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Joint implementation

A promising mechanism for all countries?

Rolf Selrod, Lasse Ringius and Asbjørn Torvanger

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Joint Implementation - a promising mechanism for all countries?[1]

by

Rolf Selrod, Lasse Ringius and Asbjørn Torvanger

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ABSTRACT

The United Nations Framework Convention on Climate Change establishes no legal commitments for any of the Parties to reach specific targets of reduced greenhouse gas emissions. Although the Convention emphasizes the importance of immediate action by the industrialized countries, it is also weak with respect to incentives for the industrialized countries to take the lead in fighting global warming.

The way in which costs and benefits are distributed between countries is essential for mobilizing collective action. For many political and economic reasons, the best international policies are those that are cost-effective and are perceived as fair.

This paper focuses on attractive implementation measures, in particular the mechanism of Joint Implementation established under the Climate Convention. Before it is concluded whether Joint Implementation is an useful and promising mechanism, it is necessary to understand the motives behind it, the opportunities for common benefits, as well as the need for equitable rules and regulations. Accordingly, this paper analyses a number of cost and benefit issues with regard to this mechanism, in a situation in which the Annex II countries have legally binding commitments, a situation which might become true in a near future.

It is concluded that Joint Implementation under certain circumstances is an effective and attractive instrument for reducing global greenhouse gas emissions. Joint Implementation may also create an opportunity to assist a large number of countries in becoming more energy-efficient and in promoting a sustainable development. However, it is essential that potential problems concerning proper selection of Joint Implementation projects, uncertain abatement effect and consideration of strategic behavior and incentive problems be addressed in an efficient manner. To that end incentive correcting contracts, and adequate monitoring and verification capabilities, must be developed.

CHAPTER 1: DEVELOPMENT OF THE CLIMATE CONVENTION AND THE CONCEPT OF JOINT IMPLEMENTATION

1.1 THE THREAT OF GLOBAL WARMING

In 1992, the Intergovernmental Panel on Climate Change (IPCC) concluded that greenhouse gases (GHGs) are accumulating in the atmosphere due to human activities. The IPCC also concluded that the global mean surface air temperature has increased by 0.3 to 0.6° C over the last century.[2] Many expect that a global temperature rise will take place due to the observed on-going increase in the levels of GHG emissions.

The United Nations Framework Convention on Climate Change (FCCC) was signed by more than 150 countries assembled at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in June 1992. The FCCC entered into force in March 1994. As of 9 January 1995, 119 of the 191 countries in the world had ratified the Convention.[3] The FCCC establishes a global legal and institutional framework for how the Parties to the Convention shall act to reduce net emissions of GHGs [4]. Under the FCCC, Annex I countries have agreed to adopt national policies and measures to mitigate climate change, and have recognized the importance of establishing a goal of returning anthropogenic GHG emissions to 1990 levels by the year 2000.[5] However, the FCCC presently establishes no legally binding commitments to reduce GHG emissions. Until reduction targets are legally binding in terms of quantities and time framework, the FCCC's role in curbing GHG emissions will be speculative and the incentives for emissions reductions will continue to be weak and insufficient.

Unless strong counteractive measures are introduced the expected emissions in the coming decades will quickly outgrow the political commitments made by the Annex I countries to stabilize their GHG emissions. The expected global growth of carbon dioxide emissions - 21.6 billion tons in 1990, 25.1 billion tons in 2000, and 32 billion tons in 2010 - makes the present commitments under the FCCC seem highly inadequate.[6] The main obstacle to a solution to global warming is that the problem 'is a result of normal, not aberrant, human behavior involving uncountable, independent decisions in daily life by individuals, by industry, and by governments

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[2] J.T. Houghton, B.A. Callander, and S.K. Varney, eds., (IPCC), *Climate Change: The Supplementary Report to the IPCC Scientific Assessment* (Cambridge, Britain: Cambridge University Press, 1992).

[3] Climate Change Secretariat 1995, (internet: gopher://unep.unep.no:70/00/unep/convent/climate/cc).

[4] Net emissions of GHG are defined as gros emissions subtracted carbon sequestration, primarily in tree biomass.

[5] Annex I countries include 24 OECD countries except Mexico as well as 12 countries from Central and Eastern Europe with 'economies in transition'.

[5] IEA, *World Energy Outlook* (Paris, 1994)

all over the globe'.[7] Solving the climate change problem will necessitate significant changes in future energy consumption, as well as changes in the consumption behavior in many affluent societies. It furthermore presents an unprecedented challenge to cooperation between industrialized and developing countries.

Table 1.1 World CO_2 emissions by Region under Different Scenarios (billion tons and percentages of change)

Group of countries	Bill. tons 1990	Percentage change from 1990 to 2010		
		Refer-ence	High growth	Low growth
OECD	10,4	28,4	34,1	22,0
Former Soviet Union and Central and Eastern Europe	4,8	-3,7	3,2	-7,1
Latin America	1,0	84,4	108,3	66,5
Africa	0,7	81,5	106,0	64,0
Middle East	0,7	117,7	150,2	93,4
East Asia	1,0	167,8	212,2	121,6
South Asia	0,7	148,8	221,9	101,3
China	2,4	109,3	130,4	69,5
World	**21,6**	**47,6**	**61,5**	**33,6**

Source: (IEA, *World Energy Outlook* (1994)). Totals may differ from the sums of individual figures due to rounding.

A global stabilization of carbon dioxide emissions has been estimated to cost about 1.5 percent to 2.5 percent of the world GNP in the first half of the 21st century and about 3 percent in the second half.[8] The Convention emphasizes that financial resources are scarce, especially in the case of global environmental issues surrounded by scientific uncertainty. Among the principles adopted by the Parties, therefore, it should be taken 'into account that policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost'.[9]

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[7] Eugene B. Skolnikoff, *The Elusive Transformation* (Princeton, New Jersey: Princeton University Press, 1993), p. 184.

[8] William R. Cline, *The Economics of Global Warming* (Washington, D.C.: Institute for International Economics, 1992), p. 191.

[9] FCCC, Article 3.3

Considering the objective of the Convention and its commitments, it is a weak environmental agreement. It is also weak in providing incentives for the industrialized countries to take the lead in fighting global warming as they have pledged in the Convention.

1.2 THE LEGAL STATUS OF JI

The FCCC establishes a number of principles to guide the Parties in implementing the provisions and promoting the objectives of the Convention. It should be noted, however, that neither the concept of JI, nor the criteria for the mechanism are defined in the FCCC.[10]

But the basic idea is rather simple: The country that pays for abatement abroad (the investing country) will reduce its costs needed to meet its legal commitment under the Climate Convention, while the country carrying out the emission reduction (host country) may, in addition to reducing the threat of global warming, gain from local environmental improvements, economic benefits and technological innovations. In the case of carbon sequestration through forestation, other benefits might also be gained.

JI may reduce the global costs of achieving a GHG emissions reduction goal, but does not necessarily lead to lower global emissions. The global emissions depend on the targets which are agreed upon under the Convention. However, by reducing costs the obstacles to implement a global climate policy are reduced, which may have implications for the willingness of countries to participate and may lead to a more ambitious reduction target.

The Convention identifies three groups. These are:
- The Annex I countries: the OECD Countries (minus Mexico) and the countries with an economy in transition to a market economy;
- the Annex II countries: the OECD countries (minus Mexico); and
- the Non-Annex countries: the developing countries.

The concept of JI allows all countries, Parties to the FCCC, to take part in its activities. However, there is no consensus within the Intergovernmental Negotiating Committee (INC), an interim meeting forum examining and pre-negotiating issues of relevance to the FCCC, as to whether or not JI should be extended beyond the Annex I parties.[11]

Due to the variation in GHG emission reductions costs between countries, cost-effectiveness implies larger reductions in some countries than in others.[12] In case countries with comparatively

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[10] Art. 4.2 (a) reads: 'The developed country parties (...) commit themselves specifically as provided in the following (...) These parties may implement such policies and measures jointly with other Parties and may assist other Parties in contributing to the achievement of the objective of the Convention'. Furthermore, it reads that '(...) The Conference of the Parties, at its first session, shall also take decisions regarding criteria for joint implementation (...)'.

[11] See UNGA/49/485 para. 38.

[12] See IEA, ETSAP news (no. 2 1994).

low GHG emissions reduction costs do not participate in any international arrangement to control GHG emissions, a significant potential for cost-effective emission reductions or carbon sink enhancement will not be taken advantage of globally. Countries with such potentials, such as Eastern Europe and developing countries, are accordingly being considered as a group of countries in which JI projects could be carried out. On the other hand, the European Union (EU) and the OECD countries are being considered as groups of countries which might invest in JI projects. As Table 1.2 depicts, the OECD countries have also been considered as a group in which JI projects might be carried out.

Table 1.2 The basic design of a global JI regime

Group of countries/Role of countries within a JI regime	Group of countries investing in JI projects	Group of countries in which JI projects are carried out
OECD	x	x
Former Soviet Union / Central and Eastern Europe		x
All other countries		x

A global JI regime, which would make it possible for JI projects to be financed by the OECD countries and be implemented in the former Soviet Union, the Central and Eastern Europe or other countries, holds the biggest potential for JI as an instrument for global GHG emissions reduction. This makes a global regime attractive to both investing and host countries at least from a cost-effectiveness perspective.

It seems likely that the FCCC will develop through the following four phases in the future:[13]
-phase I, similar to the present situation; no countries have legally binding commitments,
-phase II is the phase where all Annex II countries have legally binding commitments,
-phase III is the phase where all Annex I countries have legally binding commitments, and
-phase IV is the phase where all countries have legally binding commitments.

It is not certain when the FCCC can be expected to develop from phase I to phase II, and it is even more uncertain if, and when, the FCCC might develop from phase II to phase III and IV. But phase II does not have to be very far into the future. At present, there is broad support within the INC for initiating negotiations on a global warming protocol specifying strengthened commitments at the first meeting of the COP in the Spring of 1995. Should negotiations on a global warming protocol be initiated in March-April 1995, it is not unlikely that they might be completed in 1997 or 1998.[14]

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[13] A phased development of JI is discussed in P. Vellinga and R. Heintz, 'Joint Implementation: Institutional Options and Implications', mimeo, Institute for Environmental Studies, Free University, Amsterdam (1993).

[14] Kåre Bryn, Head of the Norwegian Delegation to the INC, in *CICERONE* (1994), no. 3, pp. 1-2.

1.3 THE MOTIVES BEHIND JI

In negotiations each Party will always try to understand the motives and the rationale behind proposals made by other Parties. If one feel that these motives are legitimate and acceptable, it is often easier to enter into a constructive discussion of the proposal itself. What are the motives for introducing the concept of JI in the climate negotiations? There have been a number of motives. The main motive is to find viable and operational mechanisms to reduce the threat of global warming. Secondly there is a concern for cost-effectiveness and a need to involve all countries in fighting global warming.

If we want to understand the specific economic interests of a small country, there seems to be at least three main reasons for why Norway, who introduced the JI concept into the negotiations on the FCCC, did - and still do - advocate the concept of JI.

Firstly, Norway has a 'clean' energy production based on hydroelectric power, previously large investments in pollution control and high fossil fuel prices. Hence it is extremely costly to reduce emissions of greenhouse gases in Norway compared to almost any other country. Because GHG emissions have the same global effect regardless of their geographical origin, it is considered an inefficient use of scare resources to reduce emissions where it is most costly.

Secondly, Norway is a large exporter of oil and gas. The oil is so-called 'light' with a low sulphur content with is preferable compared to other oils because it is less polluting. Both the oil, and especially the gas, are much preferred to coal with respect to emissions of carbon dioxide and other pollutants. An emission target covering also the off-shore fossil fuel production in the North Sea will not only have serious economic consequences for Norway, but could also restrain a fuel-switching from coal to gas in Europe.

Thirdly, emission reductions in Norway will mean very little for global warming by themselves. This is true for most other countries too. It is therefore imperative to find ways whereby a maximum number of countries can develop incentives to curb greenhouse gas emissions . JI may serve as such a mechanism.

1.4 A GLOBAL REGIME FOR JI

In its most simple form, a global regime will determine JI criteria that apply to all regime members. Group-specific commitments might accordingly be ruled out. But a global regime does not have to impose uniform behavioral rules and standards on its members. Within a global regime, some countries could be bound by one particular set of rules, while another group of countries could be bound by a different set of rules. By establishing non-uniform rules it might become possible for diverse groups of countries to become *de facto* and *de jure* members of a global regime. In other words, a global JI regime could be based on groups reflecting regional configurations of countries that make group-specific commitments to participating in a JI regime.

The principal limitation of any global JI regime is the heterogeneity of members as well as the high number of regime members. Everything else being equal, countries at different levels of economic development are less alike in terms of resources available for environmental protection

and, therefore, are less alike also in terms of their willingness to pay for environmental protection. This might influence also the attractiveness of and willingness to undertake JI projects. However, the combined effect of unevenness of concern for environmental protection, unevenness with regard to ability to pay for environmental protection, and large variation in GHG emissions reduction costs makes a global JI regime an attractive option. In addition to the attractiveness of cost-effectiveness, it is perhaps just as important that a global regime creates an opportunity to assist a large number of host countries in becoming more energy efficient and in promoting a sustainable development.[15]

1.5 FURTHER DEVELOPMENT OF THE CONCEPT OF JI

Since the Fall of 1993 the JI concept has been discussed at the meetings of the INC and in other fora. The first Conference of the Parties (COP) will take place in Berlin in March 1995, and is expected to begin deliberations on the issue of JI. Among the issues to be discussed is the definition of JI, the conditions under which JI projects might be carried out, crediting of the investing country for emissions abatement in the host country, and other relevant issues. Some of these issues related to JI will probably be difficult to codify in a strict set of rules and criteria. Based on experience with some JI-demonstration projects, it seems, in an early phase of the development of JI advisable to establish a few important criteria and leave other elements to the discretion of the parties to negotiate.[16]

Before a cooperative arrangement for JI can begin to function, the COP will have to decide on an objective and a definition for JI. The objectives of JI and the FCCC may not be identical and, in the case that they are not, the COP will establish specific objectives of JI. Principal among the objectives that have been discussed so far are identifying and initiating cost-effective opportunities for reducing GHG emissions, supporting sustainable development, and encouraging participation of private capital in JI projects.

The JI project criteria that finally are agreed upon will determine when a country might act as an investing or a host country, and in what way states, private enterprises, international organizations and non-governmental organizations might participate in JI projects. The final choice of such criteria will determine the strength of the incentives to initiate JI projects, and accordingly how powerful JI will be as an instrument for reducing global GHG emissions. Several arrangements to institutionalize JI within the FCCC have been proposed and considered since the concept of JI appeared for the first time. Proposals have ranged from purely bilateral arrangements that

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[15] J. Parikh, (1994), 'Role of Markets, Governments and International Bodies in Joint Implementation in the South', in Ramakrishna, ed. (1994) *Criteria for Joint Implementation under the Framework Convention on Climate Change* (Woods Hole, Mass.:Woods Hole Research Center).

[16] See R. Selrod and E. Sørensen (1993), 'World Bank Appraisal Mission to Poland, The GEF Coal-to-Gas Project', *CICERO Report* No. 1994:7, Oslo and R. Selrod. and J.M. Skjelvik (1993), 'World Bank Appraisal Mission to Mexico, The GEF-Ilumex Project', *CICERO Report* No. 1994:8, Oslo.

involve no international institution or organization to a global Credits Bank.[17] It is assumed that JI projects will be institutionalized within the FCCC.

The bilateral JI arrangement is one in which an investor and a host country agree on an investment project. How project costs and GHG emissions abatement credits are shared is left to the two countries to decide. The project is reported to the COP by the two countries.

More complex bilateral arrangements are also possible. Proposals for a Clearinghouse are based on the perceived need for a 'market place' for JI projects.[18] The Clearinghouse collects information on potential JI projects and brings together investing and host countries, serving as a mediator. Furthermore, the Clearinghouse may control the information given on JI projects, especially with respect to the effect on GHG emissions. A global Clearinghouse would most probably be institutionalized within the United Nations system.

A more complex and ambitious version of a multilateral arrangement is the establishment of a Credits Bank for investments in JI projects. Investing countries could make deposits in the bank and receive credits for GHG emissions abatement. The bank will evaluate investment projects suggested by potential host countries, and decides in which projects it wants to participate. Based on a portfolio of investment projects and their features with respect to costs and GHG emissions abatement, the bank will calculate the average interest on the deposits, namely the average credits due for each amount invested. By taking the average over the projects the risk in terms of uncertain emission abatement effect and credits given is shared among investing nations.

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[17] Hanisch, et al., 'Study to Develop Practical Guidelines for 'Joint Implementation' under the UN Framework Convention on Climate Change', *CICERO report* no. 2, 1993; I. Mintzer, 'Institutional Options and Operational Challenges in the Management of a Joint Implementation Regime', in Ramakrishna, ed., (1994) *Criteria for Joint Implementation under the Framework Convention on Climate Change* (Woods Hole, Mass.:Woods Hole Research Center).

[18] See the discussion in T. Hanisch, 'Joint Implementation of Commitments to Curb Climate Change', *CICERO Policy Note* no. 2., 1991, and T. Hanisch, et al., 'The Climate Convention: Criteria and Guidelines for Joint Implementation', *CICERO Policy Note* no. 2, 1992.

CHAPTER 2: POTENTIAL ADVANTAGES OF JOINT IMPLEMENTATION

2.1 INTRODUCTION

The introduction of the concept of JI has been met with criticism and many shortcomings have been noted. However, much criticism has assumed that JI would be conducted free of rules and without criteria. Many skeptics have assumed that JI would not be a controlled mechanism.

Some developing countries have expressed reservations about JI. They fear that JI might make it possible for industrialized countries to continue to increase GHG emissions, while it may retard industrial development in the South. Some also suggest that JI projects might divert host countries from their own development priorities and that development assistance resources increasingly will be spent on solving global environmental problems. Furthermore, concern have been voiced over sovereignty issues such as long term foreign contracts for management of national resources and that cheap options for reducing emissions will be exploited by industrialized countries, while host countries later will face only the most costly abatement options. [19] [20]

In our opinion most of these above-mentioned reservations are questionable.

This said, JI *might* have a negative impact with regard to two of the above-mentioned issues. First, there is a possibility that JI might be a slowing factor for innovative technological change in industrialized countries, which might otherwise be driven further by the high costs they are facing in reducing GHG emissions nationally. On the other hand, new market opportunities in host countries might instead spur technology development. One could also claim, and hope, that lower costs of abatement might lead to a more ambitious global target and thus stimulate technological progress, as well as participation of more countries. Secondly, on the issue of additionality, one may fear that new funds to global environmental issues might reduce the level of Official Development Assistance (ODA). Some industrialized countries have given genuine, new and additional resources to the GEF, while others have not. The best way to meet this problem is to build on increased transparency of the statistics of the OECD and in the FCCC on these issues.

Large developing countries with a potential to become very large emitters have insisted that they will not act to slow the growth of their GHGs unless the industrialized countries show leadership by lowering their emissions first. The credibility of the Annex I countries will be damaged if they are not prepared to reduce domestic emissions when they consider JI.

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[19] N. Matsuo, 'Trends of the Global Climate Change Policies after Entry into Force of the UNFCCC - Implications of Protocol, Joint Implementation and so on' (mimeo 1994).

[20] Confer the 'cream skimming' problem discussed in chapter 3.3.

2.2 POTENTIAL EFFECTS FOR INVESTING COUNTRIES

For investing countries, a strong incentive to participate in JI projects is the cost saving potential. An agreement to reduce GHG emissions jointly with other Parties to a given level might be achieved at a lower price than if this commitment should be met only within national borders. If JI is not a possibility, there might be a lower level of commitments among countries during the future protocol negotiations, and thus a reduced effect on global GHG emissions.

Furthermore the investing countries may hope that by committing themselves to invest in emissions abatement projects, other nations will be encouraged to contribute. In this way, global warming could be further reduced and the costs hereof would be more evenly shared among countries. Investments in JI activities might also prove to be economically beneficial and result in extended trade and economic cooperation between the parties engaged in JI projects. While climate and economic benefits are the most obvious, and therefore have received most attention, advantages of technological, institutional and cognitive nature should not be neglected.

On the other hand, the investing country might fear a possible reduction in economic growth since, at least in the short term, national investments in GHG abatement measures could create new jobs and activity in other sectors. Investing countries will also forego a potential benefit when taking abatement projects abroad, because reduced emissions of GHG also mean reduced emission of other 'national' pollutants. The risks, uncertainties of transaction costs, implementation performance and emission leakages may often make investing countries think twice before they engage in JI activities, especially if the risk is not shared with other nations.

2.3 POTENTIAL EFFECTS FOR HOST COUNTRIES

Countries who believe that JI have more negative than positive effects might choose not to participate in this activity. However, there seem to be a number of advantages for those developing countries deciding to participate in JI projects. Advantages may include reduced negative impact of global warming, local and national benefits in the area of environment, economy, technology, trade and social development, decrease in fuel dependency and job creation. On the other hand, participation in JI might imply that other projects will be given less priority. Some of these issues are addressed below.

Additional flow of resources and technology
An investing country must as a point of departure cover the incremental cost of a JI project. This is defined as the difference in net benefits (total national benefits minus total national costs) between the JI project and the best alternative for the host country. If the incremental cost is exactly covered in addition to the share of global benefits, the host country will be equally well off accepting the JI project or rejecting it. The JI might also prove to be an opening for increased flow of private capital investment to the host country.

There might, however, often be various spin-offs such as new flows of investments and transfer of new and more efficient technologies, that are difficult to evaluate and calculate and thus are not added to national benefits in the calculations. Consequently such benefits can make the host country better off accepting the JI project, even if the agreement between the participating

countries is based on incremental cost. However, based on our experience with JI-demonstration projects as reported in section 1.5, the incremental cost focus seems less promising due to methodological problems involved in making the concept operational. Also the so called 'no regret' investment options might be accepted to induce earlier emissions abatement than otherwise possible. What might look like a 'no regret' option might not be implemented due to institutional and other barriers to such investments.[21]

It is likely that most host countries will be developing countries or countries undergoing the process of transition to a market economy. Some of these countries may have older polluting technologies and thus gain from a transfer of better technology and know-how. Through JI projects, host countries will often acquire more efficient technology, reducing energy consumption. This may also help industry to develop further, create new jobs and meet other development needs. New technologies will often be more cost effective and more environment-friendly than the previous one, reducing future economic costs of environmental protection and restoration. More energy-efficient technologies will also help to reduce fossil fuel dependency. Transfer of technology from the North to the South, although having some complications, is a high priority of many developing countries.[22] JI might also provide a channel for mutual exchange of knowledge between the North and the South.

Advantages for the environment and society
Many developing countries and countries with economy in transition are concerned over growing environmental problems. Many East and Central European countries have considerable pollution problems from combustion of fossil fuels. JI projects in the area of fuel switching (e.g. substituting gas for coal) will undoubtedly also reduce the air pollution regarded as a significant health problem and also give an improved local environment. This is also true for many of the cities in developing countries. Many developing countries rely to a large degree on their natural ecological systems. These systems are often vulnerable to climate change and variability. Global warming might be a serious threat to food security and may also cause land degradation. JI projects will increase GHG abatement measures and reduce the threat of global warming.

JI projects might often be a source of new job opportunities. It may create new initiatives both related to the JI project and as result of generally increased activity. It may create increased knowledge and interest in technology development and cooperation, and reduce potential conflicts due to local and regional environmental pollution.

Equity
JI projects should be initiated on the basis of a negotiated contract between the involved countries. The COP must decide on some minimum requirements for the criteria of the JI mechanism to avoid a system whereby some countries may be able to serve their own interest at

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[21] Confer Selrod and Skjelvik, 'World Bank Appraisal Mission to Mexico, The GEF-Ilumex Project' *CICERO Report* No. 1994:8.

[22] See, for example, C. Juma, J.B. Ojwang and P. Karani: 'Equity Considerations in the Climate Debate: Technology Transfer'. Paper presented at the Intergovernmental Panel on Climate Change, WG III Workshop, UNEP, July 1994.

the expense of others.[23] Such contracts should contain incentives for both sides and be open to the COP for their general information and possible comments. Many countries have a limited capacity to engage in development projects. JI might divert some projects to lower priority than intended. However, this will be on the basis of the host countries preferences as they are offered a new alternative to the previous setting.

The argument that JI might mean increased foreign influence over management of national resources is not an important objection to the mechanism as such. It may be an argument in specific cases and then it will be up to the host country to decide whether to participate in the proposed project. However, most countries in the world have already decided to participate in a variety of international cooperation and trade arrangements. Small countries, like Norway, find it necessary to accept rules and regulations decided by other countries or international organizations to be able to sell products and/or to cooperate in other ways.

2.4 SUMMARY OF POTENTIAL ADVANTAGES AND DISADVANTAGES

The main value of JI is will be its ability to spur activity to reduce the threat of global warming. Because JI lowers the costs of abatement, it becomes both politically and economically more attractive for investing countries to participate in fighting climate change and to cooperate within the framework of the FCCC. As a consequence, countries might decide on a more ambitious global reduction target. Table 2.1. summarizes the pros and cons of JI.

Advocates of JI have claimed that this mechanism has the potential to accomplish a number of tasks.[24] JI will establish a market for investments, stimulate a search for cost-effective projects across national borders, promote transfer of efficient and clean energy technologies, and provide additional financial resources to host countries. Due to technology transfer, JI might provide local, positive environmental and developmental side-effects, and create incentives to improve the management of carbon sinks. Finally, it can serve as an instrument for mobilizing private capital steering new and additional resources to host countries.

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[23] R. Selrod and A. Torvanger. 'What Might be the Minimum Requirements for Making the Mechanism of Joint Implementation under the Climate Convention Credible and Operational', *CICERO Report* 1994:4. Presented to TERI/CICERO Workshop in New Delhi January 1994.

[24] For an interesting discussion on Joint Implementation and possible effects on different levels, see P. Vellinga and R. Heintz: 'Joint Implementation. Economic and Political considerations' Draft paper, Dec. 1994

Table 2.1 Potential advantages and disadvantages of JI

Country type	Potential advantages	Potential disadvantages
Global level	- Encourage commitments from other countries - Increased incentives to develop new technologies? - Increased activity to reduce GHGs - Reduced costs	- Leakage problems; problems of control and verification - Reduced incentives to develop new technologies?
Investing country	- Cost savings - National share of global climate benefits - Possible new export and investment markets	- Reduced national economic growth? - Credits uncertainty; risk of inefficient implementation of projects - Uncertainty relating to transaction costs - Reduced abatement of other (local) pollutants? - Project information distortions, projects may cost more than anticipated
Host country	- Additional financial resources - Cost savings from more efficient technologies - Transfer of technology and know-how - National share of global climate benefits - Decreased fuel dependency - National/local environmental benefits - Job creation - Capacity building	- Distortion of own development preferences - Increased foreign influence over management of national resources - Uncertain global equity effect

CHAPTER 3: POTENTIAL PROBLEMS AND UNCERTAINTIES

3.1 JI PROJECT TYPES

JI should reduce global GHG emissions in a cost-effective manner. Under which conditions can JI realize this objective? A realistic strategy for an analysis is to focus on the fundamental issues facing all categories of JI projects, even the simplest project types. Subsequently, after finding ways to handle the basic issues, more complicated JI project categories and additional problems related to these can be dealt with.

JI projects are in the following divided into categories based on 'simplicity' according to the size of 'transaction costs'.[25] Furthermore, JI projects are organized according to the following two dimensions:

1) The type of countries involved (Annex II countries only, or Annex II countries and all other countries, Parties to the Convention),
2) Project categories (fossil fuel saving, changing industrial technologies, carbon sink enhancement, or changing agricultural practices).

The most important GHG abatement option is reduced combustion of fossil fuels associated with production and consumption of goods and services. The major GHG released from fossil fuel production, transport, distribution and combustion is carbon dioxide. Also some methane and nitrous oxide are released. The principal ways of reducing fossil fuel consumption are fuel-switching and energy efficiency improvements.

Another project category is sink enhancement, where net anthropogenic release of carbon dioxide is reduced through carbon fixation in biomass or changes in land use and management practices. There are further potential problems related to baseline definition and calculations for carbon sequestration projects. Next, there are possibilities to change agricultural practices and reduce emissions of carbon dioxide, methane and nitrous oxide. Finally there is a potential for GHG emissions abatement through changing industrial technologies. Some abatement options and examples are given in Table 3.1.

The most practical way to estimate reduction in carbon dioxide emissions from reduced fossil fuel combustion in category 1) is to employ consumption data from the relevant sources. The carbon content of various fossil fuels is well known and the monitoring possibilities will depend on the availability and quality of consumption data. Estimation of nitrous oxide and methane emissions is more complicated since the emissions are more technology-specific, and varies with, among other things, the combustion conditions. Controlling and verifying emissions will have to rely on measurements and site inspections.

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[25] The transaction costs for JI can, in general terms, be defined as the total administrative costs for all parties involved in the development, implementation, control and verification process of a JI project. This is total project costs subtracted economic expenses in strict terms, such as project investment costs and operation and maintenance (O&M) costs for some time horizon.

Table 3.1 JI project categories

JI Project category	Abatement options	Examples	Greenhouse gases	Monitoring possibilities
1) Fossil fuel saving: - Fuel switching - Energy efficiency improvements	- Develop renewables - DSM [a] - Reduce losses in energy supply sector [b]	- Substitute gas for coal in a thermal power plant - Replace traditional light bulbs with high-efficiency CFLs [c]	- Carbon dioxide - Nitrous oxide - Methane	- Consumption data - Site observations
2) Changing industrial technologies	- Replace process technologies - Modify products and related technologies	- Replace older aluminum production technologies	- Perfluorocarbons - Sulphur hexafluoride - Hydrofluoro-carbons	- Site observations
3) Carbon sinks enhancement	- Afforestation or reforestation - Changes in land use and management practices	- Reforest degraded grasslands - Increase carbon sequestration in soils [d]	- Carbon dioxide	- Remote sensing - Field observations
4) Changing agricultural practices	- Develop new crop variants - Collect and combust methane emissions	- Develop rice variants that generate less methane emissions - Employ methane from dung and wastes as energy source	- Carbon dioxide - Methane - Nitrous oxide	- Field observations - Remote sensing

[a] Demand Side Management.
[b] Losses in conversion, transportation, and distribution.
[c] Compact Fluorescent Lamps.
[d] One option is application of phosphorus.

Change in GHG emissions from modifying and replacing industrial technologies in category 2) can be estimated from technology data and site observations. Emission reduction is technology-specific and must be controlled from site observations, engineering data and emission measurements for each technology.

The increase in the relevant type of biomass in category 3) can be calculated based on species and local ecological conditions. Total carbon fixation can then be estimated from the carbon

content of the specific biomass type. Forestation and changes in land use can be inspected by remote sensing in combination with field observations. Compared to the earlier project categories monitoring may be somewhat more complicated.

GHG emissions abatement in category 4) can be estimated from model calculations calibrated on field observations. With respect to changes in agricultural practices and effect on emissions of carbon dioxide, methane and nitrous oxide, remote sensing is also an option, but it is likely that site observations and estimates will be more important since emission sources and the relations between agricultural activities and emissions are more complicated and ambiguous than for other project categories.

From present knowledge and monitoring possibilities, project categories 1) and 2) are less complicated to include in JI arrangements than project categories 3) and 4). Based on these dimensions, four main JI project types can be defined, confer Table 3.2. Apart from project Type IV, which concerns a regime of tradeable GHG quotas, unlikely to be established in the near future, the project types are organized according to increasing transaction costs; they are lowest for Type I and highest for Type III.

Type I is the simplest project type, whereas there are significant baseline and control problems for Types II and III. There may be additional monitoring problems for Type III projects, which are mostly forestation projects.

Table 3.2 JI project types classified according to rising transaction costs. [a]

JI project dimensions	FCCC Parties involved	GHGs abatement category
Type I	Annex II countries	- Fossil fuel saving - Changing industrial technologies
Type II	All countries	- Fossil fuel saving - Changing industrial technologies
Type III	All countries	- Carbon sink enhancement - Changing agricultural practices
Type IV	All countries	All categories

[a] Transaction costs are lowest for Type I and highest for Type III.

For type I JI projects only Annex II countries are involved. The host country must consequently be an OECD country (except Mexico). GHG emissions are abated through fossil fuel saving, either through increasing energy efficiency or fuel switching, or through changing industrial technologies.

At the project level a simple JI project example would be fuel-switching for an existing power plant, e.g. substituting a gas-based technology for a coal-based technology in a electricity-generating thermal power plant. If there is no change in the amount of electricity produced, the GHG abated can be calculated as the difference between the emissions from the coal and gas combusted by the power plant.

Type II projects have higher transaction costs than Type I projects because all Parties to the FCCC can participate, even those countries that have not established a national emission target. In this case defining the baseline is much more complicated than for Type I projects since developing countries are not obliged to report national emission targets to the COP.

For Type III projects the countries involved and institutional setting are similar to Type II projects, but the abatement mechanism is, instead, carbon sink enhancement or changes in agricultural practices. The prevailing project category is forestation.

3.2 ASYMMETRIC INFORMATION AND POTENTIAL INCENTIVE PROBLEMS

The existence of asymmetric information and incentives for parties undertaking JI projects may lead to inefficiencies, *inter alia* in terms of uncertain GHG abatement effects of the projects, and in terms of reducing the cost saving potential of JI projects.

Some parties may take advantage of asymmetric information (e.g. in terms of reducing their cost share of the global climate measures). An important issue is therefore the potential of incentive contracts designed to reduce such problems. Another issue is the extent to which one will be able to reduce the incentive problems through establishing specific JI criteria or through institutional arrangements.

The first topic considered in the following concerns incentives for the parties reporting a JI project to the COP. The second relates to political decisions at government level in the host country, and the last topic relates to potential incentive problems between an investor and a host country in a bilateral setting.

Incentives for investor and host to overstate the potential of JI projects
In a bilateral setting investing and host countries will prepare a JI project and report the project and estimated GHG abatement effect to the COP. After the JI project is initiated, there will be a monitoring process to determine its actual GHG abatement effect as a basis for a later report. Incentive contracts based on after-the-fact control of the GHG abatement effect may play an important role and reduce the incentive to overstate the abatement potential of projects (see section 3.4).

Since the COP will have less project background data than the participating countries, and since it will be impossible to control all JI projects, both the investor and host will have incentives to overstate the potential of the project in terms of a larger emissions abatement effect. Asymmetric information and less-than-perfect *ex post* control increases this incentives of both the investor and host. On the other hand the investor has an interest in keeping the estimated GHG emission abatement effect of the project low in negotiations with the host so as to get a better bargaining

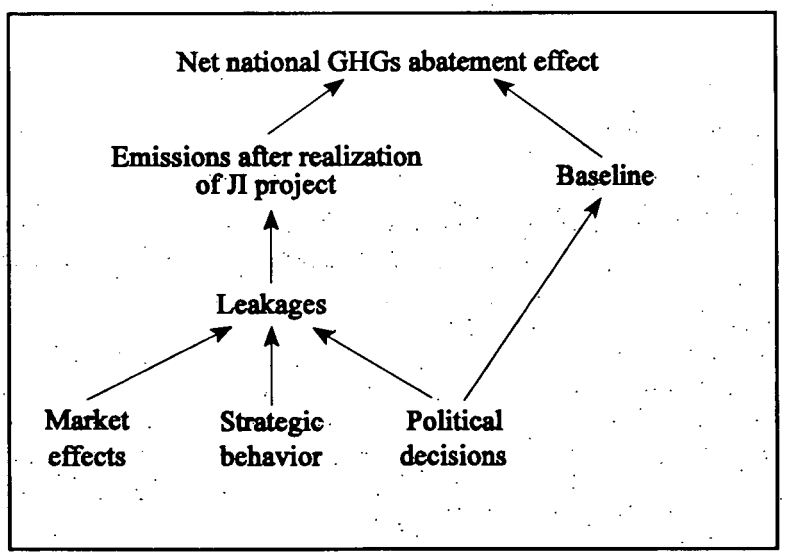
position and cut down the price the host can charge. On the part of the investor such strategic behavior may partially counterbalance the incentive to overstate the potential of the project to the COP.

Political distortions and baseline problems

Some issues associated with planning and political decisions are more pronounced at the national level than at the firm level. In Figure 3.1 the determinants of the net national GHGs abatement effect of a JI project are shown in principal terms. The net national abatement effect is defined as baseline emissions subtracted emissions after realization of a JI project. Emissions after realization of a JI project can be higher than anticipated due to leakages. Leakages can be defined as a lower-than-planned or calculated GHGs emission abatement effect at the national or global level. In the literature leakages are commonly discussed only in terms of market effects (e.g. effect on relative prices and consumer reactions and changes in 'terms of trade'),[26] but this paper also includes strategic behavior and political decisions as determinants of leakages.

In general terms the baseline may be affected by political decisions and the possible existence of JI financing of no-regrets projects, which are projects that are profitable under ordinary market conditions. In the following we consider a baseline that is determined *ex ante*, that is before any JI activities are undertaken. The baseline can only be modified later in particular circumstances. However, the discussion of leakages concerns an *ex post* situation, where JI projects have been or are being implemented.

Figure 3.1 Determinants behind net JI abatement effect



[26] For a general discussion of leakages and baseline definitions the reader is referred to e.g. Barrett (1993), Bohm (1994 a) and (1994 b), Kuik, Peters and Schrijver (1994), and Selrod and Torvanger (1994).

Political decisions at the national level may reduce the abatement effect through leakages. A government in a host country may, through its planning, economic policy and political decisions be influenced by external funding and implementation of JI projects, or the anticipation of such funding. Since JI projects will *inter alia* have local economic and labor market effects, and may have some national effects, it can be rational for the government to let its policies be influenced by such external funding. Such influence is more likely the larger the total JI funding is. These effects will make the calculation of the emission abatement more complicated and uncertain, in particular for developing countries which do not have a national emission target as a foundation for a baseline.

Policy changes affecting the net abatement effect of JI projects are difficult to monitor and control. By assumption these policy changes are a rational response to incentives that make them profitable and are due to limited monitoring and control abilities by the investor and COP. In such a situation an important issue is the potential of incentive contracts to induce a host country to refrain from political decisions which reduce the net national abatement effect of one or more JI projects.

There is also room for strategic behavior by the host government in a 'game' of baseline calculations with investing countries or enterprises. In such a situation future JI funding may be influenced and increased. One example of this can be to exaggerate project costs and turn no-regrets projects into projects that need external funding to be realized, thus earning extra profits.

Carbon sequestration projects have larger baseline, control and verification problems than most other JI project categories. The main feature of these projects is carbon sink enhancement, mainly in the form of forestation. In some respects control might be more complicated, for example long-term monitoring of forest areas, for which it may be necessary to verify the long-term net sequestration of carbon. The earlier mentioned incentive contracts should be applicable for these projects with the purpose of inducing the host country to avoid forest and national policies inconsistent with the planned sequestration under the JI project. Such policies might for instance contain plans to increase logging in other forest areas that may reduce the forest cover and long-term carbon fixation in those areas.

Incentives for investor and host in a principal-agency framework

A branch of the incentive contract literature is the principal-agency literature.[27] In the standard example a firm can be the principal and one employee the agent. This literature deals with how to design a compensation scheme that motivates the agent to act in the interest of the principal, given asymmetric information that leads to unverifiable efforts. The contract cannot be made contingent on efforts since efforts are unverifiable. Even if the output can be exactly measured, the effort cannot be measured if output also depends on some variable that cannot be observed with certainty. Due to uncertainty and incomplete contracts agents do not bear the full consequences of their actions. The agent may have some degree of risk aversion. Risk aversion can be defined as reluctance to accept risk, for instance measured as the extra compensation

[27] Surveys of this literature can be found in, for example, Hart and Holmström (1987), Kreps (1990) and Rasmusen (1989).

required to accept a risky option of the same expected value as an option of certain value.[28] Thus a risk averse agent requires extra compensation, i.e. insurance, to accept risk in terms of payment that depends on the uncertain output resulting from effort and some variable that cannot be observed. On the other hand, the principal would prefer that the agent bears the full consequences of the effort to give incentives to work hard. Thus there will be a tradeoff between incentives and insurance, and the incentive contract has to strike a balance between these considerations.

Let us now relate the principal-agent literature to the analysis of JI contracts between an investor and a host (where both the investor and host may be countries or firms). In such a setting the investor and host negotiate a contract on a JI project, after which the host exerts some effort to implement the project. Afterwards, the investor (and COP or any designated body) is assumed to be able to observe the output of the project (i.e. the GHG emissions abatement effect), but, due to monitoring problems, the exact effort of the host cannot be determined. The project output is uncertain since it depends both on effort and some variable that cannot be directly observed, or that is excessively expensive to monitor and verify. Thus it is not possible to let the payment to the hosts depend on their efforts and there will be an incentive for the host to exert too low effort, and thereby gain a rent.[29] The rent increases the project cost for the investor and makes cost minimizing unobtainable. Consequently, the potential cost saving of JI projects for the investor is reduced.

Given a risk averse host and imperfect effort control, the inefficiency in terms of a non-minimized project cost can be reduced through formulation of incentive contracts. Private information held by the firms may be beneficial for the firms if they are chosen to be a host for a JI project. One type of strategic behavior is to abstain from investing in less polluting technology so as to avoid revealing their private information. Strategic behavior of the potential host firm may therefore have an adverse effect on global emissions.

Asymmetric information is not just costly for the investor, but also generates uncertainty related to the abatement cost per unit and the total abatement achieved by the project. The uncertainty could be reduced by establishing a Credits Bank that receives funds from the investors and implements several JI projects. By taking the average over many projects the risk in terms of uncertain abatement effect is shared among the investors. Furthermore, a single investor in the form of a Credits Bank could reduce the rent due to asymmetrical information, and consequently reduce incentives to abstain from no-regrets investments.

Summing up, asymmetric information between parties to a JI contract can reduce the potential global cost saving, since the most cost-effective projects are not carried out first. Furthermore, asymmetric information leads to inefficient implementation of some of the chosen projects. Thus the cost per unit GHG abatement for the investor would not be minimized. Furthermore, strategic behavior of the host could lead to uncertain abatement outcomes for the investor. The risk of such effects can be reduced through a Credits Bank institution, and shared among all investors.

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[28] Moreover a risk neutral agent requires no compensation to take on risk as long as the expected outcome is equal to the certain outcome.

[29] Rent can be defined as payment to the host in access of what is necessary to induce the host to carry out the JI project, given full information.

3.3 UNCERTAINTY

Two important types of uncertainty related to planning and implementation of JI projects are uncertain investment costs and uncertain operation and maintenance (O&M) costs. There is also uncertainty related to the size of transaction costs and the existence of no-regrets projects. And even further, there is the possibility that host countries without present commitments anticipate future targets, the so-called cream skimming problem.

Uncertain future prices
Due to uncertainty related to future prices and other conditions there is an extra value associated with a flexible GHG abatement strategy. This may affect the ranking of different JI project categories. A flexible JI strategy is characterized by choosing JI projects where the O&M share of the total cost is high compared to the investment share. If such a flexible strategy is chosen there is an opportunity to regret if conditions change and make another strategy attractive. If, on the other hand, one chooses JI projects where the share of investment is high, the opportunity to regret and chose another strategy is lower as long as the investment is assumed to be sunk cost.[30]

JI widens the available climate measures, thus extending the possibilities for flexible strategies. It may also favor general domestic measures compared with inflexible agreements with host countries. It seems that flexible alternatives mainly will exist within countries that commit themselves to targets. This is not because flexible alternatives are unavailable in, e.g., developing countries, but rather that the type of measures that allow for flexible strategies, such as general economic measures, *inter alia* carbon tax, will not be appropriate for JI. Uncertainty can favor, e.g., fuel switching JI projects, since the O&M cost of these is relatively more important than the investment cost, as compared to energy efficiency improvement projects, where investment cost is relatively more important than O&M cost.

Uncertainty can also be reduced through project diversification. A country that initiates a number of abatement measures with uncertain costs should aim at making the uncertainty of its total portfolio of measures as small as possible.[31] Then, it is the correlation between this particular measure and all the other measures that counts. In other words, the uncertainty of a given measure may be attractive if it counterbalances the uncertainty of other measures, because it thereby reduces the total uncertainty of all the measures.

Introduction of JI may contribute to stabilizing the uncertainty of climate measures by extending the availability of alternative measures. Moreover, attention to this aspect may provide guidance to how an efficient JI regime should be designed, namely to diversify all measures on a world scale in order to minimize the total uncertainty. From this point of view, the best possible JI regime would be the establishment of a Credits Bank that traded abatement projects subject to JI.

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[30] An investment is 'sunk cost' if it has no alternative value. Thus the capital is assumed to have no second-hand value.

[31] Wilson (1984) provides a framework for a practical application of this result.

Uncertain transaction costs

In the process of planning, developing, implementing, monitoring and controlling JI projects there are transaction costs. In principle, transaction costs should be included in the total JI project costs to find the abatement cost per unit of emissions for the JI project, which is a main criteria for the acceptance of the project and selection of the project in a portfolio of possible JI projects. Some degree of economics of scale is likely to exist for transaction costs associated with JI projects. Thus the transaction cost share of total costs is probably larger for small-scale JI projects than larger JI projects. This means a relatively disadvantage to small projects compared to larger projects.[32] In general transaction costs may significantly reduce the number and types of interesting and acceptable JI projects. Due to economics of scale effects (i.e. information gathering, human skills, experience, etc.) and smaller incentive problems in a Credits Bank setting, transaction costs may be reduced and more potential JI projects be acceptable.

Transaction costs (and other project-related costs) cannot be known with certainty when planning and developing JI projects. The abatement cost per unit might also be uncertain due to baseline uncertainty and/or uncertain emission abatement effects from a JI project. This type of uncertainty will have implications for the comparison of projects with different profiles and the optimal choice between them. If there is some risk that the cheapest JI projects are no-regrets and do not qualify for credits based on after-the-fact control, there may be a biased selection of projects where the most cost-effective projects are not attractive to investors.

The cream skimming problem

JI implies that the least-cost abatement alternatives on a world scale are initiated first. Most of these low-cost alternatives are expected to take place in developing countries. This situation has brought forward the question of 'what will the situation be when developing countries shall meet their commitments some time in the future; will JI leave only the most expensive projects to the previous host countries?

This is referred to as the cream skimming problem.

First, this is a problem only for countries without present commitments that anticipate targets in foreseeable future, e.g. European countries in transition toward market economy. Second, if these countries are certain about how much to abate in the future and what the cost will be, they will be able to account for a premium which compensates the future extra cost that accrues because the cheapest projects are not available anymore. Third, new and attractive abatement alternatives may occur in the future due to technical progress. Forth, if a developing country in the future will accept an emission target, it will be a country with improved economic capacity to deal with emission reductions. Fifth, the host country might want to share credits and bank them for future use instead of receiving other benefits through project negotiations. In other words, the cream skimming problem might occur as a consequence of uncertainty for a limited number of countries.

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[32] Confer the discussion in Bohm (1994 b)

3.4 OPTIONS TO REDUCE POTENTIAL INCENTIVE PROBLEMS

In a situation of asymmetric information and incentive problems the crucial issue is how to reduce such incentive problems. This may be achieved through incentive contracts, through institutional arrangements for the JI mechanism, or through special reporting criteria, established by the COP.

The potential of incentive contracts
Incentive contracts can contain bonus payments and/or fees,[33] and must be based on some after-the-fact emission reduction verification. All JI projects need not be subject to an expensive verification process of the net GHG abatement effect, but at least some fraction of the projects must be chosen for spot checks. The final fee or bonus payments might as a rule be awarded on the basis of an after-the-fact report by the project participants. Finally, the host must find that the expected benefit from a JI project, given the exposure to the output risk of the project, is high enough to be willing to offer the project and participate in it.

Two options for incentive contracts are:

1. A simple type of incentive contract could include contingencies on the success of the JI project in the form of a bonus to be paid to the host upon after-the-fact control of the abatement effect of the JI project. The host will receive the bonus if the project satisfies the planned abatement effect.

2. A more demanding solution would be to focus on the additional baseline and control problems of non-Annex II countries and require that the host country must establish a national emission target or a sector-specific emission target in order to participate in JI contracts.[34] This target could be stated in every JI contract. Alternatively, a statement on this could be issued to the COP.

No such contracts can be expected to remove the initial incentive problem of 'political distortions'. However, contracts might be able to reduce the problem. The feasibility of all contracts depend on the after-the-fact monitoring and verification possibilities for measuring the GHG abatement effect of a project at the national level. Furthermore, some incentive contracts may be less acceptable to host countries (confer option 2 above), and there may be distribution effects between investor and host that limit their potential.

Institutional solutions: Clearinghouse and Credits bank
When moving from bilateral arrangements to a Clearinghouse institutional setting one important feature is the establishment of a 'market' for JI projects.[35] In this setting a potential host may still exaggerate the GHG abatement potential of a JI project in order to make it appear more attractive to a potential host. However, the market should have a moderating effect on the ability for hosts to exploit asymmetric information, exaggerate the abatement effect or understate project costs

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[33] One option is to give the host country some share of the emission credits. Credits are interesting to Annex II host countries, but could also be of interest as 'political credits' to other countries.

[34] A sector specific emission target will imply additional monitoring problems due to an increased danger of leakages.

[35] Confer Hanisch et al. (1993) for a further discussion of Clearinghouse.

because there are other potential hosts that may lower their 'prices' (i.e. abatement unit cost) as long as there is a rent to gain.

In the case of the Credits Bank the incentive problem related to overstating the GHG abatement effect of a project is likely to be reduced. A unit abatement price will develop as an average return to JI projects compared to costs, and consequently the JI project risk in terms of uncertain costs and abatement effect is shared between the investors. In this setting a potential host may still exploit asymmetric information and exaggerate the GHG abatement potential of a JI project in order to make it more attractive for the Credits Bank, but there is less room for an alliance with an investor compared to a bilateral setting. In addition, the resources of the Credits Bank should mean improved capacity to participate in the reporting to the COP and thus discourage exaggerations of the abatement potential. The Credits Bank can arrange auctions, where potential hosts offer their JI projects at a price, and the bank buys the cheapest projects (in terms of unit abatement cost) up to the preferred total abatement effect. Furthermore, the Credits Bank may act as a single buyer of JI projects, in which case the 'market' power of the Credits Bank makes it able to reduce the 'prices' charged by potential hosts. All these possibilities imply relatively more 'market' power to the Credits Bank compared to the hosts, and may, under some circumstances, reduce the ability for hosts to extract rent due to asymmetric information.

Reporting and verification

In a situation with incentives to overstate the abatement effect of a JI project, the COP is left with the option of establishing reporting requirements which can be verified by a third party.[36] One relevant type of criteria should demand strict documentation requirements for the GHG abatement effect of a JI project compared to a reasonable baseline.

JI projects will require extensive examination of their GHG abatement effect and perhaps also their externalities. It seems preferable to organize reporting as a three-step process. The first step could be a 'note of information'. Such a note of information should be made by the Parties planning a JI project, and be forwarded to the designated JI organization under the FCCC. It should be publicly available. A second communication could be an official report by the participants to the COP made in accordance with an established reporting format. Because JI projects might perform better or worse than expected, a third and final report could be made on the basis of the completed project where actual emission reductions are established. The report will give the possibility to award credits only on the basis of after-the-fact emission reductions.

Reporting on JI projects and its GHG abatement effect may be a complicated and difficult task. The JI mechanism should therefore also have a system for reassessment of reports, control of data and on-site inspections. The verification processes should include spot checks, and different categories of JI projects may be randomly chosen at irregular intervals. Apart from the reporting of the Parties participating in a JI project, an implementation control should allow for independent reassessment of reports by a designated body under the COP. This designated body should be a Committee on Implementation under the COP. A JI secretariat could also be established to serve

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[36] Confer the criteria proposed by the Intergovernmental Negotiating Committee in INC (1994 a) and the discussion in Jones (1993).

as an information center on JI activity and assist the Implementation Committee and the COP in the tasks discussed in this chapter.

The first COP should make decisions as to the establishment of these bodies. They may initiate a constructive phase I period during which pilot projects and further discussions on JI may help all Parties evaluate the possible benefits from JI and the question of how JI may best serve the objectives of the FCCC.

CHAPTER 4: CONCLUSIONS

It is urgent that the Parties to the Climate Convention find mechanisms which will create the necessary incentives for countries to cooperate in reducing global warming. As predicted by the International Energy Agency, the future global growth of carbon dioxide clearly indicates that strong measures are needed.

Because of large variation of GHG emission reduction costs between countries and because financial resources are scarce, cost-effective responses to the threat of global warming are the most promising route to take.

In the near future, the Annex II countries may agree to establish legally binding commitments to reduce emissions of GHGs under the FCCC. It is important to realize that it is those countries who will be interested in financing JI projects. The commitments will be stronger if some of these could be met cost-effectively through JI and not just by domestic measures alone.

The motives behind the introduction of JI are to find a viable and operational mechanism to reduce the threat of global warming. Because of their different energy situation, an equal per capita reduction of GHG emissions in the OECD countries would result in a very unequal economic burden among these countries. It is therefore argued that this mechanism must be cost-effective and fair so that countries that have invested heavily in energy efficiency and reduction of pollution will not have to suffer due to higher abatement cost for their remaining reduction possibilities.

JI should also be looked upon as a possibility for increased North-South cooperation with shared benefits. In addition to reducing the threat of global warming, it offers the opportunity for an increased flow of financial resources and technology, and job opportunities as well as improved local environmental and social conditions.

The JI mechanism should be allowed to develop gradually by initiating a number of demonstration projects to be reported to the COP for scrutiny. In this way rules and criteria could be developed on a basis of sound experience.

This paper discusses some of the issues which have been raised in the discussions on the JI concept. Many of the objections which have been raised about JI need careful consideration. It is essential that potential problems concerning proper selection of JI projects, uncertain abatement effect, consideration of strategic behavior and incentive problems will be addressed in a more effective manner. To that end incentive contracts between the investor and host, and adequate monitoring and verification capabilities must be developed. It seems plausible that these issues can be solved in a satisfactory way and that the possible advantages and benefits of JI certainly are larger than some of the perceived problems and disadvantages.

It is thus concluded that Joint Implementation under certain circumstances is an effective and attractive instrument for reducing global greenhouse gas emissions. JI may also create an opportunity to assist a large number of countries in becoming more energy-efficient and in promoting a sustainable development.

REFERENCES

Barrett, S. (1993), 'Joint Implementation for Achieving National Abatement Commitments in the Framework Convention on Climate Change', OECD, Group on Economic and Environment Policy Integration, mimeo, Paris.

Bohm, P. (1994a), 'Making Carbon-Emissions Quota Agreements More Efficient: Joint Implementation vs Quota Tradeability', *Research Papers in Economics* No. 1, University of Stockholm, Stockholm.

Bohm, P. (1994b), 'On the Feasibility of Joint Implementation of Carbon Emissions Reductions', *Research Papers in Economics* No. 2, University of Stockholm, Stockholm.

Bryn, K. (1994), 'Klimaforhandlingene', *CICERONE*, no, 3, pp.1-2.

Cline, W.R. (1992), *The Economics of Global Warming*, (Institute for International Economics.Washington, D.C).

Hanisch, T. (1991), 'Joint Implementation of Commitments to Curb Climate Change', CICERO *Policy Note* No. 2,.

Hanisch, T., R.K. Pachauri, D. Schmitt and P. Vellinga (1992), 'The Climate Convention: Criteria and Guidelines for Joint Implementation', CICERO *Policy Note* No. 2.

Hanisch, T., R. Selrod, A. Torvanger and A. Aaheim (1993), 'Study to Develop Practical Guidelines for "Joint Implementation" under the UN Framework Convention on Climate Change', *CICERO Report* No. 2, and OECD, Group on Economic and Environment Policy Integration, mimeo, Paris.

Hart, O. and B. Holmström (1987), 'The theory of contracts', in Truman F. Bewley, (ed.), *Advances in Economic Theory - Fifth World Congress*, Cambridge University Press, Cambridge and New York.

Houghton J. T., B.A. Callander, and S.K. Varney, eds., (IPCC), Climate Change: The Supplementary Report to the IPCC Scientific Assessment (Cambridge, Britain: Cambridge University Press, 1992).

International Energy Agency, (1994), *World Energy Outlook*, Paris.

IEA, ETSAP news (no.2 1994)

Intergovernmental Negotiating Committee for a Framework Convention on Climate Change, INC (1994a), 'Matters Relating to Commitments Criteria for Joint Implementation', note by the interim secretariat, for the ninth session of INC in Geneva, 7-18 February.

Jones, T. (1993), 'Operational Criteria for Joint Implementation', mimeo, OECD, Paris.

Juma C., J.B. Ojwang and P. Karani: 'Equity Considerations in the Climate Debate: Technology Transfer'. Paper presented at the Intergovernmental Panel on Climate Change, WG III Workshop, UNEP, July 1994

Kreps, D. M. (1990), *A Course in Microeconomic Theory* (Harvester Wheatsheaf, New York and London).

Kuik, O., P. Peters and N. Schrijver (eds.) (1994), *Joint Implementation to Curb Climate Change - Legal and Economic Aspects* (Kluwer Academic Publishers; Dordrecht and Boston).

Matsuo, N. (1994), 'Trends of the Global Climate Change Policies after Entry into Force of the UNFCCC - Implications of Protocol, Joint Implementation and so on', mimeo, *Energy in Japan* (forthcoming)

Mintzer I. (1994), 'Institutional Options and Operational Challenges in the Management of a Joint Implementation Regime', in K. Ramakrishna.

Parikh, J. K.(1994), 'Role of Markets, Governments and International Bodies in Joint Implementation with the South', in K. Ramakrishna (ed.) (1994), Ramakrishna K., *Criteria for Joint Implementation under the Framework Convention on Climate Change* (Woods Hole, Mass.: Woods Hole Research Center).

Rasmusen, E. (1989), *Games and Information - An Introduction to Game Theory* (Basil Blackwell, Oxford and Cambridge).

Selrod R. and E. Sørensen (1993), 'World Bank Appraisal Mission to Poland, The GEF Coal-to-Gas Project', *CICERO Report* No. 1994:7, Oslo.

Selrod, R. and J.M. Skjelvik (1993), 'World Bank Appraisal Mission to Mexico, The GEF-Ilumex Project' *CICERO Report* No. 1994:8, Oslo.

Selrod, R., and A. Torvanger (1994), 'What Might be Minimum Requirements for Making the Mechanism of Joint Implementation under the Climate Convention Credible and Operational', in Prodipto Ghosh and Jyotsna Puri (eds.), *Joint Implementation of Climate Change Commitments - Opportunities and Apprehensions*, Tata Energy Research Institute, New Delhi, and *CICERO Report* No.4, Oslo.

Skolnikoff, E.B. (1993), *The Elusive Transformation: Science, Technology and the Evolution of International Politics*, (Princeton Univerity Press, Princeton and New Jersey).

Torvanger, A., J.S. Fuglestvedt, C. Hagem, L. Ringius, R. Selrod and A. Aaheim (1994), 'Joint Implementation Under the Climate Convention: Phases, Options and Incentives', *CICERO Report* No. 6, Oslo.

Vellinga, P. and R. Heintz (1993), 'Joint Implementation: A Phased Approach', mimeo, Institute for Environmental Studies, Free University, Amsterdam.

Vellinga, P. and R. Heintz (1994), ' Joint Implementation. Economic and Political considerations' draft paper, Institute for Environmental Studies, Free University, Amsterdam.

Wilson, R. (1984), 'Risk Management of Public Projects' in R. Lind (ed.): *Discounting for Time in Energy Policy*, (Baltimore: Johns Hopkins University Press for Resources for the Future).