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# JOINT IMPLEMENTATION AND CLIMATE CHANGE:

Rationality of joint implementation
when energy markets are not well-functioning

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**ABSTRACT**: The study investigates the possibilities for joint implementation (JI) of the Rio (1992) Framework Convention on Climate Change, i.e. multinational abatement of the net emissions of greenhouse gases, from Finnish point of view. At the moment countries can co-operate in reducing the greenhouse gas emissions (activities implemented jointly) but no transboundary credit is given. The decision on the creation of a full JI system with credits for the investing country will be made by the end of the millennia. In principle JI can reduce the costs of greenhouse gas abatement because the activities would be implemented where the cost of abatement is lowest. There exists several incentive effects and transaction costs, however, that may significantly diminish the profitability of JI. Imperfections of the energy market can improve the seeming profitability of JI but in reality diminish the real usefulness of JI. Joint implementation requires careful planning and well-founded organisation. The potential for small scale JI between Finland and neighbouring areas, especially Estonia, seems fairly good. Liberalising the Russian energy policy further and dismantling subsidies would promote environmental protection. Finland may have to compete for the opportunities with other countries implying a premium for early action.

**KEYWORDS**: Joint implementation, climate change, FSU energy markets

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**TIIVISTELMÄ**: Paperi tarkastelee Rion (1992) ilmastosopimuksen kansainvälisen yhteistoimeenpanon (joint implementation) mahdollisuuksia kasvihuonekaasujen nettopäästöjen rajoittamiseksi Suomen tilanteessa. Nykyisin maat voivat tehdä yhteistyötä kasvihuonekaasujen päästöjen rajoittamiseksi (activities implemented jointly) mutta siitä ei hyvitetä rajojen yli. Järjestelmän, jossa toisen maan päästöjen vähennykseen investoivaa maata hyvitettäisiin, käyttöönotosta sovittaneen ennen vuosituhannen vaihdetta. Periaatteessa JI voi alentaa päästöjen vähentämisen kustannuksia, koska toimenpiteet voidaan toteuttaa halvimmissa kohteissa. Järjestelmän ylläpitoon liittyy kuitenkin insentiivivaikutuksia ja transaktiokustannuksia, joiden merkitys saattaa heikentää joint implementaation kannattavuutta. Energiamarkkinoiden epätäydellisyydet voivat parantaa yhteistoimeenpanon näennäistä kannattavuutta, mutta heikentävät sen todellista hyödyllisyyttä. Joint implementaatio edellyttää huolellista suunnittelua ja asiantuntevaa organisointia. Suomen ja lähialueiden, erityisesti Viron, välillä on olemassa melko hyvät mahdollisuudet ainakin pienimuotoiseen JI-toimintaan. Energiapolitiikan markkinaehtoistaminen Venäjällä edistäisi ympäristönsuojelua. Suomi saattaa joutua kilpailemaan tilaisuuksista muiden maiden kanssa, joten yhteistyökanavia on syytä kartoittaa ja valmistella ajoissa.

**AVAINSANAT**: Yhteistoimeenpano, JI, ilmastonmuutos, lähialueiden energiamarkkinat

## Summary

Climate change is a multidimensional problem calling for holistic solutions. The Rio (1992) Framework Convention for Climate Change (FCCC) has proven to be difficult to implement in most of the Annex I countries. It is likely that the goal of stabilising the greenhouse gas emissions at the year 1990 level by the year 2000 will not be achieved. Reduction of the greenhouse gas emissions is too costly for many countries to be politically feasible. Joint implementation of the FCCC has been proposed as an innovative and efficient solution to the abatement of greenhouse gases.

The purpose of this paper is to study the potential for JI between Finland and the neighbouring areas and try to understand how energy market imperfections affect the outcome of JI. We approach the problems firstly by a brief survey to the existing economic and related literature. Secondly, we study JI under conditions of malfunctioning markets and thirdly study the conditions in Russia and Estonia from the perspective of the previous chapters. Thus, the weight of the paper is on the Fenno-Russian case.

In the introduction we present some basic arguments behind joint implementation and briefly survey the literature around the climate change policy. Some material on the climate change policy is also annexed. The second chapter discusses the issues related to the climate change policy and JI in more depth and presents a framework for understanding the environmental co-operation between Finland and Russia. The third chapter surveys briefly the current conditions in the neighbouring energy markets and discusses the real potential for JI. Lastly we summarise some of the main findings.

JI is not a real policy option yet. Many agents like energy industry in the OECD countries have a good reason to speed the process but some, e.g. developing countries, have doubts. From a globally optimal point of view it would be important to remove all the support from GHG production which exists in some countries like Russia before accepting JI. The global society does not, however, have powerful means to produce the socially optimal outcome.

Rio (1992) agreement gave in principle the right to reduce carbon emissions jointly with other nations. ("*Efforts to address climate change may be carried out co-operatively by interested Parties.*") The agreement did not, however, specify the mechanism for joint implementation (JI) and COP I meeting in Berlin (1995) discussed the topic in depth. Yet, the result was that no credits are given for co-operation but countries can engage in activities implemented jointly co-operation (AIJ) when reducing greenhouse gas emissions as a possible preliminary step for JI. Some countries like USA have developed their own AIJ-programme hoping for the possible provision to be able to use a share of the fruits of co-operation in their own greenhouse gas balance in future.

The basic argument for JI is that emissions would be reduced where the cost of abatement is cheapest, i.e. resources would not be wasted in expensive projects when one can find cheap abatement options in other countries willing to co-operate. Typically JI is projected to happen so that rich industrialised countries make emission reducing investments into transitional economies and developing countries. However, the evidence on the practical

workability of JI is mixed. Abandonment of subsidies especially on fossil fuels is an important preliminary step before full-scale JI. Subsidies distort JI which, on the other hand, may distort R&D of environmentally friendly technology.

JI or AIJ has currently no official or explicit role in the Finnish climate change policy. Finland has, however, helped some economies in transition to build more efficient energy facilities and has some energy development co-operation with the neighbouring countries. JI has also been seen as one of the most favoured methods for achieving the abatement goals of FCCC.

Russia and Baltic countries have transformed from centrally planned socialist economies into market economies with varying success. Estonia has taken the lead in liberalisation with good results during the last few years though all the economies were cast into recession by the collapse of the Soviet regime. Emissions of greenhouse gases (GHG) have diminished as the industrial and energy production have declined. The Soviet energy system was, however, inefficient and pollutive due to cheap energy and disregard for environmental problems. Energy prices were subsidised and the environmental technology backward. The information on the current situation is very limited but many of the problems of Soviet-regime remain especially within Russia. However, the prices of imported fuels have been freed in the Baltic republics to large extent. The possibilities for much further energy efficiency improvements and emission abatement is evident.

As the mere volume of the Russian energy production including fossil fuels is tens of times the size of the Finnish energy production and consumption there should be large possibilities for JI if it is done solely between Finland and Russia. Finland will, however, have to compete with other countries for the best projects if the JI is fully accepted. This implies convergence of the greenhouse gas abatement costs between countries where it has previously been different. The gains that may appear large if we consider only Finland and Russia could be largely reduced due to this factor. Some engineering type of studies show that there exists some potential for gains from JI between Nordic countries and Baltic countries. Russian energy efficiency might be improved as much as 40 per cent.

Estonia as a JI-partner might be easier to negotiate with than currently bureaucratic and yet great power Russia in transition. In any case the engagement in JI requires careful planning of the program and prudent surveillance and information system. These may add to the total costs significantly.

In conclusion we could say that joint implementation is a prerequisite for the globally efficient environmental policy but that it includes many hazards that reduce the benefits. A subglobal JI may not be much better than completely disjoint implementation. Finland should keep a keen eye on the Russian and Baltic JI possibilities as the competition for best projects may be intense when and if greenhouse gas credits will be allowed.

## Yhteenveto

Ilmastonmuutos on moniulotteinen ongelma, joka edellyttää kokonaisvaltaista tarkastelua ja ratkaisuja. Rion (1992) ilmastosopimus on osoittautunut vaikeaksi toimeenpanna useimmissa sopimuksen allekirjoittaneissa "Annex I" maissa. Sopimuksen tavoitetta, jonka mukaan kasvihuonekaasujen päästöt pitäisi saada vuoden 1990 tasolle vuoteen 2000 mennessä, ei todennäköisesti saavuteta. Kasvihuonekaasujen päästöjen vähentäminen perinteisin menetelmin on monissa maissa niin kallista, että se on poliittisesti lähes mahdotonta. Ilmastosopimuksen yhteistoimeenpanoa eli *joint implementaatiota (JI)* on ehdotettu uutena ja tehokkaana ratkaisuna kasvihuonekaasujen päästöjen vähentämiseen.

Tämän keskustelupaperin tarkoitus on tutkia Suomen ja lähialueiden välisen yhteistoimeenpanon mahdollisuuksia ja selvittää energiamarkkinoiden epätäydellisyyksien vaikutusta yhteistoimeenpanoon. Ongelmaa lähestytään ensinnäkin lyhyellä katsauksella kirjallisuuteen. Toiseksi tarkastellaan huonosti toimivien markkinoiden vaikutusta yhteistoimeenpanoon ja kolmanneksi tutkitaan Venäjän ja Viron nykytilannetta. Työn painopiste on Suomen ja Venäjän yhteistoimeenpanoon liittyvissä kysymyksissä.

Johdannossa esitetään muutamia perusargumenttejä yhteistoimeenpanolle ja tarkastellaan alan kirjallisuutta. Toinen kappale keskittyy syvällisemmin yhteistoimeenpanoon ja esittää analyysikehikon Suomen ja Venäjän välisen ympäristöyhteistyön ymmärtämiseksi. Kolmas kappale sisältää katsauksen lähialueiden energiamarkkinoihin ja selvittää yhteistoimeenpanon potentiaalia. Lopuksi vedetään päälöydökset yhteen.

JI ei ole vielä todellinen politiikkavaihtoehto. Monilla ryhmillä kuten OECD maiden energiantuottajilla on tarve nopeuttaa prosessia, mutta esimerkiksi kehitysmailla on epäilyksia järjestelmän hyödyllisyyden suhteen. Globaalista näkökulmasta kaikki fossiilisten polttoaineiden tukiaiset, esimerkiksi Venäjällä, pitäisi poistaa ennen yhteistoimeenpanon käyttöönottoa. "Maailmanyhteisöllä" ei kuitenkaan ole tarvittavia keinoja tai voimavaroja sosiaalisesti optimaalisen järjestelmän saavuttamiseen.

Rion (1992) ilmastosopimus antaa periaatteessa mahdollisuuden vähentää hiilidioksidipäästöjä yhteistyössä muiden maiden kanssa. ("*Efforts to address climate change may be carried out co-operatively by interested Parties.*") Sopimus ei kuitenkaan määritellyt tarvittavia järjestelyjä ja seurantakokous COP 1 Berliinissä 1995 käsitteli asiaa. Kokouksessa päädyttiin pilottivaiheen (*activities implemented jointly* tai *AIJ*) aloittamiseen ilman hyvitysjärjestelmää. Yhteistoimeenpano on siis mahdollista, mutta maiden on toistaiseksi noudatettava ilmastosopimuksen määräyksiä kotimaisiin päästöihin nojautuen eikä yhteistoimeenpanosta hyvitetä. Muutamat maat, kuten USA, ovat kehittäneet oman AIJ-ohjelmansa toivoessaan tulevaisuudessa hyötyvänsä yhteistyöstä.

Yhteistoimeenpanon tärkein perustelu on päästöjen vähentäminen halvimmissa kohteissa, eli resursseja käytettäisiin sopimuksenvaraisesti valtiollisista rajoista riippumatta päästöjen vähentämiseen edullisimmissa kohteissa. Tyypillinen JI-projekti tapahtuisi rikkaan teollisuusmaan tehdessä kasvihuonekaasujen päästöjä vähentävän investoinnin

siirtymätalouteen (esim. Viro tai Venäjä) tai kehitysmaahan. Yhteistoimeenpanon toimivuuteen ja järjestämiseen käytännössä liittyy kuitenkin merkittäviä ongelmia. Tukiaisten poistaminen erityisesti fossiilisilta polttoaineilta on tärkeä edeltävä vaihe yhteistoimeenpanossa. Tukiaiset vääristävät yhteistoimeenpanosta saatavaa hyötyä. JI saattaa toisaalta heikentää painetta uuden ympäristöystävällisen teknologian kehittämiseksi.

JI tai AIJ ei toistaiseksi ole selvästi kirjattuna Suomen ilmastopolitiikkaan. Suomi on kuitenkin avustanut siirtymätalouksien energiajärjestelmien uudistamista ja toiminut yhteistyössä ympäristönsuojelussa lähialueiden kanssa. Yhteistoimeenpanoon suhtaudutaan sidosryhmien taholla myönteisesti.

Venäjä ja Baltian maat ovat vaihtelevalla menestyksellä siirtyneet sosialistisista suunnitelmatalouksista markkinatalouteen. Viro on nopeimmin ja viime vuosina hyvällä menestyksellä omaksunut liberaalin markkinajärjestelmän, vaikka kaikki entisen Neuvostoliiton alueen maat joutuivat syvään taantumaan neuvostojärjestelmän romahdettua. Kasvihuonekaasujen päästöt ovat vähentyneet teollisuustuotannon supistuttua. Neuvostoliiton energiantuontanto ja -kulutus olivat kuitenkin tehottomia ja saastuttavia halpojen polttoaineiden ja ympäristönsuojelun laiminlyöntien takia. Energian hintaa tuettiin ja ympäristönsuojelu oli takaperoista. Nykytilanteesta on vähän tietoja, mutta useat neuvostoajan ongelmat ovat säilyneet erityisesti Venäjällä. Baltian maissa ja myös Venäjällä on polttoaineiden hintoja kuitenkin merkittävästi vapautettu. Huomattavia parannuksia energiatehokkudessa ja päästöjen vähentämisessä on saavutettavissa.

Koska Venäjän energiantuotannon laajuus on kymmeniä kertoja Suomen vastaava, pitäisi yhteistoimeenpanolle olla hyvät mahdollisuudet. Suomi joutuu kuitenkin kilpailemaan muiden maiden kanssa parhaista projekteista jos JI hyväksytään osaksi ilmastosopimuksen toimeenpanoa. Kilpailu johtaa kasvihuonekaasujen vähentämisen kustannusten yhdenmukaistumiseen maiden välillä. Vaikka Suomen ja Venäjän välinen JI näyttäisikin tällä hetkellä hyvältä, voi kilpailu siis muuttaa tilannetta merkittävästi. Muutamat tekniset tutkimukset ovat osoittaneet, että myös Pohjoismaiden ja Baltian välillä on joitain mahdollisuuksia yhteistoimeenpanoon. Venäjällä energiankäytön tehokkuutta voitaneen parantaa jopa 40 prosenttia.

Viro on todennäköisesti joustavampi neuvottelukumppani kuin siirtymätalouden varhaisemmassa vaiheessa oleva byrokraattinen suurvalta Venäjä. Joka tapauksessa JI edellyttää huolellista ohjelmaa ja seurantajarjestelmää. Nämä transaktiokustannukset saattavat lisätä kokonaiskustannuksia merkittävästi.

Yhteenvetona voidaan sanoa, että JI on perusedellytys maailmanlaajuisesti tehokkaalle ympäristöpolitiikalle, mutta siihen liittyy myös monia haittatekijöitä. Suppea alueellinen yhteistoimeenpano ei välttämättä ole kasvihuonekaasujen kokonaispäästöjen kannalta parempi vaihtoehto kuin nykyinen järjestelmä. Suomen tulisi kuitenkin valvoa huolellisesti etujaan lähialueilla yhteistoimeenpanon sallimista ja kilpailua silmälläpitäen.

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# Joint implementation and climate change

## Rationality of joint implementation when energy markets are not well-functioning

Pasi Kuoppamäki[1]

*Climate change is a multidimensional problem which calls for holistic solutions. The Framework Convention for Climate Change has proven to be difficult to implement in most of the Annex I countries. It is likely that the goal of stabilising the greenhouse gas emissions at the year 1990 level by the year 2000 will not be achieved. Reduction of the greenhouse gas emissions is too costly for many countries to be politically feasible. Joint implementation (JI) of the Climate Convention has been proposed as an innovative and efficient solution to the abatement of greenhouse gases. We study the emerging market for joint implementation and concentrate on the Finnish-Russian case.*

*The purpose of this paper is to study the potential for JI between Finland and neighbouring areas and try to understand how energy market imperfections affect the outcome of JI. We approach the problems firstly by a brief survey to the existing economic and related literature. Secondly, we study JI under conditions of malfunctional markets and thirdly research the conditions in Russia and Estonia from the perspective of the previous chapters. Thus, the weight of the paper is on the Finnish-Russian case.*

*In the introduction we present some basic arguments behind joint implementation and briefly survey the literature around climate change policy. Some material on climate change policy is also annexed. The second chapter discusses the issues related to climate change policy and JI in more depth and presents a framework for understanding the environmental co-operation between Finland and Russia. The third chapter surveys briefly the current conditions in the neighbouring energy markets and discusses the real potential for JI. Lastly we summarise some of the main findings.*

*We show that joint implementation is a good addition to an effective climate policy under certain conditions. The JI-policy should be well-formulated and lead to a global Pareto improvement. To minimise free-riding and maximise local and especially global benefits from JI one should require the participating countries to have clear base-line targets for environmental policy and to abolish existing subsidies on greenhouse gas emitting industries.*

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[1] I gratefully acknowledge the financial support from Maj and Tor Nessling foundation which allowed me to study the subject during 1996 and from Jahnsson foundation which helped me to finish the report in January 1997. I also want to thank the people who have shared their thoughts, given material and commented on the manuscripts. Foremost, I thank Kari Alho for helping in organising the project and commenting on the final manuscript.

# 1 Introduction

The first chapter introduces the basic concepts of joint implementation without trying to be a comprehensive presentation[2]. We have also included informational boxes on several aspects of climate change debate that are relevant to the present discussion.

## 1.1 Principles of Joint implementation

The concept of "Joint Implementation" (JI) or "Activities Implemented Jointly" (AIJ) was introduced early in the negotiations leading up to the 1992 Earth Summit in Rio, and was formally adopted into the text of the United Nations Framework Convention on Climate Change (hereafter FCCC or Rio (1992) agreement). The terms "JI" and "AIJ" have been used subsequently to describe a wide range of possible arrangements between interests in two or more countries, leading to the implementation of co-operative projects that seek to reduce or sequester greenhouse gas emissions.

Finland has agreed by signing the Rio (1992) agreement to limit its greenhouse gas emissions to the 1990 level by 2000. The general purpose of the agreement is to achieve "... *stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner*". This goal seems, however, currently very difficult to meet. The Finnish economy suffers from a severe unemployment and needs more growth and energy which has to be supplied mainly by new coal fired power plants[3]. Rio (1992) agreement gave in principle the right to reduce carbon emissions jointly with other nations. ("*Efforts to address climate change may be carried out co-operatively by interested Parties.*") The agreement did not, however, specify the mechanism for joint implementation and COP I meeting in Berlin discussed the topic in depth. Yet, the result was that no credits are given for co-operation but countries can engage in activities implemented jointly in co-operation when reducing greenhouse gas emissions as a possible preliminary step for fully fledged JI[4]. Berlin did, however, establish the target of making the final decision on JI before the turn of the century.

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[2] Jepma (ed. 1995) gives a good overall presentation of the concepts.

[3] The Parliament decision to not to build more nuclear power together with increasing demand for energy has led to a pressure to increase the use of fossil fuel based power production. See e.g. the Finnish Energy Review (Energiakatsaus).

[4] See the appendix at the end of the paper.

**Box 1: Climate change policy so-far**

The history of significant climate change policy discussion is not long. The first time the climate change was acknowledged as a serious problem by a significant intergovenmental meeting was in 1979. The First World Climate Conference was an important scientific event. It issued a declaration calling on the world's governments "to foresee and prevent potential man-made changes in climate that might be adverse to the well-being of humanity."

Many international conferences on climate change have convened since then. Attended by government policy-makers, scientists, and NGOs, they have addressed both scientific and policy issues. Important meetings have been held for example in Toronto, the Hague, Villach and Bergen. The Second World Climate Conference, held in 1990 in Geneva, was a significant step towards a global convention on climate change. Some of these meetings have taken place under the United Nations and its specialized agencies. Others have been held within regional and global platform such as the European Community.

The 1992 UN Framework Convention on Climate Change (FCCC) is the first binding international instrument to address the issue specifically. Adopted after 15 months of intensive negotiations within the Intergovernmental Negotiating Committee (INC) for a FCCC, it was opened for signature in Rio de Janeiro in June 1992. The INC negotiators drew on the First Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). The Convention incorporates a number of emerging legal principles that had been developed by various climate conferences and it will provide a general framework for addressing the climate change issue. Berlin COP 1 meeting in 1995 and Geneva COP 2 in 1996 meetings continued discussion on climate change including JI.

Moreover, before the Convention was adopted, some countries had already taken unilateral action at the national level. Most OECD member states have set national targets for stabilizing or reducing their emissions of greenhouse gases (GHG). In addition, two other international environmental treaties address climate change indirectly. The 1987 "Montreal Protocol on Substances That Deplete the Ozone Layer" obliges its parties to phase out chlorofluorocarbons (CFCs) by the year 1996. The 1979 Geneva Convention on Long-Range Transboundary Air Pollution and its protocols regulate the emission of noxious gases, some of which are precursors of greenhouse gases.

Joint implementation can be divided into open and closed form JI. Closed form JI would be organised as a market for tradable emission rights. Some areas like the EU might adopt a system where the total emissions of the area would be fixed at the 1990 level and the rights to pollute distributed initially on some fair and efficient basis. The participating countries would then let the holders of the rights to trade on a stock exchange type of a market. Currently there is no definite timetable for this kind of approach and many questions remain to be solved. One way to organise such a solution would be a creation of a "climate clearinghouse"[5] in which participating governments (or firms) could offer GHG reduction possibilities or right to pollute for sale. Making such an organisation work is an awesome task not likely to be created during the 20th century. Open form JI refers mainly to smaller scale technological co-operation between two or more countries, e.g. Finland

[5] Tol et al (1995)

could help a country to improve its energy efficiency by a technology transfer. The open form JI is more likely between Finland and the neighbouring areas and the closed form JI within the EU.

**Box 2: Impact of Climate Change on the Finnish Economy and Adaptation**

Climate change has a direct and indirect impact on the economy and many other sectors of the society. The impacts include both benefits and costs. Agriculture is one of the most climate sensitive industries in Finland because it has to operate at the climatic limits of cultivable land. Crop potential will grow and Finnish agriculture may benefit FIM 1 - 3 billions in 1993 money from climate change annually. The benefits are mainly allocated to the producers and possibly to taxpayers via diminished agricultural subsidies. However, risk of harmful impacts through the international markets exists. The global economic impact of climate change has usually been estimated to be around two percent damage of the global GDP by the mid-21st century.

Silviculture is a major industry in Finland and the impacts of climate change will cause multiple indirect implications for the rest of the economy. The forest growth in Finland is estimated to increase and birch will conquer area from pine and spruce. The annual value of the forest growth may increase FIM 4 billion in 1993 money.

Climate change has significant negative impacts on Finland through international markets. The impacts of climate change vary a lot among and within countries. Damages are estimated to be most severe in the developing countries. Extreme weather events may become more common and the biodiversity can suffer as the climate change is faster than the ability of species to adapt. Extreme events can lead to damages also in Finland. In the worst case there will be lot of climatic migration which may partly lead to migration to Finland from the damaged areas.

A significant factor influencing the impacts is the adaptation to the climate change. Adaptation means changes in the agricultural production and plant varieties, different construction methods, changes in forestry, alteration of spare-time activities, etc. State can speed up adaptation by shaping the social structure, legislation and infrastructure. Adaptation can significantly diminish the costs of climate change.

If we sum up monetary estimates for the impacts on economy, migration and biodiversity and divide it by the GDP we get a figure which is an order of magnitude estimate for the change in the national welfare. The analysis shows that the climate change may increase welfare by one per cent in Finland by the year 2050. The error margin of the estimate is large because both the magnitude of climate change and the economic development are highly uncertain. The Finnish economy is an open economy depending strongly on the rest of the world. Therefore, the Finnish economy will also suffer if the international economy is severely depressed by the climate change. Current wisdom seems, however, to be that the Finnish situation is rather comforting.

Source: Kuoppamäki, Pasi, Impacts of Climate Change From a Small Nordic Open Economy Perspective, The Potential Impacts of Climate Change on the Finnish Economy. ETLA, The Research Institute of the Finnish Economy, 1996.

Joint implementation or AIJ has currently no official or explicit role in the Finnish climate change policy. Finland has, however, helped some economies in transition to build more efficient energy facilities and has some energy development co-operation with the

**Box 3: Research on joint implementation**

JI is of special interest to few disciplines. As it solves some politically important problems of meeting international agreements many political scientists have been interested in studying the different forms and arrangements for JI. For example Jepma (ed. 1995) includes many articles that could be described as political science. While the practical aspects of engaging in JI require detailed technological knowledge engineers have made research especially on the technical foundations of JI. For example, Finnish energy company IVO has produced fairly detailed calculations for Narva powerplant in Estonia. While the multinational nature of joint implementation demands for detailed legislation the students of jurisprudence have also made their contribution.

However, as the basic arguments behind JI are economic cost saving arguments economics stands up as the primary field for academic joint implementation studies. Economists have concentrated on few basic questions. At the beginning it was important to lay down the theoretical foundations for joint implementation. Few macrotheoretical optimization models (e.g. Aaheim 1994) and microeconomic marginal cost models (e.g. Jackson 1995) have emerged. As the argumentation is fairly well suited for general equilibrium studies some have introduced large global models to study the long term economic impacts of JI (e.g. ABARE 1995). These studies either discuss the theoretical arguments behind JI or calculate the welfare gains from JI. The criticism and caution against JI has also blossomed into divergent literature of several risky and negative aspects of JI. The strategic interactions between the parties involved have been studied under game theoretical framework (e.g. Hagem 1994), transaction cost problems have been discussed (e.g. Jackson 1995) and problems related to the fears of developing countries have resulted in many papers (e.g. Parikh 1994). Thus, the work on different aspects of JI has boomed after the introduction of the concept in the Rio FCCC in 1992.

neighbouring countries. A survey-type of study, Tirkkonen & Wilenius (1995), under the Finnish climate research programme produced some results on opinions of the experts and policy-makers on different options for climate policy. In general international environmental aid to the neighbouring areas was seen as a fairly important form of policy the only clearly more preferred policies being energy-saving and development of cleaner technology. The differences between different groups of respondents, however, were slightly surprising. Government officials were much more positive towards AIJ than representatives of the firms. It seems that many business leaders see AIJ as a leakage of budget funds to foreign targets instead of domestic ones. The difference cannot be interpreted as a clear sign of a negative attitude as the sample was not random and not very large. Anyway, it implies that much work is needed to construct and explain a workable and widely accepted AIJ/JI-programme.

Joint implementation, as any type of climate policy, can take place in several forms which all, naturally, aim at the reduction of atmospheric GHG content. Thus, the broadest definition includes carbon sink enhancement as well as usual GHG emission reduction. Selrod et al. (1995) have categorised the practical JI projects into four distinct groups: (i) saving of fossil fuels, e.g. improved efficiency in energy production; (ii) structural

changes in industrial production technologies; (iii) add carbon sinks, e.g. forest plantations; and (iv) develop agricultural processes into less pollutive direction. However, as JI has to be transparent and results clearly measurable to grant the GHG reduction to the investor JI cannot be as diverse as unilateral climate policy. For example, a country may be able to reduce waste and GHG emissions by environmental education but the results are impossible to measure[6]. Thus, not all policies are possible under JI arrangement and the most debated method has been the sink enhancement[7]. However, actions based on climate policy have also other implications, e.g. sustainable silviculture may prevent desertification, and the actions should be judged by the total cost-benefit calculation.

1.2 Analytics of joint implementation

There are some economic fundamentals that make JI a worthwhile policy. In this section we show why countries like Finland should develop a JI-programme or begin with AIJ while hoping for the possible provision to be able to use a share of the fruits of co-operation in their own greenhouse gas balance in future. We present some basic arguments for and against JI.

The theoretical argument behind JI can be based on a dynamic model with a simple two country world. We follow here the trails of Aaheim (1994).

Welfare (W) of a nation is an increasing function of consumption ($c_t$) and decreasing of global greenhouse gas (GHG) emissions ($e_t$). No climate convention exists.

$$(1)\ W_0 = \int_0^\infty w(c_t, e_t, t)dt$$

The country has one industry producing good $x$ with capital k accumulating in a normal neoclassical way. We assume no depreciations, i.e. $\delta$ is zero in the rest of the model.

$$(2)\ x_t = f(k_t)$$
$$(3)\ \dot{k}_t = \delta k_t + i_t$$

Production is allocated to investment (i), consumption (c), domestic emission abatement $a^D$ and emission abatement abroad $a^F$ (joint implementation). Thus, the economy is a closed economy with the exception of JI-investments. The production based domestic GHG emissions are determined by:

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6 See annexed table and Kuoppamäki (1996) for a categorization of policies.

7 Pearce in Jepma (1995) discusses various aspects of the scope of JI

(4) $e_t^D = G(x_t, a_t^D) = g(k_t, a_t^D),\ g_k' > 0\ ja\ g_a' < 0$

(5) The global GHG emissions in our model are sum of the two countries' though in reality no two countries can control the global GHG emissions. Here a country can influence also the GHG emissions of the other country via JI.

(6) $e_t^F = h(a_t^F)$

When we know the initial level of capital we can determine the optimal level of consumption and investment by maximising (1) subject to (2)-(6). The first order conditions are

(7) $g_a' w_e' = h_a' w_e' = w_c'$

(8) $-\dot{\lambda}_t/\lambda_t = g_a'/g_k' + f_k'$

$\lambda$ is the cojoint factor of the control problem. (7) shows that at the static equilibrium the marginal benefit of consumption has to equal both the marginal benefit of domestic and foreign GHG abatement investment. Thus, we get the common-sense result of equal marginal benefits at the optimum. The result also implies that JI is a pre-condition for welfare maximisation. (8) gives the intertemporal optimum $\lambda$ being a shadow price for restricting the use of capital. The rate of change in (8) is also the social discount rate implied by the model. One implication is that when the GHG emission abatement becomes cheaper the economy grows faster producing more emissions. In the long run the emissions may grow faster than without JI implying a need for a global GHG emissions reduction agreement. Thus, a JI-agreement without a clear target level for emissions may lead to more emissions than desirable. Pure cost saving arguments have to be combined with global externality thinking.

In other words, the basic argument for JI is that emissions would be reduced where the cost of abatement is cheapest, i.e. resources would not be wasted in expensive projects when one can find cheap abatement options in other countries willing to co-operate. Typically JI is projected to happen so that rich industrialised countries make emission reducing investments into transitional economies and developing countries. However, the evidence on the practical workability of JI is mixed. In principle joint implementation adds to the toolkit of policy-makers but there are many drawbacks mainly related to transaction costs and incentive mechanisms. We address these issues in the next chapter.

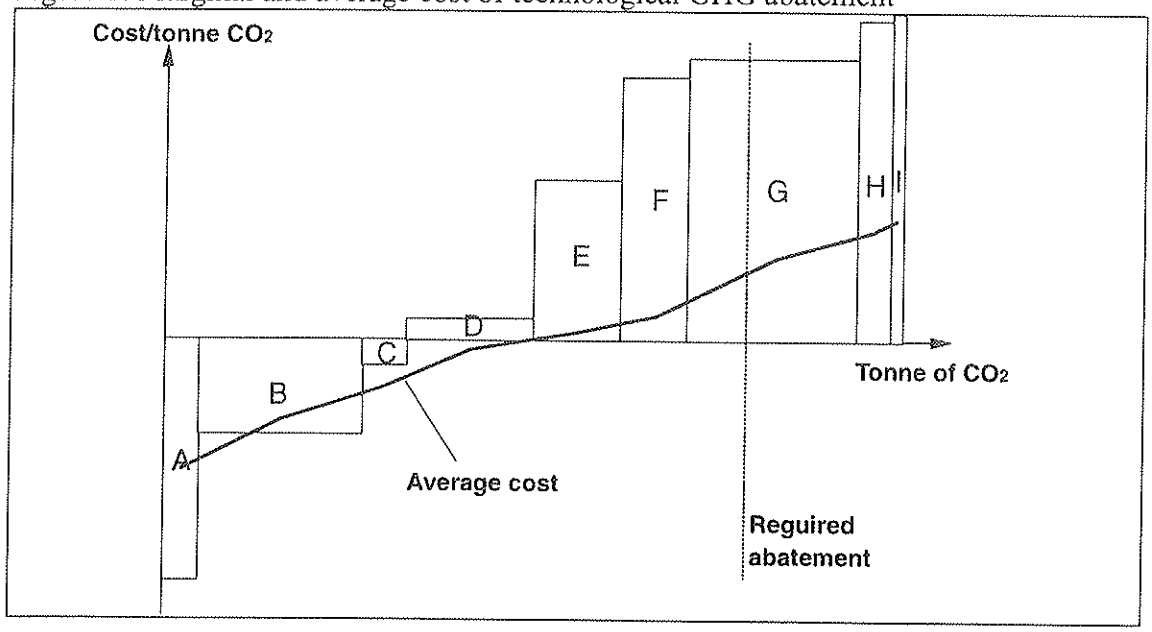
# 2 Rationality of joint implementation

The second chapter discusses the arguments behind JI in more detail. The previous chapter already established the basic economic argument behind JI, i.e. that of equalising the marginal costs and benefits of GHG abatement across borders to maximise welfare. The emphasis here is, however, on the risks embedded in subglobal and even global joint implementation. We try to show that one must have a good knowledge of the conditions for co-operation and well-specified rules for JI.

## 2.1 Cost saving arguments for JI

The adjacent figure (1) displays an imaginary marginal cost curve for technological GHG abatement options. The vertical axis shows the social cost of GHG abatement per tonne and the horizontal axis the magnitude of each technological abatement option, e.g. *A* could be installing better combustion technology to the worst power plants and *I* building more water power. It is often argued that there are win-win options where one can find technological improvements that both save production costs by improving efficiency and reduce emissions. Thus, there might be free lunches hidden in the technological advances that have not been utilised for some market or information imperfections. However, it is inevitable that there can be only few not generally known possibilities for win-win technology and most of the abatement projects must bear a net cost. The kinked line describes the average cost of abatement. If the required abatement is as shown by the vertical line the social cost of achieving will be slightly positive. The marginal cost is assumed to rise together with the stringency of the abatement requirement.

Figure 1: Marginal and average cost of technological GHG abatement



If we combine the different cost functions of two countries it is easy to see that the aggregation increases the options for the achievement of the combined abatement goal of the countries. Thus, the average cost of abatement is less than or at worst equal to the sum of the separate costs of the countries.

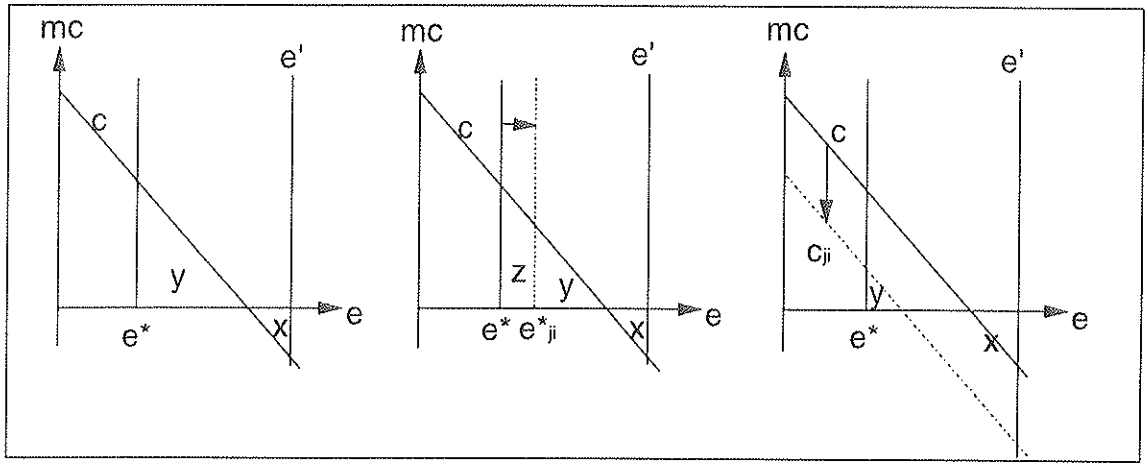
There is a problem, however, imbedded in the above described logic. These technological options are derived from *a bottom-up* methodology as opposed to *top-down* macroeconomic models. The marginal cost curve shows only the costs of technological improvement abatement possibilities ignoring economic control methods, e.g. $CO_2$-taxation. Economic policies that pursue to influence the amount of emissions via the impact of the price system on the agents' behaviour may also change the conditions for technological options. Bottom-up cost-benefit analysis do not capture all the impacts, e.g. cross-sectoral impacts are generally neglected. The change in relative prices may make different production technologies more or less lucrative than before and also alter the incentives for new R&D. As the impacts of environmental, like carbon, taxes are usually analysed in a general equilibrium framework assuming efficient technologies and no win-win possibilities it is nearly impossible to discuss all the options within the same scheme. Neoclassical GE models leave no room for win-win[8] arguments and little for technological change. More evolutionary engineering models cannot, on the other hand, really incorporate the general equilibrium impacts of the price system. Much remains to be done to combine these two views of the phenomenon.

One further way to demonstrate the benefits from different types of JI can be seen from the adjacent figure (2). The left-hand part of the graph shows the original situation with emissions on the horizontal axis and marginal cost of emission abatement on the vertical axis. The marginal cost of greenhouse gas emission abatement is shown by the *c*-curve and *e'* denotes the business-as-usual emissions without any emission restrictions. *e** is the desired level of emissions set by FCCC. The figure is based on the assumption that there exist some no-regret possibilities, area *x*, which would be beneficial to use even without environmental benefits. No-regret options may exist because of asymmetric information and other deviations from the first best world. The emission target, however, requires also costly actions shown by the triangle *y*. The net-cost of reaching the emissions target is y-x. If the country can find clearly defined zero net-cost JI-projects in other countries the emission target for the country would be less stringent, *e*ji*, by the amount credited due to the emission reduction in the foreign country. Thus, the country would save the amount *z* as the most costly domestic abatement projects would be abandoned. If the country would

[8] Win-win denotes a Pareto improvement where all parties benefit.

engage in closed-form JI with another country with good abatement possibilities the marginal cost curve might shift from c to $c_{ji}$. In our example the pool of no-regret options would be vastly enlarged so that the abatement target would be reached with profit. Most of the abatement actions would be undertaken in the foreign country. The situation we depict is rather simplifying and purely imaginary but it shows how the different forms of JI would in a simple world help a country to achieve its abatement target.

Figure 2: Impact of JI on the cost of achieving GHG abatement target



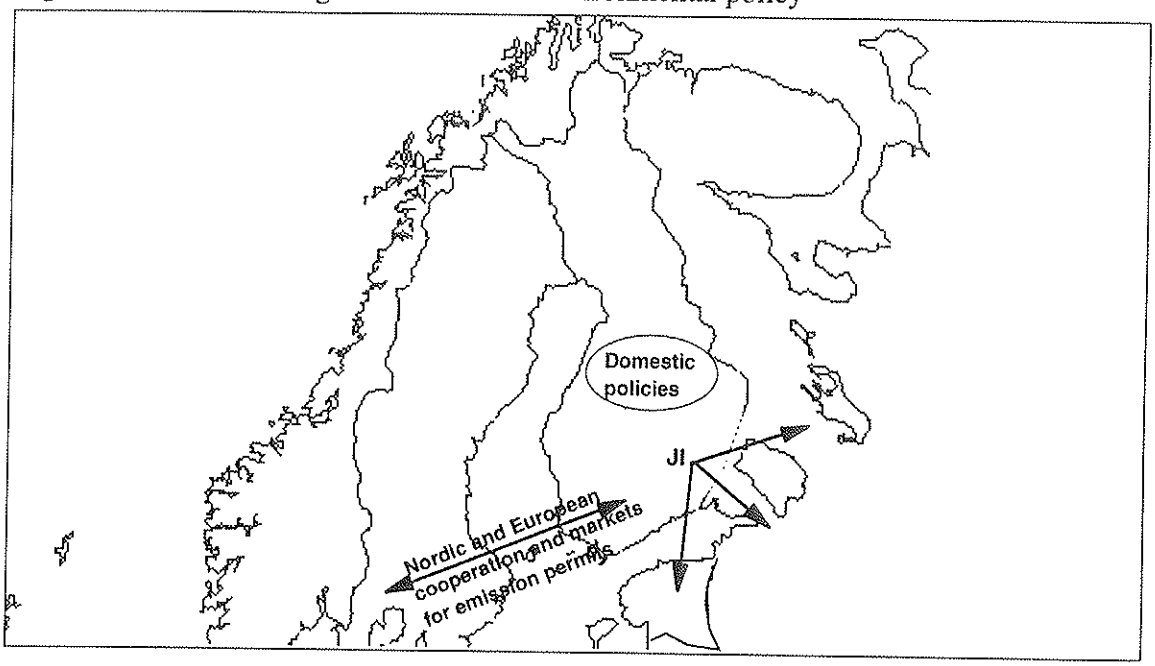

The figure (3) displays the main Finnish possibilities for limiting any emissions including greenhouse gases and meeting the targets of international agreements. First and foremost, Finland must implement domestic environmental policies including environmental taxation and regulations. As to economic measures especially carbon taxes have been under fairly extensive study[9]. Secondly co-operation with other Nordic countries[10] or/and the EU offers some possibilities in the form of technological co-operation and joint markets for emission permits. Nordic joint energy markets are a good beginning for this sort of co-operation. Harmonisation of environmental taxation may also promote the adoption of better policies across borders as the competitive impacts of differences in environmental policies would be eliminated. Finnish industrial leaders have often complained that stringent environmental policies like the relatively high taxation on energy puts the Finnish industries into a competitive disadvantage compared to other

9 See for example Jerkkola & Kinnunen & Pohjola (1993)

10 One form of Nordic and Baltic cooperation is the formation of a "power-ring". Dagens Industri, 26 Oct 1996, reports that the final report of "Baltic Ring" committee between Sweden, Finland, the Baltic States, Russia, Belorussia, Poland, Germany, Denmark and Norway will be published in October 1997. Existing power lines between the Baltic states can be complimented with a new link between Kaliningrad oblast and Poland, plus another within Finland and Estonia, and one between Russia and Finland. Sweden and Finland are in reality the main future power suppliers to the Baltic states. Chalmers University in Sweden has done few studies on the Nordic co-operation, see e.g. http://www.entek.chalmers.se/annreport/report.html

countries that do not have the same level of environmental policy. Small differences may not be very important as the high environmental standards can produce a image-benefit but large differences can naturally produce unfair competitive situations. Thirdly, Finland could engage in joint implementation mainly with the neighbouring areas in Russia and Estonia, possibly also with other countries. One promising area for developing co-operation could be the Baltic Sea rim around which one might try to co-operate in GHG abatement simultaneously with other environmental issues.

Figure 3: The main categories of Finnish environmental policy




Joint implementation may also reduce the so-called carbon leakage which results from polluting industry moving from countries with strict environmental policy to countries with loose environmental policy. There exists, however, also many drawbacks which are difficult to measure. JI may reduce the incentive to develop more environmentally friendly technology in both the investing and receiving country as it relaxes the need for technological improvements. Transaction and administrative costs may be significant and the receiving partner may lose a share of their decision making power to the investing partner[11]. On the other hand, the investing country has always a risk of political changes in the JI system and the receiving country's policy.

[11] There has to be a clear agreement on the management of the JI-target-project and sharing of the benefits. The investor is unlikely to be willing to leave completely free hands to the receiver. Thus, the receiving agent may have to give up a significant part of his power over the target in exchange for the JI-investment. For example, a decision of a shut-down of a power plant may be impossible as the investor would lose the benefits as there would no more be any abated GHG emissions to be abated. The receiver might be forced to run the plant on financial loss. See also Hagem (1994) for a model of

Some forms of JI have often been proposed as a solution to environmental policy in many occasions. The $SO_x$-debate showed that it would be economically rational to help the most pollutive countries to reduce their emissions before any domestic operations. For example, if Finland helped the neighbouring FSU areas to reduce $SO_x$-emissions, the cost-benefit ratio of environmental investments would be much better than pure domestic improvements would have[12]. Thus, the victim pays principle is in work here and Pareto optimality implies drastic reductions of emissions in the neighbouring FSU-areas with the help of Finnish financing. The study is based on several assumptions, however, that cannot be seen as possible basis for GHG abatement studies, especially joint implementation research. Kaitala et al. (1991) was based on the assumptions that both Finland and Soviet Union have clear abatement goals, the cost of abatement is known, the damages caused by pollution can be calculated, the transport coefficients and resulting deposits are known. They compare co-operative agreement to noncooperative equilibrium and find that the difference in the target deposit levels is the main source of benefits from co-operation. $CO_2$ has a uniform "deposit level" around the globe making the problem different from $SO_x$-problem.

Studying GHG abatement is generally much more fuzzy while there are more relevant gases, sources and agents involved. The cost of abatement is not known as there is still virulent debate on almost every aspect of the cost measurement. Moreover, the impacts of the climate change are less known than the costs of abatement leaving little room for real optimisation[13]. Stochastic optimisation models and models based on option pricing theory[14] can give some insight into the world of unknown parameters but there is not much room for similar insights as in the above mentioned studies for a more clearly defined case of environmental policy. Climate change has many distinct features from any other environmental problems, its impacts extend over several decades if not centuries, it covers the whole globe though its impacts are not equally distributed and it has more uncertainty related to every factor. A particular "problem" related to single abatement projects and even countries is that their GHG emissions do not matter when we think of the speed of climate change. Only really huge changes in the emissions have significance.

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asymmetric information. Jackson (1995) believes that the transaction costs are a very significant factor determining the profitability of JI-investments.

[12] Kaitala & Pohjola & Tahvonen (1991 a and b).

[13] Models like Nordhaus (1995) are based on very raw data and back-of-the-envelope estimates for all the important parameters like the cost of climate change in different parts of the world. What these models are best at is sensitivity analysis.

[14] See Dixit and Pindyck (1994) for a presentation on uncertainty and option models.

Even if Finland and all the neighbouring areas would stop emitting GHG immediately, it would have only a very small marginal impact on the climate in Finland or elsewhere. The reasons for reducing GHG in Finland must be found from international solidarity and possible other dividends, e.g. reduced sulphur emissions or generated tax funds. Thus, we cannot straightforwardly apply familiar methods from other environmental problem-solving literature to JI. Caution is needed and especially the uncertainty factor calls for prudence and well-planned interdisciplinary research.

2.2 Criticism towards joint implementation

Joint implementation has also received much criticism alongside the positive features of cost saving described above. In this section we go through some basic arguments against especially liberal JI-policy accepting all sorts of projects with little regulation. Our main interest, however, is the case of malfunctional energy markets.

The studies promoting JI without any second considerations for free riding and market distortions can be criticised in several ways. Many people object to helping financially other nations by saying that they should carry their responsibility and not be let to free-ride. Thus, there exists fairly strong objection against subsidising other countries. This argument, however, cannot usually be supported by basic economics. On the other hand, there has been some discussion on the solidarity issues and North-South division as basis for equitable environmental policy, i.e. rich countries should help poor countries without demanding these to stick to any rules. Rich jargon exists around the debate concerning environmental co-operation, fairness and solidarity. The real effective breakthroughs in global environmental policy are rare.

JI is not a risk free undertaking. Investments to other countries always face a country risk and JI is also as prone to political and economic risks as any other investment. The only significant absent risk compared to the usual investments is the exchange rate risk[15]. Political risks related to the sustainability of the flow of greenhouse gas credits can also be significant in politically instable countries. Decisions on operating the JI-targets like power plants or forest plantations can cause friction between the parties or even lead to one-sided changes in the rules or sharing the benefits of JI.

The models that have been used to demonstrate the efficiency of different JI policies with different pollutants do not generally consider the existing market distortions[16]. Models use

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[15] After the initial investment all the benefit flows are in the form of carbon credits which are real units not depending on exchange rates.

[16] For example ABARE (1995) has a very extensive global scale model but it

abatement cost data and other information which may be substantially disturbed by subsidies or other interventions and imperfections. Compared to well functioning markets with world market price level or higher with Piqou taxes the situation may be completely different.

JI-projects would most likely take usually place between a wealthy and developing or transitional economies as the marginal cost of abatement is most likely to differ between these groups. Many developing economies do not tax fossil fuels[17] and some transitional economies even subsidise the use directly or through export quotas. These as such violate optimal policy. If the country in question would abandon subsidies or adopt tax on pollutants from fossil fuels it might improve its welfare and raise the price of fossil fuels[18]. Increased fossil fuel prices could lead to better production processes and diminished energy use with less emissions. This, on the other hand, would bring environmental benefits also to the neighbouring areas and the whole Globe as the greenhouse gas emissions are also reduced. As the level of environmental protection increases it leaves less room for JI. Therefore, wise domestic policies in the potential receiving countries diminish the scope for joint implementation. In the Finnish-Russian case the abolishment of subsidies for fossil fuels and other market distortions might make the picture for JI different from what the current cost-benefit computations may show. Thus, the Finnish welfare is a function of both JI with Russia and the energy policy of Russia.

Abolishing subsidies is nearly analogous to adopting a Piqou-tax on harmful activity. We can demonstrate the "double-dividend" as follows in the adjacent figure (3). Double dividend refers to gaining two or more benefits from the public policy change. The usual case for double-dividend is when an environmental tax leads to improved quality of the environment and welfare gain via increased budget revenue or a reduction in another tax.

We study only one industry which produces energy or uses energy as an input. Thus, our model is also purely partial model as it does not deal with the general equilibrium impacts, e.g. relative prices. Horizontal axis show the level of production of an energy intensive good and vertical axis the consumer price and marginal cost of the production. MCp denotes the private marginal cost the producer faces in production while MCs

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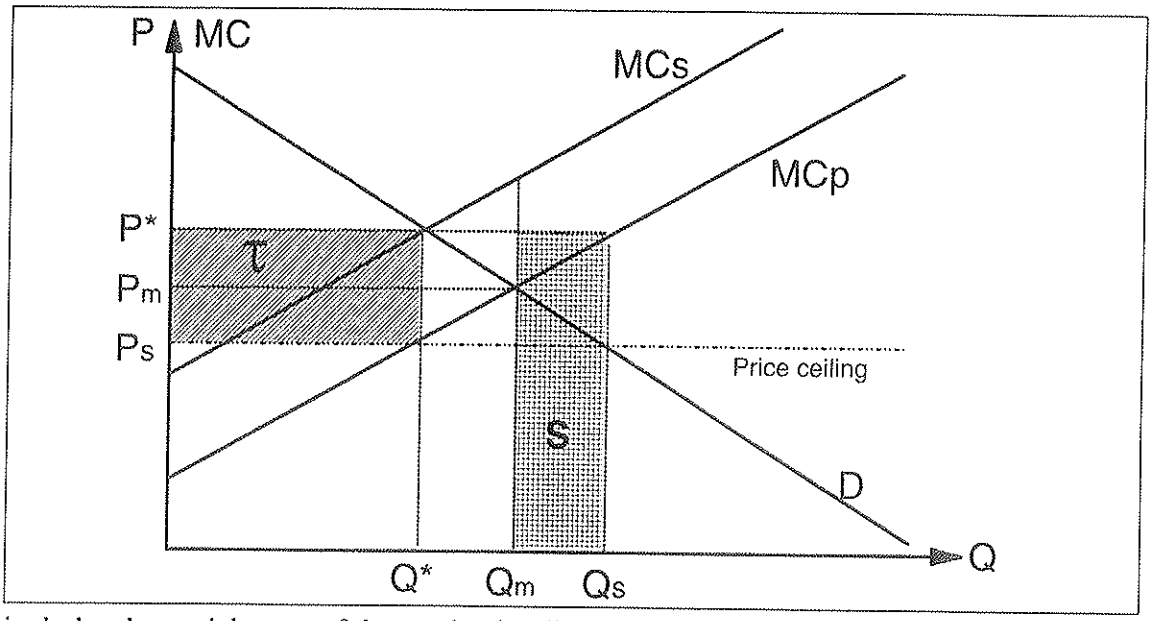
operates on high level of aggregation and debatable data.

[17] For example, there is an everlasting debate in the USA on the petroleum tax. The pressuregroups like truck drivers have hindered environmental taxes and the price of gasoline remains low.

[18] See the model below. Removing subsidies on a single industry when there are no significant subsidies in most other countries is likely to increase aggregate welfare.

Figure 4: Change from a subsidy to a tax




includes the social costs of the production like pollution or emission of greenhouse gases. Consumer demand is function D. Free market would clear at point ($P_m$, $Q_m$) where the supply and demand equal. The negative externalities of the production shown by the higher social marginal cost of the production, however, imply that the social optimum would be found at (Q*, P*). Market solution produces too much waste for it to be the social optimum. Furthermore, if government has adopted a subsidy based on some reasoning like improving employment or infant industry the price for consumers has to be less than $P_m$ for the market to be able to clear. In our example the consumer price has been set to Ps with use of price ceiling and the government has to subsidise the industry with a payment equal to area *S* in the figure. The subsidised solution produces even more pollution than the market solution and is further away from the socially optimal solution.

If the government would swap from a subsidy to taxing the activity by an amount equal to the difference between the social and private marginal cost, i.e. pass a Piqou-tax, it would reach the social optimum and the budget would gain the sum of areas S (eliminated subsidy) and τ (revenue from the Piqou-tax). Thus, the government would produce a double dividend of socially optimal solution and increased budget revenue. The model, however, is simple in terms that is does not include other relevant factors like impact on employment, income distribution, adaptation costs, etc. Also the use of the collected tax-funds effects the final impact of the policy. There might also be ways to close the gap between MCs and MCp like abatement technology.

The above described policy leads to less emissions and provides an incentive for adoption of environmentally friendly technology. Thus, the point of our discussion is that OECD

countries might be wise to try to conduct such policy that would require developing and especially transitional economies to revise their policies before giving free environmental aid. The revision might benefit all parties concerned. It is also common for other kind of international funding arrangements, e.g. those by IMF or the WorldBank, that they require a policy reform as a prerequisite. The adoption of the above describe policy, however, reduces the scope for JI by definition as the emissions would be diminished and the marginal cost of further emission abatement would be increased.

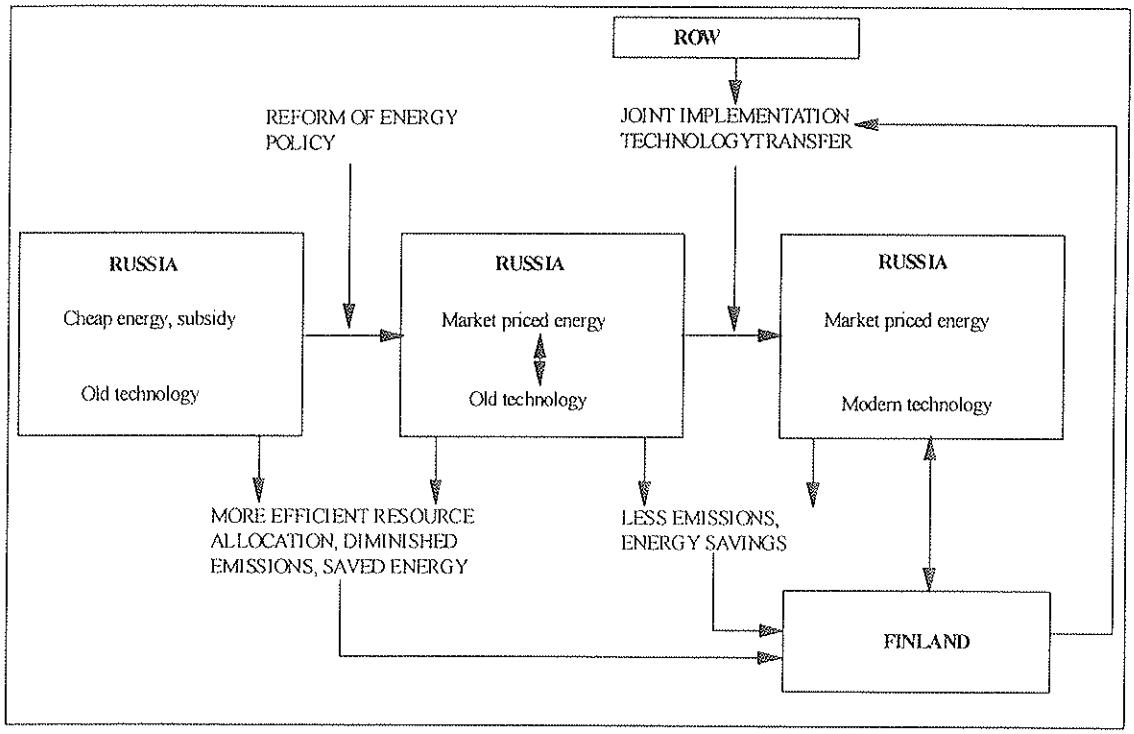
There exists, however, important interest differences what comes to the energy policy reform. From global point of view the goal is to reduce greenhouse gas and other emissions by making both policy reform and JI desirable. For the investing country, however, policy reform may offer advantages (e.g. in the form of less pollution from nearby areas) but also disadvantages as the scope for cheap JI is reduced. The investing firm may have even narrower viewpoint while the policy reform would make it more expensive to reach the environmental targets while offering relatively little profit generating factors. The receiving firm, on the other hand, may oppose policy reform if it means less subsidies and more investments into something that they seek to get free of charge from the investing JI-agents. The receiving country might improve its environmental state and public finance by the abandonment of energy subsidies but simultaneously losing a part of the incoming JI-investments. Thus, many agents have reasons to oppose the reform and the strongest proponent, the global community, does not have strong institutions or effective means to force the reform. FCCC is an attempt to create also the needed institutions but the process of setting up the system and giving the global authorities enough power, resources and information is time-taking.

Most importantly, we have shown that subsidies are bad policy if we consider efficiency of JI in a total welfare calculation. Investing country might be better of if the receiving country let the energy market function freely or tax the polluting activity. Even if it means less cheap JI-project it leads to environmental improvements, energy savings which could mean cheaper energy and healthier world economy. On the other hand, we cannot forecast all the results from the change in the relative competitiveness of fossil and other energy forms of energy generation like nuclear power. It is unlikely that these changes would be large for a small change in relative prices.

The adjacent figure shows the basic idea of JI co-operation between Finland and Russia and what the above discussed reform for energy policy implies. In the left-hand side box we depict the current situation with old polluting technology and cheap energy in Russia. Thus, we have a combination of overuse of energy resources and bad environmental

quality due to high level of pollution. If the energy subsidies are removed and the policy-making becomes more environmentally concerned we can expect improved resource allocation and better quality of environment also in the neighbouring areas (the middle box). Thus, a unilateral reform of the energy policy benefits both Russia and Finland among other countries. Energy technology based JI would bring in new environmentally friendly technology leading to further energy savings and cut in related emissions as depicted in the right-hand side box. Finland will compete and co-operate with other countries (ROW). If there was no energy policy reform part of the gains would not be realised and resource misallocation would continue. On the other hand, energy reform removes part of the gains that make JI look good at the initial situation with old policies. Old policies imply lost environmentally benefits and the reform may be seen as a precondition for large scale JI.

Figure 5: Reform of energy policy in Russia and JI




Proper modelling of the above kind of co-operation would require a fairly detailed model of the both economies, model of pollutant transmission combined with the globally competed markets for JI. The project would be large and modelling of Russian economy and energy sector would rely on bad information of not-so-fully competitive markets.

One issue related to the JI between neighbouring areas contra distant areas is the question of uniform mixing. That is, $CO_2$ emissions spread equally but aerosols, which cool the atmosphere unlike GHG, produced together with $CO_2$ have local coverage. Thus, when

one reduces domestic $CO_2$ emissions by reducing usage of fossil fuels it is possible that the local climate warms up faster as the cooling aerosol content is curtailed. The issue is most important in the northern hemisphere, i.e. Finland may be able to slightly alter the speed of warming by choosing its JI-partners on the grounds of geographic distance. However, there exists no reliable method to tell how the climate would behave making the debate currently extraneous.

Joint implementation has also potential for reducing the so-called carbon leakage, though there exist also negative features. Carbon leakage refers to polluting industry moving from a country with strict environmental policy, e.g. high carbon-tax, to a country with lax environmental regulation. JI would reduce the stringency of the policies giving less incentive for the leakage. On the other hand, multinationals may seek possibilities for combining their global emissions which might induce making originally polluting investments without environmental concerns in countries where it is possible and then abate the emissions according to a predetermined plan gaining a significant $CO_2$-credit. The risk of this sort of behaviour may not be very large but it underlines the need for clear rules and effective surveillance on sources of GHG.

## 2.3 Strategic behaviour

Joint implementation as well as any form of co-operation is subject to strategic behaviour and may often be studied under a game theoretical framework. The significant uncertainties related to nearly every aspect of large scale JI enhance the possibility to behave strategically, i.e. try to maximise welfare in a manner that may not be Pareto efficient by hiding information and trying to outguess the other agents behaviour. Hagem (1994) has studied the effects of asymmetric information on JI-projects. The investing agent (usually firm) may not exactly know what is the level of technology in the JI-target and what kind of no-regret options (emission abatement options with no cost of profit) may exist. The owner of the target has an incentive to lie of its own capabilities and pursue for as large JI-investment as possible. Thus, asymmetric information can lead to downfall in the environmental investments of the owner of the JI-target. The risk concerning for example some receiving countries letting their energy production facilities deteriorate to save the investment for other purposes and to lure as much JI-investments as possible is real. Instead of double dividend we might get dual taxation as the receiving party freerides and the investing party does not reduce its domestic emissions. Thus, in the worst case we may have nearly the same amount of emissions in the "target country" and more emissions in the investing country while JI has made the domestic abatement

requirement less stringent[19]. The real picture is, however, likely to be much better as there are many ways to avoid much of the freeriding and other negative impacts.

Strategic behaviour is possible both at the firm and the national level. If a country expects to receive new technology cheaply (or for free) there is no incentive for R & D. Thus, JI may weaken the level of target country's own environmental policy if there was a possibility for such without foreign aid. Asymmetric information can, therefore, diminish the global benefits from JI even if the parties involved would be better off. Under perfect information one would be able to demand a treaty under which the receiving country would agree to follow its policy line without aid, i.e. give up free-riding and stick to rules. In real world the information is hardly ever perfect. It is impossible, however, to correctly evaluate the magnitude of strategic behaviour and its negative impacts when measuring the benefits of co-operation.

Strategic behaviour and imperfect information add to the costs also at a more practical level. All transactions involve various costs related to purchasing and processing of information and tangible goods. The cost of negotiating an agreement on the transaction in question can be costly as such, e.g. use legal advisers and lobbying. Getting unprejudiced and adequate data on the subject under negotiations may also make a significant contribution to the total cost of the project. Supervising an already established project also incurs costs. Thus, when we see engineering type of cost accounting about JI-projects we should keep in mind that those costs are only a part of the cost of the whole enterprise when engaging in JI-cooperation.

Jackson (1995), who studied also the basis of cost effectiveness of JI, has made some research on the transaction costs. He doesn't, however, consider these when he makes few cost comparisons between GHG abatement in Denmark, Poland, UK and Zimbabwe. He claims that the transaction and supervision costs have been 10 to 30 per cent of the total costs of the so-far organised AIJ-projects. Furthermore, he states that the profitability of JI is strongly linked to the level of transaction costs and warns about the risks related to free "ad hoc" trading in emission credits. Finally he notes that without transaction costs JI between the above mentioned countries would reduce the cost of achieving Toronto (1988) target by 7.5 per cent but remains sceptical towards JI due to several critical factors.

New possibilities for GHG abatement have intrinsic value as such even if they would not be exercised when they occur. JI has option value in the sense that it hedges the country

[19] See Alho (1993) who discusses the impacst of international environmental aid.

against unanticipated future changes[20]. The option view can also be stressed by the following reasoning. Adoption of a policy may have irreversible impacts and sunk costs. Furthermore, policy-makers have typically very limited knowledge of the real impacts of the policy and development of the target of the policy even if they learn all the time. Thus, there may exist a case for waiting and accumulating new information.

However, the option view has a disadvantage when applied to JI-projects. Even if there exists option value for waiting before implementing a policy, i.e. engaging in joint implementation, the option might be exercised by someone else. Thus, there is a risk of the option disappearing in a way that does not exist in usual option-context. One "application" for the option thinking could be reserving rights to JI-projects for a limited period of time without obligation to use the option. It might be possible for Finnish firms to negotiate a primary right to co-operation with some Estonian or Russian power plants and pay a fee for that. FCCC, however, provides no rules for this kind of arrangement and it may prove to be problematic in practice. The tradability of JI based GHG emission reduction rights by project might, however, enhance the interest in JI participation as the projects would not be sunk costs. For example, if a Finnish company helps to reduce GHG emissions in an Estonian power plant and finds itself in a new position without need for JI it might be willing to sell the rights to use the GHG abatement under FCCC. Currently no plans that have come to the knowledge of the present author have considered this view and the tradable rights issue is restricted strictly to the trading in clearly defined and institutionalised rights to emit GHG.

As some of the above described problems have been understood for few years there has been attempts to formulate suitable guidelines for policy-making. Torvanger (1993) already lists four basic requirements for JI-projects: (i) projects must serve the interests of the Rio FCCC agreement to reduce the GHG emissions; (ii) one must be able to monitor and verify the reduction in GHG emissions; (iii) the cost of achieving global GHG emission target with JI should be less than a target achieved by purely national means; and (iv) both the investing and receiving country should be better off by participating in JI than not. These keypoints help in formulating an efficient JI-policy and needed legislation but are by no means enough to create a workable framework for JI. One more general rule could be that JI should mean a global pareto improvement. This would make JI more lucrative also for developing countries that are a bit afraid that JI would be usual development aid in technological disguise leaving less money for the real development projects, i.e. poor people in the developing world might be worse off and rich

[20] See Dixit and Pindyck Ch. 12 for some environmental applications of option theory. Environmental improvements are considered as an option to invest.

industrialists with the ownership of the JI-targets could be better off. Thus, JI should be clearly separated from already established forms of international aid and co-operation what comes to the financial flows. JI arrangements could and should, however, use the already existing channels and experience gained from other cross-border activity.

As a summary we can say that JI creates both costs and benefits at national and firm level. The adjacent table reproduces and appends some of the main findings from Kuoppamäki (1996 b). The investing side, both state and firms involved, gain for example in the form of reduced cost of meeting the GHG abatement target. On the other hand, they may suffer from a image problem if JI doesn't enjoy universal acceptance.

Table 1: Benefits and costs of joint implementation

| Country | Investing high cost country | | Receiving target country | |
|---|---|---|---|---|
| Level | State | Firm | State | Firm |
| Benefits | + ability to achive FCCC target with lower costs<br>+ other than GHG transboundary pollution is also reduced, e.g. $SO_x$<br>+ no need for major changes in energy policy | + costs to reach the GHG abatement target are reduced<br>+ firm has a change to create new business opportunities and networks | + access to new technology<br>+ possible cash-flow from premium of the right to use the JI-option<br>+ environmental benefits as GHG and other emissions are diminished<br>+ can lead to further cooperation | + access to new technology and finance<br>+ reduced pollution<br>+ could lead to further cooperation |
| Harms | - may become politically instable: JI needs international recognition, changes in rules are possible<br>- control and operating can be unexpectedly expensive<br>- own R&D may be diminished<br>- possible image problem created by "cheap solution" | - image problem if JI does not have universal approval<br>- risk of technology leakage to competitors | - cost of own abatement is increased as the foreign investor uses cheap options<br>- risk of reduced supervision and decision power in energy production and other JI-targets | - partial loss of decision-making power |

# 3 Some empirical evidence on the neighbouring areas and JI

Third chapter presents some scarce evidence on the current situation in Russia and Baltic area what comes to potential for JI. We do not try to make any in-depth analysis and do not present any really new empirical findings. Instead, we try to briefly focus on thinking the scope for JI and practical possibilities in the light of the previous chapters. Foremost we make a brief review to the economic and environmental conditions in Russia and Estonia.

## 3.1 Russian economy and environment

The Russian economy has during the last six years transformed from a centrally planned communist economy into a decentralised market economy. The transformation is still underway and major restructuring of industries and social structures is in progress. President Yeltsin's government has made substantial steps in converting to a market economy since launching its economic reform program in January 1992 by freeing nearly all prices, slashing defence spending, completing an ambitious voucher privatisation program, establishing private financial institutions, and decentralising foreign trade. Russia, however, has made little progress in a number of key areas that are needed to provide a solid foundation for the transition to a market economy. Russia is a country with huge area of land and natural resources, large population, deeply rooted bureaucratic thinking and history of a superpower. The economic transformation in a huge country that has many domestic and foreign policy goals requiring for a strong state is a slow process. Privatisation, creation of new legislation and especially the implementation of law, e.g. in taxation, are causing problems. Russia has, however, shown willingness to adopt market based policies and the current regime seems stable enough to keep the transformation going on.

The collapse of Soviet Union left Russia with the core of the vast country. As all the post-communist countries Russia experienced huge decline in the industrial production and GNP. Some cities with heavy industry, e.g. St. Petersburg, have had more than average recession. GNP growth was still negative in 1995 and 1996 but the grey economy which has not been accounted may be significant cancelling the fall in 1995 in reality. In 1995 using the nominal exchange rates the Russian GDP (USD 413.6 billion, EBRD) was about 4 times the Finnish GDP which, given the population of more than 30 times and vast resources, shows the poor state of the economy. Purchasing power parity comparison gives a bit less bleak picture. Inflation has surged as the monetary policy has been expansive. In 1995 the inflation was 130 per cent (220 per cent in 1994) despite the improvements in central bank activities. Russia's 1994 trade with nations outside the

former Soviet Union produced a USD 12.3 billion surplus, up from USD 11.3 billion in 1993. Exports consists largely of oil, natural gas, and other raw materials. As the country is an exporter of resources sustaining inefficient energy system has been possible with opportunity cost rather than real cash flow. The same fact underlines the basic strategic independence of Russia as it doesn't have to be worried of the availability of most natural resources during crisis. Furthermore, Russia probably can, especially in the future, exercise influence in the world energy market as it is backed with such reserves.

Energy prices were significantly subsidised during the Soviet era. The current Russian policy is to free energy prices but also to keep the delivery of energy going even if there exists huge payment problems. There are differences between pricing of different resources. Russia's internal energy market is dominated by natural gas and this influences also the pricing. The idea behind policy decisions is that "*the total welfare of the Russian economy will be maximised if prices are set (as closely as the process of estimation allows) to long run marginal costs (LMRC)*[21]". Price liberalization brought the internal gas wholesale prices closer to LMRC in 1995 which is still below the world market prices. Internal crude oil prices and export quotas have also been decontrolled in several steps. However, several practical reasons related to pipeline bottlenecks and bureaucracy limit exports in reality. The export restrictions and direct internal price controls for coal have been eliminated during the last few years resulting in price increases. The prices remain, however, below world market level and this is partly due to remaining federal subsidies for producers. Also the low price of competing fuels like natural gas keeps the price level down. One problem in pricing is the lack of proper equipment to measure the consumption of fuels like natural gas per consumer. Currently coal industry suffers also from cash flow problems resulting also in non-payment to workers of the industry and strikes.

The following figure shows the price-dynamics of few important fuels also produced in Russia which has a highly significant stock of natural resources in the world-scale[22]. The prices are internal for Russia. The exchange rate between Russian ruble and USD is also shown demonstrating the unhealthy speed of devaluation of the ruble. All the prices of fuels have increased after the transformation into a market economy began but they remain far below OECD import prices during the period of observation. The average import prices of steam coal for OECD countries is here taken as an indicator of true

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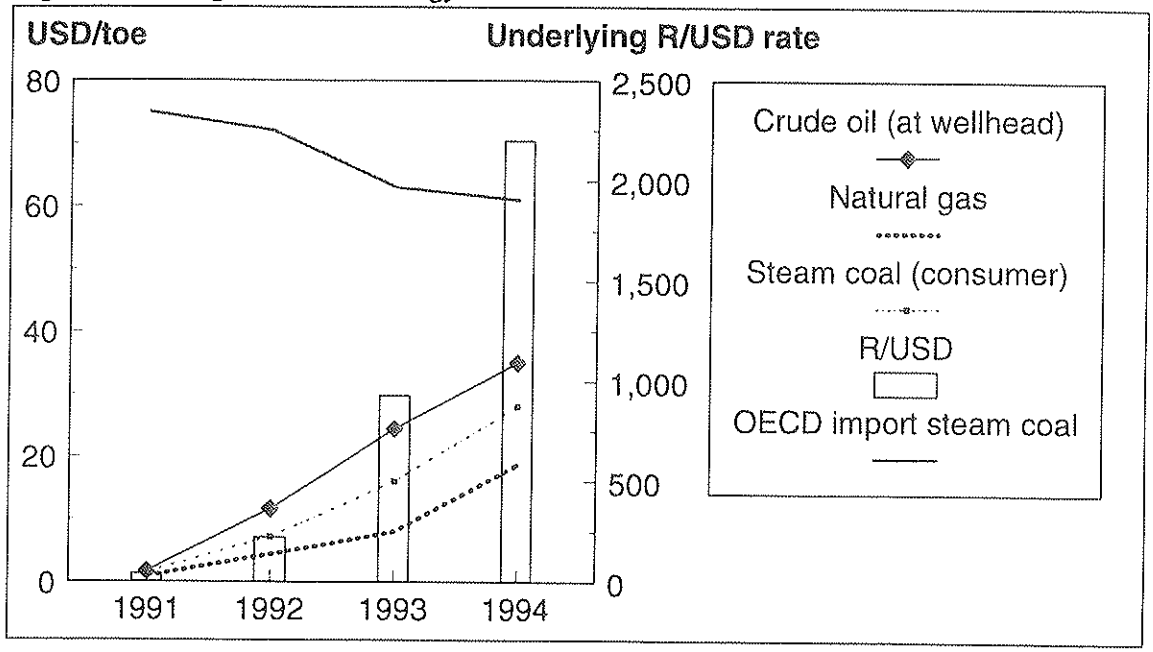
[21] OECD (1995) paper on Russian energy on which much of the discussion in this section is based on.

[22] Sources of information were IEA 1996 and OECD 1995. Few transformations from tonnes to toe were made.

market value of steam coal. Unfortunately we do not have newer data but despite the convergence in prices the Russian energy market remains problematic.

Figure 6: Pricing in Russian energy market 1991 - 1994




One of the major problems partly diluting also the comparison of internal prices to international prices is the fact that many buyers of fuels, e.g. natural gas, do not pay their bills[23]. Gazprom among the other major suppliers is ordered by the government to supply gas also to non-paying customers. Thus, the effective price of energy is in a way even less as there is no guarantee that the customers will not go bankrupt or pay interest on their debt. On the other hand, Gazprom has left some taxes unpaid as a retaliation. Thus, the pricing system within Russia is far from free-market organisation and will have implicit subsidies for many years to come if not explicit.

The Russian energy system has been inefficient and pollutive due to cheap energy and disregard for environmental problems during the Soviet era. Energy prices were subsidised and the environmental technology backward. The Soviet Union declared environmental issues as priority but in practice did a lot damage ignoring the fine principles. Current regime in Russia has made efforts to improve the environmental management but other performance criteria remain more important both in the private and public sector. Russia passed an environmental protection law in 1991. It created the Environmental Protection Fund serving as the principal environmental policy instrument. Government uses also several environmental fees which are partly used to finance the

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fund. The fund, however, is small and incapable of achieving significant environmental improvements.

The information on the current environmental situation is very limited making environmental management difficult. As the industrial production has declined and public environmental concern probably slightly grown the state of environmental degradation has somewhat improved. Some reverses, however, like the non-existence of proper Russian environmental authorities hinders the development, adoption and implementation of environmentally friendly policies in Russia. The possibilities and need for much further energy efficiency improvements and emission abatement is evident and Finland has many opportunities to engage in co-operation with Russia. Market based pricing of the fossil fuels without subsidies could also be seen as a precondition for JI as there is no reason to improve technology before significant market distortions have been removed. Elimination of subsidies and other market distortions would also improve local resource allocation.

The neighbouring areas from the Finnish point of view, Karelia and oblast of Leningrad, possess significant growth potential even if the transformation to market economy with decline in military and other heavy industry left these areas with crumbling economy. St.Petersburg, an important Russian center close to Finland has good economic growth potential with many possibilities for mutually beneficial environmental improvements, should be seen as a priority area in Russia. Other than GHG emissions have usually limited spread but several like $SO_x$ transport to Finland making the co-operation especially with Karelia and St.Petersburg and Murmansk region important.

Available estimates of the $CO_2$-emissions in Russia show that Russia's share of world emissions is about 10 per cent. Forecasts indicate that Russia will be able to limit its emissions to the 1990 level by the year 2000 because the declining industrial production. In the longer run as the economy recovers one has to adopt a policy which restricts the emissions.

As the mere volume of the Russian energy production including fossil fuels is tens of times the size of the Finnish energy production and consumption, there should be large possibilities for JI if it is done solely between Finland and Russia. This is unlikely, however, and Finland will have to compete with other countries for the best projects if the JI is fully accepted. This implies convergence of the greenhouse gas abatement costs between countries where is has previously been different. The gains that may appear large if we consider only Finland and Russia could be largely reduced due to this factor. Some engineering type of studies show that there exists some potential for gains from JI

between Nordic and Baltic countries[24]. Varying estimates show that Russia has an enormous potential for cost-effective efficiency improvements in its energy sector. The Institute of Energy Research of the Russian academy of Sciences has estimated the conservation potential could be 40 - 45 per cent of the present energy consumption. On the political side Russia looks favourably upon JI projects as they bring in funds and knowledge. The policy has been and will, however, be such that the Russian government will have a major position in all the approved projects. Russia will not cede significant decision power to outsiders making negotiations and operational measures rigid. Few pilot programs have been initiated with USA and Germany in the forest sector which is far from certain to be included in real JI.

The Second Finnish $CO_2$-committee report (1994) states that the marginal cost of reducing a tonne of carbon dioxide in Karelia is FIM 20 for the first GHG abatement opportunities. As the respective domestic costs in Finland are estimated to be FIM 150 per tonne, the apparent conclusion is that one should first exploit the cross-border possibilities if it is otherwise feasible. Finnish energy companies have their own interest and IVO has studied the potential for JI between the Nordic and Baltic countries. In one report they state that the potential might be three per cent of the total carbon dioxide emissions on the area[25]. Another paper, concentrating on eight different energy saving projects, concludes that there exists possibilities for abatement of 665.000 tonne of carbon dioxide per year at the price of FIM 120 per tonne. They use the figure of FIM 150 per tonne for domestic costs to argue for advancements in JI.

When Finland is considering JI-policy the natural partners would seem to be found in the Former Soviet Union (FSU) countries. Karelia and St. Petersburg on the Russian side of the border and Estonia have older technology in energy production and much cheaper possibilities for GHG emission reduction and forest carbon sink enhancement[26]. Moreover, as the other fossil fuel combustion based emissions like sulphur spread also to the Finnish side of the border the abatement of GHG emissions via improvement in the energy economy is likely to create multiple environmental benefits.

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[24] See for example IVO/KTM (1994): Joint implementation -mallitarkasteluja Suomen ja lähialueiden ympäristökuormituksen vähentämisessä.

[25] Samarbete mellan Baltikum och de nordiska länderna för reduktion av koldioksidemissioner, IVO 1996. Ibid.

[26] Inclusion of forests as carbon sinks into the possible JI-system is highly uncertain. The forest sinks are difficult to measure and manage which implies more difficulties in controlling than with energy efficiency or transmission improvement projects.

Finland has had various kinds of co-operation with the neighbouring areas for several years. The amount of money invested by the Finnish government in this co-operation has, however, nearly halved from the level of early 1990s. The reason has been the general reallocation of funds due to the depression and possibly the political changes in the FSU.

Table 2: Funds for enviromental cooperation with the neighbouring areas[1]

| Year | 1992 | 1993 | 1994 | 1995 | 1996 | *1997 |
|---|---|---|---|---|---|---|
| Mill FIM | 85.6 | 55.0 | 57.0 | 57.0 | 56.6 | 59.6 |

[1] Source: Luonnonvarat ja ympäristö 1996, Tilastokeskus (Natural resources and nature 1996)

The above mentioned Finnish funds have been allocated to many targets including some energy related improvements. However, there exists no explicit agenda for using the GHG emission reductions in a manner of JI co-operation.

One important point that the above figures tell us is that even if JI would be tenfold compared to the all other current environmental co-operation the investment would still make relatively small numbers compared to GDP. That amount of money should cover a fairly large share of Finnish GHG emissions. If we use 120 FIM/tonne of carbon as the price for the JI projects we would abate an amount of nearly half of the total Finnish GHG emissions with a tenfold environmental investment compared to the current aid. The real scope for JI is likely to be much less but it could still be significant portion of the Finnish total emissions. Thus, JI might be an important part of the Finnish climate policy but it is unlikely to have any macroeconomic significance. Furthermore, as JI should be treated separately from other international co-operation one should not mix JI with other vastly more significant foreign exchange and trade issues. Some JI-modelling efforts, e.g. Aaheim (1994), analyse the terms-of-trade implications of JI which, however, seems overestimation of the importance of the JI.

Thus, we have tried to show that the economic and environmental conditions in Russia are still muddled but huge potential for GHG emission abatement exist. Both threats and opportunities are present. Finnish companies and government should at least keep the channels for co-operation open with St.Petersburg and also Karelia and Murmansk and map the possibilities for JI. Early bird has the best changes for cheap abatement.

### 3.2 Baltic economy and environment

The economies of the newly independent Baltic states has during the last six years successfully transformed from centrally planned communist economies into decentralised

market economies. Estonia has been the forerunner in many ways in the rapid transformation.

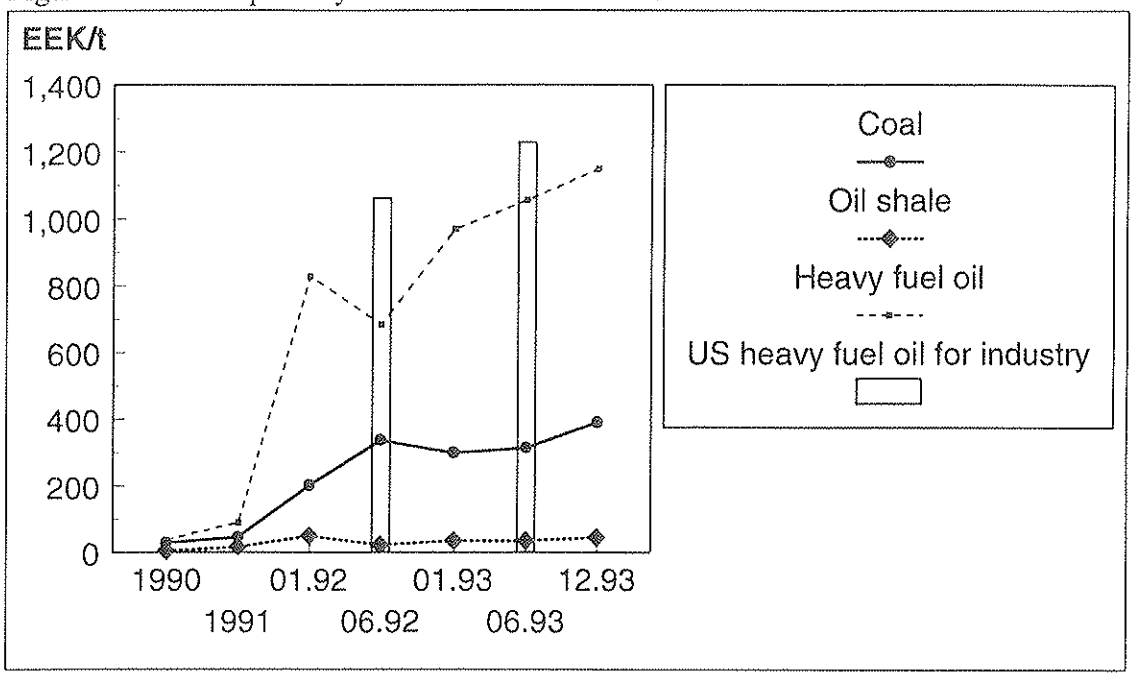
During 1995 GDP grew approximately 3 per cent in Estonia and Lithuania but diminished in Latvia. Industrial production initially decreased in all Baltic countries but the economy has otherwise converged towards a more western type of structure with a high share of services of GDP. Privatisation has proceeded fast in Estonia and Lithuania but Latvia has a slower speed. All the economies have had some problems with the creation of a stable financial system. Especially Latvia has suffered from a banking crisis. The foreign exchange system, however, has been well functioning under different currency board arrangements and the countries have less inflation than Russia. The economic growth is likely to continue brisk if the political environment and relations to Russia remain stable. The fairly well educated population of the three Baltic republics corresponds to the population of Sweden. The area has good possibilities for sustaining a higher than average European growth rate of GDP and converging towards the living-standards of Nordic countries. The process will, however, probably take many decades and there is no quarantee of complete convergence to the same level as in the richest western economies. In any case the economic growth implies increasing demand for energy even is the efficiency in energy use is improved.

Of the Baltic countries only Estonia has significant fossil fuel resources, i.e. oil shale. Estonia produces almost all its electricity and a large share of its heating from oil shale. The consumption of energy in Estonia was 8350.000 toe in 1993 which is only slightly over half of the level of 1990. The drop in industrial production has caused a huge change in the use of energy. Despite the reduction Estonia has a negative energy balance. It is likely that Estonia like all the Baltic countries are unable to produce all their energy by domestic means as the rapid economic growth is going to demand more energy than is possible or economically viable to produce in situ. Estonia has also established an *Estonian energy-saving programme* which includes measures for reducing the energy output ratio and the need for imported fuels. In 1994 state allocated EEK 15 million from budget to the programme. EBRD and the World Bank have given loans for power technology development. Few Finnish firms, e.g. IVO, have conducted research on energy saving. One of the major problems seems to be the lack of proper housing insulation making the demand for heating energy unnecessary high. The programme has an ambitious goal of achieving a 50 per cent saving in the consumption of fuels.

Prices in Estonia were regulated during the Soviet-era and the transformation into liberal market economy brought a fast change into world-market prices also in energy.

Government has some influence over the electricity tariffs and the price of the oil shale but in general energy is priced by the market. Taxation for environmental reasons or otherwise is low. The adjacent graph displays some of the energy prices in Estonia from 1990 to 1993 and the price of heavy fuel oil for industry in the US in 1992 and 1993. The US price for industry is generally lower than that for other purposes but demonstrates the lower limit of market priced heavy fuel oil in the OECD countries. As we can see the transition has led to a rapid increase in the prices of oil and coal but no dramatic change in the price of domestic oil shale. The prices of imported fuels have converged towards the world market prices but state intervention can be seen in the price of domestic resource.

Figure 7: Estonian price dynamics of fuels 1990 - 1993




Thus, the Estonian pricing is, as the economy in general, much farther liberalised than the Russian. Other Baltic countries follow well except Latvia to some extent as it has still much privatisation to do. Baltic republics have also shown willingness to environmental co-operation and JI would probably be much more easily organised with them than with Russia. Estonia as the closest country in many senses provides the best opportunities and least threats to JI-investments from Finland.

The north-eastern Estonia with oil shale mining and power plants is one of the most polluted areas around the Baltic Sea. Air-borne pollutants spread over vast areas including Finland and Leningrad oblast. Estonia has already had co-operation with Finland in reducing its $SO_2$ emissions. Otherwise the state of environment in Estonia is slowly improving as industrial production has declined like in the whole FSU . Some sources of

pollution like large military bases have been shut down. The situation is similar in Latvia and Lithuania but the pollution does not carry so much to Finland.

In summary, the Baltic countries, and Estonia especially, have a potential for JI-activity. The possibilities for flexible co-operation is likely easier to achieve with Estonia than the Russian areas. All the areas should, however, be kept on the agenda.

3.3 Practical considerations of co-operation with Russia

As we have discussed, it is a due question whether JI with a politically sensitive great power in economic transition, Russia, is sensible and can it be arranged without huge costs and timely negotiations. Common sense would tell that JI is much easier between small closely located countries like Finland and Estonia. As we have noted that there exists potential for some beneficial JI between Finland (and other Nordic countries which may compete) and Baltic area. The vastly larger potential JI, however, is located in Russia and we have to concentrate on thinking how to manage Pareto efficient JI between Finland and Russia.

As the US government has initiated a large scale AIJ-programme we go through it in some detail as an example. In 1993 the United States announced the US Initiative on Joint Implementation (USIJI), a voluntary pilot program that will contribute to the international knowledge base through projects demonstrating several approaches to reducing or sequestering greenhouse gas emissions in different countries. The USIJI will provide public recognition and technical assistance to approved projects[27].

The final groundrules, including a discussion of the specific comments received, were published by the Department of State on June 1, 1994. These rules establish an Evaluation Panel to decide which proposed projects qualify for USIJI status.

The final groundrules state that the purpose of the USIJI pilot program shall be to:
a) Encourage the rapid development and implementation of co-operative, mutually voluntary, cost-effective projects between the US and foreign partners aimed at reducing or sequestering emissions of greenhouse gases, particularly projects promoting technology co-operation with and sustainable development in developing countries and countries with economies in transition to market economies.
b) Promote a broad range of projects to test and evaluate methodologies for measuring, tracking, and verifying costs and benefits.

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27 Main source of the information on the Internet: http://www.ji.org/usiji/profile.htm

c) Establish an empirical basis to contribute to the formulation of international criteria for joint implementation.
d) Encourage private-sector investment and innovation in the development and dissemination of technologies for reducing or sequestering emissions of greenhouse gases.
e) Encourage participating countries to adopt more complete climate action programs, including national inventories, baselines, policies and measures, and appropriate specific commitments.

The Interagency Work Group, which is chaired by the US State Department, is responsible for general policy development on JI, decisions on amendments to program groundrules, and formulating the international strategy for promoting joint implementation. The Evaluation Panel is an independent technical body composed of representatives from several Government agencies. The Panel will make final decisions on whether projects qualify for USIJI status and will have the discretion to approve operational protocols and methodologies, and preliminary evaluation criteria. The Secretariat supports the Evaluation Panel in the daily operation of the program. Based on the proposals and the Secretariat reviews, the Panel will select a portfolio of projects representing a broad range of approaches in different geographic regions. Any US citizen or resident alien, any company, organisation or entity incorporated under or recognised by the laws of the United States and any US federal, state, or local government entity can apply for the program. Foreign partners can include any country that has signed, ratified or acceded to the United Nations Framework Convention on Climate Change; any citizen or resident alien of a country identified above; any company, organisation or entity incorporated under or recognised by the laws of a country identified above; any national, provincial, state, or local government entity of a country identified above.

According to groundrules, the Panel is responsible for "approving or rejecting project submissions for inclusion in the USIJI" based on the specific criteria. In evaluating projects, the Panel will consider how a project measures against all criteria, as well as how the project contributes to the purposes of the pilot program. USIJI is a pilot program that will evolve through participant feedback and experience with successive rounds of projects. The expected benefits of the USIJI include input to development of international criteria for JI, information gained from US participants' projects will contribute to the development of the international program for joint implementation and USIJI participants will receive public recognition for their efforts to reduce the threat of climate change and contribute to sustainable development and provide access to new market opportunities. Outside US participants will gain from technology transfers and the USIJI will facilitate investments in technologies and projects that reduce greenhouse gas emissions while

contributing to overall host country development objectives. Globally greenhouse gas emissions will be reduced and sustainable development promoted in participating countries.

USIJI can serve as a useful case-study and benchmark for Finnish authorities when formulating the appropriate Finnish-AIJ/JI policy. As the Finnish situation is slightly different, however, the special conditions and existing contacts between Finland and potential partners should not be forgotten.

## 4 Concluding remarks

In short, we have pursued to show that JI may not be a good policy if the receiving country has significant market distortions. In Finnish-Russian case this refers to the existing subsidies for fossil fuels on the Russian side. These subsidies make the JI-investment look better than it actually is. If the subsidies were removed, both environment and resource allocation would be improved. At the same time JI-investment would make real market based improvement and free riding would be minimised.

JI is not a real policy option yet. Many agents like energy industry in OECD countries have a good reason to speed the process but some, e.g. developing countries, have doubts. From a globally optimal point of view it would be important to remove all the support from GHG production which exists in some countries like Russia before accepting JI. The global society does not, however, have powerful means to produce the socially optimal outcome. JI with a large power in economic and political transition may be more difficult than a with small more advanced country.

Many countries and firms will compete for the same JI-projects. The competition implies convergence in the price of abatement across countries and requires speed in policy if one wishes to grasp the best possibilities.

In conclusion we could say that joint implementation is a prerequisite for the globally efficient environmental policy but that it includes many hazards that reduce the benefits. A subglobal JI may not be much better than completely disjoint implementation. Finland should keep a keen eye on the Russian and Baltic JI possibilities as the competition for the best projects may be intense if greenhouse gas credits will be allowed.

## Appendices

Most economists would recommend that we should carefully evaluate both the costs and benefits of our response to the climate change. At the one extreme, people argue that no policy on climate change is needed because not enough is known about the problem. At the other end are those who contend that atmospheric concentrations of greenhouse gases must be stabilised whatever the cost. Economic analysis takes the middle road: it argues against passivity because the cost of a very modest policy would be less than the expected benefit. It also advises against drastic action, as the expected benefit of a major reduction in greenhouse gas emissions would be smaller than the cost.

The adjacent figure, appendix 1, reproduces a table from Kuoppamäki (1996 a) demonstrating the different theoretical policy options for managing the impact of climate change. Rows show the different ways of reducing the damage caused by climate change and the columns include the different tools to achieve these ways. The combinations of ways and tools gives several theoretical policy options shown in the matrix. The boxes show some examples of practical policies. In the real world there exists different realistic means to put these options into practical policy.

The debate on the optimal climate policy is continuing as many speak for a wait-and-see policy against fast adoption of strong measures to reduce GHG emission. AIJ has, however, already led to few projects some of which are listed in the next appendix 2. The last appendix 3 reproduces the AIJ-pilot-phase paper from Berlin (1995) COP 1 meeting.

| Appendix 1: Climate Change Policy Options | | | | |
|---|---|---|---|---|
| TOOLS<br>WAYS | PRICE<br>Tax/Permits | CONTROL<br>Bureaucracy | SUBSIDIES<br>R&D | LIFESTYLE<br>Education, peers |
| ADAPTATION<br>Reduce climatic sensitivity | Industrial policy and subsidies. Reduce rigidities. | Laws to enhance adaptation, coastal building, etc. | Subsidise the development of new species, tech., etc. | Teach people to be more flexible. |
| ENGINEERING<br>Manage climate | Not feasible in large scale, microclimates | National or international actions | Subsidise research on climatic engineering. | Does not exist |
| SINK MGNT<br>Manage sinks | Influence market price of wood, etc. | Preservation of forests, etc. | Subsidise sink development | Preservation of sinks like forests |
| ENERGY TECH<br>Cleaner energy | Emission taxes, tradable permits | Quota for emissions, standards for tech. | Develop cleaner technology. Technology transfer | Using low-emission technologies, e.g. bike instead of car. |
| PRODUCTION<br>Less energy | Energy taxation | Standards for technology, quotas. | Develop more efficient technology | Substitution on a personal level |
| CONSUMPTION<br>Less consumption | Consumption taxes, subsidies | Quotas | Recycling | New more ecological way of consumption |
| POPULATION<br>Reduce growth | Cost of children | Limit the number of children (China) | Develop and implement ways to reduce fertility | Make people want fewer children |
| OTHER GHG<br>Waste management | Emission taxes, subsidise use of bioenergy from landfills, etc. | Quotas, compulsory use of cleaning technology. | Develop cleaner and gas collecting technology. | New more ecological way of living. |

| Appendix 2: Examples of AIJ Projects 1996 | | | | | |
|---|---|---|---|---|---|
| No. | Project place | Host country | Partner country | Project description | CHG |
| 1 | Dìèín | Czech Republic | USA, Denmark | Fuel switching from coal to natural gas, cogeneration, efficiency improvements | $CO_2$ |
| 2 | KrkonoÆe Nat. Park | Czech Republic | Netherlands | Afforestation | $CO_2$ |
| 3 | Hungary | Hungary | Netherlands | Energy saving through low-cost measures simulation project | $CO_2$ |
| 4 | RABA, Hungary | Hungary | Netherlands | Fuel switching from diesel to natural gas in city buses | $CO_2$ |
| 5 | Hungary | Hungary | NEW | Afforestation and plantations of short rotating woods | $CO_2$ |
| 6 | Kaczyce | Poland | USA | Coal mine methane recovery and desalinization of waste water | $CH_4$ |
| 7 | KoÆice | Slovakia | NEW | Cogeneration Plant | $CO_2$ |
| 8 | Ptuj, Ljubljana | Slovenia | NEW | Waste incineration plant | $CH_4$,$CO_2$ |
| 9 | Tallin | Estonia | Sweden | Energy efficiency in four apartment buildings | $CO_2$ |
| 10 | Tartu | Estonia | Sweden | Heating boiler plant conversion from HFO to wood-chip firing | $CO_2$ |
| 11 | Voru | Estonia | Sweden | Heating boiler plant conversion from HFO to wood chip firing, new oilburner | $CO_2$ |
| 12 | Haabneeme district | Estonia | Sweden | Heating boiler plant conversion from HFO to wood-chip firing | $CO_2$ |
| 13 | Valga district | Estonia | Sweden | Heating boiler plant conversion from HFO to wood-chip firing | $CO_2$ |
| 14 | Jelgava district | Latvia | Sweden | Heating pipeline replacement | $CO_2$ |
| 15 | Balvi district | Latvia | Sweden | Heating boiler plant conversion from coal to wood-chip firing | $CO_2$ |
| 16 | Slampe district | Latvia | Sweden | Heating boiler plant conversion from HFO to wood chip firing | $CO_2$ |
| 17 | Aluksne district | Latvia | Sweden | Heating boiler plant conversion from coal to wood-chip firing | $CO_2$ |

| | | | | | |
|---|---|---|---|---|---|
| 18 | Janmuiza Agric. School | Latvia | Sweden | Heating boiler plant conversion from LFO to wood chip firing | $CO_2$ |
| 19 | Ugale district | Latvia | Sweden | Heating boiler plant conversion from LFO to wood chip firing | $CO_2$ |
| 20 | Birzai district | Lithuania | Sweden | Heating boiler plant conversion from LFO to wood chip firing | $CO_2$ |
| 21 | Kazlu Rudos | Lithuania | Sweden | Heating boiler plant conversion from LFO to wood chip firing | $CO_2$ |
| 22 | Saratov, (RUSAFOR) | Russia | USA | Afforestation | $CO_2$ |
| 23 | Palasovka, (RUSAGAS) | Russia | USA | Fugitive gas capture | $CH_4$ |
| 24 | Slovakia | Slovakia | NEW | Fuel switch from coal to wood for small heaters | $CO_2$ |
| 25 | Vologda Region | Russia | USA | Reforestation | $CO_2$ |
| 26 | Serpuhov, Mytishi | Russia | Netherlands | Methane recovery from a landfill | $CH_4$ |
| 27 | Tyumen | Russia | Netherlands | Energy efficiciency in greenhouse | $CO_2$ |
| 28 | Kostroma | Russia | IUEP | Energy efficiency improvements in district heating system | $CO_2$ |
| 29 | Troitsk | Russia | IUEP | Energy efficiency improvements in district heating system | $CO_2$ |
| 30 | Ukraine | Ukraine | NEW (USA) | Small hydropower stations | $CO_2$ |
| 31 | Zelenograd | Russia | USA | Energy efficiency improvements in district heating system | $CO_2$ |

http://www.ji.org/projects/project7.shtml (Thursday, 02-Jan-97 02:54:58 EST )

International Utility Efficiency Partnerships, Inc.

See the source for further information

## Appendix 3: Berlin COP 1 meeting statement on the JI

UNITED NATIONS Framework Convention on Climate Change

FCCC/CP/1995/L.13

CONFERENCE OF THE PARTIES
First session
Berlin, 28 March - 7 April 1995

CONCLUSION OF OUTSTANDING ISSUES AND ADOPTION OF DECISIONS

Draft decision under agenda item 5 (a) (iv) submitted by the Chairman of the Committee of the Whole

The Committee of the Whole recommends to the Conference of the Parties the adoption of

the following decision:

Activities implemented jointly under the pilot phase

The Conference of the parties,

Recalling that,, in accordance with Article 4.2(d) of the Convention, the Conference is required to take decisions regarding criteria for joint implementation as indicated in Article 4.2(a),

Noting that the largest share of historical and current global emissions of greenhouse gases has originated in developed countries, that per capita emissions in developing countries are still relatively low and that the share of global emissions originating in developing countries will grow to meet their social and development needs,

Acknowledging that the global nature of climate change calls for the widest possible co-operation by all countries and their participation in an effective and appropriate international response. in accordance with their common but differentiated responsibilities and respective capabilities and their social and economic conditions,

Recognising that,

(a) According to the provisions of the Convention, the commitments under Article 4.2(a) to adopt national policies and to rake corresponding measures on the mitigation of climate change apply only to Annex I Parties, and that non-Annex I Parties have no such commitments;

(b) Activities implemented jointly between Annex I Parties and non Annex I Parties will not be seen as fulfilment of current commitments of Annex I Parties under

Article 4.2(b) of the Convention; but they could contribute to the achievement of the objective of the Convention to the fulfilment of commitments of Annex I Parties under Article 4.5 of the Convention;

(c) Activities implemented jointly under the Convention are supplemental, and should only be treated as a subsidiary means of achieving the objective of the Convention;

(d) Activities implemented jointly in no way modify the commitments of each Party under the Convention

1 . Decides:

(a) To establish a pilot phase for activities implemented jointly among Annex I Parties and, on a voluntary basis, with non-Annex I Parties that so request;

(b) That activities implemented jointly should be compatible with and supportive of national environment and development priorities and strategies, contribute to cost-effectiveness in achieving global benefits and could be conducted in a comprehensive manner covering all relevant sources, sinks and reservoirs of greenhouse gases;

(c) That all activities implemented jointly under this pilot phase require prior acceptance, approval or endorsement by the Governments of the Parties participating in these activities;

(d) That activities implemented jointly should bring about real, measurable and long-term environmental benefits related to the mitigation of climate change that would not have occurred in the absence of such activities;

(e) That the financing of activities implemented jointly shall be additional to the financial obligations of Annex II Parties within the framework of the financial mechanism as well as to current official development assistance (ODA) flows;

(f) That no credits shall accrue to any Party as a result of greenhouse gas emissions reduced or sequestered during the pilot phase from activities implemented jointly;

2. Further decides that during the pilot phase:

(a) The Subsidiary Body for Scientific and Technological Advice will , in coordination with the Subsidiary Body on Implementation, establish a framework for reporting, in a transparent well-defined and credible fashion, on the possible global benefits and the national economic, social and environmental impacts as well as any practical experience gained or technical difficulties encountered in activities implemented jointly under the pilot phase;

(b) The Parties involved are encouraged to report to the Conference of the Parties through the secretariat using the framework thus established. This reporting shall be distinct from the national communications of Parties;

(c) The Subsidiary Body for Scientific and Technological Advice and the Subsidiary Body on Implementation, with the assistance of the secretariat are requested to prepare a synthesis report for consideration by the Conference of the Parties,

3 . Further decides:

(a) That the Conference of the Parties will, at its annual session, review the progress of the pilot phase on the basis of the synthesis report with a view to taking appropriate decisions on the continuation of the pilot phase;

(b) In so doing, the Conference of the Parties will take into consideration the need for a comprehensive review of the pilot phase in order to take a conclusive decision on the pilot phase and the progression beyond that. no later than the end of the resent decade.

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