a significant expected surplus if its average emissions in the five years before the start of CP1 (2003–2007) were more than 20% below its CP1 reduction target. By this definition, more than 95% of ERUs issued up to March 2014 came from countries with a significant expected surplus. Among the four JI host countries with the largest shares of ERUs, only Germany, accounting for 1.6% of total ERUs issued, did not have significant expected surplus (see Section 6 for country-specific analysis).

Another important consideration for our analysis is whether surplus AAUs from CP1 could be used or sold at a later date. Removing allowances from an oversupplied market may lead to additional emission reductions later in time, assuming the surplus was temporary and that allowances will be in short supply at a later date. If surplus AAUs could be used or sold at a later date, a country may want to hold on to them instead of issuing ERUs from non-additional JI projects now. Second, if all the surplus is used at a later date, i.e. in subsequent commitment periods, then non-additional or overcredited JI projects would not lead to higher global GHG emissions than in a scenario without JI where all of the AAU surplus is used over time. But as we discuss below, we do not see this as a realistic assumption.

The Kyoto Protocol allows for full carry-over of AAUs from one commitment period to the next (UNFCCC 1997; Article 3, paragraph 13). This carry-over provision is meant to encourage and reward early action – mitigation activity that goes beyond the committed target. But this carry-over provision also enables surplus AAUs to be carried over into the

[11] Countries with an emission reduction target inscribed in Annex B of the KP issue AAUs for each commitment period corresponding to their emissions budget over that period. In addition, countries may issue RMUs – or may have to cancel AAUs – to account for land use, land-use change, and forestry activities under Articles 3.3 and 3.4 of the KP.

next commitment period. As we show in Section 6, most of the 13 billion AAU surplus that accumulated in CP1 is due to weak reduction targets. Policy-makers are well aware of this problem and have tried for many years to amend the Kyoto rules in a way that would minimize the use of surplus AAUs in CP2. At the UN Climate Change Conference in Doha in 2012, the Parties adopted a compromise relating to surpluses from CP1 and CP2 (Kollmuss 2013). The decision does not limit the carry-over of surplus AAUs from CP1 but limits their use in CP2. It also makes it impossible for countries without a reduction target in CP2 to sell their surplus to countries with a reduction target. Russia, which generated 30% of all ERUs in CP1, did not join CP2 and cannot sell AAUs to CP2 countries.

The Parties further decided in Doha to restrict the number of CP2 AAUs that a country will have available for the CP2 by requiring the cancellation of AAUs that exceed the country's average emissions in 2008–2010 in order to avoid the build-up of new surplus. The Doha decisions would mean that Ukraine, which has generated almost 60% of all ERUs, will not be able to use its CP1 surplus to meet its CP2 target if it does not strengthen its CP2 target from 76% to 42% of 1990 emissions (Morel and Shishlov 2014). It is therefore unclear if Ukraine will ratify CP2 and, if it does, if it will change its target (Storchylo 2014).

Over 91% of ERUs were generated in countries that likely cannot use their CP1 surplus in future commitment periods. It is even less likely that AAU surplus can be used in the post-2020 agreement that is currently being negotiated. Since AAUs are the currency of the Kyoto Protocol the view of the majority of Parties seems to be that they should not be used in the post-2020 agreement. **For these reasons, we assume in our analysis that countries with a significant expected surplus will not be able to use their AAUs in the future.**

A last important consideration for the incentives to issue ERUs from non-additional JI projects is whether the demand and price is higher for ERUs or for AAUs. If countries with significant AAU surplus could make a larger profit from selling AAUs than selling ERUs they would not have incentives to issue ERUs from non-additional projects. Of the 13 billion AAU surplus that accumulated in the first commitment period only about 450 million, less than 4%, have been sold (UNEP Risoe 2014). Almost twice as many ERUs were sold – almost 857 million ERUs have been transferred as of August 2014. The demand for ERUs could be larger due to the fact that the European Emission Trading Scheme (EU ETS), the largest market of emissions units, only allows ERUs to be used for compliance but not AAUs. Anecdotal evidence also indicates that some countries were hesitant to buy AAUs from countries which were seen as having a large AAU surplus. **This seems to indicate that overall the demand for ERUs is higher than for AAUs.**

3.3 Are the JI emission reductions reflected in the host country's GHG inventory?

Emission reductions achieved by JI projects are in most cases reflected in the host country's GHG inventory. In other words, the reported host country's GHG emissions will be lowered by the number of tonnes of emissions reductions achieved through JI. However, this is not necessarily the case with all project types. Some emissions reductions may not be reflected in the country-wide GHG inventory, for example, because the country uses simple Tier 1 methods to estimate an emissions source which do not account for the emission reductions achieved through JI projects or because the reductions occur in a sector that is not covered by the host country's GHG inventory. For example, a project-based mechanism may issue units for N_2O abatement from nitric acid production. If the country uses a simple Tier 1 method with default values to estimate N_2O emissions from nitric acid production, the emission reductions achieved through the project-based mechanism may not be reflected in the GHG inventory of the country.[12] This issue has been referred to as "inventory visibility" (Prag et al. 2013). In our analysis we distinguish between both cases. We explore in Section 5 which project types may not be reflected in the host country's emissions inventory.

Inventory visibility is important with regard to the impacts of JI projects on global GHG emissions. Inventory inconsistencies with JI projects may point to potential overcrediting or a lack of inventory accuracy, as we discuss further in Section 5, where we analyse the most important project types.

3.4 Impact of environmental integrity of JI projects on global emissions

Tables 6 and 7 below show how the three key assumptions and circumstances of JI projects discussed above – whether JI projects are additional and whether they are undercredited, correctly credited, or overcredited; whether the JI host country has a significant AAU surplus; and whether the emission reductions from the JI project are reflected in the GHG inventory – affect global GHG emissions. The tables describe the emissions impact compared with a situation where JI would not be used, assuming that the ERUs will be used for compliance under the Kyoto Protocol.

It is important to note that in Table 6, we assume that the country exactly meets its target – to clearly distinguish from the case illustrated in Table 7, where the country has significant surplus. In reality a country may fall slightly short or have some surplus at the end of its commitment period.

[12] GHG inventories for Annex 1 aim to consistently estimate anthropogenic emission by all sources and removals by all sinks of all GHGs, as covered by the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories and IPCC good practice guidance, in accordance with relevant decisions of the COP and/or COP/MOP FCCC/CP/2001/13/Add13, Decision 20.CP.7 Annex 1 Art 9. Inventories use different types of information Tier 1 methods use default values, Tier 2 are similar but with country-specific emission factors and other data, Tier 3 are more complex approaches, possibly models.

Table 6: Impact of JI projects on global emissions if the host country does not have significant expected AAU surplus+

Project and ERU characteristics	Impact on global emissions	
Additional and…	**Emission reductions (ER) correctly reflected in host country inventory**	**Emission reductions (ER) not correctly reflected in host country inventory**
… correctly credited	Zero*: emissions decrease in host country and increase in buyer country by number of ERUs sold.	Decrease**: equivalent to ERs from the JI project. Host country loses AAUs but equivalent ERs are not reflected in its inventory.
Example: JI project reduces 100 tonnes and receives 100 ERUs	Host country emissions decrease 100t: 100 AAUs converted to ERUs, 100t reduced Buyer country emissions increase 100t → Total GHG emissions change: Zero	Host country emissions decrease 200t: 100 AAUs converted to ERUs, 100t reduced but not reflected in emissions inventory → host country has to decrease emissions by another 100t to compensate for 100 lost AAUs Buyer country emissions increase 100t → Total GHG emissions change: – 100t –100t +100t = Decrease of 100t
… overcredited	Zero: emissions decrease in host country and increase in buyer country by number of ERUs sold.	Decrease**: equivalent to ERs from the JI project. Host country loses AAUs but equivalent ERs are not reflected in its inventory.
Example: JI project reduces 100 tonnes and receives 120 ERUs	Host country emissions decrease 120t: 120 AAUs converted to ERUs. 100t reduced. → host country has to decrease its emissions by 20t more to compensate for 20 overcredited ERUs = 20 lost AAUs Buyer country emissions increase 120t → Total GHG emissions change is zero: –100t –20t +120t = 0t	Host country emissions decrease 220t: 120 AAUs converted to ERUs. 100t reduced but not reflected in emissions inventory → has to decrease emissions by 120t more to compensate for 120 lost AAUs Buyer country emissions increase 120t → Total GHG emissions change: – 100t –120t +120t = Decrease of 100t
…undercredited	Zero: emissions decrease in host country and increase in buyer country by number of ERUs sold.	Decrease**: equivalent to ERs from the JI project. Host country loses AAUs but the equivalent ERs are not reflected in its inventory.
Example: JI project reduces 100 tonnes and receives 80 ERUs	Host country emissions decrease 100t: 80 AAUs converted to ERUs. 100t reduced. → host country has 20 extra AAUs available due to 20 none-credited ER. Host country has to decrease emissions by 20t less Buyer country emissions increase 80t → Zero-sum: –100t +20t +80t = 0t	Host country emissions decrease 180t: 80 AAUs converted to ERUs. 100t reduced but not reflected in emissions inventory → has to decrease emissions by another 80t to compensate for 80 lost AAUs Buyer country emissions increase 80t → Total GHG change: – 100t – 80t + 80t = Decrease of 100t
Non-additional* **	**Emission reductions (ER) correctly reflected in host country inventory**	**Emission reductions (ER) not correctly reflected in host country inventory**
	Zero: emissions decrease in host country and increase in buyer country by number of ERUs sold.	Zero: emissions decrease in host country and increase in buyer country by number of ERUs sold.
Example: JI project receives 100 ERUs, but does not reduce emissions	Host country emissions decrease 100t: 100 AAUs converted to ERUs but no ERs → has to decrease emissions by 100t more to compensate for 100 lost AAUs. Buyer country emissions increase 100t → Total GHG emissions change is zero: –100t +100t = 0t	Host country emissions decrease 100t: 100 AAUs converted to ERUs but no ERs → has to decrease emissions by 100t more to compensate for 100 lost AAUs. Buyer country emissions increase 100t → Total GHG emissions change is zero: –100t +100t = 0t

+ We classify a JI host country as having a "significant expected surplus" if the country's average 2003-2007 emissions were more than 20% below its CP1 reduction target, which we see as a strong indication that a country could have expected to have significant surplus well before 2008, when JI crediting started.
** Zero means global emissions are not changed compared to a scenario without JI.*
*** Decrease means a net atmospheric benefit is achieved.*
**** We did not distinguish between over-, under- and correctly credited non-additional projects since although the number of ERUs would vary in each case, the outcome has no impact on global emissions and the host country has to engage in more mitigation activity equivalent to the number of ERUs issued.*

Table 7: Impact of JI projects on global emissions if the host country has a significant expected surplus+

Project and ERU characteristics	**Impact on global emissions**	
Additional and …	**Emissions reductions (ER) correctly reflected in host country inventory**	**Emissions reductions (ER) not correctly reflected in host country inventory**
… correctly credited	Zero*: emissions decrease in host country and increase in buyer country by number of ERUs sold.	Zero: emissions decrease in host country and increase in buyer country by number of ERUs sold.
Example: JI project reduces 100 tonnes and receives 100 ERUs	Host country emissions decrease 100t: 100 surplus AAUs converted to ERUs, 100t reduced. Buyer country emissions increase 100t → Total GHG emissions change: Zero – 100t +100t = 0t	Host country emissions decrease 100t: 100 surplus AAUs converted to ERUs, 100t reduced but not reflected in emissions inventory. Buyer country emissions increase 100t → Total GHG emissions change: Zero – 100t +100t = 0t
…overcredited	Increase equivalent to number of overcredited ERUs	Increase equivalent to number of overcredited ERUs
Example: JI project reduces 100 tonnes and receives 120 ERUs	Host country emissions decrease 100t: 120 surplus AAUs converted to ERUs, 100t reduced, 20 surplus AAUs are lost Buyer country emissions increase 120t → Total GHG emissions change: –100t +120t = Increase of 20t	Host country emissions decrease 100t: 120 surplus AAUs converted to ERU, 100t reduced but not reflected in emissions inventory, thus 120 surplus AAUs are lost Buyer country emissions increase 120t → Total GHG emissions change: –100t +120t = Increase of 20t
…undercredited	Decrease** equivalent to the ERs not credited	Decrease equivalent to the ERs not credited.
Example: JI project reduces 100 tonnes and receives 80 ERUs	Host country emissions decrease 100t: 80 surplus AAUs converted to ERUs, 100t reduced, host country has 20 extra AAUs available. Buyer country emissions increase 80t → Total GHG emissions change: –100t +80t = Decrease of 20t	Host country emissions decrease 100t: 80 surplus AAUs converted to ERU, 100t reduced but not reflected in emissions inventory. Thus 80 surplus AAUs are lost. Buyer country emissions increase 80t → Total GHG emissions change: –100t +80t = Decrease of 20t
Non-additional* **	**Emissions reductions (ER) correctly reflected in host country inventory**	**Emissions reductions (ER) not correctly reflected in host country inventory**
	Increase equivalent to the number of ERUs issued	Increase equivalent to the number of ERUs issued
Example: JI project receives 100 ERUs, but does not reduce emissions	Host country emissions stay the same: 100 surplus AAUs converted to ERUs. Buyer country emissions increase 100t → Total GHG emissions change: increase of 100t	Host country emissions stay the same: 100 surplus AAUs converted to ERUs. Buyer country emissions increase 100t → Total GHG emissions change: increase of 100t

+ We classify a JI host country as having a "significant expected surplus" if the country's average 2003-2007 emissions were more than 20% below its CP1 reduction target, which we see as a strong indication that a country could have expected to have significant surplus well before 2008, when JI crediting started.
** Zero means global emissions are not changed compared to a scenario without JI.*
*** Decrease means a net atmospheric benefit is achieved.*
**** We did not distinguish between over, under and correctly credited non-additional projects since although the number of ERUs would vary in each case, the outcome is the same: an increase in global emissions equivalent to the number of ERUs issued.*

Table 6 shows that – **no matter what the environmental integrity of the JI project – global emissions do not increase if the JI host country does not have a significant AAU surplus.** In this case, the overall emissions are determined by the emissions budget assigned under the KP. If projects are non-additional or overcredited, the cost will be borne by the host country as it will have to engage in more mitigation activity in order to meet its own reduction target. If JI projects are undercredited, the opposite holds true: the host country has to engage in less mitigation compared to not hosting such JI projects.[13] If JI emissions reductions are not reflected in the host country's emissions inventory, they may lead to a net atmospheric benefit – a decrease of global emissions beyond that which could have been expected by the reduction targets. The cost for such net atmospheric benefit will be borne by the host country: it will have to engage in more mitigation activity equivalent to the number of emission reductions not reflected in its inventory in order to meet its mitigation target.

Table 7 shows that **if the JI host country has significant AAU surplus, non-additionality as well as overcrediting leads to higher global emissions, whereas undercrediting leads to some net atmospheric benefit**. Regardless of the project's environmental integrity and inclusion in the national GHG inventory, there is no need for the host country to engage in more mitigation action because it can issue the ERUs using its AAU surplus. Therefore, JI host countries with significant AAU surplus have little economic incentive to ensure the environmental integrity of ERUs.

4. ASSESSMENT OF APPROACHES FOR DEMONSTRATING ADDITIONALITY

This section provides an assessment of the main approaches used for additionality demonstration in JI projects. We use the random sample of 60 projects to assess how JI projects demonstrated additionality and discuss the likelihood of projects being additional. The rules for Track 2 projects are set by the JISC. Track 1 project additionality requirements are determined by the host countries but often Track 2 rules are followed, see Section 2 for details. Many JI projects use the CDM additionality tool or elements of it to demonstrate additionality (UNFCCC 2008). For this reason we assess the following core elements of the CDM additionality tool:

- Identification of alternative scenarios
- Investment analysis
- Barrier analysis
- Common practice analysis

We also look at other aspects of demonstrating additionality, such as prior consideration of JI, the use of retroactive crediting, and the overall timing of steps in the project cycle. We also assess the demonstration of additionality through a reference to other registered projects. Differences between project types, host countries, the track of JI projects are assessed in Sections 5, 6 and 7, respectively.

4.1 Identification of alternative scenarios

As a first step, many PDDs identify realistic and credible alternatives that provide outputs or services comparable with the proposed JI project. This is also the required first step in the CDM additionality tool. In our sample, 85% of the 54 projects for which PDDs are available identify alternative scenarios. Most projects identify several alternative scenarios, although

[13] If undercrediting is too severe, it may lead to some JI projects not being implemented.

24% of the projects for which PDDs are available list only the current status quo or no implementation of the JI project as an alternative. For example, partial implementation of a project without JI is often not considered as an alternative, in particular for projects that bundle several activities. The justifications why other alternatives are not further considered are in some cases rather weak.

4.2 Investment analysis

The investment analysis is used to demonstrate that a proposed JI project would have been economically unattractive or less attractive than another plausible course of action (and thus would not have proceeded) without the incentives from JI. Of the 54 sampled projects for which PDDs are available, 54% use the investment analysis to demonstrate additionality. These 29 JI projects account for 43% of the ERUs issued to the sample projects.[14]

The projects use the following approaches for the investment analyses (see Table 8):

- The **simple cost analysis** is used to demonstrate that a project has no revenues other than ERUs but involves costs (such as for example secondary N_2O abatement from nitric acid production);
- The **investment comparison analysis** is used to demonstrate that the proposed project activity is economically and financially less attractive than another alternative that provides similar outputs or services;
- The **benchmark analysis** is used to demonstrate that a proposed project is, without revenues from ERUs, economically not attractive (i.e. it does not meet a financial benchmark).

Table 8: Type of investment analysis used

Type of investment analysis	Number of projects	% of projects	% of ERUs issued to projects that used the investment analysis
Simple cost	8	28%	52%
Benchmark	19	66%	48%
Investment comparison	2	7%	1%

Data source: Random sample of 60 projects

Demonstrating additionality is straightforward for projects that do not save costs or generate revenue other than from JI because there is little incentive to implement the project as long as it is not mandated and enforced by the government. This applies for example to most industrial gas destruction projects. In our sample, five of the eight projects that use the simple cost analysis are projects abating N_2O from nitric acid production. However, the three other projects apply the simple cost analysis despite the fact that they reduce costs or generate other revenues: one agricultural no-till project saves costs from tillage operations, one project avoiding PFC emissions in the aluminium industry reduces electricity consumption, and one project for N_2O abatement from adipic acid production saves costs from steam generation.

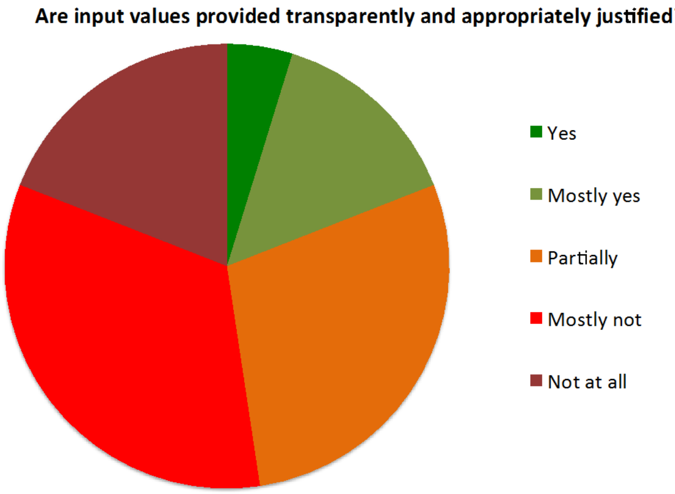
[14] Some projects provide information on their costs or profitability but do not use this information to justify additionality and some projects claim financial or cost barriers without conducting a full investment analysis. We do not classify these projects as conducting investment analysis. We exclude one programme of activities for which no CPA-DD is available on any specific activities (DE1000469). We include projects which conduct an investment analysis as part of claiming financial or cost-related barriers. One project (UA1000416) conducted both a simple cost analysis and a benchmark analysis for two sub-components; as the benchmark analysis covers the main investment of the project, we classified this project as conducting benchmark analysis.

Using the simple cost analysis for these project types is methodologically inappropriate and can lead to a wrong conclusion on the assessment of additionality.

The additionality proof is inherently more difficult for projects that save costs or generate revenue, such as power or energy efficiency projects. Such projects have to apply a benchmark or investment comparison analysis. One of the criticisms to the application of the investment analysis under the CDM was a lack of transparency (Schneider 2009). Project developers may not reveal all information necessary to allow replication of their calculations and may not provide appropriate justifications for their input values. However, transparency of the investment analysis is crucial to assess its appropriateness.

In our random sample, only two of the 21 projects that used the investment comparison or benchmark analysis provided transparent information on costs and revenues in the PDD which would allow a third party to reproduce the calculation. The level and type of information is often insufficient or questionable. Many projects do not provide sufficient information on assumptions and input parameters used in the analysis, such as investment costs, operation and maintenance costs, or revenues, neither for the baseline nor the project scenario. One third of the projects provide only information on the result of the investment analysis, one third provide information on investment costs and the result, and one third also specify some revenues from project operation. Figure 2 shows that in most projects input parameters were not provided transparently or appropriately justified. Out of the 21 projects that used the investment comparison or benchmark analysis, we identified only one project with a transparent investment analysis. Several PDDs refer to confidential information that is not made publicly available.

Figure 2: Level of information provided on input parameters to the investment analysis



Data source: Random sample of 60 projects (21 using investment comparison or benchmark analysis).

The financial benchmark is a key parameter for the investment comparison and benchmark analysis. Among the 21 sampled projects which use investment comparison or benchmark analysis, four did not include information on which value was used in the calculation, and seven of the 17 projects which provided a value did not provide clear information how the value was derived.

The values used for the financial benchmark varied significantly, from 8% to 25%, with an average of 15.8%. Most projects used values in the range of 15%–25%. The average value of 15.8% used in the sampled JI projects is significantly higher than the average value of 9.3% used in CDM projects.[15] Using high financial benchmarks enables JI projects that are rather attractive economically to pass the additionality test. Indeed, more than half the sampled JI projects which provided the relevant information would not pass the additionality test if the average financial benchmark under the CDM were used.[16] One project (RU1000431) even reported an IRR without ERU revenues of 22.7% and used a benchmark of 25% to demonstrate additionality. The use of significantly higher financial benchmarks under JI than under the CDM does not appear appropriate, since the risks in the most important JI countries (Ukraine, Russia) were not significantly higher than those of major CDM countries (China, India, Brazil) in the period up to 2012. The use of significantly higher values under JI than under the CDM also raises questions whether AIEs assessed financial benchmarks with the same scrutiny as under the CDM.

Another indicator for the likelihood of additionality is the impact of ERU revenues on the economic attractiveness of the project (Sutter and Perreno 2007; Schneider 2009). The larger the impact of ERU revenues, the more likely it is that ERU revenues played a role in the decision to proceed with the investment. Of the 21 projects which applied investment comparison or benchmark analysis, 12 projects provided information on the project IRR with and without ERU revenues. The difference in IRR due to ERU revenues ranges from 0.4% to 23.3%. This large diversity indicates that for some projects ERU revenues could have played a major role, while for others it seems unlikely that the incentives from JI played a role. For example for one project (PL1000534), which claimed additionality by comparison to a similar project (and not based on investment analysis), the IRR changes only by 0.08% due to ERU revenues, from 5.87% to 5.94%. The ERU prices assumed in PDDs vary considerably, between 1 EUR and 25 EUR.

A sensitivity analysis is an integral part of the investment comparison and benchmark analysis under the CDM. Among the 21 sampled projects that used the investment comparison or benchmark analysis, five did not conduct a sensitivity analysis. Among the projects which conducted the analysis, the type of parameters varied, including within similar project types. The range of the variation was mostly 10%, as under the CDM.

Finally, we observed that several projects were funded or subsidised through other sources of finance, in particular loans provided by the European Bank for Reconstruction and Development. Only in some of the PDDs these loans are mentioned. The provision of loans through ODA – usually many years before the projects sought determination or registration under JI – further questions the additionality claims of these projects, since the banks seemed confident that the loan could be repaid.

4.3 Barrier analysis

The barrier analysis is used to demonstrate that a project would not be implemented in the absence of JI because it would face significant barriers. Under the CDM, the barrier analysis can be used as an alternative to investment analysis or to supplement it. An important

[15] The value for CDM projects was derived from more than 4000 registered CDM projects included in the IGES CDM investment analysis database as of August 2014 (IGES 2014).

[16] Eighteen sampled projects provided a value for the internal rate of return (IRR) of the project without ERU revenues; for 10 of these projects the project IRR without ERU revenues was higher than the average benchmark value used under the CDM (9.3%).

criticism of the barrier analysis is that it is very difficult to assess objectively whether barriers are prohibitive for implementing a project and whether JI alleviates such barriers.

In our random sample 38 of the 54 projects for which PDDs are available use the barrier analysis. The barriers most often mentioned are costs or financial risks, lack of capacity, prevailing practice, and technology risks (see Table 9).

Table 9: Types of barriers cited in the sampled projects

Barrier	Projects	ERUs
Costs or financial risks	100%	100%
Lack of capacity	55%	60%
Prevailing practice	47%	29%
Technology risks	47%	28%
Political	24%	11%
First of its kind	13%	12%
Not preference of management	5%	15%

Data source: Random sample of 60 projects (of which 38 use barrier analysis).

Overall, the barriers are often not substantiated by evidence. Of 38 projects that used the barrier analysis, 32 include either no explanation or only a short explanation on how JI will help overcome the barriers. In many cases the barrier analysis by itself seems insufficient to differentiate between additional and non-additional projects because its application is highly subjective and difficult to verify. Nevertheless, nine of the 38 projects used the barrier analysis as the only additionality test and did not apply an investment analysis or a common practice test.

4.4 Common practice analysis

The common practice analysis is used to demonstrate that a proposed project activity is not frequently implemented in the sector. The key challenges of the common practice analysis are 1) defining what is regarded a similar technology used to compare the proposed activity to, 2) what geographical scale should be considered, and 3) what threshold should be used to assess whether a project is deemed common practice.

The definition of similar technologies is important because the project technology could be defined very narrowly (e.g. small scale hydro power), while the technology it is compared to could be defined broadly (e.g. the country's power production), in order to show that the project technology has a low market penetration. Choosing the project technology and the peer group carefully is therefore essential to ensure the common practice test can identify projects that are already business-as-usual. The geographical scale is important because market penetration could vary, e.g. depending on geographical or economic circumstances.

Two thirds of the sampled projects for which PDDs are available use the common practice analysis. Of these 36 projects, 30 use the host country as geographical scale, four projects the whole of Europe, and two project a region within the host country.

Under the CDM a quantitative analysis needs to be conducted and common practice is defined as a market penetration rate of more than 20%. Among the 36 sampled projects which conduct a common practice analysis, only four projects provide a quantitative assessment. These projects specify the observed market penetration rate for the project technology, which ranges from 0 to 23%, but only one project explicitly uses the CDM threshold of 20%; the other three do not provide explanations which market penetration rate is deemed as common practice. Thirty-two of the 36 projects, accounting for more than 97% of ERU issuance to the sampled projects, give only qualitative descriptions. These can be harder to verify, especially when insufficient information is provided. For example, several projects claim that a particular technology is not used anywhere else in the host country or only in other JI projects, without providing references, supporting documentation, or statistics. For six projects we identify clear flaws, such as the common practice test being performed for a different technology than the one used by the project.

Overall, in most cases the information provided in PDDs is not sufficient to conclude whether or not a project is common practice. Under the CDM, the common practice test cannot be used as a standalone test. However, under JI, three of the sampled projects that use the common practice analysis applied it as a standalone test.

4.5 Prior consideration

In assessing the additionality of JI projects, one important aspect is whether JI was considered in the decision-making process to proceed with the implementation of a project. If JI was considered, the project is not necessarily additional; however, if JI was not considered at all, the project is clearly not additional.

Under the CDM, project developers have to notify the UNFCCC of their intent to register a CDM project within six months of the decision to proceed with the project (or before these current rules they had to provide written evidence that the CDM was known to them). Under JI, there are no rules that require the proof of prior consideration.

Many PDDs include information on the history of the project and when the decision was made to proceed with the project. They often provide some kind of evidence to support information when the decision was made, but – given the absence of requirements for prior consideration – only some state that JI was considered in proceeding with the project. In most cases, the evidence only supports when the project was started (e.g. contracts for equipment purchase) but not whether JI was considered in proceeding with the investment decision.

However, even in the absence of rules for prior consideration, whether and when JI was considered by the project developers can be assessed based on the project implementation timeline, specifically by comparing the "starting date of the project"[17] with the date of issuance of the project's Letter of Endorsement (LoE). If JI was seriously considered and important for project implementation, it is reasonable to assume that the project participants would have tried to secure the status of JI for their activity as early as possible by applying for an LoE. Obtaining an LoE is the first step towards JI registration in most host countries, did not require elaborate project documents, and was usually not difficult or time-consuming (unlike getting a Letter of Approval).[18]

Figure 3 illustrates the time period between the project starting date and the issuance of the LoE for those 36 projects in our sample of 60 for which the LoE issuance date is available.

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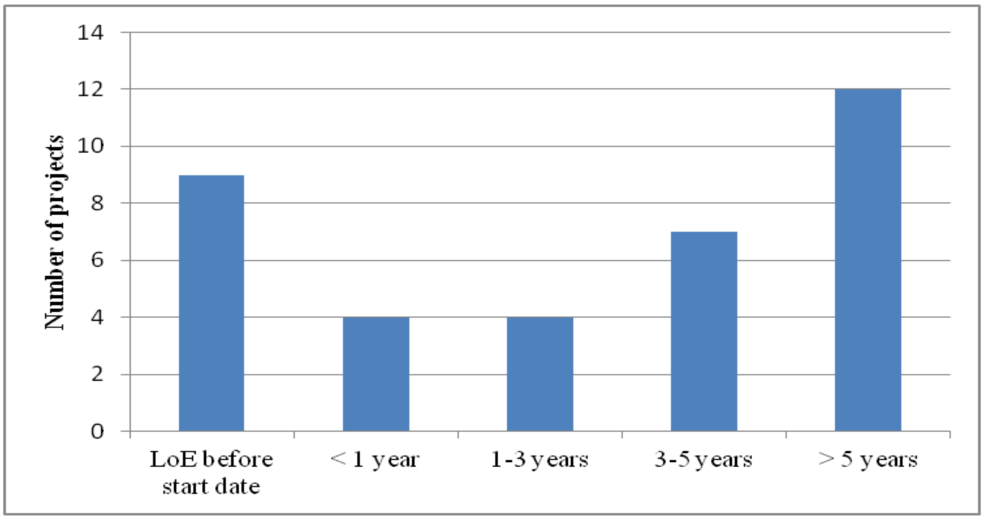
[17] The starting date of a JI project is the date on which the implementation or construction or real action of the project begins (ref. Guidelines For Users Of The Joint Implementation Project Design Document Form, JISC)

[18] In Russia the applicable JI procedures do not require an LoE. For these countries LoEs are not available. We therefore limited our analysis to those countries and projects for which LoEs are available.

Figure 3: Time period between project starting date and issuance of LoE



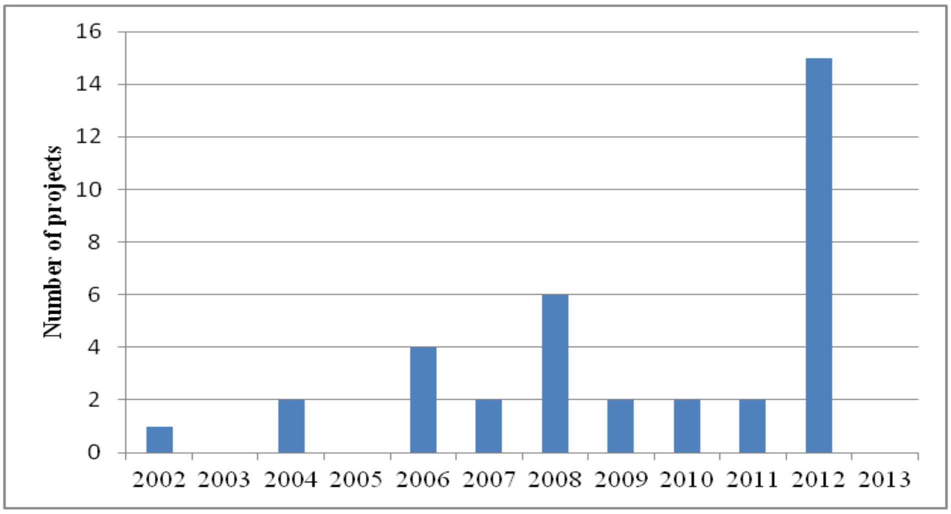
Data source: Random sample of 60 projects (of which the date of the LoE is available for 36 projects)

One quarter of the projects applied for and received the LoEs before their project start. For these projects it is clear that they considered JI when proceeding with the project. Four received their LoEs within a year of their starting date. Considering that LoE issuance requires some time after submitting the application for an LoE, these projects may have considered JI as well when proceeding with the project. Another four projects received their LoE within three years of their starting date. For this group it is not clear whether the issuance of the LoE was delayed, e.g. due to bureaucratic processes of the host country, or whether the project participants did not consider JI earlier and therefore did not apply for the LoE.

More than 50% of the projects received their LoEs three or more years after the project start. The majority of these projects obtained their LoEs in 2012 when project endorsements sharply increased (see Figure 4). In fact, all projects that were endorsed in the last year of CP1 received their LoEs three or more years after the project start. For more than a quarter of the analysed projects (10) the discrepancy is particularly large: the time gap between project start and LoE exceeds seven years; some projects received their LoEs at the end of 2012, while their starting dates go back to 2002.[19] In other words, these projects were initiated 10 years before they received an LoE. It is unlikely that projects in this group considered JI when proceeding with their implementation; these projects are very unlikely to be implemented due to the incentives of JI and are thus very unlikely to be additional.

[19] E.g. projects UA1000422, "Implementation of Energy Saving Measures at PJSC Khartsyzsk Pipe Plant," and "Lvivoblenergo PJSC Power Distribution System Modernization"

Figure 4: Issuance of LoE by year



Data source: Random sample of 60 registered projects.

Overall, the lack of any rules with regard to prior consideration is a major shortcoming of JI, which severely impacted the integrity of the mechanism.

4.6 Retroactive crediting of emissions reductions

Under current JI rules, projects may be implemented before the start of CP1 but ERUs are only granted for reductions occurring during the commitment period. However, projects can be registered after their start and be issued ERUs for reductions that occurred before registration. In other words, under the current JI rules ERUs can be issued retroactively for the period from 2008 (so-called "retroactive crediting"), provided that the project was operational and delivered emission reductions (see also Section 2.2).

Retroactive crediting was meant to enable projects to go ahead before JI was operational and avoid possible delays due to the approval and registration processes. Thus, the projects did not lose ERUs if they started operating before JI registration was completed.

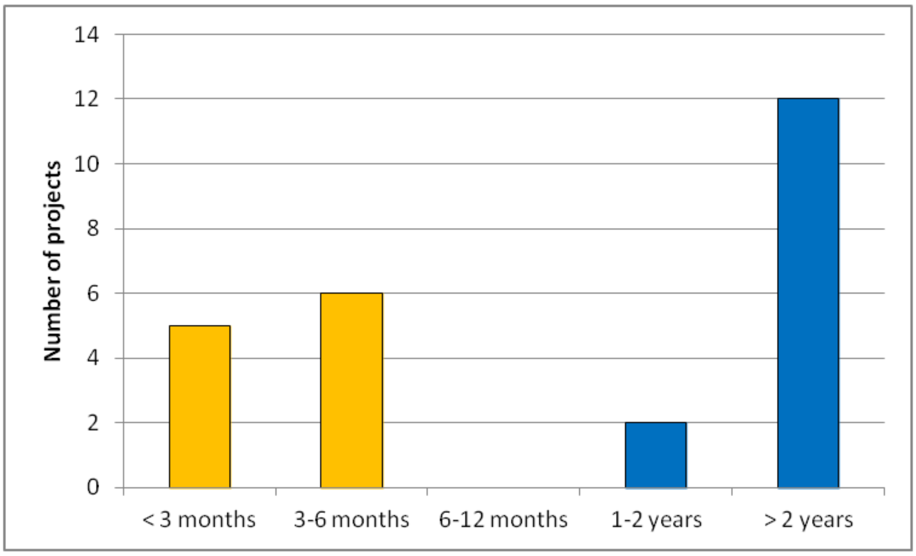
However, this rule also enables activities that were not originally intended as JI projects to receive ERUs retroactively, even if they did not make attempts to register as JI projects for many years after they were implemented.

To examine the extent of retroactive crediting, we analysed the date of the host country approval, the crediting period start date, and the number of ERUs issued for all registered JI projects included in the UNEP Risoe database. As the registration dates are not available for most JI Track 1 projects, we use the date of host country approval (LoA issuance) instead of the registration date and deem that projects which received their LoA after the start of their crediting period benefited from retroactive crediting.

Almost half of all projects were approved in 2012 and these projects generated 71% of all ERUs issued (more than 590 million ERUs). All of these projects retroactively claimed ERUs for previous years. Two thirds have their crediting period starting in 2008. This means that these projects started operation in 2008 or earlier, but did not get approved until 2012 and then claimed all or most of their ERUs for the past years retroactively. It should be noted that in the last year of CP1 the prospects for starting new JI projects were highly insecure given the uncertainty of continuation of JI and demand for ERUs in CP2. It is therefore likely that the main motivation for registering these projects was not to generate ERUs in CP2 but to claim CP1 ERUs retroactively. All projects approved in 2011 and 98% of the projects approved in 2010 also claim ERUs retroactively. This means the majority of all ERUs were issued using retroactive crediting.[20]

In contrast, for many of the projects the whole JI cycle, from the issuance of the LoE to the first ERU issuance, was completed in a very short time. We analysed the time period from the initial project endorsement (LoE) to the first issuance of ERUs for the 25 projects in our sample for which the dates of both the LoE issuance and first ERU issuance are available. As shown in Figure 5, the projects fall into two separate groups: for 14 projects, the project cycle took more than one year (usually more than two years), which seems reasonable considering that PDD determination, host country approval, verification and ERU issuance typically take time. However, 11 projects, all approved in 2012, completed all project cycle steps in less than six months. One project received the host country LoE and LoA, prepared the PDD and monitoring report, performed PDD determination, got registered, verified emissions reductions and received ERUs in less than 40 days.[21]

Figure 5: Project cycle duration in sampled projects (time between LoE and ERU issuance)



Data source: Random sample of 60 projects (for only 25 of which both the LoE and first ERU issuance dates are available).

A significant time gap between project start and JI approval, combined with a very short approval process, raises serious questions about whether projects considered JI when deciding to implement activities – and thus about the additionality of these projects.

4.7 Demonstration of additionality by reference to a comparable project

One of the approaches to demonstrate additionality permitted under Track 2 is to provide evidence that the proposed activity is comparable to another project that has already been registered under Track 2; see Section 2.2. When using this approach, a project does not have to perform its own additionality test, but can refer to a similar project, demonstrating that it 1) uses the same emission reduction technology; 2) is located in the same host country and the starting dates of the proposed and the similar project are not more than five years apart; 3) the

[20] We did not calculate the exact share of ERUs that were issued retroactively. This would require checking the monitoring reports of each project. Not all monitoring reports for all projects are available.
[21] Project UA1000380.

difference in scale of activities does not exceed 50%; and 4) the regulatory framework has not changed in a manner that would affect the baseline of these projects (UNFCCC 2011b).

Only seven projects in the sample use this approach to demonstrate additionality, but these projects are large: they account for 25% of the ERUs issued to the projects in the random sample. In applying this approach the projects sometimes make long chains of references. [22]

We traced from the sampled projects up to five sequential references from one project to another. Six of the seven projects involve coal extraction from waste piles, which is the largest project type in terms of ERU issuance (see Section 5.2). We show there that such chains of references can reduce the comparability of the projects: the last project in the chain may not be comparable with the first project for which additionality was initially determined. The demonstration of additionality by making a reference to a comparable project is also prone to possible flaws in determining additionality in the original project. If additionality is not appropriately determined in the original project, the wrong conclusion on additionality could also apply to all following projects that use it as a reference.

4.8 Overall assessment of the likelihood of additionality of JI projects

In this section we assess the overall plausibility of the additionality claims by JI projects based on the information on additionality determination available from the 60 sampled projects. We evaluate the plausibility of the additionality claims of each project by assessing the plausibility of the timeline of project implementation and registration under JI as well as the information on the main additionality tests used to determine additionality (investment analysis, barrier analysis, common practice analysis, reference to a comparable project).

We use three broad categories to classify each project:

- “Plausible” means that, based on the available information, the claims for demonstrating additionality seem plausible;
- “Questionable” means that the available information raises questions or doubts about the additionality;
- “Not plausible” means that the available information suggests that the projects are unlikely to be additional.

For six of the 60 projects a PDD is not available; we exclude these projects from our assessment. For the remaining 54 projects we use a consistent approach to classify each project in one of the categories. With regard to the timeline of project implementation and registration, we assess when the project was initiated, i.e. when the decision was taken to proceed with the project, and when the project made apparent efforts to seek JI status, i.e. when the project received a LoE or when the determination report was prepared.[23]

As pointed out in Section 4.5, projects may require some time after their initiation to seek JI status, e.g. for preparing a PDD and contracting a DOE or submitting a request for a LoE. However, if projects do not make any efforts to seek their JI status for several years after their initiation, it seems questionable that JI was decisive for the implementation of the project. We use the timelines to classify the projects:

[22] The PDDs of these projects also contain elements of other additionality tests, but the demonstration of similarity to another registered project is their main additionality argument.

[23] For the three projects we did not have LoE or determination dates, we used the LoA or PDD date, whichever was earlier.

- **Up to three years**: If a project made apparent efforts to seek JI status either before project initiation or within three years thereafter, we deem the timeline as plausible.
- **Three to five years**: We deem the additionality claims as “questionable” for projects that have not made apparent efforts to seek their JI status within three to five years of their initiation.
- **More than five years**: We deem the additionality claims as “not plausible” for projects that have not made apparent efforts to seek their JI status within five years of their initiation.

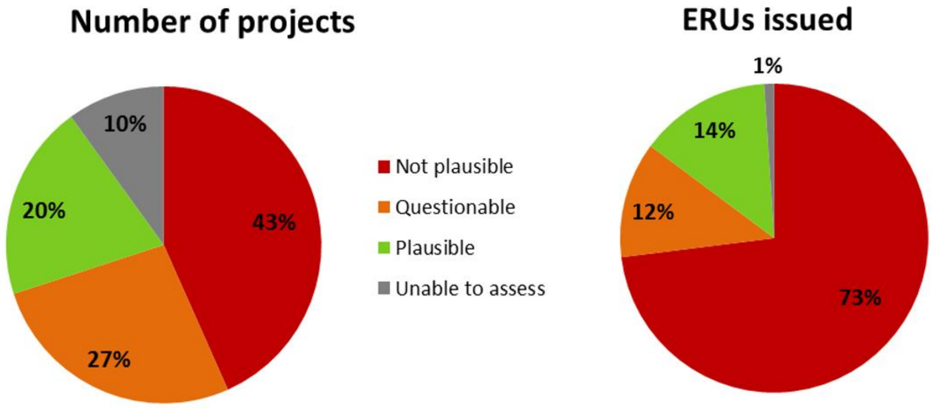
With regard to the tests used to demonstrate additionality, we consider the tests plausible if the tests are applied correctly, e.g. a simple costs analysis is applied to a project type that does not generate revenues other than ERUs, and if key information on the test is provided and justified, e.g. if key input parameters for the investment analysis are provided and justified, if the financial benchmark is derived in a transparent manner, or evidence is indicated for the main barrier. We also deem the additionality claims as plausible for projects that do not lead to cost savings or generate revenues other than ERUs. Where projects use long chains of reference to a similar project as a means of additionality demonstration, with the first project being substantially different from the last, we consider the approach as questionable.

Where a project has both a “questionable” timeline and “questionable” application of the additionality test, we consider the overall additionality claim of the project as “not plausible”.

It is important to note that this approach has clear limitations. First, the classification can only consider information that is publicly available, which is in some cases limited. Very early projects may have provided rather limited information to support additionality claims and are therefore classified as “questionable” but which may nevertheless be additional. Similarly, the plausibility of the information presented does not ensure that a project classified as “plausible” is actually additional. And second, the assessment of the completeness, appropriateness and plausibility of the additionality tests is to some extent subjective, in particular for more subjective tests, such as the barrier test. We nevertheless argue that this assessment is useful to provide an overall impression of the frequency, seriousness and impact of the issues identified in the previous sections.

Figure 6 shows the results of the classification by the number of projects and the ERUs issued to the projects. The 12 projects with plausible additionality claims account for 14% of the ERUs issued to the sampled projects; the 16 projects with questionable additionality claims account for 12% and the 26 projects with additionality claims that were not plausible account for 73% of the ERUs issued.

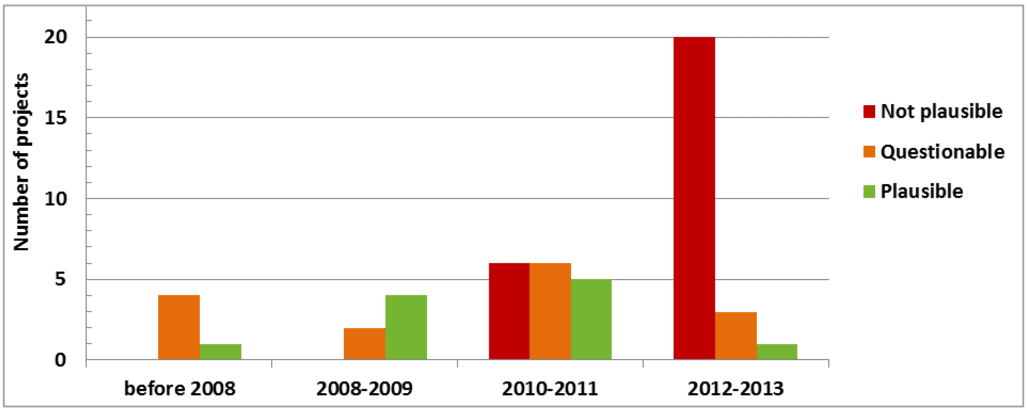
Figure 6: Plausibility of the additionality claims of the sample projects



Data source: Random sample of 60 JI projects.

Figure 7 indicates that the share of projects with additionality claims that were not plausible grew significantly in 2012, correlating with our findings that projects approved earlier were crowded out by projects with more questionable quality that were approved in 2012 and retroactively received ERUs.

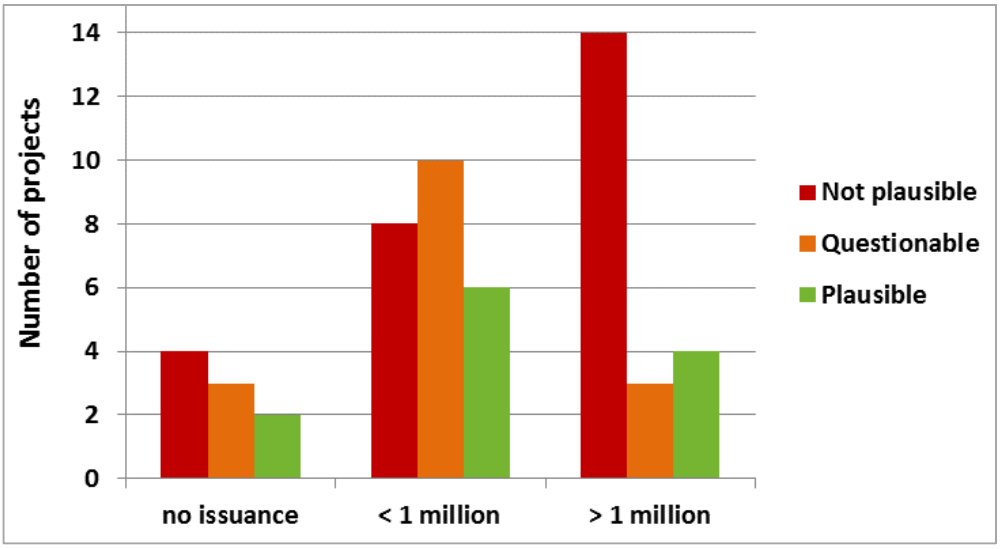
Figure 7: Plausibility of additionality claims of projects by year of approval



Data source: Random sample of 60 registered projects, excluding the 6 projects without PDDs.

Figure 8 shows additionality rating of the sampled projects by total ERU issuance to each project. The figure indicates that additionality for larger projects seemed to be more questionable than for smaller projects. The category of projects with more than 1 million ERUs issued is dominated by projects with additionality claims that are not plausible. The 14 large projects with additionality claims that are not plausible generated 68% of ERUs issued to the sampled projects. It is notable that the vast majority of ERUs issued to all projects were generated by very large projects. The 10 JI projects with more than 10 million ERUs generated more than 23% of ERUs issued. The 46 projects that generated more than 5 million ERUs generated 52% of all ERUs and the 179 projects with more than one million ERUs generated more than 90% of ERUs.

Figure 8: Plausibility of additionality claims of projects by size



Data source: Random sample of 60 registered projects, excluding the 6 projects without PDDs.

5. ASSESSMENT OF SPECIFIC JI PROJECT TYPES

In this section we examine the six project types with the highest ERU issuance in greater detail, in order to assess the degree of environmental integrity of different project types. The project types represent 84% of the ERUs issued and 53% of registered projects in CP1.

Table 10: Project types evaluated, number of projects and their ERU shares

Project types evaluated	Number of registered projects	ERUs issued (millions)	% of ERUs issued in CP1
Spontaneous ignition of coal waste piles	78	219	26.1%
Energy efficiency in industry and power production and distribution	164	195	23.1%
Associated petroleum gas utilization	22	117	13.9%
Natural gas transportation and distribution	32	83	9.8%
HFC-23 abatement from HCFC-22 and SF6 abatement	4	54	6.4%
N_2O abatement from nitric acid	41	36	4.5%
Total	**341**	**705**	**83.8%**

Source: UNEP Risoe (2014)

We did not evaluate or rate the project types listed in Table 11. These account for 16% of ERUs issued in CP1.

Table 11: JI project types not evaluated and rated

Project types	Registered projects	% of ERUs issued in CP1
Fossil fuel switch	17	3%
Agriculture: no tillage	7	3%
PFC reduction	6	2%
Energy efficiency in service sector	23	2%
N_2O abatement from adipic acid	3	2%
Coal mine methane	28	1%
Biomass energy	46	<1%
Hydro	20	<1%
Wind	43	<1%
Cement	4	<1%
Afforestation	2	<1%
Energy efficiency in households	12	0%
Landfill gas	67	0%
Methane avoidance	7	0%
Geothermal	5	0%
Avoided deforestation	1	0%
Transport	4	0%
Agriculture	4	0%
Total	**299**	**16%**

Source: UNEP Risoe (2014)

5.1 Spontaneous ignition of coal waste piles

Overview

This project type primarily involves avoidance of GHG emissions from uncontrolled fires due to spontaneous self-ignition of coal waste piles. Coal waste piles contain a certain share of coal which was not extracted from the bedrock. Large coal waste piles with high coal content can self-ignite and burn for years. Apart from CO_2 emissions, coal waste fires cause severe local air pollution, including particulate matter, carbon monoxide, polycyclic aromatic hydrocarbons, nitrogen oxides and other noxious gases (Ewall 2007; Stracher and Taylor 2004).[24]

JI projects of this type can be divided into two sub-types according to the approaches applied to deal with self-ignition of coal waste:

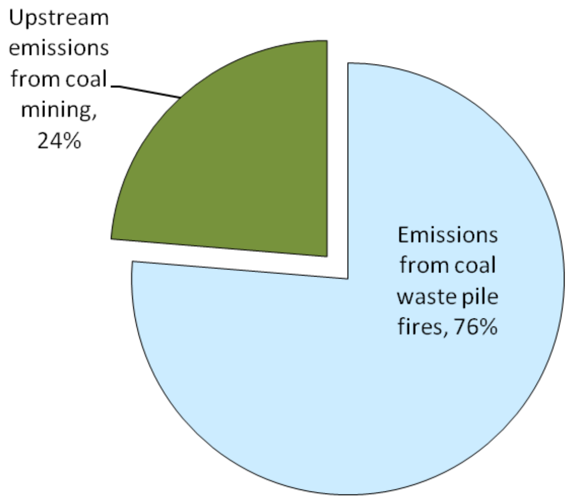
1. **Coal extraction and combustion:** 65 projects extract coal from coal waste piles, leaving bare rock which does not ignite, and combust the extracted coal, mostly in power plants. Emission reductions are claimed for the avoidance of waste pile fires, while emissions from combustion of the extracted coal are not counted because it is assumed to substitute coal which would be otherwise obtained from coal mines. For the amount of coal that would otherwise be obtained from coal mines, projects also claim emissions reductions for avoiding upstream emissions from coal mining, including methane emissions

[24] See: http://www.energyjustice.net/coal/wastecoal.

associated with deep coal mining and CO_2 emissions from electricity consumption by coal mines (see Figure 9).[25]

2. **Fire extinguishing:** 13 projects implement measures to extinguish and prevent fires in coal waste piles. In this case ERUs are claimed only for the reduction of emissions due to avoidance of CO_2 emissions from uncontrolled fires at coal waste piles.

Figure 9: Emission reduction claims by coal waste pile projects by emission source[26]



According to the UNEP Risoe database (2014) there are 78 registered coal waste piles projects, of which only one project was registered under Track 2.[27] This project type delivered almost 220 million ERUs, which is more than 26% of all issued ERUs. This makes it the biggest project type in terms of ERU supply, while it is the second largest by the number of registered projects. Coal waste pile projects are not only numerous but they are also notable for their size: the average annual projected emission reductions are 837 ktCO_2e, with some projects reaching almost 2.5 MtCO_2e per year. Over the first commitment period those projects which issued ERUs received on average 3.5 million ERUs each, while some of the largest projects received close to 10 million ERUs.

The 65 projects that extract coal from waste piles delivered 88% of these ERUs (around 192 million). The 13 projects that implement measures to extinguish and prevent coal waste pile fires account for 28 million ERUs.

All registered projects are located in the Luhansk and Donetsk regions of Eastern Ukraine where the large Donetsk coalfield is located. It is unclear why this type of emission reduction activity is not practiced in other coal mining regions with large volumes of accumulated coal waste, e.g. in Russia or in Poland.

The coal industry in Ukraine is partially privatized, but the majority of coal mines have remained state property.[28] The state heavily subsidizes coal mining as in most cases it would

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[25] Some monitoring reports present CH_4 emissions associated with deep coal mining and CO_2 emissions from electricity consumption by coal mines separately, whereas others put them together.

[26] Average values based on monitoring reports from a sample of projects (UA1000380, UA1000392, UA1000515, UA1000521, UA1000329, UA1000378, UA1000393, UA1000424, UA1000426, UA1000437, UA1000458, UA1000492, UA1000512, UA1000522).

[27] No additional such Track 2 projects were found in the UNEP Risoe database.

[28] See: http://www.confcontact.com/2012_05_25/1_kuhno.php [accessed 17 September 2014]

be unprofitable.[29] The equipment at the mines dates back from the Soviet Union and is in most cases obsolete.[30] This results not only in poor safety conditions, but also in poor environmental performance, including water contamination and air pollution. Coal seams in the Donets Basin are rich in methane, which is normally vented directly into the atmosphere as part of the coal mining process. Under Ukrainian regulation the coal mines have to pay a fee for venting methane, but the fees are not sufficiently high to motivate to reduce emissions, rather they are considered as part of normal operating costs.

Similarly, regulation requires that coal waste pile fires are prevented and extinguished by the owners or managing companies of the coal mines, otherwise fines may be issued (Ukraine 2004).[31] However, relevant literature acknowledges that the current policy is not very effective and that the relevant environmental and safety requirements often are not met (Mayevska 2007; Barabadjanova 2012). This is supported by news publications that occasionally report fires at coal waste piles.[32]

In the following, we focus our analysis on waste extraction projects due to their large contribution to the overall emission reductions from this project type. To assess this project type in more detail we closely analyse the six waste coal extraction projects in our random sample (see Section 4). In addition, we examine certain aspects in a sample of 10 other waste coal extraction projects, [33] including monitoring data, crediting period start and LoE dates. We also draw upon relevant literature and conduct expert interviews.

Additionality

Waste coal extraction projects normally list numerous baseline scenarios, including systematic monitoring of coal waste piles and regular fire prevention. In the six projects included in the random sample, the project developers claim that these measures face a prohibitive “investment barrier”, meaning that the costs of fire prevention are higher than the non-compliance penalties, but no further details are given. Interestingly, projects that involve fire control and extinguishing measures do not consider extraction of coal from waste piles among their alternatives. The baseline scenario in both coal extraction and fire extinguishing projects is therefore defined as continuation of the existing practice without effective fire prevention and control measures. The PDDs list different types of barriers, including financial risks, technological barriers, and investment costs, and state that all other projects that reduce emissions from coal waste piles use JI for their implementation. However, the explanations why the barriers are prohibitive for the presented alternatives are usually very short and not supported by sufficient evidence. Likewise, it is not clearly demonstrated how JI overcomes all listed barriers.

In all six waste coal extraction projects the main approach for demonstrating additionality is referring to a similar project and demonstrating comparability with it. This approach is permitted by the *Guidance on Criteria for Baseline Setting and Monitoring* for Track 2 projects. Version 3 of the Guidance, which was the most recent version at the time of

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[29] See: http://en.wikipedia.org/wiki/Coal_in_Ukraine [accessed 17 September 2014]
[30] See: http://golubs.wordpress.com/2013/01/20/вугільна-промисловість-україни/ and http://www.confcontact.com/2012_05_25/1_kuhno.php. [Both accessed 17 September 2014].
[31] The compliance with the regulation is supervised by the State Service of Mining Supervision and Industrial Safety of Ukraine.
[32] See: http://www.civicua.org/news/view.html?q=1482493 [accessed 17 September 2014]
[33] UA1000329, UA1000378, UA1000393, UA1000424, UA1000426, UA1000437, UA1000458, UA1000492, UA1000512, UA1000522.

determination of all examined projects, requires that only a registered project can be used as a comparable project. However, the examined projects, all of them Track 1, apply the previous version of the Guidance (yet state that they use Version 3). Version 2 allowed using a comparable Track 2 project that an AIE had positively determined but that was not yet registered (UNFCCC 2009, p.2; UNFCCC 2011b, p.3).

In demonstrating additionality the projects refer to each other, making sometimes long chains of references, which ultimately refer to one of the few projects that used the CDM additionality tool for their additionality demonstration or a JI-specific approach. We traced up to five sequential project references; see the footnote for examples.[34]

Such reference chains can reduce the comparability of the projects: the last project in the chain may not be comparable with the first project for which additionality was initially determined. For example, under the Guidance the difference between the proposed project and the other project(s) cannot be more than 50% in terms of the project's output (UNFCCC 2011b). It is unclear if the rule is meant to be applied to reference chains. If each project in a chain is 50% bigger, the size of the final project in the chain could be significantly bigger. For example, expected emission reductions of the project *Dismantling of Waste Heap #3 at "Kurahivska" Mine* are close to 3 million tonnes, whereas the size of the original project UA2000020 was less than 0.5 million tonnes. The comparability of other parameters may be distorted as well over the sequence of references. Even if the original project had a high likelihood of being additional, the comparability of projects through such chains of references does not seem to be a good indicator of additionality.

In addition, some projects supplement this additionality demonstration by using other approaches or their elements. In some cases, these claims are not well substantiated. For example, one of the six evaluated waste coal extraction projects used an investment comparison analysis and applied the additionality tool of the CDM, selecting the net present value (NPV) as the financial indicator. However, the PDD simply states that the NPV would be negative without ERU revenues and be positive with ERU revenues without any quantitative information. Input data, such as investment costs, operational expenditure and income from coal sales are not provided. This makes it impossible to assess the calculations and the conclusion.

For the common practice analysis, which is used in three projects, the PDDs simply claim that no similar activities would have been implemented without JI even though they also acknowledge that in a few other cases waste coal extraction does take place. There is no quantitative analysis of the common practice test and no evidence is given for the claims that are made.

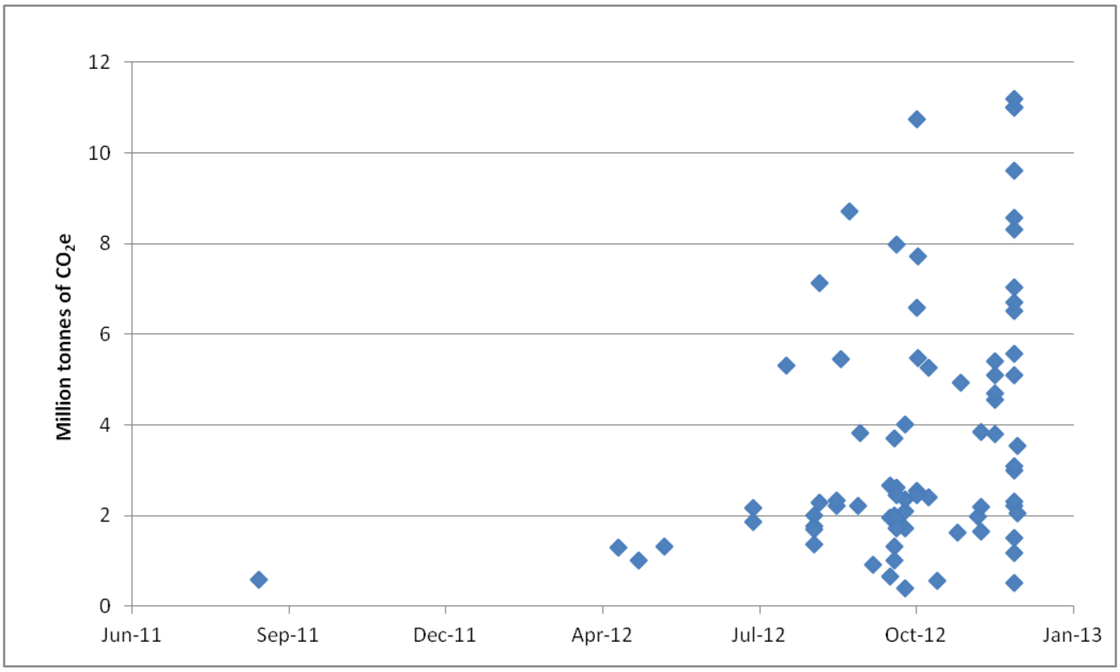
The conclusions of the PDDs regarding the lack of profitability of this project type and the common practice are not consistent with other sources of information. According to a number of local news publications, extraction of coal from coal waste piles is a profitable business, which has become a common practice in Ukraine over the last years. For many years, illegal local scavengers collected coal from such waste piles. In recent years medium-sized and even large businesses have taken over this business niche because the cost of surface mining is

[34] Chain 1: Dismantling of Waste Heap #3 at "Kurahivska" Mine →→→ UA1000447 →→→ UA1000427 →→→ UA1000329) →→→ **UA2000020**.
Chain 2: UA1000521 →→→ UA1000329 →→→ **UA2000020**. (the last project in the chain is same as in chain 1)
Chain 3: UA1000515 →→→ UA1000378 →→→ **UA1000317**
Chain 4: UA1000380 →→→ **UA1000317** (the last project in the chain is same as in chain 3)

significantly lower than underground mining and because the quality of coal from coal waste piles can be comparable to conventional coal.[35]

It is notable that this project type only emerged towards the end of CP1. The first project was initiated and approved in 2010, but the large majority of projects received host country LoAs in the second half of 2012 (see Figure 10).

Figure 10: LoA issuance dates of coal waste pile projects and emission reductions estimated in PDDs



Data source: UNEP Risoe (2014).

We analysed the timeline for a sample of 16 waste coal extraction projects. Twelve projects state project starting dates of 2008, and two of 2009. Fifteen projects had their LoEs issued only in 2012 and one at the end of 2011. Thus the time span between the project start and LoE is much greater than three years in 75% of sampled projects. All projects received ERUs retroactively in 2012 or 2013; in nine of 14 projects that generated ERUs, the time of retroactive crediting exceeds four years, and in two more it is 3–4 years. The large time gap between project start and LoE and retroactive crediting for a long period indicates that it is unlikely that JI was considered at the start of these projects. (See Section 5 for methodology of project timeline assessment).

However, the time between LoEs and the issuance of ERUs is strikingly short – less than six months in 13 of the 14 analysed projects that generated ERUs, and six of those completed the whole project cycle, including receiving an LoE, determining the PDD by an AIE, receiving an LoA, preparing a monitoring report, verifying it by an AIE and issuing ERUs, in less than three months. The time span between the determination and verification reports is usually around one month, which suggests that verification of emission reductions was probably performed simultaneously with PDD determination. The dates of verification reports and

[35] See: http://tyzhden.ua/Publication/2898; http://www.umoloda.kiev.ua/regions/56/219/0/34910/; and http://www.epravda.com.ua/news/2014/02/17/420405/.

project registration typically are very close –usually only a few days apart. Thus it appears that the opportunities for issuing ERUs from coal waste pile projects were only identified at the end of the first commitment period and promptly monetized through a streamlined process of project registration and ERU issuance.

Given all the evidence discussed above, it seems implausible that this project type is additional.

Baseline emissions

The calculation of baseline emissions in the six coal extraction projects included in the random sample rests on two important assumptions:

- **Amount of coal burnt in fires:** All of the 16 examined projects assume that either 78% or 83% of the coal content in the coal waste piles would have burnt in the absence of the JI project. This assumption is based on two proprietary studies on the fire risk of waste piles in the Luhansk and Donetsk regions that are not publicly available. According to the PDDs, the studies established the probability of fire by conducting a "survey of all the waste heaps in the area providing a ratio of waste heaps that are or have been burning at any point in time to all existing waste heaps",[36] giving the figure of 78% for the Luhansk region and 83% for the Donetsk region. The PDDs then reinterpret these figures to mean that 78% or 83% of all coal contained in the coal waste piles included in the project would have completely burnt during the crediting period. However, the estimated percentages of coal waste piles that may burn at some point do not say what fraction of coal in a waste pile that would be burnt during the crediting period. Thus the assumption that 78% or 83% of the coal content would have burnt seems not backed up by any evidence and the application of these factors in calculations in PDDs is incorrect. Moreover, as pointed out above, some coal might have been extracted by scavengers or other companies, which is not taken into account in the PDDs.
- **Timing of coal waste fires:** All 16 projects assume that without the JI project the coal in the coal waste piles would burn within the crediting period. The findings of the study that coal waste piles will burn at "some point in time" was reinterpreted in PDDs to mean that all coal collected by the JI project would have otherwise burnt completely in 2008–2012. This seems unrealistic. Although some coal waste piles may have self-ignited in 2008–2012, others may only self-ignite thereafter. Moreover, uncontrolled fires can last for a considerable time, beyond 2012. When and how quickly a coal waste pile burns depends on internal and external conditions. The PDDs do not provide any evidence or explanation why the coal waste piles would burn exactly during the crediting period and not thereafter.

These assumptions and their application in the calculation of baseline emissions have very likely led to significant overcrediting of this project type.

Furthermore, the amount of coal reported to be extracted by these projects is likely exaggerated. The amount was questioned in the press[37] and by a project development company in complaints to Ukraine's DFP and the JISC after some of its projects were taken over by

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[36] PDD of project UA1000515.

[37] See: http://forbes.ua/nation/1340374-rassledovanie-kak-chinovniki-peredelili-ukrainskij-rynok-uglerodnyh-kvot.

another company, which rewrote the PDDs using calculations that resulted in a tenfold increase in emissions reductions[38] (Global Carbon BV 2012a; Global Carbon BV 2012b).

We assessed the plausibility of the claims in the PDDs on the amount of coal extracted from coal waste piles by comparing the data from PDDs with statistics on coal production. We estimated the amount of coal claimed to be produced by waste coal extraction projects using the available information in the monitoring reports of the 14 projects which issued ERUs; we determined the average amount of coal extracted per tonne of emission reduction claimed and we extrapolated the results to all projects.[39] We estimate that all waste coal extraction projects together produced about 105 million tonnes of coal, with an average annual coal production of around 24 million tonnes of coal.[40] The average annual national production of coal in Ukraine was around 80 million tonnes in this period.[41] This means that all coal waste pile JI projects together implicitly claim that they have produced around 30% of all coal in Ukraine. Or, to use another comparison, the coal extracted from coal waste piles amounts to about 46% of total solid fuel consumption for public electricity and heat generation – a key emission source in Ukraine.[42] Interviewed experts confirmed that this highly unrealistic scenario would have significantly transformed the coal industry in Ukraine. The amount of waste coal extraction claimed in PDDs is likely to have been substantially exaggerated.

In summary, the evidence suggests that in this project type both the amount of coal extracted as well as the baseline emissions claimed per tonne of coal of extracted are substantially overestimated, leading to significant overcrediting.

Other issues

An important shortcoming of fire extinguishing projects is that the projects do not account for the potentially temporary nature of the emission reductions: an extinguished fire might re-ignite. For this reason, the CDM Executive Board decided that this project type is not eligible under the CDM. For example, projects in the LULUCF sector implicitly account for potential non-permanence as ERUs are issued by conversion of RMUs which have to be replaced if

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[38] For example, two versions of the same project are available on UNFCCC website: http://ji.unfccc.int/JI_Projects/DB/GKGN2ZT4E1UCGVH27CZ0MPH2SL1T3X/PublicPDD/2109D5CNVS7PZ1NMRQZJWHDTJM047B/view.html (project 0269), and http://ji.unfccc.int/JIITLProject/DB/0VDPHZ2RCWIF3KON529ZKBR2UCFZ28/details (UA1000400).

[39] Monitoring reports were available for 14 of the 16 projects. We use the methodological approaches provided in the PDDs to calculate the amount of extracted coal underlying the claimed emission reductions.

[40] We calculate the average over the period from the crediting period start of each project until 31 December 2012. The amount of coal is calculated in the equivalent of typical coal quality used at power stations (i.e. taking into account difference in ash and moisture content).

[41] Ukraine's National GHG Inventory Report; see https://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/8108.php.
Also see BP Statistical Review of World Energy 2013 http://www.bp.com/content/dam/bp/excel/Statistical-Review/statistical_review_of_world_energy_2013_workbook.xlsx.

[42] We compare emission reductions claimed by waste coal extraction projects (which supplied their coal to thermal power stations) and national GHG inventory data on CO_2 emissions from electricity and heat production from solid fuels (which include mainly coal). In 2008–2012, waste coal extraction projects were reducing on average 44 million tonnes of CO_2e per year, of which about 34 million tCO_2 were reduced due to avoiding emissions from self-ignition of coal waste piles and related substitution of coal at thermal power stations (estimated based on typical shares of components of emissions reductions in this project type). At the same time, the country's average CO_2 emissions from electricity and heat production from solid fuels were around 73 million tonnes. This means claimed emissions reductions due to coal substitution were around 46% of total emissions from solid fuels in power sector, and coal claimed to be supplied by the projects. This confirms our finding that these projects claim to have extracted a substantial share of coal in the country, which would substitute around 46% of solid fuels in power sector. As explained above, such claims seem highly implausible.

carbon stocks are reduced. In contrast, the potential non-permanence of emission reductions from fire extinguishing projects is not addressed, potentially undermining the environmental integrity of ERUs issued for this project type.

For both project types, the PDDs are generally of poor quality and often so similar to each other that it is evident that the text was copied from one PDD to another, sometimes leaving incorrect references or numbers. In some projects the boundaries are not clearly defined, which leaves it open to addition of coal waste piles that were originally not included in the PDD.[43] Moreover, it is notable that one single AIE (Bureau Veritas) was responsible for 99% of all verifications for this project type, and that none of the multiple issues we identified were addressed by the AIE.

GHG inventory visibility

Ukraine's national GHG inventory reports emissions from coal mining and coal use (including venting of coal mine methane and solid fuel combustion). However, it does not include CO_2 emissions from uncontrolled coal waste fires (Ukraine 2014).[44] Consequently, the largest part of emission reductions claimed by this project type are not reflected in the host country's GHG inventory. This is notable because the same government body was responsible for GHG inventories and JI projects and emissions reductions claimed by these projects are equivalent to 12% of the national GHG emissions: the average annual emissions reductions of all coal waste projects were more than 49 million tonnes of CO_2e[45] in the period 2008–2012, while the total annual emissions of Ukraine were on average 398 CO_2e (excluding LULUCF) (UNFCCC 2014a).

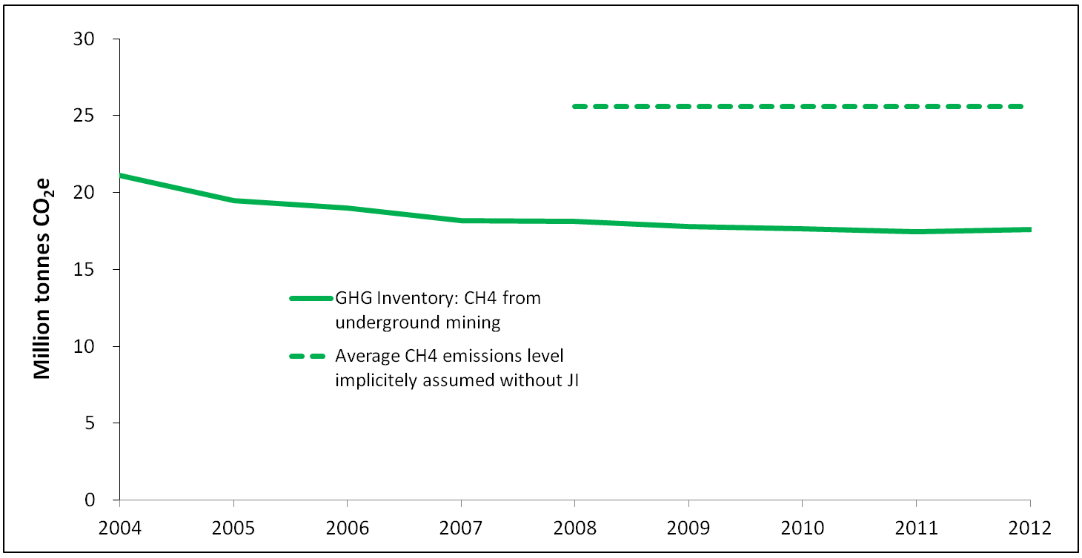
The emission reductions claims from the second source – upstream methane emissions from coal mines – are also inconsistent with data reported in GHG inventories. Together the waste coal extraction projects claim to reduce methane emissions from underground coal mining by about 8 million tonnes of CO_2e per year, while the GHG inventory reports methane emissions from underground coal mining in CP1 were about 18 million tonnes CO_2e. This implies that the national emissions in the baseline scenario without JI projects would be 45% higher than historical levels observed prior to the implementation of the project activity (see Figure 11). In this regard, the reductions in upstream methane emissions from coal mining seem to be even more exaggerated than the claims on the amount of coal produced from these projects. Moreover, the GHG inventory data shows that no reduction in methane emissions from coal mines can be observed with the implementation of the JI projects. From 2008 to 2012, methane emissions from coal mines only slightly decreased, significantly less than the reduction claimed through the JI projects.

[43] For example, the PDD of project UA1000327 states: "The project activities are physically limited to the waste heaps in the legal use of Small Private Enterprise «BIK»." However, precise geographic locations of all waste piles that are in the legal use of the company are not specified. Moreover, the PDD states: "During the monitoring period other waste heaps can be acquired. Data on new waste heaps will be included in the appropriate monitoring reports."

[44] https://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/8108.php.

[45] Here and below we use average over the crediting period of the projects.

Figure 11: Methane emissions from underground coal mining and implicit baseline emission levels in CP1 without waste coal extraction JI projects



Data sources: Ukraine's National GHG Inventory Report, 2014 submission, v.5. https://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/8108.php, UNEP Risoe (2014).

In conclusion, GHG inventory data and aggregated data from JI projects are largely inconsistent. Emissions reductions from projects of this type were not reflected in the national GHG inventory despite the fact that they should have a substantial share in the national emissions. These findings provide further evidence that the baselines and resulting emissions reductions claimed for this project type were systematically and significantly inflated.

Conclusions

Based on our findings we rate additionality of this project type as not plausible and overcrediting likely to be significant. The Ukrainian government and the AIEs endorsed these projects despite clear evidence that these projects had very limited environmental integrity. The analysis also identified that a large part of the emissions from coal waste fires is not included in the GHG inventory. Thus, we rate the overall environmental integrity of ERUs generated by this project type as low.

5.2 Energy efficiency in industry and power production and distribution

Overview

This project type includes a large variety of energy efficiency improvement measures in very diverse sectors, such as large industrial facilities, power plants, and heat plants (see Table 12). Energy efficiency (EE) in industry and power production and distribution includes 164 registered projects which generated more than 194 million ERUs, making up 23.1% of total ERU issuance. Ukraine hosts the vast majority of EE projects, both in terms of issued ERUs (almost three quarters) and registered projects (almost two thirds). Nearly all the rest are in Russia. The remaining 18, in five other countries, account for less than 2% of the ERUs issued (see Table 13).

Table 12: Energy efficiency project types in industry and power production/distribution

Project sectors	Registered projects	kERUs	% of kERUs of this project type
Iron & steel	38	73,572	38%
Efficient electricity distribution	22	34,562	18%
Food and agriculture	14	29,674	15%
District heating	23	16,092	8%
Higher efficiency coal power	8	14,245	7%
Chemical	10	4,903	3%
Other	49	21,659	11%
Total	**164**	**194, 707**	

Source: UNEP Risoe (2014)

Table 13: Energy efficiency projects in industry and power production/distribution, by country

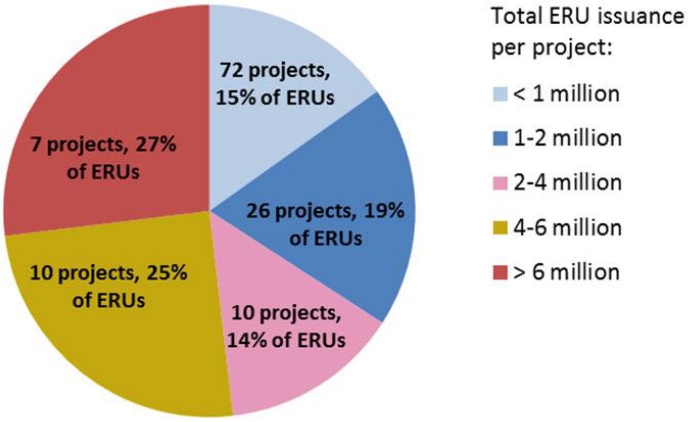
Country	Registered projects	kERUs issued	% of ERUs issued
Ukraine	106	143,668	73.8%
Russia	40	47,456	24.4%
Bulgaria	10	2 293	1.2%
Romania	4	1,221	0.6%
Germany	2	60	0.0%
France	1	10	0.0%
Czech Republic	1	0	0.0%

Source: UNEP Risoe (2014)

Track 1 projects – 157 in total – delivered 98% of ERUs. The seven Track 2 projects delivered the remaining 2%, and 39 projects did not have any issuances. Bureau Veritas audited the vast majority of these projects. It performed determinations for 125 projects and verifications for 102 projects which generated 88% of the ERUs from this project type.

Many of the EE projects are large: 53 out of the 125 projects with ERU issuances received more than one million ERUs each – they account for 85% or 165 million of the ERUs of this project type (see Figure 12). Ukraine hosts 37 of these large projects (accounting for 125 million ERUs) and Russia 16 (accounting for 40 million ERUs). Twenty-three of these large projects are in the iron and steel sector, nine in energy distribution, six in district heating, and seven in the food industry; four are coal power plants.

Figure 12: Size distribution of 125 energy efficiency projects with ERU issuance



Source: UNEP Risoe (2014)

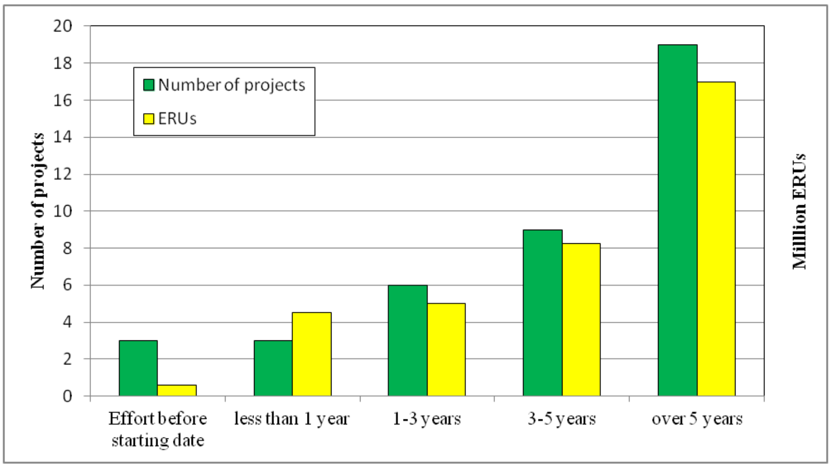
Additionality

Assessing the additionality of EE projects is inherently challenging, because these projects usually provide economic benefits by offering lifetime cost savings despite potentially high upfront investment costs. In conversations with project developers and other experts, financial additionality was not considered a characteristic of these types of projects for large industrial companies. One interviewed project developer stated: "The biggest accomplishment of JI was bringing climate change to the board room of Russian and Ukrainian companies. If we are going by financial additionality, these [steel projects] are not additional. But if we are looking at raising awareness then a lot was achieved."

However, JI may have sped up the implementation of some projects. Even if projects were not additional in economic terms, they may have been implemented sooner because of JI. But this would only be the case if project owners considered JI when they took the decision to implement the energy efficiency measures.

We analyse the timeline of project implementation more closely for 40 randomly chosen projects, representing 18% of the ERUs issued to this project type. Figure 13 shows the time gap between their project start and when they received an LoE or completed determination, i.e. when efforts to secure JI status became apparent.

Figure 13: Time gap between project start date and earliest date of LoE or determination to seek JI status



Data source: 40 energy efficiency projects drawn from UNEP Risoe (2014).

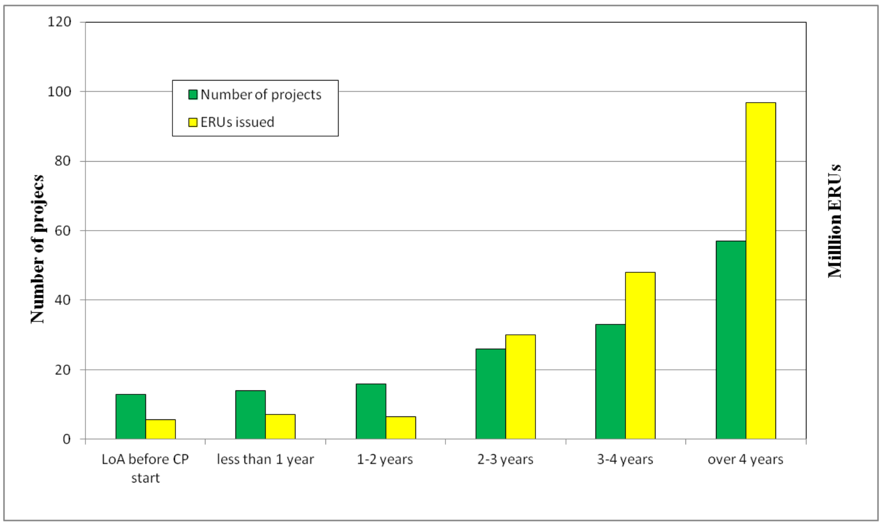
For 12 projects (accounting for 29% of ERUs of the 40 projects) the LoE or determination report were issued before or within three years of the project start. For these projects, the timeline seems plausible, and JI may have been considered when the decision was taken to proceed with the project.

For nine projects (23% of ERUs of the 40 projects), the LoE or determination report was issued three to five years after the project start. For these projects, additionality claims seem questionable.

Nineteen projects (48% of ERU of the 40 project sample) received their LoE or completed determination more than five years after their start date; for all but one, the time gap exceeded seven years; in four projects it exceeds 10 years, and in one it is almost 13 years. For these 19 projects, it seems unlikely that JI was considered at project implementation, and additionality does not seem plausible.

We further analyse whether projects were retroactively credited for the 159 EE projects for which sufficient data is available. Figure 14 shows that 57 projects received ERUs retroactively for a period of more than four years, and 33 projects for a period of three to four years. Together, these projects account for 74% of ERUs from this project type. These projects were implemented and started operation without knowing whether they would receive JI registration, which suggests that JI was unlikely to have played a decisive role.

Figure 14: Retroactive crediting in energy efficiency projects



Data source: 159 energy efficiency projects drawn from UNEP Risoe (2014).

The analysis of the project timeline and the use of retroactive crediting indicate that JI may have played a decisive role for the implementation of only a minority of projects generating less than a third of ERUs of this project type.

We further assess the additionality claims of EE projects based on a detailed evaluation of the 15 projects included in the random sample of 60 projects, along with relevant literature and expert interviews. The 15 projects represent 6% of ERUs from this sector (12 million ERUs).

Seven projects used an investment analysis. We identified issues in all projects, such as arbitrarily established or unjustified benchmarks, missing key input parameters or a low impact of ERU revenues on the economic attractiveness of the project, or insufficient information (e.g. only costs and result). None of the analysed projects presented a credible additionality demonstration through their investment analysis.

Eleven projects applied a barrier analysis (for three of these projects the barrier analysis was performed in addition to investment analysis). We also identified several issues with the barrier analysis, including the use of subjective barriers, lack of evidence to support the barriers, and the application of the same barriers to a number of bundled sub-projects that included various measures which likely faced very different barriers.

All except one project performed a common practice analysis in addition to the investment and/or barrier analysis. For several projects, the common practice analysis seemed largely plausible. However, in most cases, the common practice test is only qualitative without providing quantitative information. Two projects presented a common practice test, which was not applicable to their technology but apparently copied and pasted from another PDD. Overall, based on the project timeline and the quality of the additionality tests, the additionality assessment seemed plausible for one project (accounting for 8% of ERUs in the sample), questionable for five projects (accounting for 26% of the ERUs in the sample), and not plausible for nine projects (accounting for 66% of the ERUs issued in the sample). We rate the overall likelihood of additionality of this project type as questionable.

Baseline emissions and inventory visibility

Of the 164 projects, 116 used a JI specific approach, accounting for 85% of ERUs issues to EE projects. The diversity of the projects is also reflected in the number of CDM methodologies (22) that were used to determine baseline emissions.

A JI project specific approach can present more difficulty for AIEs, especially when the projects are highly complex and require specialized technical expertise, as is the case for many of these projects. Technologies and methods can vary significantly from project to project and in each case, in-depth technical knowledge is necessary. When sophisticated technologies are involved, AIEs need to be highly qualified in a particular technology to perform determinations and verifications. Information asymmetries can easily arise: One auditor mentioned that, because of the specialized expertise required, it was often difficult to assess if the information and data the project participants provided was credible or not.

Because of the vast variety of technologies and sectors that make up this project type, we were not able to assess the overall validity of the baseline assumptions of this project type.

Conclusions

Additionality for EE projects is difficult to establish because although these projects require large initial investment they yield considerable fuel cost savings and therefore often make economic sense, although some may not be implemented due to barriers, such as split incentives or a lack of capacity. Based on our findings the additionality of this project type seems not plausible for the majority of projects, questionable for some, and plausible for a few projects. We therefore rate the overall likelihood of additionality of this project type as questionable. We did not assess the integrity of the baseline assumptions because of the diversity of this project type. We rate the overall environmental integrity of ERUs generated by this project type as questionable.

5.3 Associated petroleum gas utilization

Overview

The third largest project type in terms of ERU issuance is projects which utilize associated petroleum gas (APG) that would otherwise be flared at oil field operations. APG is gas that is either dissolved in the oil or forms a gas cap above an oil reservoir. It consists mainly of methane and is released during crude oil production. Industry practice is to either simply flare the APG or to capture it and use it. APG has a high calorific value and can be processed for use as fuel or feedstock.

Estimates calculated from satellite images of flaring sites suggest that globally, 140 billion cubic meters (BCM) of APG was flared in 2011, resulting in approximately 315 million tonnes of CO_2e emissions.[46] The largest share was flared in Russia (37 BCM), followed by Nigeria, Iran and Iraq (GGFR 2014). Over the past 15 years, policies and regulations to reduce APG flaring have increasingly been put in place worldwide, resulting in a global decline in flaring volumes of about 20%. Flaring has also been reduced in Russia, which still flares more than one quarter of its APG (Carbon Limits AS 2013).

The 22 JI APG utilization projects generated 117 million ERUs, 14% of all ERUs issued in CP1. All of these projects are registered under Track 1 and located in Russia. The projects use the recovered APG for one or more of the following purposes: on-site electricity production (e.g. with gas turbines); delivery to a gas pipeline for off-site use; own-use as a liquid fuel (e.g. LPG for gaslifts); and delivery as a liquid fuel off-site for transport or other uses. Many of these projects received a very large number of ERUs. The largest project received more than 77 million ERUs, accounting for more than two thirds of the 117 million issued ERUs to this projects type. Two projects delivered between five and 10 million ERUs and eight between one and five million ERUs.

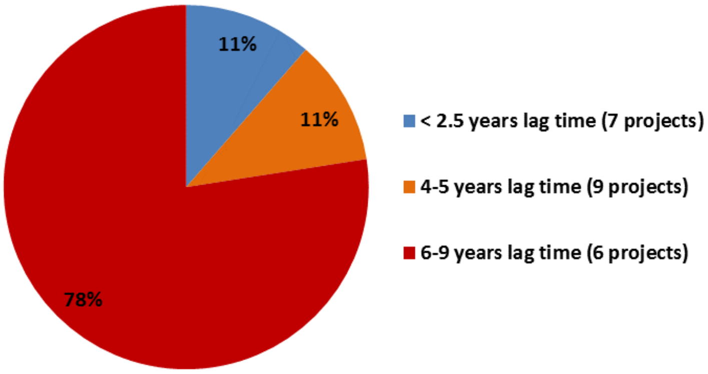
Additionality

In 2007, Russia's president announced his intent to make better APG utilization a national priority. In the following years, several laws were passed which required a 95% APG utilization and imposed penalties for flaring more than 5% of extracted gas. Some incentives to reduce flaring have also been introduced, including market liberalization and preferential market access for flaring reduction projects. But the risk of penalties for non-compliance has been perceived as limited by oil field operators (WWF Russia 2013; Carbon Limits AS 2013). Many Russian oil fields are located far from markets and have been developed without the necessary infrastructure to productively utilize the APG. Moreover, most Russian oil-producing regions have sparse populations and little local demand. Many APG utilization projects would be economical (internal rate of return greater than 7%) but APG utilization investments often compete with oil production expansion for financial and human resources and they are often not prioritized (Carbon Limits AS 2013).

To decide whether JI was likely to be considered when proceeding with the projects, we examined the 22 projects more closely in terms of their timeline for implementation. Because Russia did not issue LoEs, we look at the time gap between the project operation start date as listed in the PDD and the date of the determination report, as shown in Figure 15. Seven projects, accounting for 13 million ERUs, had a lag time of less than 2.5 years. Nine projects, accounting for 12 million ERUs, had a lag of four to five years. Six projects, accounting for 90 million ERUs, had a lag of more than six years. It seems likely that the largest share of ERUs came from APG projects that would have been implemented regardless of JI.

[46] Based on emissions factors of 2,000 tonnes CO_2 and 12 tonnes of CH_4 per million cubic meters of flared APG, and a global warming potential of 21 tonnes CO_2e per tonne of methane. The same conversion rates are used in the Russian UNFCCC inventory. It should be noted the GWP of methane is now estimated to be higher, 34 times that of CO_2 over 100 years (Myhre et al. 2013). We use the lower number because it is what is used for CP1.

Figure 15: Time lag for APG JI projects between project operation start date and date of determination report by ERU volume



Data source: UNEP Risoe (2014) and PDDs.

Project Feature: RU1000353, JI's largest project

RU1000353 is the largest JI project – it received more than 77 million ERUs. The project includes APG utilization at 10 oil fields of Khanty-Mansiyskiy Autonomous Okrug, operated by four companies owned by the parent company TNK-BP.

Only limited information is available in the PDD, which makes it difficult to verify many of its claims. Bundling the 10 oil fields into one project makes assessment of additionality for each individual project impossible. Nevertheless, the timeline and baseline information available raise several concerns.

According to the PDD, the decision to proceed with the APG utilization was made in 2003, two years before the KP entered into force and therefore well before there was any certainty about JI. In 2004, three of the four companies started construction of APG utilization infrastructure. The PDD lists 10 different infrastructure projects that were constructed in 2004, nine in 2005, 18 in 2006, 13 in 2007. Construction of various elements continued until 2012.

Nevertheless the PDD states that in 2007 that TNK-BP decided against developing a PDD for the whole project due to what they perceived as "considerable transaction costs". They decided instead to prepare a PDD for a smaller pilot project. The emissions reductions listed in the PDD for each year indicate that in 2008 the project was largely operational, emissions reductions gradually increasing from 9 to 14 million CO2e during 2008–2012. It was only in 2011 that the full PDD was submitted for determination. The project received its LoA in May 2012. All ERUs were issued retroactively. The first issuance was on 30 August 2012.

This timeline and the claim that developing a PDD was considered too risky in 2007 – at a time when the project was already well under way – indicate that it is not plausible that the project is additional. TNK-BP made large investments in infrastructure well before Russian JI procedures were established and developed their JI project documents only many years after the project was already built and operational.

Baseline assumptions are contradictory. The baseline scenario assumes all APG utilized due to project activities would have otherwise been flared. This is justified by stating that at the time of decision-making there was no legislation that would have required APG utilization and that considerable investment was made to expand APG utilization infrastructure.

But the baseline calculations show that APG was utilized already before the project started in 2003. There is no information on the maximum capacity of the old infrastructure for APG utilization. Since some of the infrastructure was still in use in 2003, it can be assumed that it was, at least to some extent, still in working condition. To determine a conservative baseline a scenario, the use of existing infrastructure up to the maximum of its capacity should have been considered.

Baseline emissions and GHG inventory visibility

All of the 22 APG utilization projects use a JI-specific approach to calculate the emission reductions. Ten projects make extensive use of CDM methodology AM0009 and other CDM tools. Emission reductions are claimed for substituting APG for natural gas, or more carbon-intensive fuels, such as oil or diesel. In some projects the captured APG is used for electricity production and is assumed to replace grid electricity. CDM methodologies take a more conservative approach and assume that the APG would replace natural gas, since determining the exact emission effects would require an analysis of the whole fuel supply chain up to the end-users for both the project activity and the baseline scenario (see AM0009).

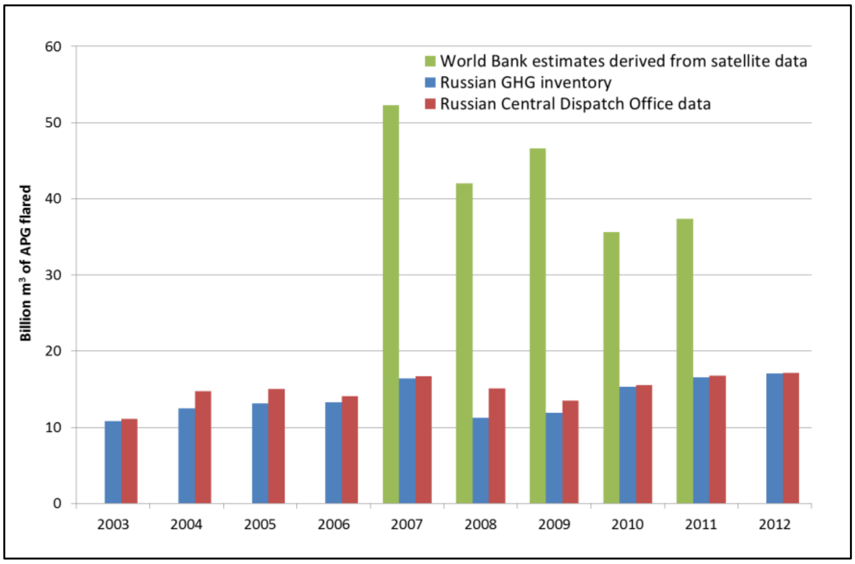
Seventeen projects also claim reductions in methane emissions due to more complete combustion in APG utilization compared with APG flaring. Because of the large uncertainties of the fraction of incomplete combustion, CDM methodologies do not allow accounting for these avoided methane emissions, but all but three JI APG projects claim them.[47] The Russian UNFCCC inventory assumes the default values in the 2006 IPCC Guidelines to estimate emissions from flaring, which are based on a flare efficiency of 98%, meaning that 98% of the methane in the APG is converted to CO_2. The lower the flare efficiency, the more emission reductions a JI APG utilization project can claim. The assumed flare efficiency varies considerably among projects: for example, eight projects assume 96.5% and six projects 98% to 99%. Hence, many JI projects assumed a lower flare efficiency than recommended by the IPCC and used in the Russian GHG inventory. A lower flare efficiency leads to higher baseline emission and therefore increases credit generation.

We also identified significant inconsistencies with Russian inventory data with regard to the quantity of gas flared. Data on the extent of APG flaring in Russia varies between different sources. For example, the Central Dispatch Office of the Russian Fuel and Energy Industry historically has reported a larger volume of APG flared than the Russian Federal Service for State Statistics. The State statistics on APG flaring are based on reports from oil and gas companies which often use estimates rather than actual measurements for the quantity of associated gas produced and flared. Given that flaring is subject to regulations and penalties it may be that flaring is systematically underreported (WWF Russia 2013).

All Russian sources report much lower flare volumes than does the World Bank's Global Gas Flaring Reduction Partnership, which uses estimates from satellite data[48] (GGFR 2014); see Figure 16. The discrepancy is reported to partly be due to overestimates from the satellite data and partly a result of underreporting in national statistics (Carbon Limits AS 2013).

[47] Two of the 22 projects were not included in this analysis: one project did not receive ERUs and for one project we were unable to determine their approach with certainty.
[48] The data is provided by the U.S. National Oceanic and Atmospheric Administration (NOAA).

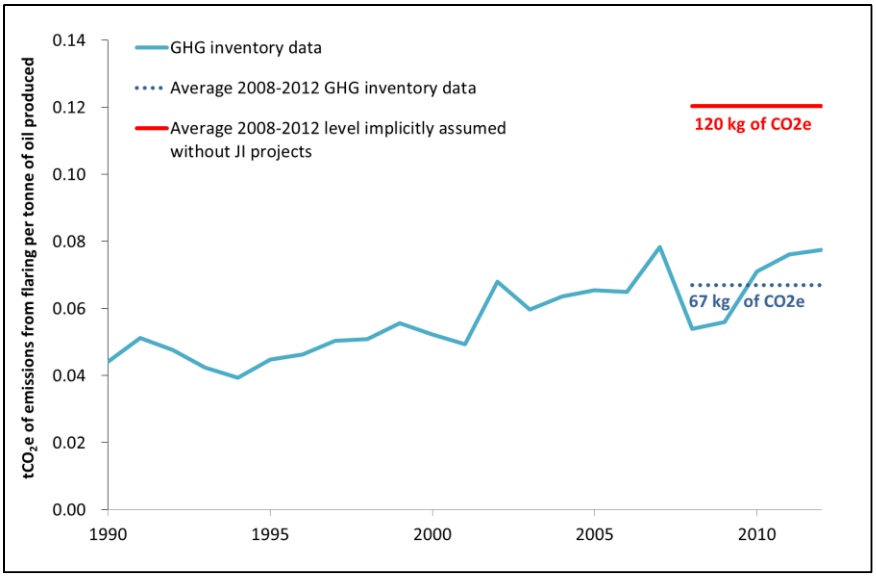
Figure 16: APG flaring in Russia: satellite estimates and national data in BCM



Sources: Satellite data from GGFR (2014), Russian Central Dispatch Office of the Russian Fuel and Energy Industry data taken from Carbon Limits AS 2013, Russian UNFCCC inventory data table: 1.B.2.c.2.iii Russian emissions from associated gas flaring (combined oil and gas), http://unfccc.int/di/FlexibleQueries/Event.do?event=go

Figure 17 shows CO_2e emissions from Russian APG flaring per tonne of oil produced. The dotted blue line shows the average emissions for 2008–2012. The red line illustrates where BAU emissions would have been if both information from JI projects and GHG inventories are correctly reported. (The distance between dotted line and red line represent the claimed JI emission reductions.) The figure illustrates that absent the JI projects, Russian emissions from APG flaring per oil production would have been approximately 80% greater in the period 2008–2012 and would have increased well above any historical values observed since 1990, if emissions reduction claims of JI projects were true. Given this large discrepancy, it seems likely that either the inventory does not appropriately reflect the amounts of APG actually flared, APG JI projects have been substantially overcredited, or a combination of both.

Figure 17: CO_2e emissions from Russian APG flaring per tonne of oil produced and implicit emission levels in CP1 without JI projects



Source: UNFCCC GHG inventory data: http://unfccc.int/di/FlexibleQueries/Event.do?event=go. JI figures from own calculation based on UNEP Risoe (2014).

Conclusions

Based on our findings, we rate additionality of this project type as not plausible and overcrediting likely to be significant. The Russian government and the AIEs endorsed these projects despite clear evidence that these projects had very limited environmental integrity. The analysis also identified emissions from APG flaring are inconsistent with the large emissions reductions claimed by the JI. Thus, we rate the overall environmental integrity of ERUs generated by this project type as low.

5.4 Natural gas transportation and distribution

Overview

This project type includes emission reduction activities related to the transportation and distribution of natural gas. It includes two sub-types:

- **Methane leakage reduction:** Methane is the main component of natural gas, which is transported via high- and medium-pressure gas pipelines and delivered to consumers though low-pressure gas distribution networks. Natural gas leakages occur at each step of transportation and distribution; they are particularly common at gas equipment of gas distributing plants such as reducing gears, valves, filters, turning off devices, and gas fittings and connections of transportation pipelines. The projects involve measures to reduce methane leakages, including repairing or replacing the equipment.
- **Extension of gas distribution networks:** This project type mostly involves the construction and expansion of gas distribution systems in order to supply natural gas to industrial, administrative and household consumers. Emission reductions are claimed for the fuel switch from coal and fuel oil to natural gas, and in the case of households the change from centralized to individual heating and hot water supply systems, which are claimed to be more efficient. These projects reduce CO_2 emissions.

There are 32 registered projects related to gas transportation and distribution (UNEP Risoe 2014). These projects delivered around 83 million ERUs, which is almost 10% of all ERUs, making it the fourth-largest project type. The 24 methane leakage reduction projects generated around 70 million ERUs. Of these projects, 22 implement measures to reduce methane leakage at gas distribution networks, and two reduce emissions from high-pressure gas transmission pipelines; however, the latter did not deliver any ERUs. The remaining eight projects involve the extension of gas distribution networks and generated 13 million ERUs.

Both project types are large: each methane leakage reduction project generated on average 3.2 million ERUs, around 650,000 ERUs per year during the project's crediting period. Gas network extension projects generated on average 1.9 million ERUs, around 400,000 ERUs per year during the project's crediting period. All projects are located in Ukraine, except for two gas network extension projects located in Bulgaria. It is not clear why this project type does not occur in other countries, given that gas transportation and distribution activities take place in many JI host countries.

All projects in this project type registered under Track 1. Bureau Veritas did the PDD determinations and emission reduction verifications for 29 of 32 projects.

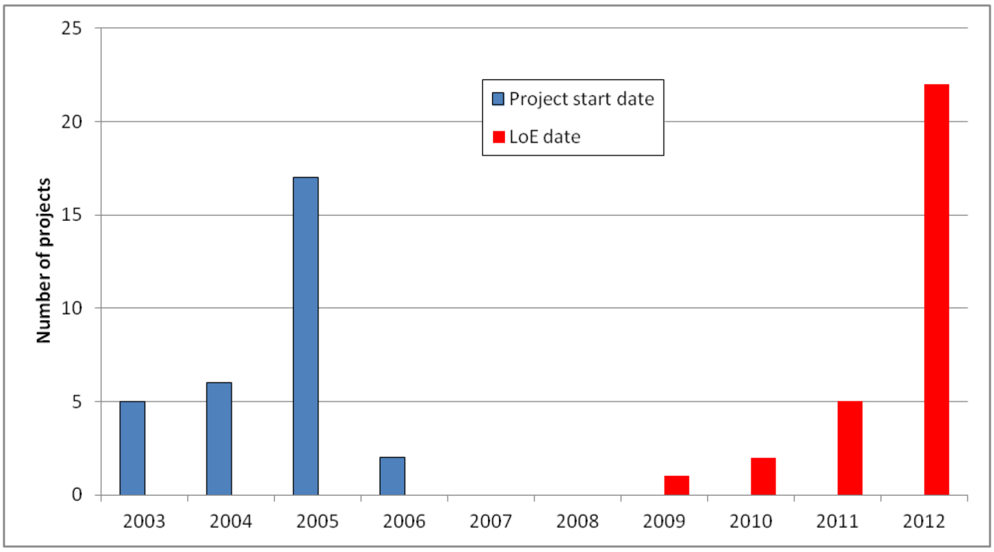
To assess the plausibility of the approaches used for determining additionality and quantifying emission reductions, we assessed in detail the three projects in the random sample, and reviewed the remaining 29 PDDs. We found the PDDs of projects in Ukraine were very similar overall, even though they were prepared by different project developers.

Additionality

In methane leakage reduction projects, the project participants typically claim that they do not benefit from the gas savings because they do not own the gas, but get paid for gas delivery (which is the case in Ukraine). For this reason, they do not conduct a full investment analysis. They also do not perform a simple cost analysis, which would be an appropriate choice if the project generated no other income except the revenue from the ERUs. Projects mostly rely on the barrier analysis to demonstrate additionality. The PDDs describe organizational, financial, lack of technical knowledge and other general barriers, but do not provide supporting evidence and fail to demonstrate how JI overcomes these barriers. The common practice analysis is descriptive (without figures on the market share of the project technology) and also lacks evidence. Projects commonly state that all other similar activities used JI for their implementation. In gas network expansion projects, the project participants assert that gas distribution companies do not have incentives to build new gas distribution systems at their own expense in the absence of JI.

The project starting dates of the 30 projects located in Ukraine were between 2003 and 2006, while most projects received their LoE only in 2012 (see Figure 18). The LoE dates for the two Bulgarian projects are not available. The time period between the starting date of the projects and LoE issuance is on average about seven years. The crediting period of all 32 projects (both methane leakage reduction and extension of gas networks) starts exactly on 1 January 2008, which means that by this date all projects had been at least partially implemented and operational. Twenty-four projects have more than four years of retroactive crediting, and four projects have retroactive crediting of three to four years. In contrast, the time period between LoE and ERU issuance dates in most projects is quite short: in 24 of 28 projects for which both dates were available, the time period is less than one year. Eleven of those projects completed their JI cycle in less than three months and three in less than six months. The very long time gap between project starting date and LoE together with the very short time period between LoE and ERU issuance make it very unlikely that any of the 30 projects in Ukraine considered JI when the project decision was made. Additionality is therefore not plausible for these projects.

Figure 18: Project start years and years of LoE issuance in natural gas transportation and distribution projects



Data source: UNEP Risoe (2014).

Baseline emissions

Methane leakage reduction projects typically base their JI-specific approach partly on the CDM methodology AM0023. The baseline scenario is determined as the continuation of the current practice, which is maintaining gas leakages at reasonable level in order to comply with safety regulations. The projects implement examination and maintenance programmes, which involve the detection and quantification of methane leakage, and repairing or replacing leaking equipment. Implementation of these measures in the absence of JI is not considered a viable alternative and partial implementation of the measures without JI is also not considered as a possible alternative. Most projects determine their baseline emissions through the measurement of gas leaks performed before the repairs, as required by the CDM methodology, for which they use different measurement technologies. However, some projects use other approaches that calculate leakage rates instead of direct measurements, which is not possible under the applicable CDM methodology.

Gas network extension projects base their JI-specific approach partly on the CDM methodology ACM0009. The baseline is defined as the continuation of the current practice. The only alternative scenario considered is the implementation of the projects without JI, which is claimed to face prohibitive barriers. Partial implementation of the project without JI are usually not considered as alternatives. The baseline scenario assumes that the energy sources consist solely of fossil fuels such as coal and heavy oil. But this does not seem plausible: in rural areas newly available gas would also substitute biomass. The use of biomass is considerable in most regions of Ukraine where the projects are implemented (State Statistics Service of Ukraine 2013). The exclusion of the use of biomass may inflate the baseline emissions. The projects might in some cases even result in net emissions.

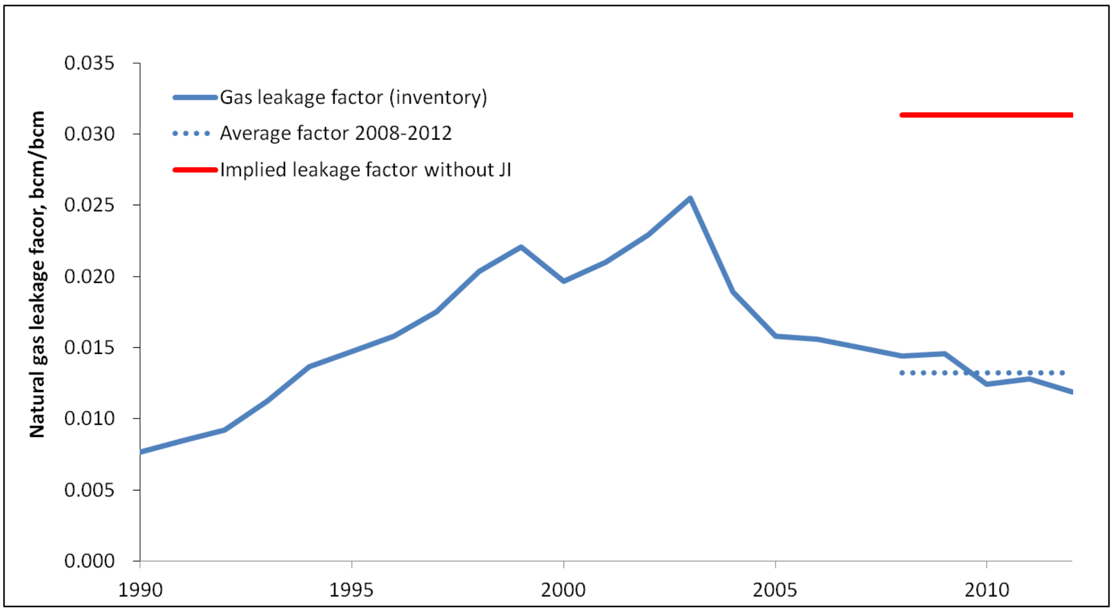
GHG inventory visibility

Emissions from natural gas transmission and distribution are reported in Ukraine's national GHG inventory (Ukraine 2014). Since natural gas transmission projects did not result in any ERUs we analyse only emissions from gas distribution. The average emissions from natural gas distribution in the GHG inventory of Ukraine are about 10.5 million tCO_2e from 2008 to 2012, while the average annual emission reductions from all gas distribution projects are 14.3 million tCO_2e. This implies that without JI projects Ukraine's average emissions from natural gas distribution would have been more than twice as high.

In order to take into account changes in the volume of gas delivered to consumers since 1990, we analyse the specific methane emissions from natural gas distribution per volumeof distributed gas based on the sectoral background data provided in the GHG inventory report (Ukraine 2014). Figure 19 shows that the specific emissions increased between 1990 and 2003, followed by a sharp decrease in 2004 and 2005. This coincides with starting dates of some gas leakage reduction JI projects, which means that emission reduction measures included in the JI projects may be reflected in the inventory. On the other hand, the decrease in gas leakage rates also coincides with an increase of gas prices. It is therefore possible that these projects were implemented not solely because of the JI incentives, but because they became economically attractive due to higher gas prices.

The implied level of leakage rates in the absence of JI (red line in Figure 19) significantly exceeds historical emission rates, which suggests that either Ukraine's emissions from this activity would have risen substantially in the absence of JI projects, or emission reductions claimed by the projects are overestimated. Given that gas distribution companies are required to maintain gas leakages at reasonable level in order to comply with safety regulations (defined as the baseline scenario in the PDDs), it does not seem likely that specific emissions would have risen so substantially beyond historical levels in the absence of JI projects. This indicates that the emission reductions claimed by JI projects could be overestimated.

Figure 19: Specific emissions from natural gas distribution in Ukraine per volume of distributed gas and implicit emission levels in CP1 without JI projects



Data sources: Ukraine (2014), UNEP Risoe (2014).

Projects extending gas distribution networks on average reduce 2.9 million tCO_2e per year in CP1. These projects are related to several sectors reported in the GHG inventory, such as fuels use in public electricity and heat production or for residential applications. The scale of emissions in these sectors is substantially higher than the emission reductions claimed by the JI projects. For this reason the impact of these projects on the total emissions cannot be traced in the national GHG inventory.

Conclusions

Natural gas transportation and distribution projects emerged only towards the end of CP1 and generated significant volumes of ERUs. Overall, the additionality claims of this project type do not seem plausible and likely some overcrediting occurred for methane reduction in natural gas distribution projects. We assess the overall environmental integrity of ERUs generated by this project type as low.

5.5 HFC-23 and SF_6 abatement

Overview

Hydrofluorocarbon-23 (HFC-23) is a waste gas generated in the process of producing hydrochlorofluorocarbon-22 (HCFC-22), which is mainly used as a coolant in refrigeration and air conditioning appliances and as a feedstock in the production of polytetrafluoro-ethylene (PTFE). HFC-23 is a potent GHG, listed with a global warming potential (GWP) of 11,700 in the first KP commitment period and 14,800 in the second commitment period. HFC-23 can be abated in two ways: the generation of HFC-23 can be reduced by optimizing the production process, which also increases the HCFC-22 yield, or equipment can be installed to capture and destroy the HFC-23. In the absence of regulations, incentives, or voluntary commitments by industry, HFC-23 is usually vented to the atmosphere. However, in the past two decades, most plants in industrialized countries have installed HFC-23 incineration equipment.

Sulphur hexafluoride (SF_6) is a non-toxic gas with a GWP of 23,900 in the first and 22,800 in the second commitment period of the Kyoto Protocol. It is mainly used in electric transmission and distribution equipment and switchgear, and as inert gas for the casting of magnesium. In the production of SF_6, a fraction of the gas may be released into the atmosphere from venting of the off-gas, filling systems, and sampling at the production site. Off-gas emissions can be abated by incinerating the off-gas stream, similar to incineration of HFC-23 emissions. The only SF_6 producer in the EU, Solvay, incinerates the SF_6 off-gas stream through plasma technology.

Three registered JI projects address HFC-23 and SF_6 off-gas emissions from the production of HCFC-22 and SF_6. The three projects are implemented at two facilities in Russia that both produce HCFC-22 and SF_6. Together, these projects issued 54 million ERUs, representing 6% of the ERUs issued by April 2014 (UNEP Risoe 2014). Project RU1000201 covers both HFC-23 and SF_6 abatement at KCKK Polymer Plant, whereas projects RU1000202 and RU1000309 separately address HFC-23 and SF6 emissions at HaloPolymer Perm. Another smaller HFC-23 project in Russia (0167) entered determination stage but was never registered. Another HFC-23 abatement project (FR1000029) is located in France; however, this project does not abate HFC-23 from HCFC-22, but rather HFC-23 from trifluoroacetic acid production. We did not include this project in our analysis due to its significantly smaller size, and because monitoring reports are not available. The monitoring and verification reports publicly available are also incomplete for projects RU1000201 and RU1000202.[49]

Additionality

In the absence of regulations or other policies, plant operators do not have economic incentives to install HFC-23 or SF_6 destruction equipment, as the installation and operation does not reduce costs or generate any revenues other than from CERs or ERUs. The CDM methodology AM0001 therefore considers HFC-23 projects to be automatically additional, as long as no regulations to abate HFC-23 are in place in the host country or as long as the HFC-23 abatement exceeds any regulations. This approach also seems generally appropriate for industrialized countries and for SF_6, although other mitigation policies beside regulations, such as voluntary agreements or emissions trading schemes, could exist. In addition, it must be ensured that HFC-23 and SF_6 were not abated prior to the implementation of the JI project or that only abatement above historically achieved abatement levels is credited.

For projects RU1000201 and RU1000202, the following information is available on regulations in Russia and whether HFC-23 and SF_6 were abated historically:

- **Historical abatement of HFC-23 and SF_6:** Both original PDDs state that HFC-23 was already abated in part prior to the implementation of the JI projects in existing incinerators, together with other waste gases originating from the same industrial facility. Historical abatement levels are partially quantified and depended on the

[49] On the website of Russian Registry of Carbon Units (www.carbonunitsregistry.ru) the following information is missing: RU1000201: The 1st and 2nd monitoring report covering the years 2008 and 2009; RU1000202: The 1st, 2nd and 4th monitoring report covering the years 2008 and 2009 and the period 1 January to 31 March 2011, the 4th verification report for the period 1 January to 31 March 2011.

capacity of the existing destruction units and the extent to which these had to destroy toxic waste gases. The objective of both original projects was to enhance HFC-23 abatement beyond historical levels. In its GHG inventory, Russia also reports that some HFC-23 was recovered prior to the implementation of the JI projects (Russia 2014). In 2011, both projects declared the original information as in accurate and adopted revised monitoring plans. The revised documentation declares for both PDDs that HFC-23 was not abated prior to the start of the JI project. In terms of SF_6 in project RU1000201, both the original PDD and the revised monitoring plan state that it was not captured and abated prior to the implementation of the JI project.

- **Regulations:** Both original PDDs considered applicable regulations with regard to a "specified level of maximum permissible emissions" in calculating the level of baseline emissions. The revised documentation concludes that no regulations are applicable and removes the relevant provisions from the calculation of baseline emissions.

Both the information in the original PDDs and the information in the revised monitoring plans was confirmed as correct by two different AIEs, Det Norske Veritas (DNV) at validation, and Bureau Veritas Certification (BVT) at verification.

The project RU1000309 does not provide information whether SF_6 was abated prior to the implementation of the project and states that its destruction is not required by regulations.

Baseline emissions

The HFC-23 generation from HCFC-22 production depends on the amount of HCFC-22 production and the ratio between HFC-23 generation and HCFC-22 production which is often referred to as "waste generation rate". The HFC-23 waste generation rate is typically in the 1.5–4% range. To bring waste generation below 1%, thermal oxidation in a separate incinerator is required (IPCC 2006).

Similarly, the amount of off-gas containing SF_6 depends on the production quantities and, among others, on the purity of the SF_6 required. The 2006 IPCC Guidelines recommend a default emission factor of 0.2% of the total quantity of SF_6 produced for those countries in which the predominant end use does not require highly purified SF_6 gas (e.g., electrical equipment, insulated windows). In countries where the major uses require highly purified SF_6 gas (e.g., semiconductor manufacturing), the default value should be 8% because of handling losses during disposal of residual gas (i.e. the "heel" that is not used or recycled) in returned cylinders (IPCC 2006). However, these higher emission factors are mainly related to the handling of produced SF_6 at the plant and not necessarily to the SF_6 content in the off-gas stream from production.

HFC-23 projects can achieve large volumes of emission reductions at low abatement costs (Schneider and Cames 2014). The revenues from carbon markets can not only significantly exceed the HFC-23 abatement costs, but also the HCFC-22 production costs (UNFCCC 2005; Wartmann et al. 2006; TEAP 2007, p.57; Schneider 2011). This can create perverse incentives for plant operators to increase HCFC-22 production and/or the HFC-23 waste generation rate beyond levels that would occur in the absence of the crediting mechanism, thereby inflating the baseline emissions and increasing profits from the emission reduction projects. Similar concerns apply to SF_6 where carbon market revenues could also largely exceed the reported costs for incineration.

An in-depth evaluation of the PDDs and monitoring data of the registered JI projects shows that all four facilities in Russia increased waste gas generation well beyond historical levels, leading to considerable overcrediting (Schneider and Kollmuss 2015). In their original PDDs and in quantifying emission reductions in 2008 and 2009, the projects RU1000201 and RU1000202 applied version 5.2 of the CDM methodology AM0001, which uses methodological safeguards to prevent perverse incentives. In June 2011, the way emission reductions are calculated was fundamentally changed for these two projects. The changes were applied retroactively as of 1 January 2010.

Most importantly, methodological safeguards to avoid perverse incentives were eliminated. With the removal of the safeguards, the project participants have strong economic incentives to increase the waste generation. In mid-2011, prices for secondary ERUs were still above 10 EUR and thus exceeded significantly the GHG abatement and transaction costs. Increasing the waste generation was therefore economically highly attractive. Schneider and Kollmuss (2015) show that the waste generation increased abruptly from the second quarter 2011, with the decision to abandon the safeguards, to unprecedented levels compared with historical and projected amounts, for both projects and for both gases, HFC-23 and SF_6.

The project RU1000309 was developed and approved in 2011/2012 and claimed credits retroactively as of 1 January 2008. The project did not apply any methodological safeguards to avoid perverse incentives. Schneider and Kollmuss (2015) show that with the implementation of the JI project, waste generation significantly increased beyond historical levels reported in Russia’s GHG inventory.

The abrupt increase occurred in all four plants exactly at the point in time when plant operators could generate (more) credits by producing more waste gas, and higher levels of waste generation were sustained thereafter. Schneider and Kollmuss (2015) further show that the increase in waste generation is mostly attributable to an increase in waste generation rate, and not in production levels. The increase of waste generation leads to an overestimation of emission reductions and excess issuance of credits. The emissions baseline is inflated compared to the emissions that would actually occur without crediting. Schneider and Kollmuss (2015) estimate that for all four plants together, about 28–33 million credits were issued in excess, corresponding to 66–79% of the credits issued for the periods where methodological safeguards to prevent perverse incentives were not applied.

Other issues

Projects RU1000201 and RU1000202 have a number of inconsistencies in monitored data, such as that they report in some periods that more HFC-23 is incinerated than generated or that fugitive emissions are negative (which is technically not possible). From 2012 on, project RU1000202 stopped reporting the HFC-23 generation at all. These issues were not identified by the AIE (BVT) in its verification.

GHG inventory visibility

For all three Russian JI projects, the emissions reported in the Russian GHG inventory do not match with data reported in JI the projects:

- **HFC-23:** The implied HFC-23 emission factor in the GHG inventory, i.e. the HFC-23 emissions per HCFC-22 production, remains constantly at about 3% in the period 2007–2009 in which the two projects were implemented (Russia 2014). If the two JI projects (RU1000201 and RU1000202) were appropriately reflected in the GHG inventory, a decrease in the HFC-23 emissions per HCFC-22 production should be observed from 2007–2008.

- **SF_6:** The SF_6 emissions reported in the GHG inventory for the period 2000–2007 – prior to the implementation of the JI projects – vary between 28 and 53 tonnes SF_6 per year (Russia 2014). From 2007–2008, the reported SF_6 emissions fall by 24 tonnes, from 53 to 29 tonnes. The two JI projects (RU1000201 and RU1000309) claim to reduce a significantly higher amount of emissions, 93–199 tonnes SF_6 per year in the period 2008–2012, which exceed both historical levels and the 2007-2008 decrease in the GHG inventory.

Conclusions

While HFC-23 and SF_6 projects have a high likelihood of being additional, emission reductions for this project type were significantly overestimated due to perverse incentives arising from carbon market incentives. The available data suggest that plant operators increased waste gas generation for the purpose of generating more ERUs. Remarkably, for projects RU1000201 and RU1000202, the methodological safeguards to prevent perverse incentives were removed at a point in time when perverse incentives from HFC-23 CDM projects received wide media and policy-maker attention, leading ultimately to a ban of HFC-23 credits under the EU ETS and a revision of the applicable methodological standard under the CDM. It is also notable that the Accredited Independent Entity (AIE) performing the relevant auditing functions – Bureau Veritas Certification – did not address the rather obvious perverse incentives, as well as a number of other issues. Although the extent of overcrediting is rather significant, we note that some emission reductions were also credited in periods when safeguards were still applied. We therefore rate the overall integrity of this project type as questionable.

5.6 N_2O abatement at nitric acid plants

Overview

Nitric acid is mainly used for the production of synthetic fertilizers and explosives. An estimated 500-600 nitric acid plants are operating globally (Kollmuss and Lazarus 2010). Nitric acid is produced through catalytic oxidation of NH_3 to NO. The more efficiently the primary catalyst functions, the less N_2O is formed. As the primary catalyst ages, it becomes less efficient and, therefore, N_2O formation tends to increase toward the end of a campaign (Kollmuss and Lazarus 2010).

N_2O emissions from nitric acid production can be abated in three ways (Schneider and Cames 2014):

- **Primary abatement** prevents the formation of N_2O at the primary catalyst. According to gauze suppliers, improved gauzes could potentially lead to a 30–40% reduction of N_2O formation (Ecofys et al. 2009).
- **Secondary abatement** removes N_2O through the installation of a secondary N_2O destruction catalyst in the oxidation reactor. The abatement efficiency of the secondary catalyst is often estimated to range from 80% to 90%. However, in practice it varies in CDM plants from 50% to more than 90% and depends on the design and operating conditions of the nitric acid plant and the way the secondary catalyst is installed. Registered CDM projects achieved an average abatement efficiency of 70% (Debor et al. 2010).
- **Tertiary abatement** removes N_2O from the tail gas through either thermal or catalytic decomposition. Tertiary abatement can reduce N_2O emissions by more than

90% but often requires reheating the tail gas. Registered CDM projects achieved an average abatement efficiency of 86% (Debor et al. 2010).

Under JI, 50 projects entered the determination stage, of which 41 were registered as of April 2014 (UNEP Risoe 2014). Among the registered projects, the vast majority – 39 plants – are located in EU countries; the two non-EU plants are both located in Ukraine but never issued ERUs. In Russia, seven projects entered the determination stage but were never registered.

Table 14: Countries with nitric acid projects

Country	Registered projects	kERUs issued	Expected kERUs
Poland	4	14,014	14,432
Lithuania	2	7,643	6,846
Romania	4	6,074	10,610
Germany	6	3,761	2,507
France	9	1,865	3,724
Sweden	2	1,340	1,105
Finland	3	972	574
Bulgaria	2	824	2,128
Hungary	1	717	4,000
Belgium	2	400	433
Czech Republic	1	0	2,975
Spain	3	0	598
Ukraine	2	0	2,847
Total	**41**	**37,610**	**52,779**

Source: UNEP Risoe 2014.

In contrast to developing countries, many JI countries have policies, regulations or voluntary agreements that address N_2O emissions from nitric acid production. In the EU, the following four policy approaches were used to abate N_2O emissions from nitric acid production:

1. **Regulations:** In 1996 the EU adopted the Integrated Pollution Prevention and Control (IPPC) directive which was last updated in 2008 (European Commission 2008). The directive requires that defined industrial installations seek a permit. To receive a permit, the installations must comply with certain basic obligations, including the use of appropriate pollution prevention measures. Appropriate measures are defined as best available techniques (BATs) and are documented in best available techniques reference documents (BREFs), which are prepared as part of information exchange between the industry and Member States. For nitric acid production, the applicable BREF defined in 2007 the following emission factor range for medium and high pressure plants as BAT: for new plants, the emissions should range from 0.12 to 0.6 kg N_2O per tonne of nitric acid, for existing plants from 0.12 to 1.85 kg N_2O per tonne of nitric acid. For existing plants the views on the appropriate value were split: the industry and one Member State were of the view that the upper BAT range should be 2.5, all other Member States considered 1.85 kg N_2O per tonne of nitric acid as appropriate; both views and values are documented in the BREF. No values are specified for low pressure plants (European Commission 2007), which raised concerns over market distortion if some producers would face emission limits while others would not. Transitional measures for the implementation of the IPPC directive were agreed in the treaties of accession for three countries that host nitric acid JI projects: in Poland until 2010, in Bulgaria until 2011, and

in Romania until 2015. Except for these transitional arrangements, the IPPC directive required all countries to issue or update permits to existing installations, reflecting the IPPC and its BREFs, no later than 30 October 2007. However, the BREF for nitric acid plants was only adopted few months earlier, in August 2007. In practice, many countries did not update the permits to reflect the BREF for nitric acid plants, in the light of the forthcoming inclusion of the emissions in the EU ETS.

Some EU member states already regulated N_2O emissions from nitric acid production before the 2007 BREF. For example, in Germany a tail gas concentration of 0.8 g N_2O / m^3 was required for new plants from 2002 and for existing plants from November 2010 (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit 2002). In France, a national regulation limited emissions to 7 kg N_2O per tonne of nitric acid (Shishlov et al. 2012); in addition, regulations at regional level limited emissions to varying degrees, with the most stringent value set at 1.2 kg N_2O per tonne of nitric acid (FR1000213).

2. **Voluntary agreements:** Voluntary emission reductions agreements with the industry were also used to abate N_2O emissions from nitric acid production. Germany, for example, made initial agreements with industry in 1995 which were updated in 1996 and 2000. In the 2000 agreement, the chemical industry committed to reducing its GHG emissions up to 2012 by 45% to 50% compared to 1990 (RWI 2013). However, N_2O emissions from nitric acid production increased over the period 2000–2007 and were only reduced thereafter, when the JI projects started in 2008 and regulations for existing plants entered into force in 2010 (Umweltbundesamt 2014).
3. **EU ETS:** As of 1 January 2013, N_2O emissions from nitric acid production are included within the scope of the EU ETS in all EU countries. Five countries – Austria, Italy, the Netherlands, Norway, and the United Kingdom – used the possibility under Article 24 of the emissions trading directive to include nitric acid production in the EU ETS before 2013. The IPPC directive specifies that once emissions are included in the scope of the EU ETS, permits issued to plants do not need to include emission limits for these gases, provided there is no local pollution problem. In other words, the EU ETS replaces the BAT emission limits under the IPPC.
4. **JI:** Twelve EU member states registered JI projects to reduce N_2O emissions from nitric acid production until 31 December 2012 (see Table 14 above).

These four policy approaches led to an increased uptake of primary, secondary and tertiary N_2O abatement over time in the EU. In 2007, many plants in the EU were still operating without any secondary or tertiary N_2O abatement, while some had already adopted mitigation technology, leading in a significant spread in N_2O emission factors (Ecofys et al. 2009). Thereafter, a significant uptake could be observed.

Ukraine has no regulations addressing N_2O emissions. Prior to JI, secondary or tertiary N_2O abatement was not installed in any of the four nitric acid facilities in operation in Ukraine. Two plants were registered under JI; the two others considered this opportunity but did not move ahead.

Additionality

In the absence of regulations or other policies such as the EU ETS, N_2O abatement from nitric acid production through secondary or tertiary abatement can be regarded as likely to be additional. Plant operators do not save costs or generate revenues from the installation of secondary or tertiary abatement. The technical abatement costs vary strongly, depending on the specific situation of the plant. Based on a review from PDDs and literature information, the average technical abatement costs are estimated at 0.89 EUR / tCO_2e for secondary abatement (with a range from 0.20 to 8.81 EUR / tCO_2e) and at 3.18 EUR / tCO_2e for tertiary abatement (with a range from 0.79 to 11.15 EUR / tCO_2e) (Schneider and Cames 2014). Due to these costs and no other revenues or cost savings, version 2.0.0 of the CDM methodology ACM0019 for N_2O abatement from nitric acid production deems this project type in the absence of any regulations in the host country as automatically additional.

In the EU, the situation is different with regard to several aspects:

- Some nitric acid plants installed secondary or tertiary N_2O abatement prior to JI due to regulations, voluntary agreements or other initiatives or incentives.
- With the IPPC directive, a regulation addressing N_2O emissions from nitric acid production was in place when JI projects were implemented, next to national and regional regulations, though it was not implemented in national laws by all member states within the specified timeline;
- In 2009, the EU decided to include nitric acid production in its ETS as of 1 January 2013.

These three aspects influence to what degree N_2O emissions abatement can be regarded as additional. In other words, additionality is closely linked to the baseline emissions level assumed in JI projects. First, only mitigation beyond historically achieved abatement levels can be regarded as additional. Second, only mitigation beyond levels required in applicable regulations can be regarded as additional. The IPPC directive was not implemented within the specified timeframe in all member states. However, even if the 2007 BREF of the IPPC directive was not yet reflected in permits, it reflects the emission limits that would apply in the near future. One could also argue that in anticipation of emission limits applicable in the near future, plant operators would likely start testing and implementing GHG abatement measures beforehand, in order to ensure that emission limits will actually be met once regulations are enforced. In Germany, the baseline emissions level in the presence of forthcoming emission limits was subject to a lawsuit where the court followed this argument (Box 3). Third, the inclusion of N_2O emissions in the EU ETS as of 2013 constitutes a particular situation for the industry. N_2O abatement costs are in most cases lower than EUA prices (Schneider and Cames 2014). Therefore, plant operators have strong economic incentives to ensure that N_2O abatement technology is installed and operational prior to 1 January 2013. A number of JI projects in the EU may have been implemented in the anticipation of the inclusion of N_2O emissions in the EU ETS; JI may have thus contributed to an earlier adoption of N_2O abatement. On the other hand, one could argue that many plants would likely have installed N_2O abatement technology not precisely on 1 January 2013 but at some point earlier in anticipation of the inclusion of nitric acid in the EU ETS. Following this argument, not all of the emission reductions up to the end of 2012 may be considered as additional.

Baseline emissions

The approach towards determining baseline emissions varies among JI projects and countries. Table 15 provides an overview of how baseline emission factors were determined in all projects for which information on the final values was available. Largely, the following approaches can be observed:

- **Historical emission levels:** Most plants in Eastern European countries (Bulgaria, Lithuania, Poland, Romania) and one plant in Sweden used unabated emission levels prior to the project implementation to establish the baseline. Under the CDM, measurements need to be conducted over a full nitric acid production campaign to reflect that N_2O formation increases over the course of a production campaign. Most projects followed this approach and determined historical emissions over a full production campaign. At least one project (BG1000154) did not use a full production campaign to establish the baseline emission factor but conducted short-term measurements, usually over a few days. In Germany, one plant (DE10000168) had already installed secondary abatement technology due to regulations applicable as of 2002; this plant also used historical data which resulted in a baseline emission factor of 1.4 kg N_2O / t nitric acid.

- **Emission benchmarks based on regulations:** All Western European countries except Sweden – Belgium, Finland, France, Germany and Spain – imposed the values specified as BAT in the EU's BREF, which range between 1.85 and 2.50 kg N_2O / t nitric acid. More stringent local regulations apply to a few plants in France (FR1000146, FR1000147, FR1000213). One plant in Lithuania (LT2000005) uses an emission benchmark of 6.04 and 6.66 kg N_2O / t nitric acid for 2012, based on an IPPC permit issued in 2008 which does not reflect the BREF adopted in 2007.
- **IPCC default values:** One plant in Sweden (SE2000040) used the IPCC default value for lower pressure plants, conservatively adjusted for its uncertainty range (4.5 kg N_2O / t nitric acid).

Table 15: Determination of baseline emission factor for nitric acid projects

		Baseline emission factor determination	
Country	**Projects**	**Value used (kg N_2O /t nitric acid)**	**Methodological approach**
Belgium	All projects	2010-2011: 2.50 2012: 1.85	Values derived from European regulations (2007 BREF issued under the IPPC)
Bulgaria	BG1000154	5.54	Short-term measurements
Germany	DE1000168	1.40	Lower value between measurements over one production campaign and German regulations applicable as of 2002
	DE1000024 DE1000182 DE1000183 DE1000197 DE1000305	1.85 – 2.50	Values derived from European regulations (2007 BREF issued under the IPPC) and German regulations applicable as of November 2010
Finland	All projects	2009-2011: 2.50 2012: 1.85	Values derived from European regulations (2007 BREF issued under the IPPC)
France	FR1000148 FR1000169 FR1000170 FR1000171 FR1000186 FR1000212	2009-2011: 2.50 2012: 1.85	Lower value between a) default values derived from European regulations (2007 BREF issued under the IPCC), and b) any other (local) regulations applicable to the plant
	FR1000146	2009 – June 2011: 2.50 July – Dec 2011: 2.47 2012: 1.85	
	FR1000147	2009 – 2011: 2.47 2012: 1.85	
	FR1000213	1.20	
Lithuania	LT2000005	6.04 – 9.19	Lower value between measurement over one production campaign and values specified in the permit under the IPPC
	LT2000014	4.27 – 10.34	Measurement over one production campaign
Poland	PL1000054	4.40 – 4.77	Measurements over one production campaign (two production lines)
Sweden	SE2000039	9.84	Measurements over one production campaign
	SE2000040	4.50	IPPC default value, adjusted for uncertainty
Spain	All projects	2.5	Values derived from European regulations (2007 BREF issued under the IPPC)
Romania	RO1000219	8.24	Measurements over one production campaign
	RO1000486	11.39	Measurements over one production campaign
	RO2000024	7.50 – 13.47	Measurements over one production campaign (three production lines)

Source: Evaluation of PDDs, monitoring reports, and LoAs from JI projects

Table 15 shows the approach towards baseline-setting is not consistent among EU countries. Although the IPPC and its 2007 BREF are applicable to nearly all plants, with few potential exceptions due to transitional arrangements, most Eastern European countries and Sweden did not apply them when setting baselines. Eastern European countries, which all had a significant

AAU surplus, and Sweden used significantly higher baseline emission factors than all Western European countries (except Sweden), which did not have a significant AAU surplus.

Using historical data to establish baseline emission factors for nitric acid plants has some shortcomings. Historic emission factors do not reflect technology improvements in primary catalysts that could lead to emission reductions over time. The applicable CDM methodologies AM0028 and AM0034, used in many JI projects, were withdrawn by the CDM Executive Board in 2013, due to concerns over perverse incentives for project developers not to implement economically viable improvements that reduce N_2O formation. Moreover, the use of short-term measurements, as practiced in at least one plant in Bulgaria, could lead to significant over- or undercrediting, depending on when the measurements were conducted.

Box 3: Nitric acid baseline emission factors in court in Germany

When issuing the letter of approval for nitric acid JI projects, German authorities imposed baseline emission factors in the range of 1.85–2.50 kg N_2O/t nitric acid. One nitric acid plant operator (DE1000024) filed a lawsuit against this decision, requesting for a baseline emission factor of 4.5 kg N_2O/t nitric acid to be applied (Verwaltungsgericht Berlin 2011). The court dismissed the claim arguing that the lower emission factors enforced by German authorities are a plausible baseline scenario, for two reasons. First, N_2O emissions from nitric acid production were included in a voluntary agreement between the German government and the chemical industry. Second, secondary abatement may have been implemented in 2008 in anticipation to meet a German regulation effective as of October 2010 to ensure that the technology would be fully functional by the time the regulation took effect. An early implementation is considered as a reasonable course of action to address the risk of future non-compliance.

GHG visibility

Most EU countries hosting nitric acid projects introduced over time Tier 3 approaches where emissions reported by plants are used to derive GHG inventory emissions. The reductions from JI projects seem to be generally reflected in trends of GHG emissions, although the emission estimates in earlier years may be more uncertain than in more recent years, as more accurate data has become available.

Conclusions

Projects abating N_2O from nitric acid production can generally be regarded as additional if regulations are taken into account in establishing baseline emission factors. Given that nitric acid production was included in the EU ETS as of 2013, the incentives from JI have likely helped to reduce N_2O emissions earlier on. Western European countries except Sweden imposed relatively conservative emission benchmarks, which likely led to some undercrediting, since higher historical emission levels were reported by most plants. Eastern European countries and Sweden used significantly higher baseline emission factors, mostly based on historical data. Thus higher baseline emission factors were mostly used by those countries which had a significant AAU surplus. The use of historical emissions data is questionable due to the emission limits set out in the BREF and potential perverse incentives not to implement measures that reduce N_2O formation. It is unclear when the BAT emission limits set out in the BREF would have been enforced in Eastern European countries. Overall, this project type has likely delivered real, measurable, and additional emission reductions. The evaluation also shows that establishing emission baselines can be complicated if different policies overlap or if existing policies are not yet fully enforced in some countries.

Based on our findings we rate additionality of this project type as plausible and overcrediting as unlikely to be significant. Thus, we rate the overall environmental integrity of ERUs generated by this project type as high.

5.7 Summary of findings by project type

We examine the six project types with the highest ERU shares in more detail to assess the environmental integrity of different project types. These project types represent 84% of the ERUs issued and 53% of registered projects in CP1. Table 16 provides an overview of the results of our analysis. It shows that for all analysed project types, except for N_2O abatement projects, the additionality seems questionable and/or emission reductions are overestimated.

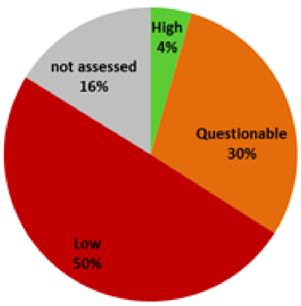
Table 16: Assessment of overall environmental integrity by project types

Project types	Registered projects	% of ERUs	Additionality	Over-crediting	Inventory inconsist-encies	Overall environ-mental integrity
Spontaneous ignition of coal waste piles	78	26.1%	not plausible	likely to be very significant	significant	low
Energy efficiency in industry and power production and distribution	164	23.1%	questionable	not known	none found	questionable
Associated petroleum gas utilization	22	13.9%	not plausible	likely to be very significant	significant	low
Natural gas transportation and distribution	32	9.8%	not plausible	Some over-crediting likely	none found	low
HFC-23 and SF_6 abatement	4	6.4%	plausible	likely to be very significant	significant	questionable
N_2O abatement from nitric acid	41	4.5%	plausible	unlikely	largely consistent	high

Data source: 642 projects registered as of March 2014.

As shown in Figure 20, we found 80% of all ERUs issued came from projects types with questionable or low environmental integrity. This is broadly consistent with Section 4, where we found 73% of ERUs from projects in our random sample have implausible additionality claims. Project types we did not assess made up 16% of the ERUs issued; see Table 11.

Figure 20: Overall environmental integrity of project types by ERUs issued



Data source: Evaluation of largest six project types, applied to the portfolio of 642 projects registered as of March 2014.

6. ASSESSMENT BY COUNTRY

In this section we assess the implementation of JI in the four countries with the highest ERU issuances during CP1: three Economies in Transition (EIT) – Ukraine, Russia, Poland – and one Western European country – Germany (see Table 17). We examined the JI rules of each of the four countries, their project portfolio, and the transparency with which they provided information about their projects.[50] Together the four countries registered 439 projects and issued more than 800 million ERUs, accounting for 94% of ERU issuance (UNFCCC 2014d).

Table 17: JI host countries: number of registered projects and their ERU issuance

Country	Registered projects	Million ERUs issued
Ukraine	278	503.3
Russia	98	266.2
Poland	38	20.1
Germany	25	13.6
Romania	18	9.2
France	20	8.6
Bulgaria	25	8.4
Lithuania	18	8.3
Hungary	12	7.4
Czech Republic	85	4.4
New Zealand	8	2.5
Sweden	2	1.3
Finland	3	1.0
Estonia	12	1.1
Spain	3	0.9
Belgium	2	0.4
Latvia	1	0.0
Total	**648**	**856.7**

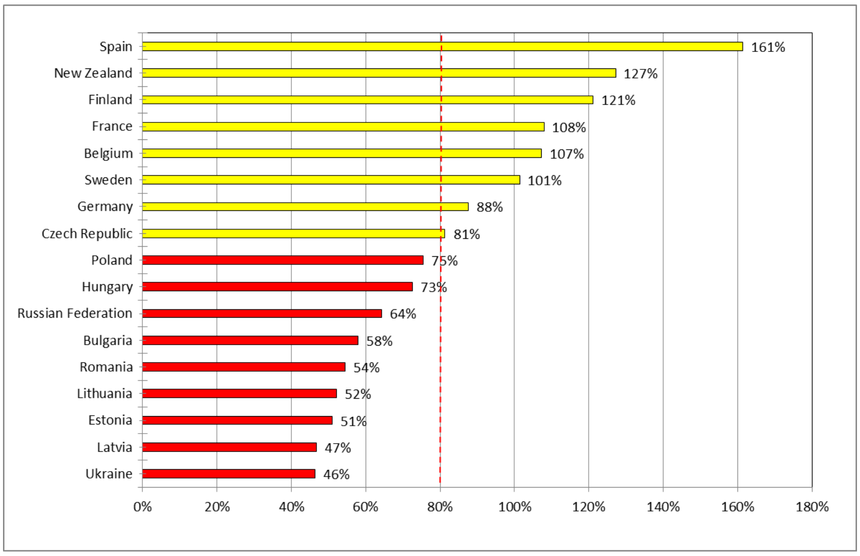
Data source: ji.unfccc.int as of 31 August 2014

In Section 3 we highlighted that a JI host country's AAU surplus can have an impact on the global emissions effect of JI projects. All four host countries had an AAU surplus at the end of CP1. However, for the purpose of this study it is more important whether a country could have expected to have significant surplus before 2008, when JI crediting started. Thus, we classified a JI host country as having a significant expected surplus if its average 2003–2007 emissions were more than 20% below its CP1 reduction target. See Section 3 for more detail.

Figure 21 shows the average host countries' 2003–2007 emissions as a share of their CP1 targets, and highlights countries with significant expected AAU surplus (marked red). These countries issued more than 95% of all ERUs. Of the four JI host countries with the largest ERU shares, only Germany – accounting for 1.6% of total ERUs issued – did not have significant expected surplus, while all three EITs had average 2003–2007 emissions that were significantly lower than their CP1 reduction targets.

[50] According to Decision 13/CMP.1 each national registry is required to make non-confidential information publicly available and provide a publicly accessible user interface through the Internet that allows to query and view information.

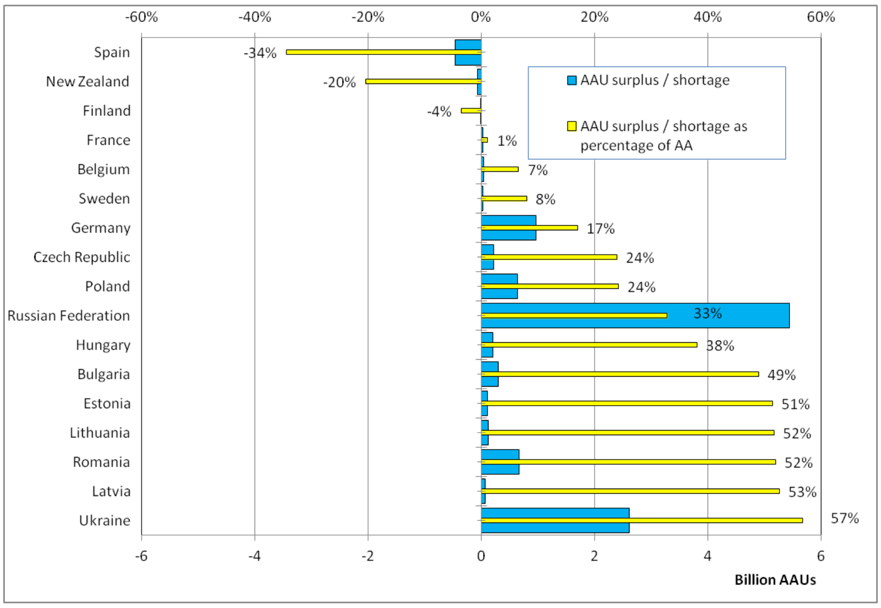
Figure 21: JI host countries' average 2003–2007 emissions as % of their CP1 target



Data source UNFCCC: (2014a) [51]

Figure 22 shows our estimates of AAU surplus or shortage for each JI host country after the end of CP1 in absolute terms (number of AAUs) and as a percentage of its total initial assigned amount for CP1. All EITs are expected to have a significant portion of their assigned amounts left as surplus. Russia and Ukraine accumulated the largest surplus in absolute terms.

Figure 22: Estimated AAU surplus or shortage compared with the host country's total initial assigned amount for CP1 [52]



Data source: UNFCCC (2014a).

[51] Calculations are based on UNFCCC GHG emissions data for 2003–2007 and respective base year of each country multiplied by its QELRO.

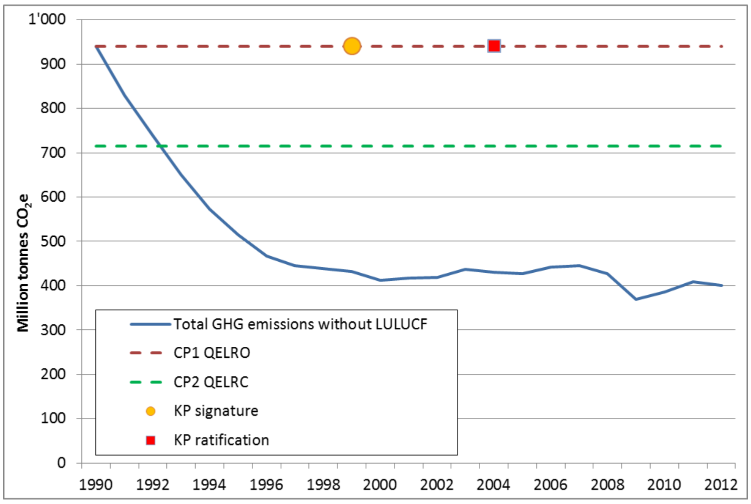
[52] Estimated AAU surplus or shortage was calculated based on UNFCCC GHG emissions data for 2008-2012 and data on host countries' Assigned Amounts.

The amount of surplus available could also impact how strictly countries ensure the environmental integrity of JI projects. The larger the surplus is, the less incentive the host country will have to restrict ERU issuance to JI projects that are additional. On the other hand, a JI host country that expects to have only a small or no surplus of AAUs has a perceived scarce supply of AAUs and therefore has to make sure to mitigate one tonne of CO_2e for each ERU transferred to another country, otherwise it will have to acquire another unit to compensate for a lost AAU. JI host countries with a perceived scarce supply of AAUs have therefore an economic incentive to ensure high integrity of ERUs and to set baselines conservatively and maybe in some cases even below BAU (Shishlov et al. 2012).

6.1 Ukraine

Ukraine, the largest JI host country both in terms of number of projects and ERUs, issued more than 500 million ERUs representing almost 60% of all ERUs issued and has 251 registered projects under Track 1 and 27 Track 2 projects[53]. Ukraine is classified as having a "significant expected surplus" because its 2003–2007 emissions are less than half than its CP1 target (see Figure 21 above and Figure 23 below). We estimate that Ukraine has accumulated an AAU surplus of more than 2.5 billion AAUs, representing almost 57% of its total CP1 assigned amount; see Figure 22. The environmental integrity of Ukrainian JI projects is therefore especially important, because the use of ERUs from projects that lack environmental integrity could lead to an increase in global emissions (see Section 3).

Figure 23: Ukraine: GHG emissions in base year and 1990–2012



Data source: UNFCCC (2014a).

Ukraine in CP2

Ukraine's mitigation target for CP2 is 76% of its 1990 emissions. This is significantly higher than the country's recent emissions. In fact, during CP1 the average emissions were 42% of its 1990 emissions. Ukraine's CP2 target of 76% means that Ukraine could increase its emissions drastically in CP2 compared to its current emissions. However, recent economic trends indicate that Ukraine's BAU emissions are very unlikely to reach the CP2 target level.

As explained in Section 3.2, the changes to the KP rules passed in Doha mean that the number of CP2 AAUs available to Ukraine will be limited to the country's average emissions

[53] See: http://ji.unfccc.int/JI_Projects/ProjectInfo.html [accessed 17 September 2014].

in 2008–2010, which were around 42% of 1990 levels. At the same time, the restrictions regarding the use of CP1 surplus in CP2 imply that Ukraine will only be able to use its CP1 surplus if the emissions exceed its reduction commitment of 76% of 1990 emissions levels. This is highly unlikely to happen. On the other hand, Ukraine would have access to its CP1 surplus if it strengthened its current CP2 target from 76% to 42% (Morel 2013; Kollmuss 2013; Storchylo 2014). However, Ukraine has not signalled that it intends to change its target; it is therefore still unclear whether Ukraine will ratify the Doha amendments and join CP2.

Even if Ukraine strengthened its target, the Doha rules would limit the use of CP1 surplus in CP2 to compliance purposes only "up to the extent by which emissions during the second commitment period exceed the assigned amount for that commitment period" (UNFCCC 2013b, paragraph 25). This means that Ukraine would not be able to substitute CP2 AAUs which it converted to ERUs with CP1 surplus carried over into CP2. Thus if Ukraine would credit a large number of non-additional projects in CP2, it may experience a shortage of AAUs which it would have to compensate by additional mitigation action, as it would not be able to use CP1 surplus to fill such a gap.

Overview of rules and governance structures

Ukraine's State Environmental Investment Agency (SEIA) was its Designated Focal Point. SEIA was responsible for JI, the Green Investment Scheme, Ukraine's GHG inventory, and other climate-related activities, as well as climate change mitigation and adaptation policies.[54]

Ukraine's initial JI procedures were adopted in February 2006. The Ministry of Environmental Protection (serving as the DFP at the time) then developed detailed project requirements which were published in August 2006. The procedures were amended a few times during CP1, but the main requirements stayed the same.

Like many other JI host counties, Ukraine has a two-step project approval process: project endorsement, confirmed by an LoE, is followed by project approval, confirmed by an LoA. LoEs were given as early as 2004, even before Ukraine had adopted its formal JI procedures. Thus there was no administrative barrier to early projects to take steps to secure their JI status. The first projects received LoAs in 2006, after the JI procedures had been adopted.

The approval requirements generally correspond to Track 2 rules, including the content of PDD, demonstration of additionality and determination opinion (Ukraine 2006a). The rules encourage the use of approved CDM methodologies, but in the absence of an appropriate CDM methodology a JI specific approach can be developed. After approval, Track 1 projects also need to be registered by SEIA. Independent entities accredited by the JISC are authorized to perform determination and verification under both tracks. The accreditation of national independent entities was envisaged by the framework JI procedures, but the accreditation process was never implemented, hence there are no national AIEs (Ukraine 2006b).

Although Ukraine's JI rules required ensuring environmental integrity of projects, in practice the rules were not applied consistently during the first commitment period. In fact, an official at DFP mentioned that they 'did not make a big issue of additionality'.[55] There were also frequent delays with project approvals, on average projects had to wait for several months in order to receive an LoA. In the early years this had mostly to do with setting up procedures

[54] In September 2014 the government announced that SEIA would be closed and its functions transferred to the Ministry of Ecology and Natural Resources.
[55] Personal communication with an official at SEIA.

and a thorough project analysis. However, soon after the approval process was established, the focus of the project analysis moved away from environmental requirements towards financial, legal and other issues. In fact, bureaucratic requirements were often used as reasons to delay or withhold project approval or ERU issuance.[56]

Towards the end of CP1 project participants reported preferential treatment of some projects (JIAG 2013).[57] Some projects had to wait for LoAs or ERU issuance for many months, while the applications of other projects were processed in only a few days.[58] This is confirmed by our analysis of the timing of the project cycle. As described in Section 4, some projects managed to get LoEs, LoAs and ERUs issued in just one to four months, while the same project cycle for others usually took several years.

Reportedly, at the end of CP1 the project participants were forced to transfer ERUs through selected intermediary companies, who sometimes kept up to 50% of ERUs or their value to themselves, otherwise ERU issuance was blocked.[59] In our analysis we observed multiple ERU transfers to a relatively limited number of accounts in 2012 and 2013[60], which indicates that certain companies may have been used as intermediaries.

It appears that in the second half of CP1, JI in Ukraine was dominated by commercial interests of a few companies, while environmental integrity clearly was not a priority of the authorities. Our analysis of 27 Ukrainian JI projects from our random sample shows that project types that we assessed to have a high likelihood of being additional were approved at the beginning of CP1 and that projects types we identified as having significant environmental integrity issues were approved very quickly during the second half of CP1. Several project developers acknowledged that at the same time projects with higher likelihood of being additional faded away by the end of CP1.

Ukraine's JI project pipeline

Ukraine endorsed 440 JI projects, of which 304 were approved and 278 were eventually registered (SEIA 2013); 217 of the registered projects generated ERUs (UNEP Risoe 2014). There is no data available on project rejections; it is therefore not known what projects if any were rejected and on what grounds. It seems plausible that some of the endorsed projects simply did not proceed further in the project cycle.

The number of project approvals increased dramatically towards the end of CP1 and peaked in 2012 (see Figure 24), despite the fact that ERU prices were already very low and that it was uncertain if countries would agree to CP2 and therefore if JI would continue. Likewise, ERU issuance grew more than fivefold in 2012 compared with 2011 and remained high even in 2013 and 2014 despite extremely low ERU prices (Figure 25).

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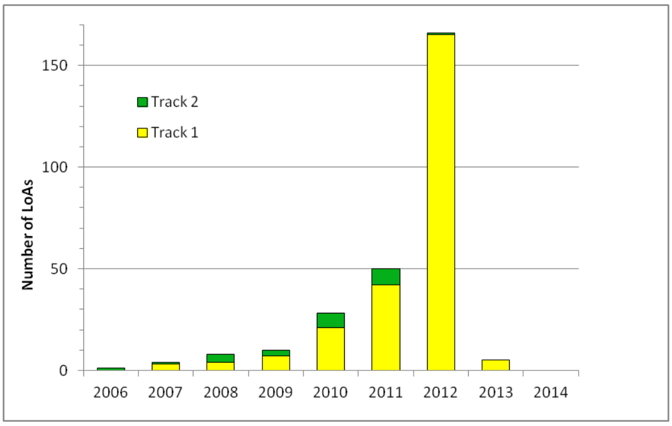
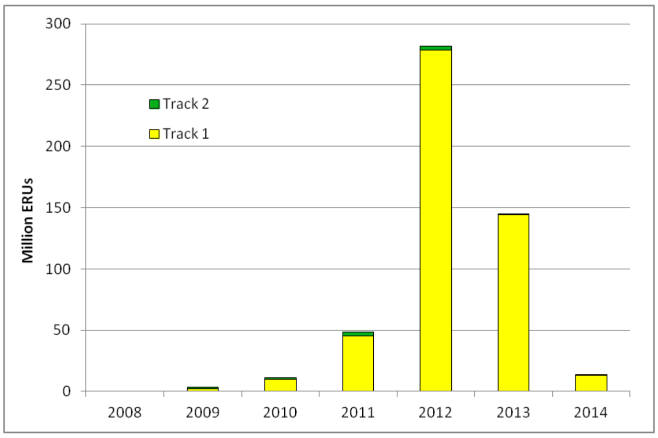
[56] Personal communications with project developers.
[57] See http://forbes.ua/nation/1334263-rassledovanie-kto-v-ukraine-zarabatyvaet-na-cosub2sub [accessed 17 September 2014].
[58] For example, the project UA1000380 submitted the application for LoE on 18/07/2012 and received it on 23/07/2012.
[59] Personal communication with project developers and http://forbes.ua/nation/1340374-rassledovanie-kak-chinovniki-peredelili-ukrainskij-rynok-uglerodnyh-kvot [accessed 17 September 2014].
[60] See: Holding and transaction information / National Electronic Registry of Anthropogenic Emissions and Absorption of Greenhouse Gases of Ukraine, http://www.carbonunitsregistry.gov.ua/en/publication/content/1209.htm [accessed 17 September 2014].

Figure 24: Ukrainian JI project approval by year



Data source: UNEP Risoe (2014).

Figure 25: Ukrainian ERUs issuance by year



Data source: UNFCCC ERU issuance data http://ji.unfccc.int/statistics/2014/ERU_Issuance.pdf [Accessed 31 August 2014]

Table 18: Ukrainian JI projects by type

Type of project	Number of registered projects	Projects that generated ERUs	ERUs generated, thousand	% of ERUs issued
Spontaneous ignition of coal waste piles	78	62	219,288	43.6%
Energy efficiency in industry and power production and distribution	106	81	143,668	28.6%
Natural gas transportation and distribution	30	28	82,705	16.4%
Agriculture: No tillage	7	6	20,701	4.1%
Energy efficiency: demand side	12	11	13,953	2.8%
Other CO_2	9	7	8,302	1.7%
Coal mine methane	13	12	8,123	1.6%
Fossil fuel switch	2	2	5,621	1.1%
Other: non-CO_2	2	2	287	0.1%
Landfill gas	5	3	240	0.0%
Renewable energy	10	3	237	0.0%
N_2O: nitric acid	2	0	0	0.0%
Total	**276**	**217**	**503,125**	**100.0%**

Data source: UNEP Risoe (2014).

The three largest project types made up almost 89% of ERUs issued (see Table 18) and were identified as having questionable or low environmental integrity (see Section 5). No-tillage agricultural projects are the fourth largest project type by ERUs issued. This project type reduces CO_2 emissions by switching from conventional farmland tillage to no-tillage approaches. While such projects clearly are land use, land use change and forestry (LULUCF) activities, the Ukrainian DFP categorized them as non-LULUCF projects. This may have been done to ensure the ERUs could be sold more easily on the European market, as LULUCF ERUs cannot be used for compliance under the EU ETS (Joint Implementation Action Group 2013).

Other project types are much smaller. Some of the project types registered in the earlier years, such as coal mine methane, landfill gas, renewable energy and N_2O emission reduction projects delivered significantly fewer ERUs than expected, and some, none at all. According to market participants some of these projects, particularly non-CO_2 projects, such as landfill gas and N_2O abatement at nitric acid facilities, were no longer feasible after the price crash, which was partially due to the huge supply of credits from the largest project types.[61]

Transparency

Ukraine publishes project information through the JI UNFCCC website,[62] on the websites of the Ukrainian State Environmental Investment Agency,[63] and through the Ukrainian Carbon Units Registry.[64] Generally all project information required under the KP (see paragraphs 44-46 of Decision 13/CMP.1) is updated on an annual basis with some information updated more frequently. The PDDs, determination reports, monitoring and verification reports are all available in English and Ukrainian, as well as host and investor countries' LoAs. Information on the total number of ERUs issued for each project is available but without information about the years in which ERUs were issued. However, this information in most cases can be found in the reports on units holding and transactions.[65] Overall, Ukraine presents JI project data in a transparent manner and the level of detail provided is higher compared to some other host counties.

Summary of findings on Ukraine as a JI host country

Ukrainian JI procedures and its institutional framework aimed at ensuring environmental integrity but compliance with the rules was very low, particularly at the end of CP1. Despite a relatively high degree of transparency, the vast majority of ERUs issued by Ukraine come from JI projects with not plausible additionality. Ukraine could afford to issue large numbers of ERUs from projects with questionable environmental integrity because of its large expected AAU surplus (see Section 3).

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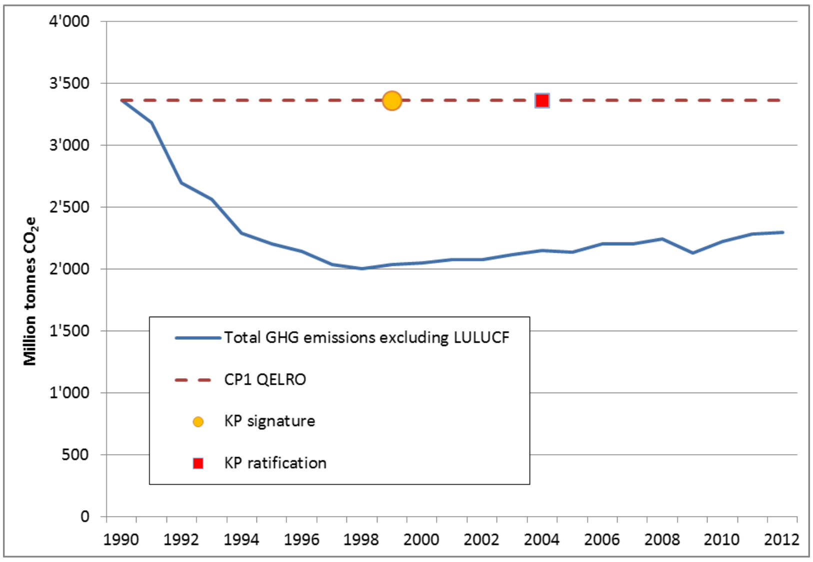
[61] Interviews with market participants.
[62] See: http://ji.unfccc.int/JI_Parties/DB/E6OJWRL8OP3UCSQ2FVQZX7TT3CL1PV/viewDFP [accessed 17 September 2014].
[63] See: http://www.seia.gov.ua/seia/control/uk/doccatalog/list?currDir=116707&documentList_stind=61 [accessed 17 September 2014].
[64] See: http://www.carbonunitsregistry.gov.ua/en/publication/content/680.htm [accessed 17 September 2014].
[65] See: http://www.carbonunitsregistry.gov.ua/en/publication.htm [accessed 17 September 2014]. A few transactions are missing from the database as the total number of transferred ERUs at the Ukrainian Registry website does not match the number presented by the JISC, which is based on precise ITL data, yet the numbers are very close.

6.2 Russia

The Russian Federation is the second-largest JI host, with 98 registered projects and more than 266 million ERUs issued – representing 31% of all ERUs issued. Russia had a CP1 reduction target of keeping emissions at 1990 levels. The country has a significant expected AAU surplus (see Figure 26). Its GHG emissions were 39% below 1990 levels at the time of KP signature and 36% below 1990 levels at the time of ratification. It should be noted that ratification of KP by the Russian Federation was necessary to enable the KP to enter into force given its large share in the total emissions of countries participating in KP and the non-ratification by the US. We estimate that Russia accumulated about 5.7 billion AAUs, representing 34% of its total assigned amount (see Figure 26). Russia did not join CP2 and can therefore neither sell nor use its surplus AAUs in CP2, and is unable to host JI projects in CP2. Because of Russia's large unusable AAU surplus, the environmental integrity of Russian JI projects is important, because the use of ERUs from Russian projects which do not ensure environmental integrity could lead to an increase in global emissions (see Section 3).

Figure 26: Russia: GHG emissions in base year and 1990-2012



Data source: UNFCCC (2014a).

Overview of rules and governance structures

Russia established its JI rules and infrastructure rather late. Although the initial JI procedures were adopted in 2007, they were not operational and were replaced in 2009 with a package of new rules, which defined a new set of responsibilities and project approval procedures. The first letters of approval were issued only in 2010 (Russia did not issue letters of endorsement). This was partly due to the internal struggles among Russia's ministries to control the JI process, but mostly due to the fact that JI and climate change policy in general have never been priorities for the Russian government (Korppoo and Gassan-Zade 2014).

The Ministry for Economic Development and Trade served as the Designated Focal Point. The state-owned bank Sberbank was appointed as the "operator of carbon units"; it served as the main contact body for project proponents and performed functions related to project approval, registration and ERU issuance, see below. The Russian JI project approval procedure is considerably different from the approaches of most other JI host countries. It involves a tendering procedure instead of ongoing project consideration and approval on case-by-case basis (New Zealand took a similar approach). The tenders were held by Sberbank in accordance with the rules and conditions established by the DFP (Russian Federation 2009c). Initially, cumulative emissions reductions of projects approved in each tender could not exceed 30 million tonnes of CO_2e. The total amount of ERUs Russia approved to issue for all JI projects combined was initially limited to 300 million. However, both limits were later removed.

A JI project application had to include a PDD, determination report and other supporting documents not directly related to JI. Sberbank rated every project that was submitted. These ratings were then reviewed by an expert council which made recommendations to the DFP on which projects should be approved. The members of the council were nominated by Sberbank and approved by the DFP. Based on the council's recommendations the DFP approved the list of projects. Approved projects were then listed in the registry maintained by the DFP. Upon approval of the tender's project list, the DFP transferred to Sberbank the number of AAUs equivalent to the expected ERUs to be issued. Therefore, the projects could not receive more ERUs than they initially stated in their bid (Russian Federation 2009b; Russian Federation 2009a).

To our knowledge, Russia is the only country which included in its JI procedures the possibility of withdrawal of host country approval. After approval a project had to report to the DFP annually information on its implementation and comply with a number of requirements, otherwise it could be removed from the list of approved projects. In principle, after the approval the project participants could only make changes to the project if they did not affect the core parameters as described in the project documents, and any changes had to be approved by the DFP. However, as shown in Section 5, in practice this requirement did not prevent large industrial gas projects from making substantial changes after their registration, which allowed them to increase ERU generation well beyond levels estimated in their PDDs.

The Russian JI procedures did not include provisions for the accreditation of national independent entities. Independent entities accredited by the JISC were authorized to perform Russian Track 1 determinations and verifications.

Sberbank charged fees for the issuance of ERUs, for which a project owner (a company registered in Russia) had to conclude a contract with the bank. In order to receive ERUs, the project owner and the buyer had to get the Emission Reduction Purchase Agreement (ERPA) approved by Sberbank. Both the fees and the involvement of a quasi-governmental bank in the commercial deals made Russia different from other JI host countries.

The slow implementation of JI in Russia meant that many projects had to wait for an LoA for many years with no clarity about their prospects to be eventually registered under JI. In fact, by the time the Russian JI procedures were set up, some market participants had begun to doubt that JI would ever take off in Russia, and some had withdrawn their activities there.[66] Even after the JI procedures were in place, the complexity of the process, with numerous bureaucratic requirements and opaque tender procedures, remained unpredictable and risky. This was exacerbated by Sberbank's heavy-handed involvement in the contracts.

Given these risks, non-additional projects may have had an advantage: such projects did not rely on ERU revenue for their implementation and could therefore be implemented while taking the risk of rejection and waiting for their approval.

[66] Personal communications with project developers.

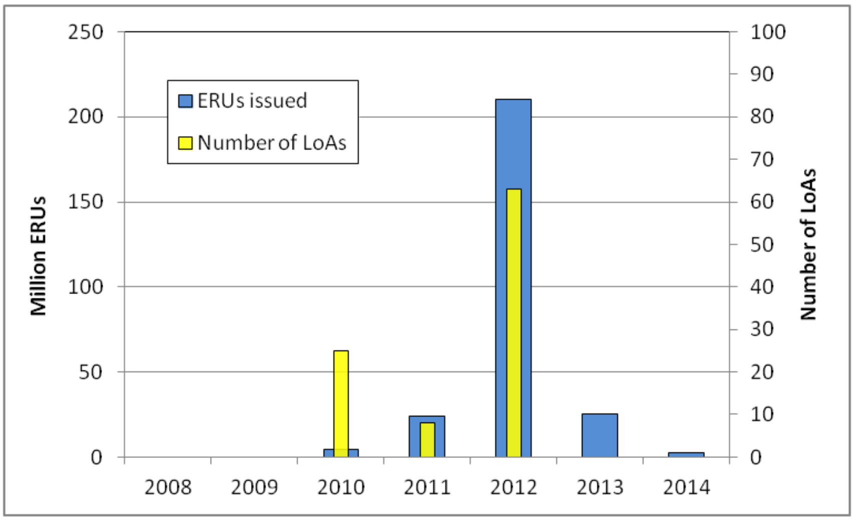
Russia's JI project pipeline

According to Sberbank, the Russian government approved 108 projects with total projected emissions reductions around 309 million CO_2e.[67] Of those, 98 projects were registered and received 266 million ERUs.[68] The majority of LoAs and ERUs were issued in 2012. During the last year of CP1 Russia approved 72 projects (67% of its approved projects) and issued 210 million ERUs (79% of issued volume; see Figure 27).

All except two projects – accounting for 99.8% of ERUs issued – were registered under Track 1. Most likely this was because registration under Track 1 was cheaper and faster, as it did not involve JISC in addition to the complex host country approval procedure.

Russia hosts the four largest JI projects, which generated more than 130 million ERUs (almost half of all Russian ERUs and 15% of global issuance). The largest project (RU1000353) received more than 77 million of ERUs; see Section 5.3. The other three largest projects involve HCF and SF_6 emission reductions; see Section 5.5.

Figure 27: Project approval and ERU issuance in Russia by year



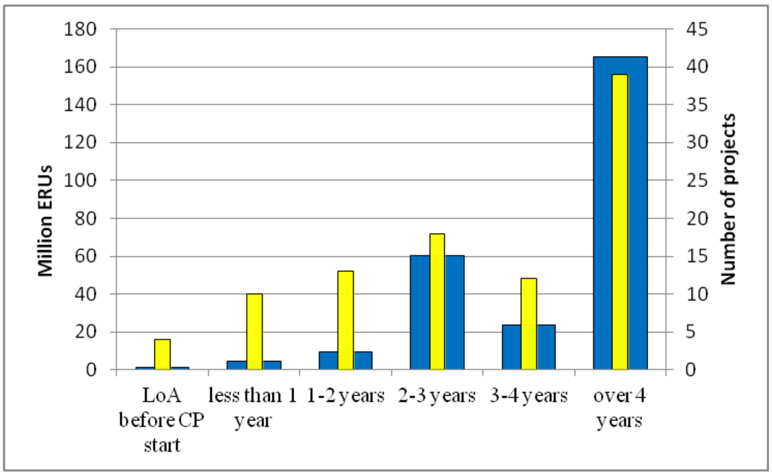
Data sources: Sberbank http://www.sberbank.ru/dagestan/ru/legal/credits/cfinans/sozip/ [Accessed 30 October 2014] and UNFCCC ERU issuance data http://ji.unfccc.int/statistics/2014/ERU_Issuance.pdf [Accessed 31 August 2014]

Since Russia did not issue letters of endorsement, and since the start of the approval process was delayed, a project timeline analysis to assess the plausibility of additionality is not as straightforward as for other countries. Considering that Russia did not start approving projects until 2010, many projects were not able to receive an LoA early in their project cycle and had to claim their ERUs retroactively for several years. Therefore, for Russian projects approved in 2010-2011, retroactive crediting for three years or less may not imply a lack of additionality (as discussed in Section 4.6), but could be due to administrative delays. To be conservative, we considered retroactive crediting only of more than four years as an indicator of questionable additionality claims in Russian projects. These projects had crediting periods that started in 2008 but were only approved in 2012 (given that the approval process was operational since 2010 they would have been able to get LoAs earlier than 2012). There are

[67] See: http://www.sberbank.ru/dagestan/ru/legal/credits/cfinans/sozip/ [Accessed 30 October 2014]
[68] JI Project Overview; see: http://ji.unfccc.int/JI_Projects/ProjectInfo.html, and UNFCCC ERU issuance data; see: http://ji.unfccc.int/statistics/2014/ERU_Issuance.pdf [Both accessed 31 August 2014]

39 projects (41%) with retroactive crediting for more than four years (see Figure 28). These projects delivered 165 million ERUs, 62% of Russian ERUs.

Figure 28: Retroactive crediting in Russia: number of projects and ERU volumes



Data source: UNEP Risoe (2014)

Russia's main project types are associated petroleum gas utilization, industrial gas abatement (HFC and SF_6) and energy efficiency (see Table 19). These three project types account for 82% of Russia's ERUs. All of them are considered in detail in Section 5, and were identified as having questionable or low environmental integrity.

Table 19: Russian JI projects by type

Type of project	Number of registered projects	Projects that generated ERUs	ERUs generated, thousand	% of ERUs issued
Associated petroleum gas utilization	22	21	116,840	44.1%
HFC and SF_6	3	3	53,347	20.1%
Energy efficiency in industry and power production and distribution	40	32	47,455	18.0%
Fossil fuel switch	10	8	18,396	6.9%
PFC	5	5	16,544	6.2%
Afforestation & reforestation	2	2	5,077	1.9%
Biomass energy	10	10	4,228	1.6%
Hydro	2	2	2,936	1.1%
Coal mine methane	1	1	138	0.1%
Waste water treatment	1	1	92	0.0%
Landfill gas	1	0	0	0.0%
Total	**97**	**85**	**265,053**	**100.0%**

Source: UNEP Risoe (2014)

Transparency

Russia publishes information on JI projects on its national registry website[69]. Basic information and documents such as the PDD are available for most projects but some verification and

[69] http://www.carbonunitsregistry.ru/reports-pso.htm.

monitoring reports are not available. The website has only the latest versions of documents, which makes it impossible to check whether substantial changes were made e.g. to the monitoring plans. A significant share of project documents is only available in Russian. The registry also regularly publishes units holding and transaction information. However, the information cannot be queried as required by paragraph 44 of Decision 13/CMP.1.

Russia also provides some information on registered JI projects to the UNFCCC Secretariat for publication (typically the PDD and determination reports are available, but not the monitoring and verification reports). In addition, Sberbank published information on project applications submitted for JI tenders[70].

Overall, complete project documentation is available for many but not for all projects.

Summary of findings on Russia as a JI host country

JI started late in Russia and its procedures differ from most other JI host countries in several aspects, including the approval of whole project lists based on a tender procedure, fees for the issuance of ERUs, and ERPA approval by quasi-governmental agency. The delay in putting JI procedures in place and the complex tender process meant that most Russian JI projects were approved late and received their ERUs retroactively. These increased risks may have prevented potential projects that were additional to benefit from JI. The lack of a project endorsement step makes it more difficult to assess the plausibility of additionality claims of Russian JI projects. Nevertheless, evidence indicates that the vast majority of ERUs issued by Russia came from JI projects with questionable environmental integrity. Like Ukraine, Russia could afford to issue large numbers of ERUs from projects with very limited environmental integrity because of its large expected AAU surplus (see Section 3).

6.3 EU Member States as JI host countries

The European Union (EU) as a whole had a CP1 reduction target of 8% and has a CP2 reduction target of 20% below 1990 levels.[71] Because the EU has wide-ranging environmental laws and climate policies, JI projects needed to be integrated in a way that ensured that they were additional to any existing EU policies and that no double counting would occur. This section briefly summarizes how the EU has addressed JI projects being implemented in EU member states.

Baseline-setting

All EU member states must obey the Community acquis – the body of EU treaties, legislation, international agreements, standards, court verdicts and fundamental rights. This also applies to JI projects. JI projects can therefore only receive ERUs from emission reductions that go beyond those required by EU law.

Some mitigation measures, such as the capture of landfill gas, are already required by EU law and are therefore not eligible as JI projects. However, many new EU Member States have not yet fully implemented the EU acquis and were given grace periods to do so. Therefore, the Linking Directive provides for some flexibility allowing emissions baselines for JI projects

[70] http://www.sberbank.ru/dagestan/ru/legal/credits/cfinans/sozip/
[71] Baseline varies somewhat for some GHG gases and some member states.

being set assuming delayed implementation of certain EU laws (European Commission 2004).[72]

Double counting

In 2005, the EU launched its Emissions Trading System (EU ETS). The EU ETS covers more than 11,000 power stations and industrial plants in all 28 EU Member States as well as Iceland, Norway and Lichtenstein. In order to avoid having emissions reductions achieved by JI projects also counted towards reduction goals under the EU ETS, the EU passed restrictions on JI projects located in the EU.

Direct double counting can occur when a JI project is implemented at an entity covered by the EU ETS, e.g. energy efficiency measures implemented in a cement plant. Indirect double counting can occur if a project not covered by the EU ETS indirectly reduces emissions of entities included in EU ETS. For example, a JI renewable energy project may reduce emissions in fossil fuel-based power stations because it would presumably replace the same amount of conventionally produced energy. Without provisions to avoid double counting, the JI projects would generate ERUs which would be used for compliance by the buyer while the same emissions reductions would also lead to conventional power operators retaining more EU allowances.

The requirements to avoid double counting of emission reductions are contained in Article11b of the **Linking Directive** (Directive 2004/101/EC). In 2006, the European Commission specified the rules regarding double counting in a Decision addressed to Member States – **Decision 2006/780/EC** (Double Counting Decision). The Linking Directive requires the cancellation of an equivalent of EU allowances for ERUs issued to a project that reduces emissions in the EU ETS.

Below we discuss how the two EU countries with the highest ERU issuance have implemented JI rules and procedures.

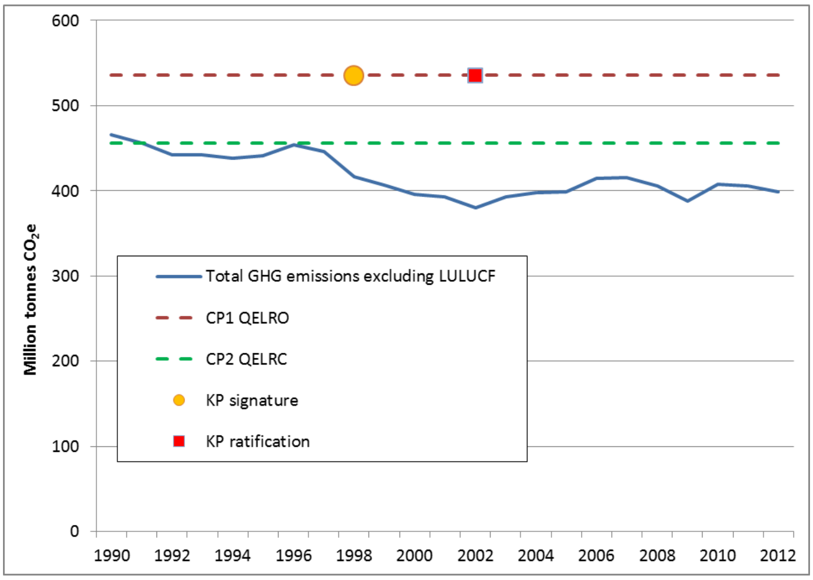
6.4 Poland

Poland is the largest JI host country in the European Union. It issued more than 20 million ERUs, 2.3% of total ERUs, and has 38 registered projects. Poland has a significant expected AAU surplus (see Figure 29). Its average 2003–2007 emissions were about 76% of its assigned amount. We estimate that Poland accumulated about 640 million surplus AAUs, or 24% of its initial CP1 assigned amount (see Figure 22). Poland's base year is 1988,[73] when emissions were higher than in 1990. Poland is part of the EU's 20% reduction target for CP2 (part of the EU bubble) and is therefore likely to able to use at least part of its CP1 surplus in CP2.

[72] Article 11b Project activities 1. Member States shall take all necessary measures to ensure that baselines for project activities, as defined by subsequent decisions adopted under the UNFCCC or the Kyoto Protocol, undertaken in countries having signed a Treaty of Accession with the Union fully comply with the Community acquis, including the temporary derogations set out in that Treaty of Accession (European Commission 2004).

[73] Except for fluorinated gases, for which the base year is 1995.

Figure 29: Poland: GHG emissions in base year and 1990-2012



Data source: UNFCCC (2014a).

Overview of rules and governance structures

Poland was one of the first countries that started using JI, along with Bulgaria, Romania and Estonia. In fact, it was the first host country to approve a JI project in June 2000. Until late 2009 formal JI procedures were not in place. In 2008 a temporary Track 1 procedure was applied.[74] The temporary procedure was typical for many other JI host countries: a LoE was issued based on a Project Idea Note; to receive a LoA the project participants had to submit a PDD and a determination report had to be completed by an AIE accredited by the JISC.

JI procedures were formalized in 2009 as part of the *Act on the system to manage the emissions of GHGs and other substances* (Poland 2009). In general, the principles remained the same as in the temporary procedure, but a number of clarifications and rules were introduced. The Ministry of Environment was formally authorized as the DFP. It is assisted by the National Centre for Emissions Management (KOBiZE). LoEs and LoAs are issued by administrative decisions of the Minister of Environment based on the assessment of applications performed by KOBiZE.

In principle, both AIEs accredited by the JISC or nationally authorized entities could perform auditing functions for projects. However, Poland never authorized any domestic entities, and all auditing was performed by AIEs.[75] Projects can apply under both JI tracks but in practice no Track 2 projects were approved in Poland. A Track 2 project that is rejected by the JISC cannot reapply for Track 1.

Poland put several rules in place that aimed at ensuring the environmental integrity of projects: the procedures stipulate for example that already implemented projects or activities required by EU or national law are ineligible for JI. In 2009, new projects that fell under the EU double counting rules were no longer allowed to be approved, unless their emissions reductions were taken into account in a special set-aside in Poland's National Allocation Plan

[74] See: http://ji.unfccc.int/UserManagement/FileStorage/HB2IUYKSLTFAO9ND851CRE364QWMVX [Accessed 4 November 2014]

[75] See: http://www.kobize.pl/jednostki-uprawnione.html

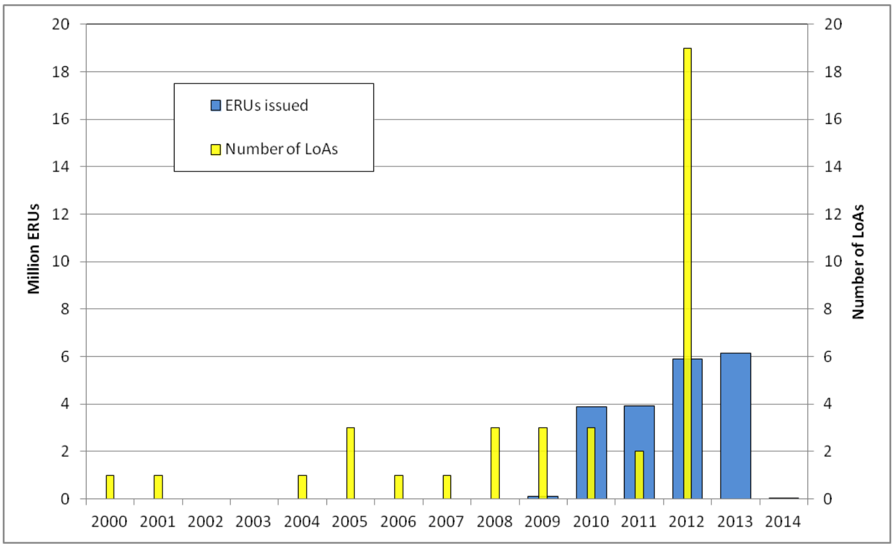
under EU ETS. Projects have to be additional, show that they limit their negative environmental impacts, and use the best available technologies. An application for a LoA has to be submitted by project participants within one year of the issuance of the LoE, otherwise the LoE expires. The total number of ERUs issued to a project during a crediting period cannot exceed the amount of emission reductions stated in the LoA. If project participants make changes to an approved project, such as the addition of other locations or a change of technology, they have to apply for an updated LoA. Project participants have to prepare a monitoring report at least every year which has to be verified by an AIE and submitted to the National Centre within six months. These timing provisions may have helped to ensure environmental integrity by restricting retroactive crediting. On the other hand, for some projects it was difficult to comply with these requirements because the preparation of the monitoring report and verification could take longer than six months.

Poland's JI project pipeline

Poland registered 38 JI Track 1 projects; 37 were implemented and 31 generated ERUs (KOBiZE 2014).[76]

Poland approved eight projects before the beginning of CP1 (see Figure 30). The project approval process continued during CP1 at relatively steady rate of two to three LoAs per year, but in 2012 a record 19 projects were approved. ERU issuance also increased in 2012 and 2013 compared with 2010–2011 levels, but the increase was not as sharp as in some other JI host countries (see Figure 30).

Figure 30: JI project approval and ERU issuance in Poland by year



Data sources: KOBiZE 2014, http://www.kobize.pl/wykazy-projektow-wspolnych-wdrozen-ji.html, https://dokumenty.kobize.pl/projekty_ji/index.htm [Accessed 10 November 2014], UNFCCC ERU issuance data http://ji.unfccc.int/statistics/2014/ERU_Issuance.pdf [Accessed 31 August 2014]

Table 20 presents project types that were registered in Poland. We discuss the two largest project types. Much more than two-thirds of ERU were generated by the four N_2O abatement projects. We rated additionality of this project type as plausible and the overall environmental

[76] See: http://www.kobize.pl/wykazy-projektow-wspolnych-wdrozen-ji.html and https://dokumenty.kobize.pl/projekty_ji/index.htm [both accessed 10 November 2014], as well as JI Project Overview; see: http://ji.unfccc.int/JI_Projects/ProjectInfo.html [accessed 31 August 2014].

integrity as quite good provided that all relevant policies are taken into account in baseline-setting. Poland did not have any regulation on N_2O emissions until 2013, when this gas was included in the EU ETS. However, in its treaty of accession to the EU, Poland was exempted from the IPPC directive, which regulates N_2O emissions only until 2010 (see Section 5.6). It is unclear why Poland did not implement the IPPC directive as of 2011 and why as a result the IPPC directive emission levels were not reflected in the baseline of nitric acid projects. If the IPPC directive was not implemented in order to provide larger benefits to these JI projects then the emissions reductions from nitric acid projects were overcredited.

Table 20: Polish JI projects by type

Type of project	Number of registered projects	Projects that generated ERUs	ERUs generated, thousand	% of ERUs issued
N_2O: nitric acid	4	4	14,014	69.9%
Wind power	10	10	2,358	11.8%
Coal mine methane	11	9	1,418	7.1%
Landfill gas	5	3	1,220	6.1%
Biomass energy	2	1	616	3.1%
Cement	1	1	354	1.8%
Geothermal energy	2	1	69	0.3%
Energy efficiency (PoAs)	2	2	10	0.1%
Hydro	1	0	0	0.0%
Total	**38**	**31**	**20,058**	**100.0%**

Data source: KOBiZE, https://dokumenty.kobize.pl/projekty_ji/index.htm

Wind power is the second largest project type in Poland, both by the number of projects and ERUs generated. Two projects received LoAs before CP1, while the remaining eight were approved in the last few days of 2012. The latter projects claimed all their ERUs retroactively, and for seven of eight projects the period of retroactive crediting was more than three years. The fact that the projects were implemented several years before LoA issuance, despite the risk of not getting approved, makes it unlikely that these later projects are indeed additional. Research suggests that power projects in general have a low probability of being additional because the revenue from offsets makes such a small fraction of overall revenues (Lazarus et al. 2012). For example, one Polish wind power project stated the difference in IRR with and without ERU revenues to be 0.08% (PL1000534).

Transparency

The Polish DFP (the Ministry of Environment) publishes only the list of approved and endorsed projects with dates of issuance of their respective letters.[77] While the list of LoAs is comprehensive, LoE issuance dates of many projects are missing.[78] KOBiZE publishes more detailed information: in addition to the full list of approved projects and LoA dates, the website contains data on expected AAUs[79] and ERUs as stated in LoAs, and total ERU issuance for each project. The website lists ERU issuance by year for each project but without

[77] See: http://www.mos.gov.pl/artykul/2108_projekty_wspolnych_wdrozen/17909_wykazy_projektow_wspolnych_wdrozen_joint_implementation_ji.html
[78] Information on LoE issuance was provided by KOBiZE upon our request.
[79] Poland issued AAUs ("early credits") for some projects that achieved emissions reductions before 2008.

dates and volumes of individual issuance events. Project documents are not fully available: determination, monitoring and verification reports are usually missing, and in some cases even the PDDs are not available. Project information provided by the DFP for publication on the UNFCCC website is also scarce. Usually it includes only basic data such as the project name, sectoral scope and location, one sentence project description and a PDD; in some cases even the PDD is missing.

Overall, the transparency with regard to JI projects in Poland is notably lower than in other analysed JI host countries.

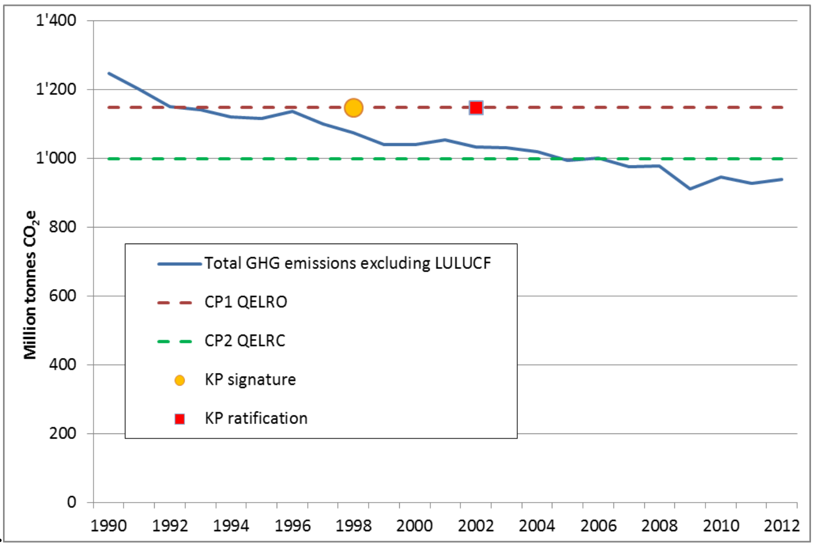
Summary on findings on Poland as a JI host country

Polish JI rules and procedures included several elements that aimed at ensuring environmental integrity. Poland was one of the early starters in JI and hosted a number of early projects, however, these projects delivered few or no ERUs. The majority of Polish ERUs were delivered by N_2O emission reduction projects, which have plausible additionality. Wind power projects, which have more questionable additionality, produced only a relatively small share of ERUs. Thus, despite the fact that Poland could expect a large AAU surplus there is no evidence that it issued a significant number of ERUs with low environmental integrity.

6.5 Germany

Germany is the Annex II host country with the highest ERU issuance: more than 13 million ERUs (1.6%) and 25 registered projects. For the period 2008–2012, Germany had a CP1 reduction target of 21% below 1990 GHG emissions. We estimate that Germany accumulated 962 million surplus AAUs by the end of CP1, about 17% of its total initial assigned amount (see Figure 22). Nevertheless, Germany is not classified as having a “significant expected AAU surplus”, because its 2003–2007 emissions are above its target; see Figure 31. For the period 2013–2020, Germany pledged to reduce its GHG emissions by 40% below 1990 levels by 2020. It could use at least part of its CP1 surplus in CP2 if it chooses. Therefore, the use of ERUs from German JI projects which lack environmental integrity would not necessarily lead to an increase in global emissions (see Section 3).

Figure 31: Germany: GHG emissions in base year and 1990–2012



Data source: UNFCCC (2014a).

Overview of JI rules and governance structures

The German Emissions Trading Authority (DEHSt) which is part of the Federal Environment Agency functions as Germany's Designated Focal Point (DFP). DEHSt approves projects and ERU issuance and confirms verification reports. DEHSt also serves as an information provider for JI stakeholders, publishes guidance documents, and maintains a website with information about JI projects, including a project database.[80]

In September 2005, Germany passed the "Act Implementing the Project-based Mechanisms of the Kyoto Protocol" (Projekt-Mechanismen-Gesetz – ProMechG) which transposed the EU Linking Directive into German law.[81]

Germany places several restrictions on the JI projects it hosts. German JI projects can only receive ERUs for the period from 2008–2012. Thus, Germany does not issue ERUs for emissions reductions that occur after 2012. Determination reports have to confirm that no double counting would occur due to the project. EU-ETS installations cannot receive ERUs in order to avoid double counting.

If a JI project receives public funding (e.g. low-interest loans), then the share of emissions reductions that could be attributed to such financing has to be subtracted from the total of ERUs received. Exceptions are allowed if public funding is used to hedge against possible risks, e.g. if the public financing is designed as a financial guarantee to cover certain project risks. Originally, the feed-in tariff for renewable energy and financial incentives for combined heat and power plants were classified as public funding (DEHSt 2009). However, in 2009 the law was further clarified to the effect that projects that were eligible to receive a feed-in tariff were ineligible for JI.

Germany is the only country we could identify that also assesses the projects it was involved in as an investor country – it approved 45 and rejected three (Deutscher Bundestag 2014).

Germany's project pipeline

Germany approved 25 JI projects, an additional 10 projects received a LoE but no LoA, and 45 projects were rejected (Deutscher Bundestag 2014). Table 21 gives an overview of the German projects.

[80] See: http://www.dehst.de and German JI Database: https://www.jicdm.dehst.de/promechg/pages/project1.aspx [accessed 17 September 2014].
[81] See: http://www.gesetze-im-internet.de/promechg/BJNR282610005.html [accessed 17 September 2014].

Table 21: German JI projects by type

Type of project	Number of registered projects	ERUs generated, thousand	% of ERUs issued
Adipic acid	2	9,375	69%
Nitric acid	6	3 761	28%
PFCs	1	260	2%
Coal mine methane	3	95	1%
Energy efficiency*	9	70	< 1%
Biomass energy*	3	5	< 1%
Transport*	1	1	< 1%
Total	**25**	**13,568**	**100%**

Data sources: UNEP Risoe (2014) and DEHSt, personal communication.

The eight projects that reduce N_2O emissions from adipic and nitric acid production make up the largest share of ERUs and account for 97% of ERU issuance. Of those, the two adipic acid projects generated almost 70% of the ERUs issued. German laws or regulations do not require the destruction of N_2O in adipic acid production. Nevertheless, in the 1990s, the adipic acid industry agreed to voluntarily install waste destruction facilities at adipic acid plants that achieved destruction rates of about 90%.[82]

The two German adipic acid JI projects, operated by BASF and Lanxess (DE1000017 and DE1000018), installed second, redundant N_2O abatement facilities that minimized the downtimes of the N_2O abatement systems and therefore brought the destruction of N_2O to almost 100%. For both projects the baseline is based on historic emissions from 1998–2002 with an average abatement of about 90% (Schneider et al. 2010). A careful examination of the project DE1000017 suggests that the project is likely to be additional. Before JI, no adipic acid plants had installed a redundant decomposition facility to destroy the portion of N_2O that is usually vented due to shutdowns of the main decomposition facility. Furthermore the timeline of the JI project looks consistent and the issued ERUs are in the range of the projected emissions reductions estimated in the PDD.

Nitric acid JI projects and the German court case are discussed in detail in Section 6. We rated project type as having plausible additionality and conservative baselines.

Programme of Activities (POA): The concept of PoA aims to foster replicable, distributed projects that can be bundled. Germany approved quite a few programmatic JI projects which aim to implement distributed energy efficiency and bio-energy activities. Most of the 13 German POAs generated no or very few ERUs, representing less than 0.6% of German ERU issuance.

Coal mine methane projects: Germany rejected 44 proposed coal mine methane projects, because of insufficient proof of additionality as project developers also receive public funding through the Renewable Energy Sources Act (EEG) (Deutscher Bundestag 2014). Several appeals and administrative court procedures followed after DEHSt rejected the projects. In one case, a project developer tried to register a facility that started operation in 2003. The

[82] "The inter-industry group of five major adipic acid manufacturers worldwide in 1991 to 1993 have agreed on information exchange and on a substantial emission cut before the year 2000. These major producers probably will have reduced their joint emissions by 91%. It is estimated that emissions from the 24 plants producing adipic acid worldwide will be reduced by 62% in the year 2000 compared to 1990." (IPCC 2001 Section 3.5.4.1)

facility collected mine methane from abandoned and active coal mines and generated electricity of about 8 MWs and received EEG subsidies. The project developers claimed that the methane destruction should be seen as separate from the electricity generation and that therefore the EEG only covered the electricity generation but not the methane destruction, for which the project developer claimed ERUs. DEHSt argued that the methane destruction was necessary to generate the electricity and to receive the feed-in tariff which rendered the project non additional. The project developers argued their case up to the highest German administrative court, where it was rejected.[83]

In reaction to the court cases, Germany revised its law to clarify projects that receive feed-in tariffs are no longer eligible as JI projects, see above. For other project types, combining JI with public funding is still possible. However, in practice it proved to be too difficult to determine which fraction of the emissions reductions should be attributed to the public funding; therefore projects that received such funding were usually not considered eligible.

Transparency

Germany presents project information and rules and regulations completely and transparently on the DEHSt website.[84] All JI project documents can be downloaded from the German JI database.[85]

Summary of findings on Germany as a JI host country

Germany's rules and procedures which include restrictions on JI project types and a thorough assessment of each JI project helped ensure high environmental integrity. Several court cases confirmed Germany's strict approach to additionality and baseline setting. The two main project types (N_2O destruction) have a high likelihood of being additional due to limited other incentives and conservative baseline requirements. Although Germany ended up with significant AAU surplus it could not necessarily expect to have a significant surplus. The expectation of not having a significant AAU surplus may have played a role in Germany emphasizing environmental integrity of its JI projects.

6.6 Comparison of environmental integrity of the project portfolio by country

We compare the environmental integrity of ERUs issued in each of the four analysed countries, by assessing the project portfolio in each country, drawing upon our assessment of the integrity of key project types in Section 5 and the findings on some other project types in this section. Figure 32 shows that we identify significant environmental integrity concerns for a large majority of ERUs from Russia and Ukraine, whereas the environmental integrity seems considerably higher in Poland and Germany. Project types we did not assess are shown in grey; see Table 11 for a list of those project types.

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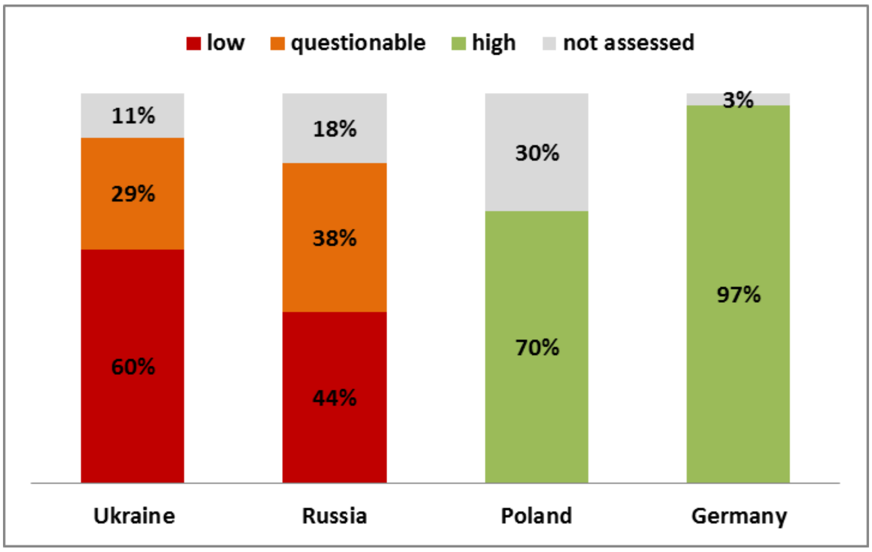
[83] See: http://www.bverwg.de/entscheidungen/entscheidung.php?ent=170311B7B63.10.0; http://openjur.de/u/282569.html; http://openjur.de/u/280621.html [accessed 17 September 2014].

[84] See: http://www.dehst.de/DE/Klimaschutzprojekte/Projektmechanismen/JI/ji_node.html [accessed 17 September 2014].

[85] See https://www.jicdm.dehst.de/promechg/pages/project1.aspx [accessed 17 September 2014].

Figure 32: Environmental integrity of ERUs issued in each country by project type



Data source: Evaluation of the largest six projects applied to the portfolio of projects registered in Ukraine, Russia, Poland and Germany as of March 2014.

We hypothesized in Section 3 that the amount of AAU surplus available could impact how strictly countries ensure the environmental integrity of JI projects. The country analyses of Ukraine and Russia seem to confirm that if a country can expect a large AAU surplus it has less incentive to restrict ERU issuance to JI projects with high environmental integrity. This is not true for Poland, however – although it could expect a significant surplus, it did not issue large amounts of ERUs with low environmental integrity. Germany, which did not expect a significant surplus AAUs, did indeed emphasize environmental integrity.

7. ASSESSMENT OF DIFFERENCES BETWEEN TRACK 1 AND TRACK 2

As noted earlier, under the current JI Guidelines, projects can be implemented under two tracks (UNFCCC 2006b). Under Track 1, host countries have ultimate responsibility for all aspects of the project cycle; under Track 2, some responsibilities are assigned to the JISC. Details are discussed in Section 2.1. Details are discussed in Section 2.1. As Table 5 illustrated, 92% of projects, accounting for 97% of all ERUs, have been registered under Track 1.[86] Ten countries – Belgium, Czech Republic, Estonia, Finland, France, Germany, Hungary, Latvia, New Zealand, and Poland – have hosted only Track 1 projects.

There could be several reasons for the preference for Track 1. Until 2011 there were no fees for Track 1 projects, while Track 2 projects had to pay 0.10 USD per tonne of CO_2e of annual reductions for the first 15,000 tonnes and 0.20 USD per tonne exceeding this number.[87] Moreover, Track 2 projects had to pay an advance payment upon submission of the PDD determination report to the UNFCCC Secretariat. Until 2009, when the advance payment was limited to 30,000 USD it could reach several hundred thousand USD for large projects. The

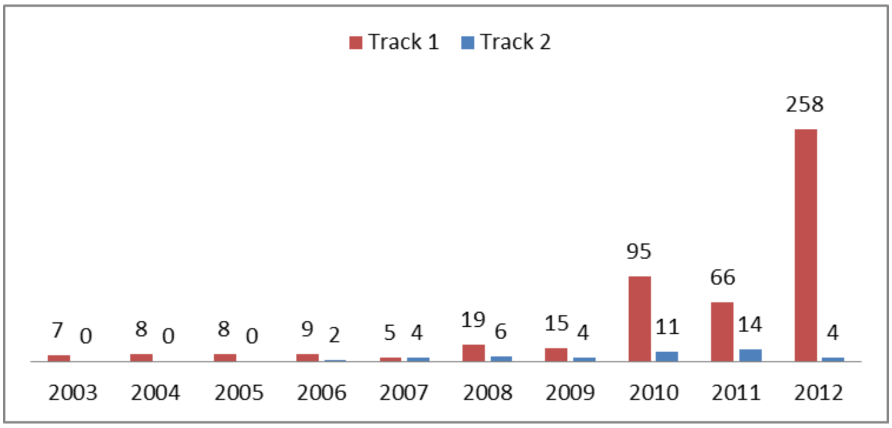
[86] Eighty-one projects accounting for 16% of ERU issuance were initiated under Track 2 and later switched to Track 1. These projects were located in Russia (37), Ukraine (28), Poland (6), Bulgaria (5) and Estonia (3), Germany (1), Romania (1).

[87] Provisions for charging of fees to cover administrative costs relating to the activities of the Joint Implementation Supervisory Committee and its supporting structures.

one-time fee of 20,000 USD to the UNFCCC for registering a Track 1 project that was introduced in 2011 was still considerably less than Track 2 fees.

The reason why Track 1 flourished and Track 2 remained small may to some extent be due to how the two tracks developed. Early JI projects were developed before Track 2 was established. In 2006, when the JISC was established, there were already at least 127 JI projects in the pipeline (UNEP Risoe email 14 September 2006). In order to be registered under Track 2, these early projects would have been required to follow all the Track 2 rules which were established after these projects had already been initiated. Several interviewed JI experts highlighted that many of the early projects did not apply under Track 2 because the administrative burden was considered too great. They also mentioned that Track 1 procedures were perceived to be less stringent because they did not require supervision by the JISC. On the other hand, one project developer pointed out that they used Track 2 despite the higher fees because Track 1 was losing credibility. Figure 33 shows that the number of Track 2 projects grew very significantly in the second half of CP1.

Figure 33: Number of projects approved by year, by track



Data source: 642 registered projects from UNEP Risoe (2014).

7.1 Size difference between Track 1 and Track 2 projects

One noticeable difference between Track 1 and Track 2 is the size of the projects. The average number of credits issued per year per project is about 2.5 times higher for Track 1 (433 kERUs) than for Track 2 (164 kERUs) or the CDM (147 kCERs).[88] The reason for this difference may be the very large Track 1 projects: 45 of the 46 projects with issuance of more than 5 million ERUs are under Track 1. All of the very large projects that registered in 2012 and retroactively issued credits were Track 1 projects. The 10 largest projects are all Track 1 projects (all with more than 10 million ERUs issued) and accounted for almost a quarter of the total number of ERUs issued (see Table 22). Most of these are project types that we identified to have questionable environmental integrity; see Section 5.

[88] These numbers should only be used as indicators since the crediting period start as stated in the PDD does not always correspond to the actual start of credit generation e.g. because the project implementation may have been delayed. Calculation based on http://www.cdmpipeline.org/overview.htm and UNEP Risoe (2014).

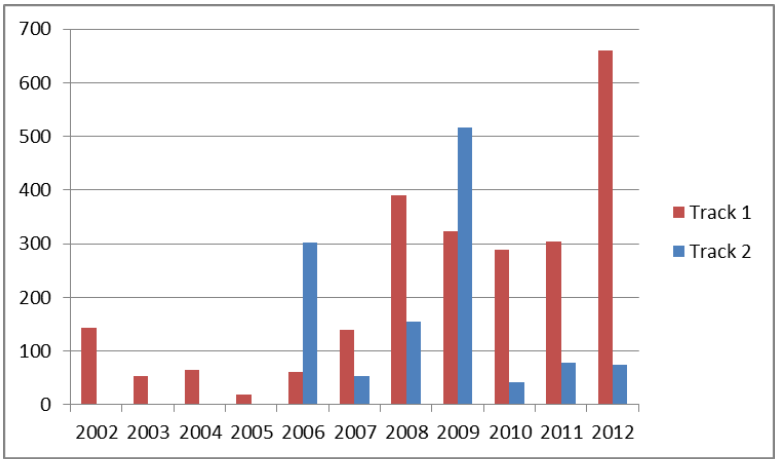
Table 22: Ten largest JI projects

Project type	Project number	Million ERUs
Associated petroleum gas emission reduction	RU1000353	77.4
HFC-23	RU1000201	20.0
	RU1000202	20.0
Spontaneous ignition of coal waste piles	UA1000540	11.0
	UA1000541	10.4
	UA1000512	10.2
	UA1000450	10.1
SF6	RU1000309	13.8
Lighting in service	UA1000468	11.9
No tillage[89]	UA1000513	10.6

Data source: UNEP Risoe (2014).

Figure 34 shows the average size of projects for each track (by average annual issuance), sorted by the year when host country approval was granted. There is a notable divergence of project size between Track 1 and Track 2 in 2010–2012. Track 1 projects registered in 2012 were on average 17 times larger than Track 2 projects registered in the same year.

Figure 34: Average annual issuance (in kERUs) by year when projects received LoA



Data source: 642 registered projects taken from UNEP Risoe (2014).

The increase of size of Track 1 projects may be related to the decrease of ERU price. By the end of the first commitment period the price dropped to below 0.20 EUR, while the administrative project costs remained generally unchanged – the development of PDD and monitoring report(s), determination and verification remained at around 50,000 EUR (personal communication with project participants). Thus a project needed to receive at least

[89] Project UA100051: Soil erosion is a major challenge for Ukraine, caused to a large extent by unsustainable farming practices. No-till framing, which minimizes soil disturbance, is only practiced on 2–3% of cropland in Ukraine. This indicates that the project may be additional, but the time line raises doubt: The project received its LoE in 2004 and was only registered in 2012. Also, no-till agriculture is considered more profitable than traditional practices (FAO 2014). This is confirmed by an article published at the website of the project participant Agro-Soyuz in July 2011 (see: http://www.agrosoyuz.ua/information/press-centr/mass-media/smi_nt_agroex), which notes that the conversion from traditional technologies of tillage to no-till technology results in saving of 60 litres of fuel per hectare, which was equivalent to 48 USD/ha in 2006, or 79 USD/ha in 2011.

250 000 ERUs, just to cover administrative costs. On the other hand, projects that needed JI revenue to be operational, may simply have stopped and never gotten a LoA. This could be one explanation for the significant drop in Track 2 issuances in the second half of CP1.

7.2 Environmental integrity of Track 1 and Track 2 projects

In order to assess if there is a difference in environmental integrity between Track 1 and Track 2 projects we use the analysis of the seven largest project types as a basis, see Section 5.[90] Tables 23 and 24 list the main projects types that were implemented under Track 1 and Track 2. We did not analyse the projects types that generated 18% of ERUs under Track 1 and 43% of ERUs under Track 2.

Table 23: Track 1 project types and their ERU issuance

Project type	kERU issuance	% of Track 1 ERUs issued	Environmental integrity rating
Spontaneous ignition of coal waste piles	219,068	27%	low
Associated petroleum gas utilization	116,206	14%	low
Energy efficiency in industry and power production and distribution	194,706	23%	questionable
Natural gas transportation and distribution	75,003	9%	low
HFC-23 abatement from HCFC-22 and SF_6 abatement	53,824	7%	questionable
Fossil Fuel switch	24,600	3%	not rated
N_2O abatement from nitric acid	24,139	3%	high
Agriculture: No tillage	20,701	3%	not rated
PFCs	16,804	2%	not rated
N_2O abatement from adipic acid	14,888	2%	not rated
EE service	13,925	2%	not rated
Natural gas pipelines	7,734	1%	not rated
Biomass energy	6,405	1%	not rated
Hydro	5,910	1%	not rated
Wind	5,230	1%	not rated
Afforestation	4,557	1%	not rated
Cement	4,399	1%	not rated

Source: UNEP Risoe (2014) and authors' evaluation of the largest six project types.

[90] We use the analysis of project types here instead of our sample of 60 projects because it included only five Track 2 projects, which is too few to use the sample analysis to make generalizations about the quality of Track 2 projects.

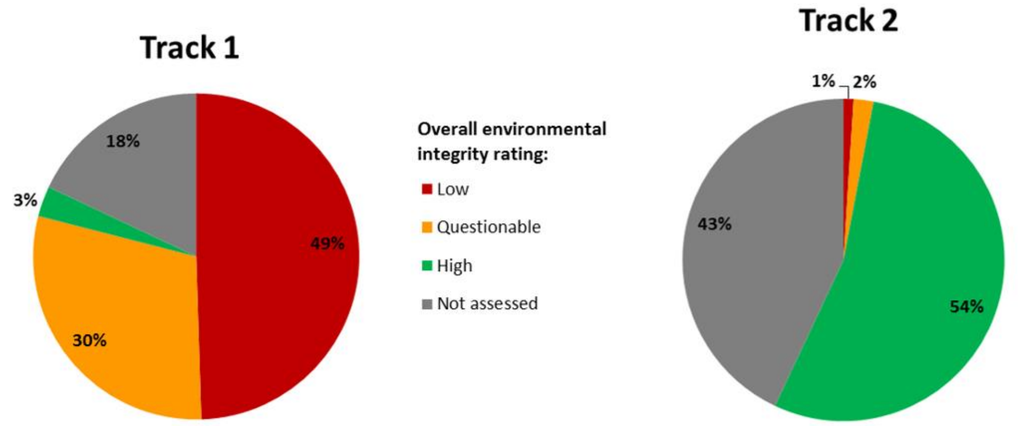
Table 24: Track 2 project types and their ERU issuance

Project type	kERU issuance	% of Track 2 ERUs issued	Environmental integrity rating
N_2O abatement from nitric acid	13,654	54%	high
Coal bed/mine methane	5,973	24%	not rated
EE industry	3,295	13%	not rated
Wind power	794	3%	not rated
Avoided deforestation	520	2%	not rated
Energy efficiency in industry and power production and distribution	414	2%	questionable
Landfill gas	320	1%	not rated
Spontaneous ignition of coal piles	220	1%	low

Source: UNEP Risoe (2014) and authors' evaluation of the largest six project types.

Figure 35 compares the ERU shares by the environmental integrity rating of project types for both tracks. Despite the fact that we did not evaluate all project types, the assessment indicates that under Track 2 the share of project types with plausible environmental integrity was considerably larger than under Track 1.

Figure 35: Environmental integrity comparison of Tracks 1 and by ERUs issued to project types



Source: Evaluation of the largest six project types applied to the portfolio of projects registered under Tracks 1 and 2 as of March 2014.

8. ASSESSMENT OF ACCREDITED INDEPENDENT ENTITIES

In the project cycle, AIEs have the key role of ensuring the compliance of the projects with JI requirements, including those related to environmental integrity. The quality of the auditing work of AIEs is especially important for Track 1 projects since those are not checked by the JISC and since some host countries conducted only very limited compliance checks. In many host countries, the DFPs simply did not have capacity to check every project and therefore relied on the AIE's determination and verification conclusions when approving projects or issuing ERUs.

Investor countries generally were even less involved in project quality assurance than host countries. Almost all investor countries simply expected the AIEs and the host countries to ensure the environmental integrity of the projects. Some investor counties had only one or two staff members who were responsible for approving all JI and CDM projects. Most JI projects were approved by investor countries that did not perform any material assessment of requests for letters of approval, such as Switzerland, Latvia, the Netherlands and the UK.

The JISC is responsible for the accreditation of Independent Entities (IEs) under Track 2, including decisions on granting initial accreditation, re-accreditation, suspension and withdrawal of accreditation. The accreditation requirements are spelled out in the JI Guidelines and the JI Accreditation Standard (UNFCCC 2010; UNFCCC 2006). The requirements for IEs include expertise, qualification and competence of sufficient number of personnel, financial stability and insurance, proper internal procedures and management structure, impartiality and transparency (UNFCCC 2006b). The JISC established a dedicated JI Accreditation Panel, which serves as the technical panel of the JISC responsible for making recommendations to the JISC regarding the accreditation of IEs.[91]

In 2009, the JISC accredited the first three AIEs, and in 2010 a fourth one.[92] But these four AIEs could not meet the demand for determination and verification services. After a change of the accreditation rules in 2011, the number of AIEs has significantly increased. By 2013, the JISC had granted accreditation to a total of 14 AIEs and suspended one AIE.[93] The JISC did not withdraw any accreditation due to non-compliance; several AIEs withdrew voluntarily due to a lack of work. As of 1 March 2015, only four AIEs remained accredited.

Most JI projects were registered under Track 1; nevertheless, only a few JI host countries accredited national JI auditors under Track 1 (e.g. Bulgaria and Czech Republic). Most countries, including Ukraine and Russia, allowed AIEs accredited by the JISC for Track 2 to perform determinations and verifications under Track 1. However, AIEs are not accountable to the JISC for auditing activities conducted under Track 1, as the JISC oversees only Track 2. National DFPs do not have the authority to oversee and suspend or withdraw accreditation of JI auditors accredited by the JISC in case of fraud, malfeasance or incompetence. Thus AIEs accredited by the JISC for Track 2 could perform Track 1 determinations and verifications without any national or international authority overseeing their performance and applying sanctions in case of non-performance. In conclusion, compared to Track 2 or other accreditation systems, AIEs conducting audition functions under Track 1 have less incentive to ensure a high performance in conducting determinations and verifications.

Figures 36 and 37 show the number of projects each AIE audited and the share of ERUs issued based on their verification reports. Bureau Veritas Certification Holding SAS audited by far the most JI projects. It performed the PDD determinations for 49% of all registered projects (see Figure 36) and verified 57% of all projects which generated 635 million ERUs – 75% of total ERUs (see Figure 37). Together, it performed determinations and/or verifications for 357 projects – 56% of the total, generating 78% of total ERUs. The popularity of Bureau Veritas increased towards the end of CP1, while the use of other AIEs that were popular in the beginning went down. For example, auditor TÜV SÜD performed determinations for 16% of projects, but verified emission reductions for only 6% of projects accounting for 4% of ERUs issued in CP1.

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[91] Procedure for accrediting independent entities by the Joint Implementation Supervisory Committee (version 07); see: http://ji.unfccc.int/Ref/Documents/Procedure_Accrediting_IE.pdf.

[92] 2009: TÜV SÜD Industrie Service GmbH, SGS United Kingdom Ltd. Bureau Veritas Certification Holding SAS, 2010: DNV Climate Change Services AS. JISC 14th, 15th, 16th and 20th meeting reports; see: http://ji.unfccc.int/Sup_Committee/Meetings/index.html.

[93] JISC 33rd meeting report; see: http://ji.unfccc.int/Sup_Committee/Meetings/index.html.

Figure 36: Number of projects determined and verified by AIEs[94]

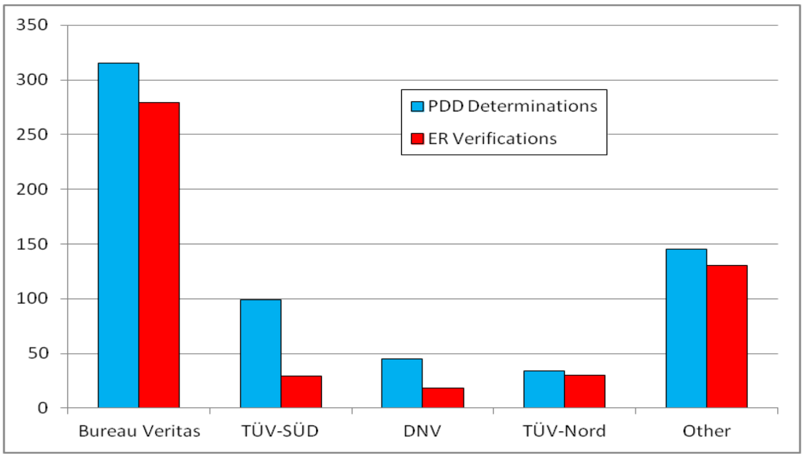
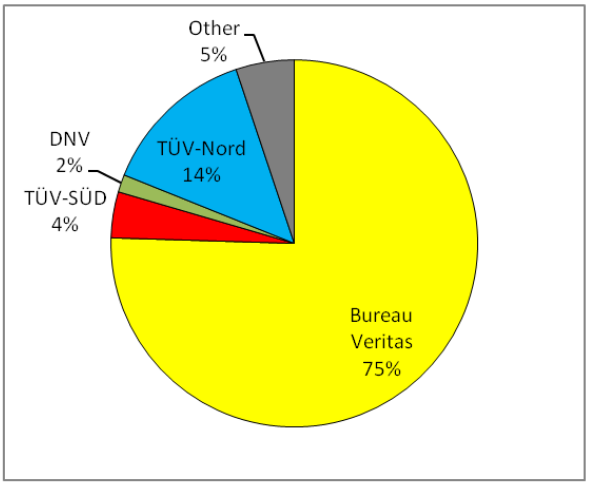


Figure 37: AIE verifications by number of ERUs issued



Data source: 642 registered projects taken from UNEP Risoe (2014).

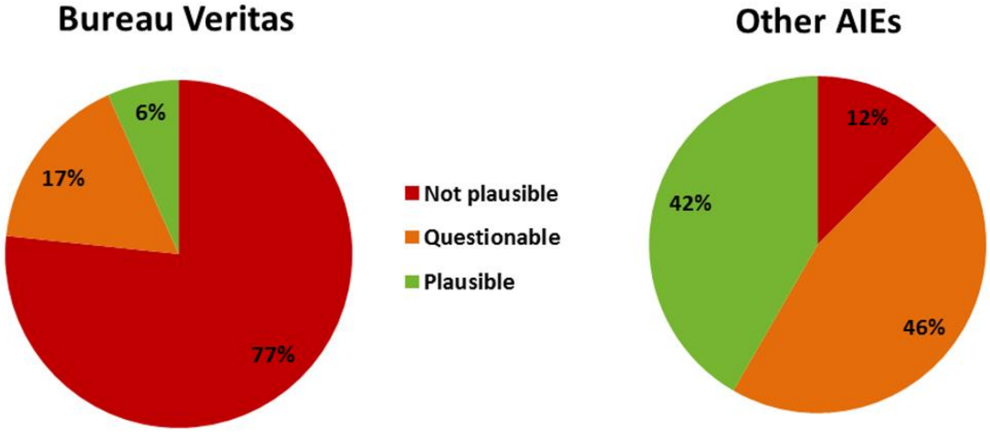
Bureau Veritas made the determinations for 30 projects, and all other AIEs for 24 projects in our sample (excluding the projects for which we did not have PDDs).

Figures 38 and 39 show that for most projects determined by Bureau Veritas, the additionality claims are not plausible. These projects delivered the overwhelming share of ERUs. The result for the other AIEs is significantly different: over 40% of the projects and ERUs issued came from projects with plausible additionality.[95] Several market participants confirmed in interviews that some AIEs were more lax in their auditing than others. A project participant raised a complaint with the JISC about the performance of Bureau Veritas on some projects reporting lax standards and practices, which resulted in overestimated emission reductions (Global Carbon BV 2012b). Since the projects in question were audited under Track 1, however, the JISC was not in a position to address the issue.

[94] In most projects all verifications are performed by the same AIE. Projects which used two or more different AIEs to perform verifications are included in the column “Other” (less than 1%).

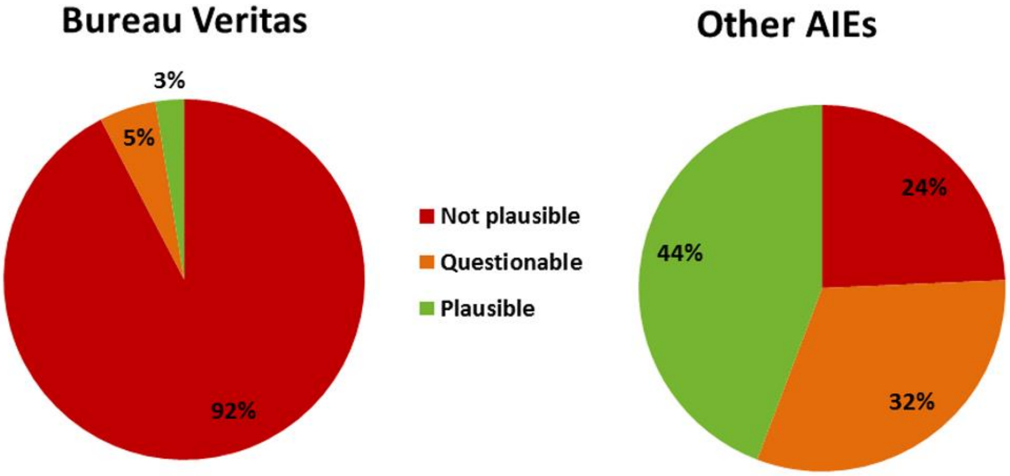
[95] The sample was too small to draw conclusions on other AIEs individually because they audited five or fewer projects in our sample.

Figure 38: Plausibility of additionality claims of the sampled projects by the AIE conducting determination, by number of projects



Data source: Random sample of 60 projects drawn from UNEP Risoe (2014), excluding the 6 projects for which we did not have PDDs.

Figure 39: Plausibility of additionality claims of the sampled projects by AIE conducting determination, by ERUs issuance



Data source: Random sample of 60 projects drawn from UNEP Risoe (2014), excluding the six projects for which we did not have PDDs.

The fact that JI project participants select and pay their AIE could cause an inherent conflict of interest. AIEs have to balance satisfying their customers, reputational risks and the need to comply with accreditation requirements. Since under Track 1 AIEs are not overseen by any authority and therefore do not face the risk of penalties in case of non-compliance, they may have little incentive to conduct stringent assessments, especially in those countries where DFPs did not thoroughly examine JI projects. The thoroughness of the auditor’s work also influenced their prices. Hence, AIEs conducting less thorough assessments may be able to offer their functions at lower prices. Market participants confirmed that AIEs which closely scrutinized each project were generally more expensive than ones were known to perform only superficial checks.

In conclusion, the lack of oversight and regular assessment of AIEs under Track 1 in most host countries is a key shortcoming of current JI rules. Our analysis shows that the performance of AIEs varied considerably and that the AIE with the highest share of projects with questionable additionality claims – Bureau Veritas – gained the largest market share, in particular in the years 2011 and 2012. This indicates that the lack of oversight and regular assessment of the auditors, the lacking threat of suspension or withdrawal of accreditation, and AIE competing for auditing services could lead to a race to the bottom undermining the overall quality of the auditing. These experiences should be taken into account in the reform of JI and in the design of any future mechanisms, by ensuring robust supervision of AIEs' performance and implementing and maintaining a system of sanctions for AIEs not performing their functions appropriately.

9. CONCLUSIONS AND RECOMMENDATIONS

JI has generated 872 million ERUs as of March 2015.[96] In principle, offsets are a zero-sum game for the atmosphere because the buyer can increase its own emissions by a corresponding amount above its target level while emissions are reduced by that amount in the host country. However, as explained in Section 3, whether global GHG emissions would be higher, lower, or the same in the absence of JI depends on two key factors: the environmental integrity of the JI projects, and whether the host countries have significant AAU surpluses. Global emissions will only increase if the JI project is non-additional or overcredited *and* the JI host country has a significant AAU surplus; see Table 7.

To safeguard environmental integrity, the Kyoto Protocol requires that emission reductions from JI projects should be "additional to any that would otherwise occur". Our evaluation of environmental integrity reveals serious shortcomings of JI as a crediting instrument. In a random sample of 60 projects, the additionality claims do not seem plausible for 73% of the ERUs issued and are questionable for another 12%. Of the six largest project types assessed in more detail, we can only identify one project type – N_2O abatement from nitric acid production – as having overall high environmental integrity. In addition, many JI projects use unrealistic assumptions which grossly overestimate the actual emission reductions. This holds true in particular for the largest project type under JI: the avoidance of uncontrolled fires at coal waste piles in Ukraine. Perverse incentives to increase GHG production are another important concern. Projects in Russia abating waste gases of HFC-23 and SF_6 removed safeguards to prevent perverse incentives and increased the waste gas generation well above levels observed historically.

The environmental integrity of JI projects not only depends on the project type but also on the host country, when and under which track the projects were registered, and how AIEs audited the project. Countries with significant AAU surpluses did not have the same incentives to ensure environmental integrity as countries without such surpluses. Our findings confirm that the environmental integrity of JI projects has been lower in countries with significant AAU surpluses. Projects registered in 2012 have on average lower integrity than projects registered earlier. As CP1 came to a close, some host countries with significant surplus – in particular Ukraine and Russia – retroactively registered many projects for which additionality is not plausible. We also observe that the environmental integrity was on average higher for the project portfolio registered under international oversight by the JISC (Track 2) than under the authority of the host country (Track 1). Finally, the environmental integrity of projects varied considerably among auditors.

Thus, the overall low environmental integrity of JI has significantly undermined efforts to mitigate climate change. Our analysis indicates that about three-quarters of ERUs did not represent plausibly additional emissions reductions, and about 95% of total ERUs issued were

[96] See: http://ji.unfccc.int/statistics/2015/ERU_Issuance_2015_03_31_1200.pdf [accessed 14 May 14 2015].

from countries with a significant AAU surplus. This suggests that the use of JI may have enabled global GHG emissions to be about 600 million tCO_2e higher than they would have otherwise been.

The implications for the EU ETS are particularly significant. As of April 2015, more than 560 ERUs[97] had been used in the EU ETS. JI may therefore have undermined the EU ETS emission reduction target by about 400 million tCO_2.

Below we draw lessons from the results of the study and offer some recommendations to improve the environmental integrity of crediting mechanisms. We begin by identifying general principles for existing and new market mechanism, then offer recommendations for reforming and improving JI – which are discussed in much greater detail in Annex 1. We end by discussing the implications of carbon markets under a post-2020 climate agreement.

9.1 Lessons learned for the design of crediting mechanisms

A key finding of our analysis is that crediting mechanisms need to be very carefully designed to ensure environmental integrity. In particular, our evaluation of the environmental integrity of JI offers the following insights:

- **Crediting mechanisms should adopt project cycle procedures which ensure full transparency and make all documentation publicly available.** Lack of transparency is an important concern in some JI host countries, where key project documentation, such as project design documents (PDDs), monitoring reports, determination and verification reports are not available or incomplete for a number of projects. To avoid this problem, crediting mechanisms need strict rules and enforcement to ensure timely and complete reporting. However, it is important to note that transparency, though crucial for ensuring environmental integrity, is not enough by itself. One host country, Ukraine, provided for a high degree of transparency but still issued mostly ERUs of low environmental integrity.
- **Only internationally accepted methodologies should be eligible for use:** Many projects applied their own, JI-specific, approaches for additionality demonstration and the calculation of emission reductions In many cases, these projects used inappropriate approaches, made unrealistic assumptions, or applied questionable values for key parameters, often leading to overcrediting and significantly higher emission reductions estimates than if, for example, CDM methodologies had been applied (e.g. in the case of associated gas flaring projects or HFC-23 projects). In addition, the findings confirm that perverse incentives arising from crediting mechanisms can have a significant impact on the way project participants operate their projects. Generic principles for baseline-setting, such as those provided by the JISC and referred to in a number of projects, were insufficient to prevent significant overcrediting. We therefore recommend that only internationally accepted methodologies that have undergone thorough review by experts and which were developed for specific and defined project types be used, and that any deviations from such methodologies, before or after registration, be assessed using appropriate regulatory oversight.
- **Auditors should be fully accountable for all their activities to the authority regulating the mechanism:** Our findings call into question the ability of and incentives

[97] Number based on data from EEA (2014), updated with information from European Commission (2015). Updated information on Exchange and International Credit Use in the EU ETS. Climate Action newsroom, 4 May. http://ec.europa.eu/clima/news/articles/news_2015050402_en.htm.

for AIEs to perform their auditing functions appropriately. AIEs often failed to identify obvious mistakes, inconsistences, questionable assumptions or claims, or changes to the project activity or monitoring plan. In many instances, determination and verification expert statements are very brief and do not specify how key requirements are assessed. Most host countries rely on AIEs accredited under Track 2 to perform determination and verification functions under Track 1, while their performance is only monitored and assessed by the JISC for functions performed under Track 2. For this reason, AIEs did not have to fear sanctions if they did not perform their functions appropriately under Track 1. We recommend that crediting mechanisms adopt accreditation systems which continuously monitor the performance of auditors and which apply sanctions in the case of non-performance, including the suspension or withdrawal of accreditation. Auditors should be fully accountable for all their activities to the authority regulating the mechanism. Merging the two tracks and the JI and CDM accreditation systems might further improve the oversight of the operations of AIEs.

- **Retroactive crediting should not be allowed:** Retroactive crediting of emission reductions has seriously undermined the integrity of JI. We recommend that current and future crediting mechanisms avoid any retroactive crediting and provide for procedures which ensure that projects must be approved or pre-approved (e.g. through a letter of endorsement) prior to the decision to proceeding with their implementation.
- **Investors should have reasonable certainty:** In several JI host countries, project developers faced considerable uncertainty as to whether their projects would ultimately be approved and ERUs issued. This uncertain environment may have favoured projects that did not rely on ERU revenues, thereby also negatively affecting the overall environmental integrity of the project portfolio. We recommend establishing a stable and predictable regulatory environment for crediting mechanisms.

9.2 Implications for the reform and future of JI

The ongoing review of the JI Guidelines offers an important opportunity to address serious shortcomings identified with regard to the environmental integrity of JI. The planned merger of the two tracks could potentially strengthen environmental integrity through more international oversight; see Annex 1 for recommendations on the draft rules as of January 2015.

However, key issues which could continue to strongly undermine the integrity of JI have yet to be addressed. For example, the current draft JI rules[98] allow existing projects to continue issuing ERUs under the new rules without having their additionality reassessed. The threat that existing projects with low environmental integrity would continue undermining mitigation outcomes is real and significant and should therefore be weighed strongly. JI projects only had certainty about ERUs up to the end of CP1. We therefore recommend that only existing projects that would stop operating without the incentives from JI should be able to continue receiving ERUs in CP2.

The draft JI rules furthermore propose different options for the length of crediting periods and their renewal. The issuance of ERUs is tied to the availability of AAUs from the same commitment period when the emission reductions occurred. It is unlikely that the Kyoto Protocol will be extended by a third commitment period, and JI may therefore not continue as a mechanism beyond 2020. Allowing for crediting periods that last beyond the end of 2020

[98] As of July 2015; see http://unfccc.int/documentation/documents/advanced_search/items/6911.php?priref=600008504 [accessed 7 July 2015].

could leave investors facing considerable uncertainty as to whether and how any reductions beyond 2020 could be credited. We therefore recommend that the new JI rules explicitly state that the crediting period ends at the end of CP2.

9.3 Implications for market mechanisms under the new climate agreement

Countries are negotiating a new climate agreement under the UNFCCC, to be approved at the Paris Climate Change Conference in December 2015 and become effective in 2021. As part of this process, each country is to submit its "intended nationally determined contribution" (INDC) under the agreement.[99] Countries have also started to discuss how carbon markets could be incorporated into this new climate agreement. As JI was implemented in countries with economy-wide mitigation targets, it can provide important lessons for market mechanisms under a new climate agreement, as well as for domestic mechanisms in countries with mitigation targets.

Our evaluation clearly shows that oversight of an international market mechanism by the host country alone is insufficient to ensure environmental integrity, in particular for countries with a significant AAU surplus which had no incentives to ensure environmental integrity. These findings have important implications for the international transfer of units from market mechanisms under a new climate regime. A new regime could create situations similar to those experienced with JI:

- **Unclear ambition of INDCs:** If INDCs are set above business-as-usual (BAU) emissions, host countries would not have incentives to ensure environmental integrity of units transferred internationally. A key challenge is that future (emission) developments are rather uncertain. An INDC which appears ambitious from today's perspective could turn out to be easily achievable due to unforeseen developments, such as an economic recession, new low-carbon fuels becoming available, or technological developments. Once countries have certainty that they will meet their INDCs, they could transfer units internationally that do not represent additional reductions, without any implications for meeting their INDCs. Uncertainty with regard to the ambition of INDCs could thus be a challenge for ensuring the environmental integrity of carbon mechanisms under a new climate agreement.
- **Absence of international accounting rules**: If countries with INDCs did not account for units transferred to other jurisdictions, they could sell credits without having to engage in additional mitigation action if these credits lack environmental integrity. An internationally agreed accounting approach is crucial to ensuring that international transfer of units does not lead to double counting of emission reductions and that host countries have incentives to ensure environmental integrity of units (Schneider et al. 2015).
- **INDCs not converted into multi-year emission targets**. If countries with single-year targets (e.g. a 20% reduction by 2025) did not convert their target into a multi-year emission target and were allowed to transfer units issued for other years than the target year, they would have no incentive to ensure the units' environmental integrity. Transferring units from or to countries with single-year targets raises also other accounting issues. Accounting of international transfer of units towards commitments should indeed only be possible if countries take on quantifiable, multi-year emission reduction targets.

[99] INDCs are being compiled on the UNFCCC website; see: http://unfccc.int/focus/indc_portal/items/8766.php [accessed 14 May 2015].

- **The reduction target may not be economy-wide.** Countries' INDCs may not cover all emissions across the economy, and some less-developed countries might not submit INDCs at all. If units were generated in sectors not covered by emissions caps, countries would not have incentives to ensure environmental integrity for such units being transferred internationally. This could, for example, occur if:
  - INDCs cover only part of their economy (e.g. an INDC for the power sector);
  - INDCs cover only some GHGs (e.g. an INDC targeting only CO_2 emissions);
  - INDCs are expressed as an non-GHG target (e.g. a renewable energy target); or
  - Countries pursue the crediting of early action taken prior to the start of the INDC under a new climate regime.

In summary, under a broad range of possible outcomes for a new climate regime, some countries may have insufficient incentives to ensure the environmental integrity of units transferred internationally. Countries will have such incentives only if they make ambitious, economy-wide, multi-year, multi-gas mitigation commitments and if international accounting rules for unit transfers are in place. Ensuring that INDCs are ambitious and converted into multi-year emission budgets, and agreeing on international accounting rules, is therefore critical to avoid that the experience with JI is repeated under a new climate regime.

We recommend that international oversight be put in place for any international transfer of units, with the view to ensuring that units represent emission reductions that are additional, not overcredited and permanent. We observed that the lack of international oversight affected the integrity of JI in various steps of the project cycle, including the quality of auditing services, use of inappropriate methodological approaches, project approval, post-registration changes, and monitoring of emission reductions. An important lesson from JI is therefore that international oversight should extend to all important elements of crediting mechanisms, from approving activities to issuing units.

While international oversight is important, we also note its limitations. Our findings reconfirm that ensuring environmental integrity of crediting mechanisms is difficult. Information asymmetry between project developers and auditors or regulators remains a major challenge that is difficult to address, even with international oversight. In this regard, international oversight can certainly reduce but may not eliminate the potential for excess issuance of credits. Furthermore, international oversight can only be effective if countries do not hamper the strengthening of a crediting mechanism's integrity. As recent reports on the CDM show, international oversight, as practiced to date, is not necessarily sufficient either (Spalding-Fecher et al. 2012; Lazarus et al. 2012). CDM and JI reform efforts under the UNFCCC have shown that often no consensus can be reached to address and rectify environmental integrity shortcomings.

A broader question is what the scope and role of crediting mechanisms might be in the longer term. The experience with JI shows that in countries with ambitious caps, the potential of a crediting mechanism may be quite limited. The EU, for example, had to limit the eligible project types considerably to avoid double counting and overlap with the EU ETS and other regulations. Effective rules that avoid double counting and ensure that projects comply with regulations or other climate policies may thus limit the potential for crediting.

More and more countries and jurisdictions are implementing climate policies, including ETSs, that cover broad segments of the economy. Given the reduced potential of crediting mechanisms in a world where most emissions are covered under other mitigation policies, and given the general challenges of ensuring environmental integrity for crediting mechanisms, the role of crediting mechanisms beyond 2020 may be rather limited.

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ANNEX 1: RECOMMENDATIONS FOR THE REVIEW OF THE JI GUIDELINES

The ongoing review of the JI Guidelines offers an important opportunity to address some of the shortcomings that have been identified in this study and elsewhere. Below we make recommendations for revising the JI Guidelines for CP2 and for the issuance of ERUs during the interim period. For a discussion of the lessons learned for carbon markets post 2021, see Section 10.

A1.1 State of the review of the JI Guidelines

Parties agreed to initiate the review of the JI Guidelines at the CMP at its sixth session in 2010 (decision 4/CMP.6, paragraph 15) (UNFCCC 2006b; UNFCCC 2011a). At the eighth CMP session in Doha in 2012, Parties agreed on a set of key attributes that should characterize the future operation of JI:

(a) A single unified track for joint implementation projects;

(b) Closely aligned or unified accreditation procedures between joint implementation and the clean development mechanism that take into account differences in the respective modalities and procedures of the two mechanisms;

(c) Clear and transparent information regarding all relevant public information required for joint implementation projects by stakeholders, accredited independent entities and host Parties in English on the UNFCCC website in accordance with decision 13/CMP.1;

(d) An appeals process under the authority of and accountable to the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol against decisions of the Joint Implementation Supervisory Committee;

(e) Clear, transparent and objective requirements to ensure that projects are additional to what would otherwise occur;

(f) Mandatory requirements for host Parties with respect to the approval of baselines, monitoring and reporting, including clear, transparent and objective requirements for the setting of standardized baselines by host Parties (UNFCCC 2013c)*;*

Parties also agreed to task the Subsidiary Body for Implementation (SBI) to prepare draft revised JI Guidelines. The draft negotiation text, called "Modalities and procedures for the implementation of Article 6 of the Kyoto Protocol Joint Implementation" (subsequently referred to as "draft JI rules"), has been discussed and updated at all subsequent UNFCCC meetings. Parties will continue their deliberations at SBI 42 in Bonn in June 2015.

Below, we start with a brief overview of the new project cycle under the proposed draft JI rules in order to show the differences between the current and the proposed project cycles. We then focus on some of the proposed changes in the draft JI rules and make recommendations that could help improve environmental integrity and transparency. All references in this section refer to the Appendix to draft CMP decision proposed by SBI Chair contained in FCCC/SBI/2014/L.34 (UNFCCC 2014e) if not indicated differently.

A1.2 Project cycle overview

The draft JI rules propose a new project cycle which combines elements of Track 1 and Track 2. According to the proposal, the JISC would set general rules and establish minimum requirements for the project cycle *"which ensure provisions in relation to the transparency of decision-making processes, local stakeholder consultation and rights for directly affected* *entities to hearings prior to decision-making, timely decisions and appeals of decisions."* (Paragraph 12)

Host Parties would implement these requirements in their national rules and establish national standards, procedures and guidelines. Host Parties would manage most steps of the project cycle including registering projects and issuing credits.

The project cycle provisions in the draft JI rules are similar to the current requirements, however there are several important modifications that reflect the single-track approach and changes in the governance structure. The main steps in the proposed new project cycle are presented in Table 25 (for comparison, see Table 4 with the project cycle under current JI Track 2 rules).

Table 25: Bodies involved in project procedure and functions per JI draft rules

Function / step in the project cycle	Responsible body
Accreditation of Independent Entities	JI Supervisory Committee
Validation of JI activity	Accredited Independent Entity
Registration of JI activity	Host Party
Review of JI activity (upon request)	JI Supervisory Committee
Verification of emission reductions	Accredited Independent Entity
Acceptance of verification	Host Party
Review of verification (upon request)	JI Supervisory Committee
Issuance of ERUs	Host Party

Table 26: Bodies involved in JI Track 2 project procedure and their functions

Function / step in the project cycle	Responsible body
Project endorsement (usually required)	Host Party's Designated Focal Point (DFP)
PDD determination	Accredited Independent Entity
Project approval	DFPs of host and investor Parties
Final Determination (registration)	JI Supervisory Committee
Verification of emission reductions	Accredited Independent Entity
Final verification	JI Supervisory Committee
Issuance of ERUs	Host Party

Project registration

A project developer has to submit an activity design document (previously – project design document) about the proposed JI activity, in order to demonstrate that the implementation of the proposed activity "*would result in real, measurable and additional reductions of anthropogenic emissions by sources or enhancements of anthropogenic removals by sinks and that these reductions would not have been implemented in the absence of the JI mechanism*" (Appendix, Paragraph 41).

The draft JI rules further stipulate procedures for the validation of a JI activity, which are equivalent to the current PDD determination under Track 2, including the publication of the JI activity design document for public comments for 30 days through the Secretariat; assessment by an AIE of the compliance of the activity with all relevant national and international requirements; and publication of the findings in a validation report.

The proposed project registration procedures resemble current Track 1 rules. Upon positive validation, the JI activity can be registered by the host Party, provided that the project is found to be in compliance with the new JI Modalities and Procedures, the standards established by the JISC, and national requirements. There is no longer any need for separate endorsement, approval and registration of the same project. The host Party decisions regarding registration of JI activities have to be made public through the UNFCCC Secretariat. Rejections have to be justified.

The draft JI rules stipulate that the JISC may request a review during the 30 days after registration by the host Party (under current Track 2 rules the period for requesting a review is 45 days). If the JISC does not request a review, the JI activity will be recorded by the Secretariat and issued a unique identifier.

MRV and issuance

The proposed monitoring procedures resemble those of Track 2. The monitoring report is prepared by the project participants and then submitted to an AIE, who makes it public through the Secretariat. Although made public, monitoring reports are not proposed to be open for public comments by stakeholders.

Similarly to Track 2, the AIE performs a verification of the emission reductions achieved by the project and publishes its verification report through the Secretariat. A new step is introduced in the draft JI rules after verification, by which the host Party has to consider and then accept or reject the verification report and communicate its decision to the JISC. After that, the JISC has 30 days to request a review (under current Track 2 rules the period for requesting a review is 15 days). If no review is requested, ERU issuance is deemed final by the JISC and communicated to the host Party. Subsequently, the host Party has to "expeditiously issue" ERUs equivalent to the emission reductions stated in the verification report, or fewer if a discount factor has been established by the host Party.

After this brief overview of the project cycle, we now assess the proposed JI rules in more detail.

A1.3 International oversight on host country implementation

How much international oversight a new single-track JI should require is a recurring theme that we discuss in several of the following sections. Our study indicates that countries with an ambitious mitigation target implemented procedures which largely ensured environmental integrity whereas countries with an ample AAU surplus did not prioritize environmental integrity. Since it is not yet clear if the Doha decisions on the surplus in CP1 and CP2 will be implemented effectively (Kollmuss 2013) – negotiations are still ongoing – we assume in our recommendations that some JI host countries may have a an AAU surplus at their disposition and that therefore international oversight is necessary to ensure the quality of ERUs.

The draft JI rules include the following bracketed paragraph that suggests that the JISC should be able to assess whether host countries comply with JI rules:

> *13 (e) [Assessing the conformity of [the implementation of JI by] [the [establishment and] implementation of the national regulatory framework for JI in] host Parties with these modalities and procedures and the minimum requirements and procedures referred to in paragraph [8 above] [31 below] through the initial assessments of implementation by Parties followed by regular assessments to monitor ongoing implementation;]*

Giving the JISC the option to intervene when a host country does not comply with the rules could be an important element to help ensure that JI's environmental integrity can be monitored and improved where necessary. Without the JISC being able to assess host country conformity, host countries may not have enough of an incentive to prioritize environmental integrity over maximizing credit issuance.

Moreover, the current draft does not specify any follow-up if the JISC identifies that a host country does not conform to international rules. If Annex B Parties to the KP fail to adequately quantify their emissions through GHG inventories or to track unit flows through registries, the compliance committee under the KP may suspend the country from the participation in international market mechanisms. The environmental consequences of not complying with JI rules can be similar or even worse than not complying with reporting requirements. We therefore argue that similar sanctions should apply and recommend that any non-compliance by host countries be brought to the attention of the KP compliance committee and that it be authorized to suspend in such cases the participation in international market mechanisms.

International oversight should also be provided in a number of other important ways, including requiring internationally agreed baselines and monitoring methodologies, the effective scrutiny of AIEs, and liability provisions for the excessive transfer of ERUs.

A1.4 Assessment of project and issuance review

The draft JI rules stipulate that the JISC will be able to request a review both at project registration and before ERU issuance:

> *48. Upon receipt of the notice of registration from the host Party, the Secretariat shall record the registered JI activity with a unique and publicly available identifier, unless the JISC requests a review according to its rules and procedures within 30 days.*
>
> *56. The JISC shall, 30 days after receipt of the notice of acceptance from the host Party, be deemed to have endorsed the issuance of ERUs on the basis of the verification of reductions in anthropogenic emissions by sources or enhancements of anthropogenic removals by sinks and inform the host Party accordingly, unless the JISC requests a review according to its rules and procedures.*

The draft JI rules do not specify how such review can be requested. The current JI Guidelines are more specific:[100]

> *35. The determination regarding a project design document shall be deemed final 45 days after the date on which the determination is made public, unless a Party involved in the project or three of the members of the Article 6 Supervisory Committee request a review by the Article 6 Supervisory Committee. If such a review is requested, the Article 6 Supervisory Committee shall finalize the review as soon as possible, but no later than six months or at the second meeting following the request for review. The Article 6 Supervisory Committee shall communicate its decision on the determination and the reasons for it to the project participants and the public. Its decision shall be final.* (UNFCCC 2006b)

[100] Under the CDM, also three Executive Board members have to request a review for a project.

The way the draft JI rules are currently written, they could be interpreted as requiring a decision by the whole JISC. It would therefore make sense to specify in the new JI rules that three or fewer members of the JISC have to request a review both at the stage of registration and of issuance.

Furthermore, the consequences of a review are still unclear. For example the draft rules do not clearly state whether the JISC could stop a project from being recorded by the Secretariat and receiving an ITL number. The draft JI rules do contain bracketed text that the JISC may be able to withhold issuance:

> *13 (f) Undertaking reviews of [randomly] selected JI activities as set out in paragraphs 48 and 56 below and, where appropriate, [[withholding] [declining to register and endorse] the process of issuance of ERUs];*

We recommend that endorsement by both the host country and the JISC be clearly required to register a project or to issue ERUs, as host countries with an AAU surplus have limited incentives to ensure environmental integrity and compliance with JI rules. Moreover, based on the experiences with HFC-23 projects for which methodological safeguards were abandoned after project registration (see Section 5), we recommend that the JISC also has the authority to endorse or reject post-registration changes.

A1.5 Accreditation of AIEs

The draft JI rules stipulate that the JISC continues to be responsible for accrediting independent entities as it is currently the case under Track 2. Furthermore, at the CMP in 2014 Parties adopted a decision in which they request the JISC and CDM Executive Board to consider unifying the accreditation systems of the JI and the CDM. (UNFCCC 2014b)

Our study revealed in some instances serious shortcomings in the performance of AIEs (see Sections 5 and 8). A unification of the CDM and JI accreditation systems may improve the oversight of the operations of AIEs. For instance, non-compliance of entities in JI (which was considered as a small market for them) may affect their larger operations in CDM. Using the CDM accreditation system, including its regular surveillance, systematic monitoring of DOE performance, and application of different sanctions in cases of non-performance, may be also helpful to ensure proper performance of AIEs in JI.

A1.6 Registration of existing projects under the new JI rules

The draft JI rules define how existing projects that intend to register under the new rules could do so. Track 1 projects could be registered *"where the project participants and the respective host Party agree to continue the project, subject to updating the baseline and monitoring plans of the project and meeting other requirements under the joint implementation modalities and procedures"*. Track 2 projects could be registered "*where the project participants and the respective host Parties agree to continue the project"* (Paragraphs 9 and 9bis).

Our analysis shows that about three-quarters of the ERUs issued come from projects with additionality claims that do not seem plausible, and that most of these projects are located in countries with a significant expected AAU surplus. If these projects could continue issuing ERUs in CP2, they would continue to undermine the environmental integrity of JI as a whole. This would especially be the case if Ukraine joins CP2. As Russia is not joining CP2, Russian projects will not be able to receive ERUs in CP2.

The proposed draft rules would not prevent these projects from continuing in CP2. First, the draft rules do not require reassessing their additionality claims. Second, they do not explicitly require that internationally approved methodologies, such as under the CDM, be used in the case of continued crediting. And third, the scope of updating seems rather limited, not necessarily addressing the issues identified in this study with regard to how emission reductions are calculated (see, for example, findings on coal waste pile projects in Section 5.1).

Unlike for Track 1 projects, the draft rules for Track 2 projects do not require that projects update their baseline and monitoring plans and meet other requirements under the new JI rules. We recommend that all existing projects should go through a thorough re-assessment. JI projects registered in CP1 only expected ERU issuance for CP1 and had no certainty about CP2. In many countries the crediting period was explicitly limited to CP1.[101] One could argue that protection from retroactivity does not go further than reasonable legal certainty for the project owner at the outset, i.e. not further than the end of the commitment period if the next commitment period is not yet ratified by the host country. The threat that existing projects with low environmental integrity would continue undermining mitigation outcomes is real and significant and should therefore be weighed strongly.

JI projects only had certainty about ERUs up to the end of CP1. We therefore recommend that only existing projects that would stop operating without the incentives from JI should be able to continue receiving ERUs in CP2.

A1.7 Crediting period

The current JI Guidelines do not stipulate the length of a crediting period. The draft rules state:

> *43. JI activity participants shall select a crediting period for the activity that shall not exceed [7] [10] years. The crediting period shall not start earlier than the submission of activity documentation to the [accredited independent entity] [secretariat] in accordance with paragraph [44 below] [46 below]. The crediting period may be renewed for periods of up to [7] [10] years, provided that, for each renewal, an accredited independent entity validates that the activity baseline is still accurate or has been updated taking new data into account, where applicable [, and that the activity is still additional, in accordance with the technical requirements referred to in paragraph 9 above]. [Once the current commitment period pursuant to Article 3 of the Kyoto Protocol has expired, the crediting period shall end, except if JI is continued on the basis of a decision to be adopted by the CMP.][JI activity participants shall select a crediting period for the activity. The crediting period shall not start before the submission of activity documentation to the secretariat in accordance with paragraph 45 below. The crediting period shall end at the latest upon expiry of the commitment period corresponding to the date of registration or crediting period renewal. The crediting period may be renewed for one commitment period, provided that, for the renewal, an accredited independent entity validates that the activity baseline is still accurate or has been updated taking new data into account, where applicable, and that the activity is still additional, in accordance with the technical requirements referred to in paragraph 9 above.]*

The draft JI rules propose an initial crediting period of either seven or 10 years with the possibility of renewal for periods of seven or 10 years. The text includes several bracketed options. The first does not have a limit on the number of times a project could renew its

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[101] In Germany the crediting period was explicitly limited to CP1. Many countries – including Bulgaria, Romania. Poland, and Ukraine – state in LoAs that they take the obligation/accept the issuance and transfer of ERUs generated within 2008–2012, with no reference to future periods.

crediting period. The second stipulates that the crediting period should end upon expiration of the current commitment period of the Kyoto Protocol, except if JI is continued explicitly by a CMP decision. The third option would allow renewal for one more crediting period.

The issuance of ERUs is tied to the availability of AAUs from the same commitment period when the emission reductions occurred. However, CP2 will end by 2020 and a third commitment period is very unlikely to follow. Thus allowing project participants to establish crediting periods beyond 2020 could attach intrinsic value to ERUs beyond the framework of the Kyoto Protocol. Because it is uncertain how and if JI will continue post-2020, allowing for crediting periods that last longer than the end of 2020 may not increase investor certainty and facilitate more long-term investments under JI, as investors would face considerable uncertainty whether and how any reductions beyond 2020 could be credited. We therefore recommend that the new JI rules explicitly state that the crediting period ends at the end of CP2.

The draft JI rules stipulate that the renewal of the crediting period would require revalidation of the baseline by an AIE. In brackets, the draft JI rules suggest that projects still would need to be additional. If Parties would decide to allow for a renewal of crediting periods, then a reassessment of additionality would be essential. But for the reasons outlined above, we recommend that crediting be limited to emission reductions achieved until the end of 2020, granting only a single crediting period up to the end of 2020. Since existing projects should go through a re-assessment if they want to register under the new JI rules, a renewal of the crediting period does not seem to be necessary. We therefore recommend not to allow for renewal of crediting periods.

Our study shows that the majority of ERUs were issued using retroactive crediting. The draft JI rules stipulate that the crediting period should not start before the submission of the activity documentation to an AIE or to the Secretariat. This means it will no longer be possible to claim ERUs for the period before project submission to an AIE. Restricting retroactive crediting is an important step to improve the environmental integrity of JI. But given that projects often face delays during the validation process we recommend the publication of an activity design document for public comments by an AIE through the Secretariat as the earliest possible starting point for the crediting period.

A1.8 Additionality requirements

As our study highlights, ensuring additionality of JI projects is especially important in host countries that have a significant AAU surplus. The draft JI rules stipulate that "minimum technical requirements" are to be set by the JISC:

> *8. The JISC shall also set minimum technical requirements for JI activities, utilizing UNFCCC-approved methodologies, such as under the clean development mechanism (CDM), after collaboration with host Parties, stakeholders and, as appropriate, the CDM Executive Board, that ensure the additionality of emission reductions and quality assurance, quality control and consistency of their measurement.*
>
> *9. The technical requirements referred to in paragraph 8 above shall provide criteria for the demonstration of additionality, through ensuring prior consideration of JI for proposed JI activities, the use of positive lists, performance benchmarks and financial return benchmarks, and the objective demonstration of barriers ensuring that positive lists are applied only in areas where there is low risk of non-additionality.*

The proposed language could enable the development of criteria for the demonstration of additionality which are more specific and transparent than the current ones.

The draft JI rules require ensuring prior consideration. Such a requirement may help improving environmental integrity. In our sample, more than 50% of the projects are unlikely to have considered JI in their decision to proceed with the implementation of the project (see Section 0 for details). Requiring prior consideration for JI projects could help ensure that such projects would no longer be approved.

We recommend implementing a procedure similar to that used in the CDM, where the project participants have to submit a notification about the proposed project to the CDM EB no later than six months after the project starts, otherwise the project cannot be registered under CDM. We suggest that in JI such notification is sent to the JISC and not to the national DFP to avoid possible manipulation with its date, and that the notification is published by the Secretariat to ensure the transparency.

A1.9 Baseline requirements

The technical requirements proposed to be established by the JISC should further define "objective criteria" for establishing baselines. Most baseline criteria that were included in the draft JI rules are based on the current JI rules with some clarifications and editorial changes. Other changes include explicit reference to programmatic or sectoral baselines, in addition to project-specific baselines.

The JISC is to develop criteria for establishing baselines ensuring that (*"baselines reasonably represent the anthropogenic emissions"* and *"take uncertainties into account and use conservative assumptions, inter alia, by using benchmarking concepts*" Paragraph 10). The rules further specify that the technical requirements *"ensure that the baseline is lower than the relevant current emission levels"*. This clarification may help to ensure conservativeness in setting baselines in some sectors. However, as pointed out above, we believe that an important step towards ensuring more robust baselines would be requiring internationally approved baseline and monitoring methodologies. Since considerable experience and a large number of methodologies have been developed under the CDM, the JISC should develop its technical requirements drawing upon existing experience and using existing CDM methodologies.

The draft JI rules contain many references to using more standardized approaches for baselines setting. If done well, standardized approaches could simplify the approval process of new projects without undermining environmental integrity. For example, financial return benchmarks could remove the subjectivity of project developers' assumptions regarding the threshold of project profitability.

But as relevant research has shown, standardization is no panacea. The experience with standardized baselines in the CDM, for example, has been mixed at best (Schneider et al. 2012; Hayashi and Michaelowa 2013; Hermwille and Arens 2013). The environmental integrity of standardized approaches depends on the details of the rules that define these and how they are applied and updated.

The draft rules state: *"Once national standardized or sectoral baselines have been approved, their use shall be mandatory for new projects. However, where existing project-specific (bottom-up) baselines are more ambitious than standardized baselines, bottom-up approaches shall continue to be applied"* (Paragraph 34). Making the use of standardized baselines mandatory for relevant new projects ensures that project developers cannot choose between different baselines in order to maximize credit generation. However, the draft JI rules do not specify whether the JISC, an AIE or a host Party would determine in what cases such a project-based baseline would be considered more ambitious.

Standardized baselines under the proposed draft JI rules are to be set by host Parties based on the technical requirements of the JISC. However, national Designated Focal Points may not have capacity to properly assess the environmental integrity of standardized baselines or, not have any incentives to ensure environmental integrity if the country has significant AAU surplus. The draft JI rules suggest in brackets (Paragraph 34): *[Standardized baselines shall be developed by host Parties based on internationally agreed methodologies. These shall be evaluated by an accredited independent entity and submitted to the JISC for its approval. The JISC shall develop criteria for the periodic update of standardized baselines.]* This text would provide additional quality control. Requiring internationally agreed baseline and monitoring methodologies, may at least to some extent ensure the use of conservative baselines and scenarios. Requiring the use of "UNFCCC-approved methodologies, such as under the CDM", as suggested in paragraph 10, could ensure that the extensive expertise for methodology development under the CDM is also used under JI. The review and updating of standardized baselines is important to ensure that no overcrediting occurs because the baselines are outdated.

A1.10 Features supporting environmental integrity: transparency, stakeholder consultations and appeals procedures

Virtually all steps in the new project cycle of the draft JI rules require that host countries communicate with the UNFCCC secretariat and that rules, documents and decisions are made public:

- The host Party decisions regarding registration of JI activities and issuance of ERUs have to be made public through the UNFCCC Secretariat and rejections have to be justified.
- All JI rules a country develops will have to be made public and be provided to the UNFCCC secretariat in English.
- All approved baselines, registered JI activities and activities under consideration will have to be made public through the UNFCCC Secretariat.

These requirements should notably improve transparency. Although transparency is an important component for ensuring environmental integrity, by itself it is not sufficient to ensure that JI projects have high environmental integrity (e.g. Ukraine; see Section 6.1).

Stakeholder involvement and appeals possibilities are other features that can strengthen environmental and social integrity. Local and global stakeholder consultations are a requirement under the CDM. Under JI Track 1, the rules depend on the host country but according to project developers are usually only treated as a formality. Under Track 2, consultations are expected to be held but there are no specific rules on how local stakeholders have to be consulted. Global stakeholder comments on the draft PDD can be submitted during determination under Track 2 and sometimes under Track 1.

The draft changes to the JI rules propose the inclusion of both a local and global stakeholder consultation and appeals procedures. Public comments can be made during the JI registration process but not during the verification process. Adding such a commenting period during the verification process may help identify instances where emission reductions have not been determined correctly due to e.g. post-registration changes in calculation approaches or changes in project implementation.

Furthermore, we recommend to set out key steps of the stakeholder consultation in the draft JI rules and to explicitly require that AIEs should verify the consideration of stakeholder comments, to ensure that the concerns that have been raised are sufficiently addressed. As the experience with the CDM has shown, without specific rules on how local stakeholder consultations have to be conducted and how the raised concerns have to be addressed, these consultations are often insufficient to enable local communities to provide input which then is sufficiently addressed.

Two appeals processes are proposed in the draft JI rules:

- A procedure for appealing decisions taken by the JISC to be determined by the CMP, under which any JISC decision can be appealed by "affected stakeholders"
- Host country *national procedures for appealing decisions, in accordance with national legislation, by the designated focal point regarding the registration of JI activities* (paragraph 31).

We recommend that appeals procedures should be established at both levels, given that decisions are taken at both levels according to the new project cycle. Affected stakeholders could then appeal to the institution that took the relevant decision against which the appeal is raised (e.g. rejection of a request for registration).

Overall, transparency, stakeholder consultations and appeals processes are important aspects that can help ensure the quality of a programme and the units that are issued.

A1.11 Atmospheric benefit

Achieving an atmospheric benefit means achieving additional emissions reductions that go beyond the sum of the reduction commitments countries have made (Erickson et al. 2014). The draft JI rules have several bracketed text suggestions that aim to achieve atmospheric benefit through cancellation of ERUs:

> *11 (b) [Option 1: [Allow for] [Ensure] net atmospheric benefits, inter alia, through the cancellation of ERUs [on a voluntary basis].] [Option 2: Ensure net atmospheric benefits, through an automatic [10] per cent share cancelled for the benefit of the environment.] [Option 3: Provide for [net atmospheric benefits], [inter alia,] through [reduced issuance of ERUs or] cancellation of ERUs [on a voluntary basis] and assist the host Party in achieving its QELRC for the purpose of meeting its commitment under Article 3 of the Kyoto Protocol through the reduced issuance of ERUs.] [Option 4: Include options for incorporating mitigation ambition going beyond the benefit of the host party, such as voluntary cancellation and discounting, and elaborate transparent criteria for the application and quantification of such increased mitigation ambition.]*

It is important to note that a net atmospheric benefit is only achieved under certain circumstances. An atmospheric benefit would be achieved if ERUs are issued and cancelled from either a) a country that <u>does not</u> have a significant AAU surplus, or b) from a project that has environmental integrity and that is located in a country that <u>does have</u> significant AAU surplus. In contrast, if the host country has a significant AAU surplus and ERUs are cancelled from JI projects that lack environmental integrity, no atmospheric benefit is achieved. Inventory visibility also affects the impacts of discounting; see Section 3 for a more detailed discussion.

Option 3 would not lead to a net atmospheric benefit: if a host country reduces the number of ERUs it issues (e.g. France applies a 10% discount to all JI project issuance) the discount assists the host Party in achieving its Kyoto mitigation target. Such host county benefits may be valuable for countries with limited resources to achieve their own targets but they do not provide a net atmospheric benefit beyond the Kyoto mitigation targets.

Cancelling of ERUs may improve the overall integrity of JI to some extent. However, in our assessment, other aspects are far more important to increase overall environmental integrity of JI projects, such as limiting the continued crediting of existing JI projects or ensuring appropriate oversight by the JISC on project registration and issuance. The final rules should clarify if they aim at achieving a net atmospheric benefit or support host countries in achieving their own target.

A1.12 Issuance of ERUs during the interim period

Under current rules, ERUs have to be converted from AAUs from the same commitment period. They can therefore only be issued by countries that have a ratified reduction commitment under the Kyoto Protocol and have established their Assigned Amount – the number of allowances equivalent to the emissions budget for the applicable commitment period (UNFCCC 2006b). The period between the start of CP2 and a country establishing its initial assigned amount is referred to as the “interim period”. During the interim period it is not possible to issue ERUs for emissions reductions achieved after 2012. CP2 Parties are unlikely to have their CP2 AAUs issued before 2016.

Parties agreed in Doha to consider possible changes to the rules that would allow for the issuance of ERUs during the interim period and requested that the Subsidiary Body for Implementation (SBI) address how ERUs could be issued during the interim period. The issue was further discussed at all following UNFCCC meetings and has not been resolved yet.

If the environmental integrity of JI projects could be ensured, then early issuance may not pose a threat to the environmental integrity of the mechanism. But our research has shown that a significant number of the existing JI projects are likely not additional and/or have inflated baselines. Therefore allowing the issuance of ERUs before CP2 AAUs may further undermine the integrity of the mechanism, in particular if this would occur without a re-assessment of these projects.

Allowing the issuance of CP2 ERUs only once Parties have received their CP2 AAUs would mirror the procedure during CP1 where it was only possible to issue ERUs once countries had their CP1 AAUs. It would mean that no ERU issuance for emission reductions that occurred after 2012 is possible until probably 2016, when countries are expected to have issued their CP2 AAUs.

Parties have also not agreed whether there should be a special rule for Belarus, Kazakhstan, Malta and Cyprus, which were not in the first Kyoto commitment period but are planning to participate in CP2 so that they would be able to issue ERUs before they have their CP2 AAUs. The current rules state that a country may buy but not issue ERUs until it has its CP2 AAUs.

Given the current status of the carbon market, namely the oversupply of credits and low prices, the need to expedite the issuance of ERUs in the 2nd commitment period seems limited. Available credits from CDM and JI CP1 are sufficient to satisfy the current demand. At the same time, the review of JI is not yet completed and the environmental integrity of JI is not secured, so such a step could further diminish trust in the mechanism.

ANNEX 2: LIST OF RANDOM SAMPLE OF 60 JI PROJECTS

UNEP Risoe ID	UNFCCC Ref. or ITL ID	Project title
JI0157	34	Benaiciai Wind Power Project
JI0178	64	Nitrous Oxide Emission Reduction Project at GP Nitric Acid Aggregate in AB Achema Fertiliser Plant
JI0193	79	CMM utilisation on the Joint Stock Company named Komsomolets Donbassa Coal Mine of DTEK (Donbasskaya Toplivnaya Energeticheskaya Kompanya)
JI0369	194	Usage of alternative raw materials at Kryvyi Rih Cement, Ukraine
JI0385	198	Reconstruction of Units 1,2,3 and 4 at Zuyevska Thermal Power Plant
JI0100	BG1000158	Bulgarian Small Hydro Power Plant (SHPP) Portfolio
JI0516	BG1000187	Bulgarian Energy Efficiency and renewable Energy portfolio project
JI0413	CZ1000110	MAEN Portfolio CZ – Nemcice
JI0572	CZ1000234	BTG Biomass Energy Portfolio CZ – Trhove Sviny
JI0582	CZ1000244	AVE CZ – Fedrpus
JI0585	CZ1000247	MAEN Portfolio CZ – Pisek
JI0211	DE1000017	Redundant thermal decomposition of residual nitrous oxide (N2O) from the LANXESS adipic acid production in Krefeld-Uerdingen
JIPoA0005.1	DE1000082	Active Climate Protection – CO2 Bonus natural gas – JPA 1
JI0507	DE1000182	YARA Rostock N2O abatement project at plant 2.01
JIPoA0013.1	DE1000469	JPA1 R1.1 (defined by route Gingen/Brenz to Hamburg/Norderstedt)
JI0368	EE1000069	Paide Bioenergy Project
JI0483	ES1000162	Fertiberia Sagunto abatement project in Spain
JI0272	HU1000007	Biomass Retrofit at Bakonyi Power Plant
JI0436	HU1000129	Geothermal methane gas utilization
JI0528	HU1000196	Climate protection by efficient manure management and biogas
JI0968	In progress	Lvivoblenergo PJSC Power Distribution System Modernization
JI0945	In progress	Implementation of Energy Saving Measures at PJSC Khartsyzsk Pipe Plant
JI0938	In progress	Dismantling of Waste Heap #3 at "Kurahivska" Mine
JI0923	In progress	Reduction of Methane Leaks on the Gas Equipment of the Gas Distribution Points and on the Gas Armature, Flanged, Threaded Joints of the Gas Distribution Pipelines of PJSC Donetskmiskgaz
JI0266	NZ1000004	Tararua Wind Farm Stage III
JI0371	PL1000071	Landfill gas extraction and utilisation in Konin
JI0289	PL1000199	Zaklady Azotowe Kedzierzyn Nitrous Oxide Abatement Project
JI0955	PL1000534	Joint Implementation Track One Project of 32MW Sniatowo
JI0299	RO1000021	Timisoara Combined Heat and Power Rehabilitation for CET Sud Location
JI0449	RO1000132	Boiler Efficiency Improvement at Holboca CET Iasi II
JI0789	RO1000486	Chemgas Nitrous Oxide Abatement Project
JI0571	RU1000233	Biomass wastes to energy at OJSC Ilim Group Branch in the town of Bratsk
JI0576	RU1000238	Reconstruction of the steelmaking at JSC Ashinskiy Metallurgical Works, Asha, Russian Federation
JI0692	RU1000304	Yuzhno Balyksky associated gas recovery project
JI0445	RU1000333	Energy efficiency interventions at OJSC Mordovcement Komsomolskiy town, Republic of Mordovia
JI0565	RU1000340	Installation of three gas turbine SGT-800 type at GTES "Kolomenskoe", Moscow, Russian Federation

UNEP Risoe ID	UNFCCC Ref. or ITL ID	Project title
JI0478	RU1000349	Production modernisation at JSC Amurmetal, Komsomolsk-on-Amur, Khabarovsk Krai
JI0758	RU1000355	Reduction of PFC emissions at RUSAL Sayanogorsk aluminium smelter
JI0841	RU1000431	Construction of gas piston power plants for utilization of associated petroleum gas at oilfields developed by OJSC “Surgutneftegas” in Khanty-Mansiysk Autonomous Okrug
JI0888	RU1000488	Increase in efficiency of heating supply system of Novo-Lenino district, the Irkutsk city, Irkutsk region, Russian Federation
JI0437	UA1000130	Installation of a New Waste Heat Recovery System in Alchevsk Coke Plant
JI0442	UA1000131	District Heating System Rehabilitation in Rivne Region
JI0506	UA1000181	Implementation of Arc Furnace Steelmaking Plant “Electrostal” at Kurakhovo, Donetsk Region
JI0530	UA1000198	Rehabilitation and technical re-equipment of Starobeshivska thermal power plant of the OJSC “Donbasenergo”
JI0189	UA1000258	Energy Efficiency Investment Program at OJSC ArcelorMittal Steel Kryviy Rih
JI0640	UA1000286	Landfill Methane Capture and Utilisation at Mariupol Landfills, Ukraine
JI0655	UA1000298	Reduction of Methane Emissions on the Gas Equipment of Gas Distribution Plants, Gas Armature, Flanged and Threaded Connections of Gas Distribution Networks of PJSC “Vinnitsagaz
JI0708	UA1000321	Reduction of Process Losses in Power Lines Vinnytsyaoblenergo PJSC
JI0783	UA1000380	Dismantling of Waste Heap at Former Enrichment Plant “Mikitivska”
JI0800	UA1000392	Waste Heap Dismantling in the Rebrykove Town of Luhansk Region of Ukraine with the Aim of Reducing Greenhouse Gases Emissions into the Atmosphere
JI0813	UA1000404	Implementation of the Energy Efficiency Measures and Reduction of Greenhouse Gas Emissions into the Atmosphere at SS “Coal mine named after F.E. Dzerzhynskyi”, SE “DZERZHINSKUGOL”
JI0823	UA1000416	Implementation of the Energy Efficiency Measures and Reduction of Greenhouse Gas Emissions into the Atmosphere at State Enterprise “Artemugol”
JI0828	UA1000422	Power Distribution System Modernization of PJSC “AES Kyivoblenergo”
JI0850	UA1000442	Reduction of Greenhouse Gas Emissions by Application of No-till Technology at LLC “Vishva Ananda” Farmlands
JI0880	UA1000478	Reduction of Greenhouse Gases Emissions by Gasification of Volyn Region
JI0895	UA1000490	Implementation of Technological Modernization of Installations with the Aim of the Introduction of Sugar Production Organic Waste Management System for the Sugar Factories Participating in the Joint Activities
JI0924	UA1000511	Development and Improvement of Water Supply Systems, Drainage System and Wastewater Treatment of CE “Dniprovodokanal”
JI0943	UA1000515	Waste coal processing in Luhansk region of Ukraine with the Aim of Reducing Greenhouse Gases Emissions into the Atmosphere
JI0658	UA1000518	Waste Heap Dismantling in Luhansk Region of Ukraine by PE “SNABTEHMONTAZH” with the Aim of Reduction Greenhouse Gases Emissions to Atmosphere
JI0908	UA1000521	Waste Heap Dismantling Near Settlement Zorynsk in Perevalsk District of Luhansk Region of Ukraine with the Aim of Reducing Greenhouse Gases Emissions into the Atmosphere

SEI - Headquarters
Stockholm
Sweden
Tel: +46 8 30 80 44
Executive Director: Johan L. Kuylenstierna
info@sei-international.org

Visitors and packages:
Linnégatan 87D
115 23 Stockholm, Sweden
Letters:
Box 24218
104 51 Stockholm, Sweden

SEI - Africa
World Agroforestry Centre
United Nations Avenue, Gigiri
P.O. Box 30677
Nairobi 00100
Kenya
Tel: +254 20 722 4886
Centre Director: Stacey Noel
info-Africa@sei-international.org

SEI - Asia
15th Floor
Witthyakit Building
254 Chulalongkorn University
Chulalongkorn Soi 64
Phyathai Road, Pathumwan
Bangkok 10330
Thailand
Tel: +(66) 2 251 4415
Centre Director: Eric Kemp-Benedict
info-Asia@sei-international.org

SEI - Oxford
Florence House
29 Grove Street
Summertown
Oxford, OX2 7JT
UK
Tel: +44 1865 42 6316
Centre Director: Ruth Butterfield
info-Oxford@sei-international.org

SEI - Stockholm
Linnégatan 87D, 115 23 Stockholm
(See HQ, above, for mailing address)
Sweden
Tel: +46 8 30 80 44
Centre Director: Jakob Granit
info-Stockholm@sei-international.org

SEI - Tallinn
Lai str 34
10133 Tallinn
Estonia
Tel: +372 627 6100
Centre Director: Tea Nõmmann
info-Tallinn@sei-international.org

SEI - U.S.
Main Office
11 Curtis Avenue
Somerville, MA 02144
USA
Tel: +1 617 627 3786
Centre Director: Charles Heaps
info-US@sei-international.org

Davis Office
400 F Street
Davis, CA 95616
USA
Tel: +1 530 753 3035

Seattle Office
1402 Third Avenue, Suite 900
Seattle, WA 98101
USA
Tel: +1 206 547 4000

SEI - York
University of York
Heslington
York, YO10 5DD
UK
Tel: +44 1904 32 2897
Centre Director: Lisa Emberson
info-York@sei-international.org

Stockholm Environment Institute

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