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## Will joint implementation survive international emissions trading? Distinguishing the Kyoto mechanisms

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Fondazione Eni Enrico Mattei

**Will Joint Implementation Survive  
International Emissions Trading?  
Distinguishing the Kyoto  
Mechanisms**

Josef Janssen

**NOTA DI LAVORO 60.2000**

# **Will Joint Implementation Survive International Emissions Trading? Distinguishing the Kyoto Mechanisms**

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## **Summary**

The Kyoto Protocol stipulates that industrialised countries and countries with economies in transition, i.e. the group of Annex I countries, shall reduce their overall emissions of carbon dioxide and other five greenhouse gases by at least 5 % as compared to their 1990 emission levels. This should be achieved by the first commitment period 2008 – 2012. In order to meet these targets cost-effectively, at an international level the Kyoto Protocol allows the use of the market-based Kyoto Mechanisms Joint Implementation, Clean Development Mechanism and International Emissions Trading.

What strikes at first glance is that the Kyoto Protocol provides for two forms of international mitigation activities among Annex I countries, i.e. Joint Implementation and International Emissions Trading. Against this background, this paper analyses how Joint Implementation and International Emissions Trading might be distinguished and how they relate to each other. Based on this discussion, the paper explores moreover how the Clean Development Mechanism could be interpreted from an economic perspective. A clear understanding of distinctions of and interrelations between the Kyoto Mechanisms is important for both further research, and implementation and design efforts in practice.

## **Keywords**

Kyoto Mechanisms, Joint Implementation, Clean Development Mechanism, emission trading, climate protection, international environmental agreements, international investments, international trade

## **JEL Classification**

F10, F20, K33, Q25, Q40

## **Non-Technical Summary**

The Kyoto Protocol stipulates that industrialised countries and countries with economies in transition – the group of so-called Annex I countries – shall reduce their overall emissions of carbon dioxide and other five greenhouse gases by at least 5 % as compared to their 1990 emission levels. This should be achieved by the first commitment period 2008 – 2012. In order to meet these targets cost-effectively, at an international level the Kyoto Protocol allows the use of the market-based Kyoto Mechanisms Joint Implementation, Clean Development Mechanism and International Emissions Trading. Essentially, the Kyoto Mechanisms enable Annex I countries and respective greenhouse gas emitting companies to meet part of their reduction commitments by financing emission reductions abroad, where reduction cost might be lower.

What strikes at first glance is that the Kyoto Protocol provides for two forms of international mitigation activities among Annex I countries, i.e. Joint Implementation and International Emissions Trading. In the pre-Kyoto regime, Joint Implementation has predominantly been regarded as a first step towards International Emissions Trading. Against this background, the interesting question arises how Joint Implementation and International Emissions Trading might be distinguished and how they relate to each other.

The objective of this paper is to examine possible distinctions and interrelations between the Kyoto Mechanisms from economic perspectives. A clear understanding of those distinctions and interrelations is important for both further research, and implementation and design efforts in practice.

The paper is organised as follows: The second section introduces the Kyoto Mechanisms as formulated in the Kyoto Protocol. The third section explores how distinctions and interrelations between Joint Implementation and International Emissions Trading have been perceived in the pre-Kyoto regime. The fourth section analyses distinctions between Joint Implementation and International Emissions Trading in the post-Kyoto regime on the basis of different criteria. They include the following: Private sector versus government participation, baseline-and-credit versus cap-and-trade trading, international trade versus international production of emission permits. The fifth section aims at relating the discussion of previous sections to the Clean Development Mechanism.

The last section tries to assign different transaction types identifiable on the basis of the discussed criteria to the different Kyoto Mechanisms.

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## 1. INTRODUCTION

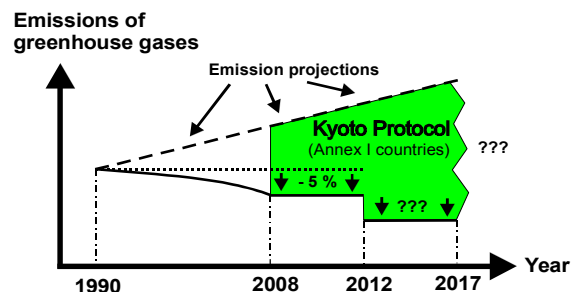
The Kyoto Protocol stipulates that industrialised countries and countries with economies in transition – the group of so-called Annex I countries – shall reduce their overall emissions of carbon dioxide and other five greenhouse gases (GHG) by at least 5 % as compared to their 1990 emission levels.<sup>1</sup> This should be achieved by the first commitment period 2008 – 2012. Developing countries, i.e. non-Annex I countries, have not assumed any legally binding limitation or reduction commitments. For the different Annex I countries the Kyoto Protocol, in conjunction with the “EU burden-sharing agreement” of June 1998, applies differentiated targets (see table 1). Since the projected business-as-usual GHG emissions of Annex I countries as a group are increasing, the effective reduction effort required for meeting the Kyoto targets will be much higher than 5 % (see figure 1).

**Table 1: Kyoto Targets of Annex-I Countries (Industrialised and Transitional Countries)**

Australia	+ 8	Liechtenstein	- 8
Austria	- 13	Lithuania	- 8
Belgium	- 7,5	Luxembourg	- 28
Bulgaria	- 8	Monaco	- 8
Canada	- 6	Netherlands	- 6
Croatia	- 5	New Zealand	0
Czech Republic	- 8	Norway	+ 1
Denmark	- 21	Poland	- 6
Estonia	- 8	Portugal	+ 27
EU	- 8	Romania	- 8
Finland	0	Russian Federation	0
France	0	Slovakia	- 8
Germany	- 21	Slovenia	- 8
Greece	+ 25	Spain	+ 15
Hungary	- 6	Sweden	+ 4
Iceland	+ 10	Switzerland	- 8
Ireland	+ 13	Ukraine	0
Italy	- 6,5	UK	- 12,5
Japan	- 6	USA	- 7
Latvia	- 8		

In order to meet these targets cost-effectively, the Kyoto Protocol allows the use of the market-based Kyoto Mechanisms at an international level. Essentially, the Kyoto Mechanisms enable Annex I countries and respective GHG emitting companies to meet part of their reduction commitments by financing GHG emission

**Figure 1: Kyoto Protocol**



<sup>1</sup> A general overview of the Kyoto Protocol is Grubb, Vrolijk and Brack (1999).



reductions abroad, where reduction cost might be lower.<sup>2</sup> The Kyoto Mechanisms refer to the following three international forms of climate change mitigation:

- ◆ Joint Implementation (JI) between Annex I countries.
- ◆ Clean Development Mechanism (CDM) between Annex I countries and non-Annex I countries.
- ◆ International Emissions Trading (IET), between Annex I countries.

What strikes at first glance is that the Kyoto Protocol provides for two forms of international mitigation activities among Annex I countries, i.e. JI and IET.<sup>3</sup> In the pre-Kyoto regime, JI has predominantly been regarded as a first step towards IET. Against this background, the interesting question arises how JI and IET might be distinguished and how they relate to each other. Is one of them redundant, or are they complements? If both have a *raison d'être*, then why is it sufficient to have only one instrument for international mitigation activities between non-Annex I and Annex I countries?

The objective of this paper is to examine possible distinctions and interrelations between the Kyoto Mechanisms from economic perspectives. A clear understanding of those distinctions and interrelations is important for both further research, and implementation and design efforts in practice: Economic research on the Kyoto Mechanisms needs to be based on sound economic interpretation of the Kyoto Mechanisms in order to generate meaningful and relevant results. To design efficient rules, guidelines and institutions for the Kyoto Mechanisms, policy makers should have a clear understanding of the activities and transactions that are to be governed by such institutions. In order to respond efficiently and effectively to the Kyoto challenges, companies intending to operate in the emerging global market for GHG reductions need to know how different international transactions relate to the three Kyoto Mechanisms.<sup>4</sup>

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<sup>2</sup> Several economic studies indicate that there are huge international differentials in abatement costs, see e.g. Weyant (ed.) (1999).

<sup>3</sup> To be precise, Article 17 on IET refers to countries of *Annex B* of the Kyoto Protocol instead of *Annex I* countries listed in the Framework Convention on Climate Change. However, the country list of Annex B is almost identical to the list of Annex I, except for Belarus and Turkey which are not listed in Annex B but in Annex I.

<sup>4</sup> Possible response strategies of financial institutions to the Kyoto challenge are explored in Hugenschmidt and Janssen (1999a) or (1999b) and Hugenschmidt, Janssen, Kermode and Schumacher (1999). Janssen

The paper is organised as follows: The next section introduces the Kyoto Mechanisms as formulated in the Kyoto Protocol. The third section explores how distinctions and interrelations between JI and IET have been perceived in the pre-Kyoto regime. The fourth section analyses distinctions between JI and IET in the post-Kyoto regime on the basis of different criteria. The fifth section aims at relating the discussion of previous sections to the CDM. The last section provides an outlook.

## **2. KYOTO MECHANISMS IN THE KYOTO PROTOCOL**

The Kyoto Mechanisms encompass JI, CDM and IET.

*JI* is described by Article 6 in conjunction with Paragraphs 10 and 11 of Article 3. Article 6.1 states that “for the purpose of meeting its commitments under Article 3, any Party included in Annex I may transfer to, or acquire from, any other such Party emission reduction units resulting from projects aimed at reducing anthropogenic emissions by sources or enhancing anthropogenic removals by sinks of greenhouse gases in any sector of the economy ...”. In addition, Paragraphs 10 and 11 of Article 3 provide that “any emission reduction units ... which a Party acquires from another Party in accordance with the provisions of Article 6 ... shall be added to the assigned amount for the acquiring Party” and “any emission reduction units ... which a Party transfers to another Party in accordance with the provisions of Article 6 ... shall be subtracted from the assigned amount for the transferring Party”.<sup>5</sup>

*CDM* is described by Article 12 in conjunction with Paragraph 12 of Article 3. Article 12.3(b) states that “Parties included in Annex I may use ... certified emission reductions accruing from such project activities to contribute to compliance with part of their quantified emission limitation and reduction commitments under Article 3 ...”. In addition, Paragraph 12 of Article 3 provides that “any certified emission reductions which a Party acquires from another Party in accordance with the provisions of Article 12 shall be added to the assigned amount for the acquiring Party”.

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(1999) analyses how companies operating in the oil & gas industry could take advantage of the Kyoto Mechanisms.

<sup>5</sup> Assigned amount is the total quantity of GHG emissions that a Party is allowed to emit during the first commitment period 2008 - 2012.

*IET* is enabled by Article 17 in conjunction with Paragraphs 10 and 11 of Article 3. Article 17 states that “Parties included in Annex B may participate in emissions trading for the purposes of fulfilling their commitments under Article 3”. In addition, Paragraphs 10 and 11 of Article 3 provide that “any part of an assigned amount, which a Party acquires from another Party in accordance with the provisions ... of Article 17 shall be added to the assigned amount for the acquiring Party” and “any part of an assigned amount, which a Party transfers to another Party in accordance with the provisions ... of Article 17 shall be subtracted from the assigned amount for the transferring Party”.

An important question is how these wordings could be interpreted from economic perspectives. To put the discussion in a more comprehensive perspective, the next section summarises perceptions on (the precursors of) the Kyoto Mechanisms which prevailed in the pre-Kyoto regime.

### **3. PRE-KYOTO JOINT IMPLEMENTATION AS A FIRST STEP TOWARDS INTERNATIONAL EMISSIONS TRADING**

Prior to the adoption of the Kyoto Protocol, there has been some experience with international forms of GHG abatement activities. These activities predominantly have been carried out under the provisions of the United Nations Framework Convention on Climate Change (UNFCCC). Under the UNFCCC, industrialised countries listed in its Annex I are obliged to adopt national policies and take corresponding measures to limit greenhouse gas emissions and to protect and enhance GHG sinks and reservoirs. Article 4.2(a) provides that Annex I countries “may implement such policies and measures *jointly* with other Parties”.<sup>6</sup> Article 4.2(d) stipulates that the Conference of the Parties, which had its first meeting in Berlin in April 1995, was to take decisions on “criteria for *joint implementation*”.<sup>7</sup> Consequently, international forms of GHG abatement activities carried out under the UNFCCC have been called *Joint Implementation*.

In Berlin, after a contentious debate over criteria for *JI* the Conference of the Parties reached an enabling compromise for a pilot phase of *JI* without any explicit

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<sup>6</sup> Italics added by the author.

<sup>7</sup> Italics added by the author.

crediting of emission reductions to the donor country. This JI pilot phase has been called “Activities Implemented Jointly” (AIJ) and is still continuing.<sup>8</sup>

Before coining the concepts of JI or AIJ, international forms of GHG abatement had still another name, i.e. (external) *offsets*. The idea of (external) offsets is that “a given actor (which could be a firm, industry, region or country) has an initial target, but is allowed to *offset* this by investing in measures to reduce emissions by an equivalent amount elsewhere”.<sup>9</sup> One main distinction and disadvantage of a tradable permit system as compared to (external) offsets is that the former involves defining an overall target for emissions for all participants, whereas offsets merely require the buyer to have a target.<sup>10</sup>

Offsets may be regarded as precursors of JI, whereas the name JI evolved into AIJ. Common to all three pre-Kyoto concepts is that they had frequently been portrayed as a first step towards an international regime of tradable GHG permits.<sup>11</sup> JI “serves the very important purpose of launching the process and providing opportunities for the various supporting administrative institutions to learn by doing as they mature in their assigned roles”.<sup>12</sup> A “full-blown international market [for GHG emission permits] will have to develop gradually over a period of time as an evolutionary process, starting with offsets”.<sup>13</sup> Offsets “could act as a natural stepping stone towards more comprehensive forms of international control, notably a system of tradable emission entitlements”.<sup>14</sup>

Against these views prevailing in the pre-Kyoto phase, it is rather confusing that the post-Kyoto phase is characterised by the co-existence of JI and IET, at least as far as the formal provisions of the Kyoto Protocol are concerned. Hence the important question arises, if JI in the Kyoto Protocol is a redundant instrument whose practical relevance will disappear as IET develops and becomes operational? Or are there any important economic and institutional reasons for a permanent and long-term factual co-existence of both instruments? In order to shed some light on these questions, the next section will explore possible distinctions between JI and IET.

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<sup>8</sup> On AIJ, see e.g. Schwarze (2000).

<sup>9</sup> See Grubb (1992), p. 18. In contrast to external offsets, internal offsets are carried out within the territory of participating countries, but are not formally part of the main controlled emissions [Grubb (1992), p. 18]. In this distinction, JI would resemble external offsets.

<sup>10</sup> Roland (1992).

<sup>11</sup> Such a perception is expressed e.g. by Bohm (1994a) and (1994b), Collamer and Rose (1998), Grubb (1992), Rentz (1996), Roland (1992), Tietenberg (1994), Tietenberg and Victor (1994).

<sup>12</sup> Tietenberg and Victor (1994), pp. 9-10.

<sup>13</sup> Roland (1992), p. 23. Text in brackets added by the author.

<sup>14</sup> Grubb (1992), p. 19.

#### **4. DISTINGUISHING BETWEEN JI AND IET IN THE POST-KYOTO REGIME**

This section examines possible distinctions between JI and IET. In the relevant literature, three main criteria have been advanced:

- ◆ Private sector versus government participation.
- ◆ Baseline-and-credit versus cap-and-trade system.
- ◆ International production versus international trade.

##### **4.1 JI versus IET: Private Sector versus Government Participation**

Sometimes it is argued that IET only allows international emissions trading among *governments*. If private entities, i.e. GHG emitting companies, wish to trade GHG reductions internationally, they would need to use JI.<sup>15</sup> According to this view, the main criterion for distinguishing IET and JI refers to participants: Regarding IET, only governments are allowed to participate, whereas JI is also available for private entities.

This perceptions originate from the language of the respective Articles of the Kyoto Protocol: Article 6.3 on JI explicitly states that “a Party included in Annex I may authorize *legal entities* to participate ... in actions leading to the generation, transfer or acquisition under this Article of emission reduction units”.<sup>16</sup> Article 17, which refers to IET, does not mention explicitly any private-sector involvement. Instead, it only states that “Parties included in Annex B may participate in emissions trading ...”.

Several arguments might be advanced against the perception that Article 17 only enables government-to-government trading: First of all, it is rather unusual that international public law, as is the Kyoto Protocol, explicitly refer to private-sector entities. Hence, the language of Article 6, referring to legal entities, is rather unusual or abnormal. The non-reference to private entities of Article 17 is instead the normal case in

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<sup>15</sup> Jepma (1998).

<sup>16</sup> Italics added by the author.

international public law. And secondly, important political proposals of Annex I governments, documented in two *non-papers*, explicitly mention the desirability of private-sector participation in IET.<sup>17</sup>

Concluding, it does not appear to be appropriate to distinguish between JI and IET by a criterion of allowed participation.

#### **4.2 JI versus IET: Baseline-and-Credit Trading versus Cap-and-Permit Trading**

Generally, in the literature on emissions trading systems, a distinction is drawn between *cap-and-trade* systems and *baseline-and-credits* systems.<sup>18</sup> In both schemes, the generic term for the unit of trade is an emissions *permit*.<sup>19</sup>

A cap-and-trade system starts by defining an aggregate, legally binding emission limit for a group of polluters, i.e. countries or companies, for a given period (see figure 2). This limit is the *cap*. The emissions authorised by this cap are then allocated to eligible participants of the trading system.<sup>20</sup> In a cap-and-trade system, the allowed emissions are termed emission *allowances*.<sup>21</sup> In principle, all allowances can be traded. The most prominent example of a successful cap-and-trade system is the US SO<sub>2</sub> trading system.<sup>22</sup>

Under a baseline-and-credit system, the reference scenario for determining the amount of tradable emission permits is a *baseline*. Baselines need to be determined for each individual project, since a baseline-and-credit system is not comprehensive by its nature. As caps, the baseline could be an absolute level of emissions, which is fixed, decreasing or increasing over time. However, baselines may also be emission limits where the total emission level is not completely fixed, nor legally binding. For example, the baseline could be CO<sub>2</sub> per capita, CO<sub>2</sub> per GDP, or some future projection of emissions.<sup>23</sup>

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<sup>17</sup> Canada (1998) and United Kingdom (1998).

<sup>18</sup> OECD (1997), pp. 49-50, or Tietenberg et al. (1999), p. 5.

<sup>19</sup> Sorrell and Skea (1999), p. 2.

<sup>20</sup> See e.g. OECD (1997), Sorrell and Skea (1999) or Tietenberg et al. (1999). An annual cap is commonly referred to as an emissions quota, while a cap covering a period of several years is termed an emission budget. Quota is also used to refer to the annual emission limit for an individual source [Sorrell and Skea (1999), p. 2]. In the Kyoto Protocol, the 5-year emission budget is termed *assigned amount*.

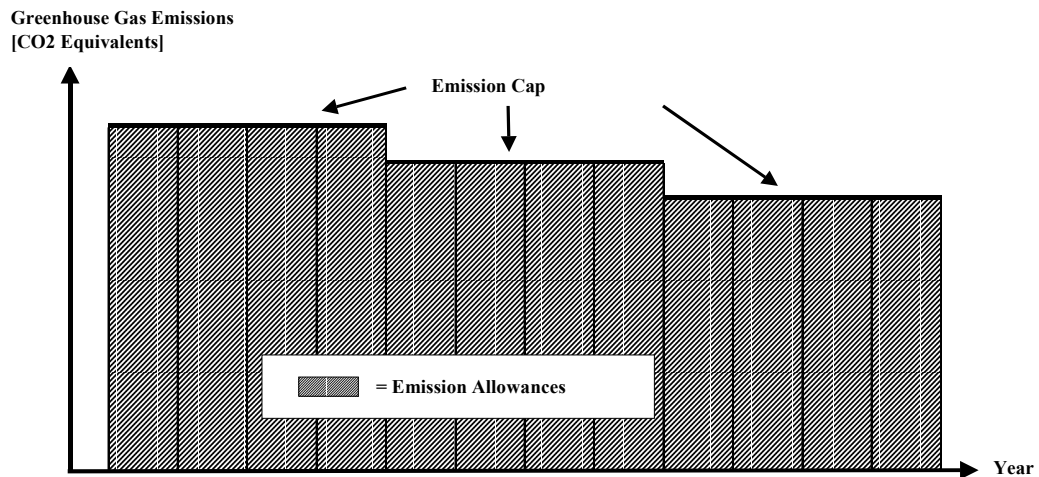
<sup>21</sup> Sorrell and Skea (1999).

<sup>22</sup> See e.g. Schmalensee et al. (1998) or Stavins (1998) for a discussion.

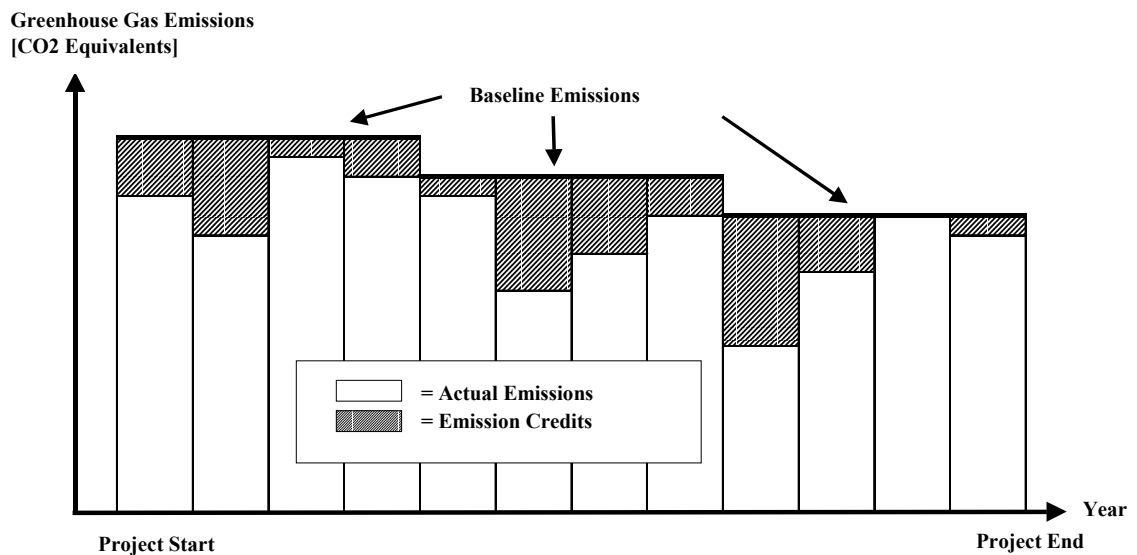
<sup>23</sup> OECD (1997), p. 50.

Any emission reductions below this baseline are referred to as emission *credits* (see figure 3).<sup>24</sup> Only those emission credits can be traded.

**Figure 2: Cap-and-trade System**



**Figure 3: Baseline-and-credit System**



The emissions baseline in a credit scheme can be identical to the emissions cap in an allowance scheme. However, the two schemes have different implications regarding the

<sup>24</sup> Sorrell and Skea (1999).

timing and extent of regulatory involvement: Cap-and-trade schemes, which are comprehensive by their nature, require an extensive regulatory involvement and hence effort at the beginning to set it up. In contrast, credit schemes require less initial design and inception effort, but baselines need to be determined on an individual basis and individual trades must be certified by the regulator.<sup>25</sup> A credit system depends on a project-by-project analysis, whereas an allowance system depends on an inventory analysis of the regulated entities.<sup>26</sup>

The main features of cap-and-trade versus baseline-and-credit systems are summarised in table 2:

<b>Table 2: Baseline-and-credit versus Cap-and-trade Schemes: Main Features</b>	
<b>Baseline-and-credit scheme</b>	<b>Cap-and-trade scheme</b>
Emission credit	Emission allowance
Applies to emission reductions below defined baseline	Applies to all emissions
Only emission reductions can be traded	All emissions can be traded
Credits are generated when a source reduces its emissions below an agreed baseline	Allowances are allocated by the regulatory authority
May develop incrementally as a means of introducing flexibility into existing regulatory structure	Trading must be built into the regulatory structure from the beginning
Participation in the credit market is voluntary – sources can just meet existing standards	Participation in the program is mandatory – the overall emission cap still applies even if sources do not trade

*Source: Sorrell and Skea (1999), p. 11, table 1.2.*

<sup>25</sup> Sorrell and Skea (1999), p. 11.

<sup>26</sup> See e.g. Ridley (1998).



Both approaches have their advantages and disadvantages, and there is considerable dispute about which system is more efficient and hence more desirable.<sup>27</sup> What is more important in the present context is how JI and IET relate to these two systems. Indeed, some authors argue that IET constitute a form of an international cap-and-trade system, while JI can be regarded as international baseline-and-credit trading.<sup>28</sup>

Analysing the wording of Article 6 on JI, such an interpretation suggests itself: Article 6.1(b) states “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*”.<sup>29</sup> In this wording, the emissions that would otherwise occur may be regarded as baseline emissions (see figure 2). In the post-Kyoto discussion, the question of how to determine additional emission reductions generated by JI projects has been termed *additionality issue* which encompasses the *baseline issue*.

Several approaches for baseline determination of JI projects are presently discussed in the political and academic debate.<sup>30</sup> The Buenos Aires Action Plan, as agreed at the 4<sup>th</sup> Conference of the Parties to the UNFCCC in November 1998, requires the recommendation of related guidelines by the 6<sup>th</sup> Conference of the Parties taking place in The Hague in November, 2000.

Regarding IET as cap-and-trade system and JI as baseline-and-credit system, the following questions arise: Does the Kyoto Protocol provide for two competing instruments and leaves it up to the future to prove the superiority of one system or the other? Which system will be more successful and generally accepted? May we expect a corner solution in the sense that IET will replace JI?

At present, the parallel implementation of both systems, cap-and-trade and baseline-and-credit, is being considered in some countries, e.g. in the United Kingdom.<sup>31</sup> Under the auspices of the Confederation of British Industry and the Advisory Committee on Business and the Environment, a group of some 30 companies and institutions, called *Emissions Trading Group*, has developed a proposal for a UK emissions trading scheme. This scheme would comprise three categories of participants:

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<sup>27</sup> A brief discussion of advantages and disadvantages is provided e.g. by Ridley (1998), pp. 43-54. Tietenberg et al. (1999), p. 31, argue that “allowance trading programmes have proven superior to credit trading systems in terms of both economic and environmental results”.

<sup>28</sup> Hahn and Stavins (1999), pp. 4-5, or Emissions Trading Group (1999), p. 24.

<sup>29</sup> Italics added by the author.

<sup>30</sup> See Ellis (1999), Ellis and Bosi (1999), OECD (1999a) and (1999b).

- ◆ Participants in the *absolute* sector: Companies in the absolute sector would receive tradable permits that matched an annual emissions limit agreed with the government. These permits would be expressed in tonnes of CO2 equivalents. Firms in the absolute sector would have an obligation to demonstrate with independent verification that they had sufficient permits to cover the actual level of emissions produced each year.
- ◆ Participants in the *unit* sector: Firms which had agreed to an output related target under the climate change levy initiative of the government. This climate change levy had been announced by the government in March 1999. In reaction to it, several industry groups have negotiated a rebate on the levy in exchange for energy efficiency improvements. In many cases these targets are expressed as cuts in energy per unit of output rather than absolute reductions in energy. Consequently, these negotiated agreements imply only relative CO2 emission reduction targets, whereas participants in the absolute sector commit to absolute CO2 emission reduction targets. Firms in the unit sector would not receive permits directly but would have the right to trade permits subject to certain limitations. Purchased permits could be used by these firms to assist them in meeting their targets.
- ◆ Participants in the *project* sector: GHG saving projects would be allowed to generate credits which could be used to meet targets or which could be sold into the market.

Participants in the unit sector would be allowed to *purchase* permits from participants in the absolute or project sector. To ensure that output growth in the unit sector does not prevent the UK as a whole from achieving real emission reductions, a gateway mechanism would restrict net permit *sales* from the unit sector to the absolute sector. International trades under the Kyoto Mechanisms would be recognised in the scheme once the governing rules had been agreed.

Trading within the absolute sector clearly shows features of a cap-and-trade system. Trading within the unit sector would constitute baseline-and-credit trading, whereby negotiated agreements with relative targets are the baseline. Hence, this proposed

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<sup>31</sup> The following description is based on Emissions Trading Group (1999). See also Cooper (1999).

UK trading scheme tries to implement a cap-and-trade system alongside a baseline-and-credit scheme. On the basis of the criteria advanced in this section, international sales out of the unit or project sector would qualify as JI, whereas international sales out of the absolute sector would constitute IET.

Coming back to the questions raised before, one could argue that the UK experiment will show if both JI and IET can co-exist in the longer term. Indeed, conventional wisdom and economic analysis suggest that the more efficient trading institution will replace the less efficient institution which involves higher transaction costs.<sup>32</sup>

That does not imply, however, that we will globally obtain a corner solution in the sense that IET will completely replace JI, et vice versa. It is conceivable that for certain countries JI is the more efficient trading institution whereas for other countries transactions under IET are more efficient. Indeed, it is sometimes argued that the countries in transition do not have the (financial) resources required to set up a comprehensive cap-and-trade system.<sup>33</sup> Hence, it could be more efficient for them to participate in international emissions trading under JI. Other countries which value the costs associated with setting-up a comprehensive cap-and-trade system differently could find it more desirable to opt for this trading institution.

Moreover, one has to distinguish between different GHG and different sources. It could be true that IET is more efficient in the context of CO<sub>2</sub> emissions from the power sector. Regarding other GHG and sources, like methane emissions from agriculture or CO<sub>2</sub> emissions from industrial processes, transactions under JI might be associated with less transaction costs.<sup>34</sup>

Concluding, JI might be interpreted as baseline-and-credit trading system, whereas IET could be regarded as representing a cap-and-trade system. If one accepts this distinction, it is interesting to ask which trading institution will be more efficient, thus replacing the less efficient one. Generally, it might be expected that JI will be more viable for certain countries, GHG and sources, whereas IET is more attractive for other countries, GHG and sources.

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<sup>32</sup> Considerations of institutional economics indicate that institutions like trading rules change over time in order to facilitate market development and reduce transaction costs. For an early discussion of this argument see Davis and North (1971).

<sup>33</sup> See e.g. Jepma (1999).

### 4.3 JI versus IET: International Investments versus International Trade

It is frequently argued that JI involve *international* (equity) investments: Grubb, Vrolijk and Brack, e.g., states that “JI enables emission savings ... arising from *cross-border investments* between Annex I parties to be transferred between them”.<sup>35</sup> And “the two project-level mechanisms JI and CDM are intended to use *international* corporate *investment* as an engine for the generation and transfer of emission credits”.<sup>36</sup> From this perspective, another distinction that might be drawn between JI and IET is that the former represents *international production* of emission permits involving international investments whereas the latter constitute *international trade* in emission permits. And it is important to note that *production* and *trade* are two fundamentally different economic activities.

From an economic perspective, emission reductions may be interpreted as intermediate inputs required by regulated industries and companies for producing final goods. Regulated companies could produce this intermediate input in-house or buy it from another producer. Both activities, in-house production and purchase from another producer, could be performed domestically or internationally. Consequently, the company has four basic options. The choice between them represent a classical *make-or-buy decision* and will rest on the comparative costs of the four alternatives which comprise production and transaction costs.

Table 3 summarises the different options available for a GHG emitting company to obtain the intermediate input *emission reductions*:

<b>Table 3: Make-or-buy Options for GHG Abatement</b>		
	<i>Domestically</i>	<i>Internationally</i>
<i>In-house production</i>	Domestic abatement	JI
<i>Purchase from another firm</i>	Domestic emissions trading	IET

<sup>34</sup> Feess and Stocker (1998) advance this general argument.

<sup>35</sup> Grubb, Vrolijk and Brack (1999), p. 131. Italics added by the author.

<sup>36</sup> Grubb, Vrolijk and Brack (1999), p. 195. Italics added by the author. See also Bayer and Cansier (1999), p. 264, Dutschke and Michaelowa (1998), p. 8, Jepma (1999) or Missfeldt (1998), p. 136.

The decision to produce abroad via JI the emission reductions required would imply some kind of backward vertical integration. The emission reductions would be transferred internally to the company. Hence, transactions of emission reductions between the JI project host and the JI project sponsor would figure as intra-firm trade.<sup>37</sup>

Accepting this interpretation of JI versus IET, the following important question arises: Why are capital transfers and emission reduction transactions carried out within the firm under centralised direction instead of being mediated through markets? Ronald Coase first posed this fundamental question in general terms. According to Coase there are costs involved in carrying out transactions, and these transaction costs differ depending on both the nature of the transaction and on the way that it is organised. Moreover, the efficiency principle suggests that the tendency is to adopt the organisational structure that is associated with minimum transaction costs. Thus, transactions tend to occur in the market when doing so is most efficient, and they are carried out within some more formal organisation when doing so minimises transaction costs.

This general idea has been adopted in international economics to explain internationalisation of production as compared to international product trade through markets. According to the *internalisation approach* a company will internalise international market transactions through international production if this organisational form involves lower transaction costs.<sup>38</sup>

Generally, the various dimensions of transactions will determine their organisational structure, i.e. hierarchies versus markets. In this context, it is useful to distinguish the following dimensions:<sup>39</sup>

- ◆ Specificity of the investments required to conduct the transaction.
- ◆ Frequency with which similar transactions occur and the duration or period of time over which they are repeated.
- ◆ Complexity of the transaction and the uncertainty about what performances will be required.
- ◆ Difficulty of measuring performance in the transaction.

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<sup>37</sup> On international vertical integration and intra-firm trade see e.g. Casson (1986) or Caves (1996).

<sup>38</sup> For a survey of this internalisation theory see Casson (1990).

<sup>39</sup> Milgrom and Roberts (1992), p. 30.

- ◆ Connectedness of the transaction to other transactions involving other people.

Generally it may be expected, that the lower the degree of these transaction dimensions are, the more efficient are transactions mediated through markets. On the contrary, the higher the degree of these transaction dimensions, the more efficient are transactions co-ordinated internally. In the present context this implies, e.g., that the higher the specificity of GHG abatements are, the higher is the probability that related international transactions are performed through international production, i.e. JI, as opposed to international inter-firm trade, i.e. IET.<sup>40</sup>

Against this background, it is a promising research area to analyse if GHG emission reductions of *different abatement project types* will be rather just purchased through IET or produced internationally via JI. In other words, will international transactions of GHG emission reductions resulting from *different abatement project types* be carried out internally on the basis of international production, i.e. JI, or through external markets, i.e. IET.

Related to this research topic, it might also be very interesting to explore the probable degree of internal co-ordination.<sup>41</sup> Besides foreign direct investments a company could choose other, less hierarchical forms of internal co-ordination. These so-called *new forms of investment* include sub-contracting, licensing, consulting and know how contracts, production sharing contracts, management contracts, contractual joint ventures and equity joint ventures.<sup>42</sup>

In conclusion, it could be plausible to interpret JI as a form of *international production* of emission permits associated with subsequent *internal international transfer*, as opposed to pure *international trade* in emission permits *through markets* which would constitute IET.

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<sup>40</sup> For a comprehensive discussion of transaction costs associated with JI see Dudek and Wiener (1996).

<sup>41</sup> Rentz (1995) provides some preliminary discussion in this regard.

<sup>42</sup> See e.g. Hennart (1989).

## 5. CDM: INTERNATIONAL INVESTMENTS VERSUS INTERNATIONAL CREDIT TRADING

After having discussed some possible distinctions between JI and IET, it suggests itself to ask how the previous discussion relates to CDM, another of the three Kyoto Mechanisms. As argued before, there are two main criteria on the basis of which one could distinguish JI and IET: International credit versus international allowance trading and international production versus international trade of emission permits. Applying these criteria to CDM, it is interesting to explore if CDM constitute international credit trading, international allowance trading, or international production of emission permits?

Analysing the wording of Article 12 on CDM, it appears more appropriate to interpret CDM as a form of credits trading as opposed to allowance trading: Article 12.5(c) require that “reductions in emissions ... are *additional to any that would occur in the absence of the certified project activity*”.<sup>43</sup> In this wording, the emissions that would *occur in the absence of the certified project activity* may be regarded as baseline emissions (see figure 3).

Concerning the criteria international production versus international trade, it is frequently said that CDM projects involve *international investments*, thus constituting *international production* of emission permits.<sup>44</sup> On the other hand, it is also argued that CDM projects formally would not necessarily require any foreign investments. Instead, “a host country could already finance projects on its own and sell credits earned. Article 12 would not prevent this”.<sup>45</sup> Such a financing (and trading) model is recently referred to as *unilateral model*.<sup>46</sup> Under the unilateral model “the developing country would ... itself be acting as the main project *investor* and would attain the benefits as well as absorb the associated project risks”.<sup>47</sup> In such a unilateral model there would be no foreign equity capital involvement as opposed to the bilateral model which is characterised by international investments by entities from Annex I countries. The unilateral model

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<sup>43</sup> Italics added by the author.

<sup>44</sup> See e.g. Grubb, Vrolijk and Brack (1999), p. 195, or Hahn and Stavins (1999), p. 5.

<sup>45</sup> Tietenberg et al. (1999), p. 49.

<sup>46</sup> Stewart et al. (1999).

<sup>47</sup> Stewart et al. (1999), p. 28.

approach has already been applied in Costa Rica that has sold some emission credits generated through forestry projects financed without foreign equity capital investments.<sup>48</sup>

The unilateral model clearly represent international emissions trading, a non-Annex I country selling emission permits or credits to Annex I countries. It is, however, questionable if such a unilateral model would be compatible with the provisions of the Kyoto Protocol: International emissions trading is governed by Article 17 on IET. Article 17 explicitly states that “Parties included in Annex B may participate in emissions trading for the purposes of fulfilling their commitments under Article 3”. Non-Annex I countries are not member of the group of Annex B countries. Consequently, they could not participate in international emissions trading which is, however, governed by Article 17. In addition, Article 3.11 makes it very clear that Article 17 is not applicable to non-Annex I countries: “Any ... part of an assigned amount, which a Party transfers to another Party in accordance with the provisions ... of Article 17 shall be subtracted from the *assigned amount* of the transferring Party”.<sup>49</sup> By definition, non-Annex I countries do not have any *assigned amount*.

One could advance the counter-argument that Article 17 covers international *allowance* trading among private entities in Annex B countries.<sup>50</sup> Consequently, the unilateral model would be interpreted as international *credit* trading between non-Annex I and Annex I countries, which would be exclusively governed by Article 12.

On the international political agenda, this issue has attracted some attention in recent month. And future negotiations need to determine if Article 12 on the CDM allows application of the unilateral model, or if CDM requires involvement of equity capital from Annex I countries.

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<sup>48</sup> The emissions trading model of Costa Rica is described by Sonneborn (1999).

<sup>49</sup> Italics added by the author.

<sup>50</sup> This is implicitly argued by Hahn and Stavins (1999), pp. 4-5.



## **6. OUTLOOK: WHICH TYPE OF KYOTO MECHANISM FOR INTERNATIONAL TRANSACTIONS IN GHG EMISSION REDUCTIONS?**

Convincing distinctions between the Kyoto Mechanisms JI, CDM and IET may be drawn on basis of the criteria *cap-and-trade* versus *baseline-and-credit* systems and *international trade* versus *international production* involving international investments.

Applying the first set of criteria, it seems that JI and CDM would represent some form of *baseline-and-credit* system. In addition, they could involve *international investments*. However, it is not clear if JI and CDM projects *necessarily* involve international investments, or if international investments in abatement projects would necessarily be carried out under the JI or CDM framework. Since international transactions of GHG reductions in a baseline-and-credit system seem to be governed by JI and CDM, it follows that Article 17 on IET would only apply to international transactions in a *cap-and-trade* system. Otherwise, either Article 6 on JI or Article 17 on IET would be redundant due to institutional arbitrage by market participants.

Concluding, international transactions related to abatement activities could be classified on the basis of the following different criteria:

- 1) Transferring entity is from (A) Annex I country or (B) non-Annex I country.
- 2) Acquiring entity is from (A) Annex I country or (B) non-Annex I country.
- 3) Transferring entity has (A) a baseline or (B) a cap.
- 4) Production of emission permits involves (A) no international investments or (B) international investments.
- 5) Acquiring entity uses the emission permits for (A) compliance with domestic regulations or (B) sale on international markets, whereby it has (BI) a cap or (BII) no cap.

As is shown by table 4, one could identify 48 different types of international transactions on the basis of these criteria.

**Table 4: Types of International Greenhouse Gas Transactions**

Transaction number:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
<b>Transaction features:</b>																								
<b>Transferring entity is from</b>																								
Annex I country	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Non-Annex I country																								
<b>Acquiring entity is from</b>																								
Annex I country	X	X	X	X	X	X	X	X	X	X	X	X												
Non-Annex I country													X	X	X	X	X	X	X	X	X	X	X	X
<b>Transferring entity has a</b>																								
Baseline	X	X	X	X	X	X							X	X	X	X	X	X						
Cap							X	X	X	X	X	X							X	X	X	X	X	X
<b>Production of emission permits involves</b>																								
No international investments	X	X	X				X	X	X				X	X	X				X	X	X			
International investments				X	X	X				X	X	X				X	X	X				X	X	X
<b>Acquiring entity uses the emission permits for</b>																								
Compliance with domestic regulations	X			X			X			X			X			X			X			X		
Sale on international markets, whereby it has		X	X		X	X		X	X		X			X	X		X	X		X	X		X	X
<i>a cap</i>		X			X			X			X			X			X			X			X	
<i>a baseline</i>			X			X			X			X			X			X			X			X
<b>Institutional Framework</b>	JI	JI	JI	JI	JI	JI	IET	IET	IET	IET	IET	IET	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
		+	+		+	+		+	+		+	+												
		IET	JI		IET	JI		IET	JI		IET	JI												

n.a. = not allowed

**Table 4 (continued): Types of International Greenhouse Gas Transactions**

Transaction number:	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
<b>Transaction features:</b>																								
<b>Transferring entity is from</b>																								
Annex I country	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Non-Annex I country																								
<b>Acquiring entity is from</b>																								
Annex I country	X	X	X	X	X	X	X	X	X	X	X	X												
Non-Annex I country													X	X	X	X	X	X	X	X	X	X	X	X
<b>Transferring entity has a</b>																								
Baseline	X	X	X	X	X	X							X	X	X	X	X	X						
Cap							X	X	X	X	X	X							X	X	X	X	X	X
<b>Production of emission permits involves</b>																								
No international investments	X	X	X				X	X	X				X	X	X				X	X	X			
International investments				X	X	X				X	X	X				X	X	X				X	X	X
<b>Acquiring entity uses the emission permits for</b>																								
Compliance with domestic regulations	X			X			X			X			X			X			X			X		
Sale on international markets, whereby it has		X	X		X	X		X	X		X			X	X		X	X		X	X		X	X
<i>a cap</i>		X			X			X			X			X			X			X			X	
<i>a baseline</i>			X			X			X			X			X			X			X			X
<b>Institutional Framework</b>	CDM u.m.	CDM u.m. + IET	CDM u.m. + JI	CDM b.m.	CDM b.m. + IET	CDM b.m. + JI	n.a. (?)	n.a. (?)	n.a. (?)	n.a. (?)	n.a. (?)	n.a. (?)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

u.m. = unilateral model; b.m. = bilateral model; n.a. = not allowed

And the main questions which deserve further examination and agreement are the following:

- ◆ Would the provisions of the Kyoto Protocol allow all the different transaction types? E.g., would transaction types 25-27 and 31-33, i.e. the unilateral model, be allowed?
- ◆ Would the different transaction types qualify as JI, CDM or IET?
- ◆ Would an international transaction that involves more than two countries be regulated by just one Kyoto Mechanism, or by a combination of them (e.g. JI plus IET, CDM plus IET, CDM plus JI, JI plus IET in the case of transaction types 2, 3, 5, 6, 8, 9, 11, 12, 14, 15, 17, 18, 20, 21, 23, 24, 26, 27, 29, 30, 32, 33, 35, 36, 38, 39, 41, 42, 44, 45, 47, 48)?

In table 3 it has been tried to assign the different transaction types to the three Kyoto Mechanisms. It should be noted, however, that so far these questions have rarely been discussed and explored in a systematic way. However, in order to design regulatory frameworks for JI, CDM and IET efficiently, policy makers need to have an idea of the nature of underlying transactions. The same is true for economic research on the Kyoto Mechanisms: In order to analyse, e.g. the implications of JI, CDM and IET for technology innovation and diffusion, one would obviously need to have a clear understanding about the economic characteristics of these concepts.

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