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Joint Implementation as Development Policy – The Case of Costa Rica

by

Michael Dutschke
Axel Michaelowa

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HWWA-Institut für Wirtschaftsforschung – Hamburg
Neuer Jungfernstieg 21, 20347 Hamburg
Telefon: +49-40/3562-0, Telefax +49-40/351900
Internet: http://www.hwwa.de

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Joint Implementation as Development Policy - The Case of Costa Rica

Michael Dutschke[1], *Axel Michaelowa*[2],

Summary

Joint Implementation (JI) is a potentially powerful instrument of climate policy that could lead to a high amount of additional financial flows to developing countries. Nevertheless, many NGOs and developing country representatives are very skeptical about JI and fear that it would not take into account development priorities and create new kinds of dependence on industrial countries. Therefore, developing countries and industrial countries found a compromise at the Berlin Conference of the Parties as they instituted a pilot phase for JI lasting until 2000 which does not allow crediting of reduction achieved via JI.

The paper discusses first results of the JI pilot phase in Costa Rica which could be important for the evaluation of the whole pilot phase. This country has a relatively high level of economic and social development and a well-developed environmental policy which is comparable to that of advanced industrial countries. It is a major destination for ecotourism. Nevertheless, it suffers from high deforestation due to unequal distribution of land, migration and cattle ranching as well as plantation expansion. Moreover, transport emissions are rising rapidly and fossil fuel electricity generation is growing despite a target of phasing out fossil fuels completely.

Costa Rica's knowledge base is high and capacity building almost not necessary. Thus, Costa Rica was able to develop creative environment policy instruments such as debt-for-nature swaps and biodiversity prospecting to attract foreign funding. It is not surprising that it was the first developing country to open a JI office, develop project approval criteria and host JI pilot projects. The framework for JI in Costa Rica can therefore be described as ideal compared to the average developing country.

Nor is it surprising that more than half of the approved pilot projects in developing countries are situated in Costa Rica. Nevertheless, the success can at best described as mixed. Only a third of the projects are actually funded though several of them seem to be profitable even without a value for carbon. Most of them are proposed by US entities. To attract more funding, the JI office now certifies tradable carbon certificates and en-

1 Hamburg Institute for Economic Research (HWWA), Neuer Jungfernstieg 21, 20347 Germany, Phone +49 403562479 Fax +49 402991855, e-mail: dutschke@hwwa.uni-hamburg.de

2 177 Bd. de la République, 92210 St.-Cloud, France

courages multi-sector large-scale projects where transaction costs are lower and coherence with national development objectives can be more easily checked. It directs its attention to public JI investors such as the Norwegian government.

The renewable energy projects suffer from the unrealistic target to phase out fossil fuels by 2001 thus making JI projects in this sector impossible from that time. Therefore the bulk of projects concern forestry which is prone to uncertainties in calculation of emission sequestration. A comparison of the estimates shows wildly differing assumptions in baselines and sequestration capacity of the forests. Whether actual project implementation conforms to the plans remains to be seen. An independent verification of project results is being undertaken.

The analysis of the Costa Rica case shows that JI can be only successful in the long run if the industrial countries offer incentives for investors and if baseline determination rests on a clear set of guidelines. Human and technical capacities are necessary but not sufficient conditions for successful JI in developing countries. They seem to be able to prevent complete project failures, though and can lead to innovative approaches. The issue will only be settled if large-scale JI investment is forthcoming under a regime of legally binding emission targets for industrial countries. Then the ability to process huge number of project proposals and check whether they conform to development priorities as well as monitoring and verification becomes crucial.

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1 JI and developing countries

1.1 The potential

International climate policy faces the dilemma that only industrial countries and countries in transition have committed themselves to emission targets whereas the developing countries with prevailing high emission intensities and low abatement costs (Pachauri, 1994) have not accepted such targets. It would be inefficient for the former countries to restrict emission reduction to domestic measures if marginal reduction costs are lower abroad (Jones, 1994). Therefore, the concept of Joint Implementation (JI) has been discussed at length in the international negotiations concerning the UN Framework Convention on Climate Change. It also became a focus for socio-economic research (Kuik et al., 1994; Jepma, 1995). A pilot phase for JI until the year 2000 was agreed upon in the Berlin Conference of the Parties in 1995.

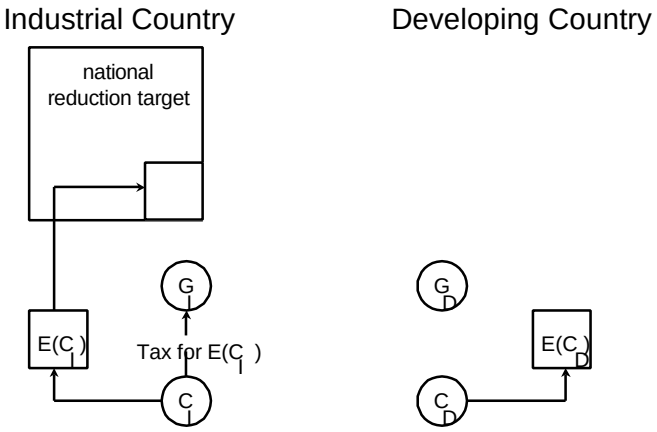
JI functions as follows: Firstly, reductions achieved abroad are credited to the home country's reduction target. Secondly, domestic emitters who can prove reductions abroad are granted relief from domestic climate policy instruments which are a necessary condition for the application of JI (Michaelowa, 1996). Such concessions are proportional to the reduction achieved. If an emissions tax is in force, the concession would be equal to the tax payments that would have to be made for corresponding emissions at home.

There is a huge potential for JI throughout the developing world. For example, substitution of outdated Chinese coal power plants with an efficiency of approximately 20% through state-of-the-art power generation technology with an efficiency level of between approximately 42% (lignite power station) and 55% (gas-fired combined heat and power station) could achieve an emission reduction of over 50%. By transferring know-how, it is possible to ensure that technically feasible efficiency levels are also achieved in practice. Similarly, emissions caused by the production and transport of fossil fuels can also be reduced. In areas with no access to the electric grid, stand-alone photovoltaic or wind systems could be installed.

Moreover, electrical transmission losses could be reduced relatively easily, and demand for biomass (as a cooking fuel) from non-sustainable sources can be diminished by using more efficient cookers. Demand-side activities, however, would have to be supported by the removal of energy subsidies which have hitherto led to artificially low energy prices in many countries. Furthermore, efficient state regulatory structures are helpful for providing incentives to conserve energy.

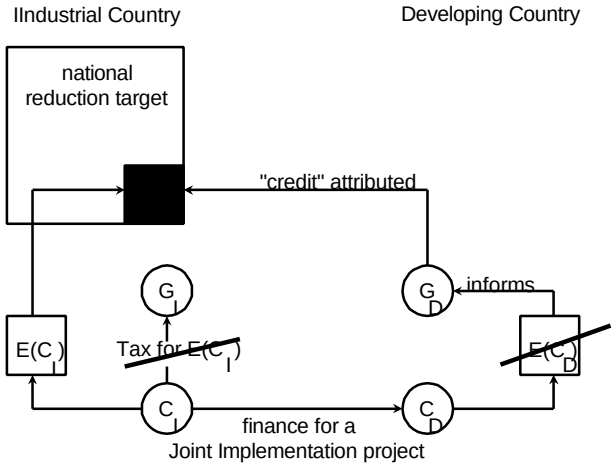
Figure 1: How Joint Implementation works

a) Situation before Joint Implementation



Company C_I pays the government G_I which is committed to a national reduction target, an emission tax on its emissions $E(C_I)$. Company C_D emits a volume of greenhouse gases $E(C_D)$ without any restrictions from its government G_D. Let $E(C_I) = E(C_D)$ in this example.

b) Situation after Joint Implementation



The reduction project financed by C_I completely eliminates C_D's emissions $E(C_D)$. The government G_D is informed of the reduction which is then attributed to the industrial country's reduction target. The government G_I grants C_I tax concessions which, in the example, correspond exactly to the tax burden created by $E(C_I)$, since $E(C_I) = E(C_D)$. Total emissions are thus reduced by 50%[3].

[3] U_A could change its behaviour, leading to an increase in $E(U_A)$. It must, however, pay tax on the additional emissions as before. In this way, there is no incentive to increase emissions in the home country.

Use of appropriate feed can drastically reduce methane emissions which are particularly high in intensive cattle farming. Methane production in wet rice farming depends largely on the kind of irrigation used. Also, N_2O production is largely determined by the use of agricultural fertilizer.

In the JI pilot phase, sequestration projects have been very attractive because of their low cost and flexible size. Nevertheless, they bear a number of risks. Monocultural reforestation - which may at first appear the most cost-efficient - is inadvisable from an ecological point of view, even if it can reduce the pressure on primary forests. Monocultures can lower the water table (e.g. in the case of eucalyptus) and are of little benefit to the local population since they allow no agricultural usage (Carrere, 1993). Projects which enable a combination of forestry and agriculture would be ideal in this context, although they would probably be considerably more expensive than simple reforestation.

The danger of countries clearing primary forests simply to gain land areas for reforestation must be ruled out (Loske/Oberthür, 1994, p. 10; Bohm, 1994, p. 191). A realistic baseline scenario is extremely important in this context in order to estimate the emissions caused by alternative land use following the deforestation which would have taken place had there not been a project. Also to be avoided is a situation whereby countries propose rainforest protection as a JI project while simply moving their previous deforestation activities to other untouched areas of forest (Goldberg, 1994, p. 3). The quality of verification is of crucial importance when it comes to the preservation and enlargement of greenhouse gas sinks. Verification is as well a political process. It requires transparency and public awareness on a national and international level. This is why the existence of democratic institutions and freedom of speech are of vital importance for international climate cooperation.

1.2 Positive Externalities

Positive externalities are the only incentive for host countries to engage in JI unless they have emission targets and receive a part of the credits. The following externalities are relevant:

- formation of human capital
- transfer of technology
- capital transfer
- foreign currency transfer
- job creation

- improvement of income distribution
- reduction of local pollutants
- protection of biodiversity
- effects on innovation

It is very difficult to quantify these externalities. Most of them are interlinked and operate on different time scales. Feedback depends on the local situation. While it is obvious that JI will lead to capital and foreign currency transfer the net effects on jobs are unclear. The transfer of modern technology could well lead to a loss of jobs, at least locally. Formation of human capital is a long-term effect, Improvement of distribution depends on the local political and social situation.

Tentative calculations (Ekins 1996) show that reduction of health care expenditures through reduction of local pollutants is comparable to the value of carbon credits under a moderate carbon tax. As health care is less developed in developing countries compared to industrialized countries, cost reduction will be lower in the former. Social benefits, in turn, may be significantly higher in developing countries.

Biodiversity will only be protected if the social and political framework is conducive to forest protection and prevents relocation of damaging activities. In the case of private enterprise sequestration projects, state grants should therefore help make diversified reforestation projects more attractive. This sort of procedure is beneficial for the economy as a whole since more diversified projects involve greater positive externalities. The preservation of threatened areas of primary forest can bring even greater positive externalities.

It is probable that many projects will have a mixture of positive and negative externalities. The question how to weight them will be crucial for the success of these projects.

1.3 Baseline scenarios

It seems very appealing to calculate a baseline for a whole country and then aggregate the effects of the different JI projects (see e.g. Ardone et al., 1996), especially if there are many projects. Reliable quantified measurements of *actual* emissions are an important prerequisite for establishing such a baseline. Costa Rica has a good data base in this respect.

A major obstacle to defining a country-related baseline is that the emission levels have to be forecast for the entire lifetime of the project. In case of sequestration projects the life-

time can be up to a century. Forecasting emission levels for such a long period will amount to pure guesswork.

Taking into account the uncertainties of country-related baselines, *project-specific* baseline scenarios have been proposed as an alternative (Roland/Haugland, 1995, 361ff, Michaelowa, 1995, 65f, Luhmann et al., 1995, 1996).

However, project-specific baseline scenarios do not take into account indirect effects which can arise, for example, when the project uses goods whose production caused GHG emissions. Emissions can also be influenced by price effects. However, these indirect effects can only partially cancel out the emission reduction achieved by a JI project. The effects described arise in any sort of climate protection projects and not just in the case of JI.

Moreover, improved access to modern technologies via JI can contribute to emission reductions. The same applies if products of the project sequester GHGs and substitute energy-intensive goods.

The problems which are created by fixing baselines for projects with long lifetimes could be alleviated through "dynamic“ baselines which uses emissions and operating data of the project to adjust the baseline. (Andrasko et al., 1996). "Dynamic“ baselines would lead to uncertainty on the investor's part as the credited emission reduction would depend on the adjustments of the baseline.

The USIJI has developed several criteria for baseline definition (USIJI, 1996, 12). Baselines have to be consistent with:

- prevailing standards of environmental protection in the host country;
- existing business practices within the particular sector of industry;
- trends and changes in these standards and practices.

Baselines have to include indirect effects such as activity shifting, price effects and lifecycle effects in products. They shall also provide information on other environmental effects of the project.

1.4 Reasons for resistance against JI

While the idea of JI did not generate any controversy at the Rio conference[4], it became clear during the subsequent negotiations that there is opposition to JI which is based

[4] At the Rio conference there were no official documents by developing countries expressing reservation against JI.

partly on non-economic, ethical and moral arguments. This opposition was voiced mainly by representatives of many developing countries and NGOs (Encarnacion, 1993; Sharma, 1993; Sanhueza et al., 1994, p. 8f) who saw JI as an attempt by the industrial countries to buy their way out of reduction commitments and who therefore demanded that JI be restricted to the industrial countries. Even the haunt of "neocolonialism" was invoked. At the eighth session of the Intergovernmental Negotiating Committee in August 1993 the G 77 strongly came out against JI and this opposition was upheld until the Berlin conference. Nevertheless, some countries quietly left the opposition and started participating in JI. Costa Rica declared itself available for JI projects as early as mid-1994 without reservations (Orlebar, 1994), and concluded a general agreement on JI with the USA on 30.9.1994. Other Central American countries followed suit. Malaysia, which strongly opposed the concept on the federal level carried out a JI project on a state level.

The critics insisted that by using JI projects to realize low-cost greenhouse gas reduction potentials in developing countries, the industrial countries could avoid cost-intensive investments at home, thus allowing them to maintain their unacceptable life style. This is a purely moral argument which disregards efficiency of climate policy.

Others assumed that JI represents a reward for polluters in the host country since they can sell their emissions as an economic good (Dubash, 1994, p. 39). Against this view it must be objected that JI does not place the emitter in a better situation than if he had produced no emissions at all. The JI project finances solely the emission reduction. On the other hand, this can be a valuable argument for a country as a whole, in the sense that the better its climate policy, the less potential it offers for JI projects.

Furthermore, some developing countries perceive a danger of JI projects exhausting the "cheap" reduction options such that when emission targets are established for their countries at a later date, these targets can only be reached at higher cost. This argument might be true for sequestration projects, but it does not consider the time elapsing until targets are agreed. In case of non-sequestration JI projects, it is likely that this time is sufficient to allow one or two project cycles without compromising future reduction ability. Losing time can be a waste of oportunites for efficient energy production or use. It can be pernicious when primary forests are being destructed. These reduction possibilities cannot be "banked".

In the critics' opinion, JI could reduce the incentive for structural change in the industrialized countries (Akumu, 1993), thus resulting in a slower rate of emission-reducing innovations (Dubash, 1994, p. 40ff). This argument is the only one which could be economically relevant. On the one hand incentives have to be granted to induce innovation

to reach long-term efficiency gains, on the other hand short-term efficiency gains through JI have to be exploited.

This could be achieved through a gliding reduction of crediting of JI while raising domestic carbon taxes in the industrialized countries (Michaelowa/Schmidt, 1997).

From a development point of view, crediting should also be linked to the extent of technology transfer as some developing countries are afraid that JI projects could run counter to their own development priorities:

- Demand-Side-Management and production of renewable energy should be credited fully.
- Large-scale projects such as fossil power plants only receive a high credit ratio in the beginning. A differentiation according to carbon content can be made. That would lead to high crediting for combined heat and power production while coal plants would be credited at a lower percentage.
- Afforestation should be credited at a low rate as it rarely entails technology transfer and leads to land use constraints. The risks of reversal have to be covered adequately.

Despite the fact that JI is voluntary, differences of politicians and local population could lead to unsuitable JI projects on the ground. Developing countries could even see themselves as being forced into offering as many JI projects as possible if development aid pledges are linked to the type and number of JI projects carried out. It is of crucial importance for the acceptance of the JI approach that governments in the industrialized countries do not regard private JI projects as a substitute for development aid and reduce their development budgets accordingly. The Berlin criteria take this into account. However, it is questionable how this rule can be enforced.

In rejecting JI projects, some developing countries and NGOs implicitly assumed a reference situation which entailed extensive finance and technology transfers on the part of the industrial countries for reduction projects in developing countries (Greenpeace, 1994, p. 3). However, as the industrial countries are not prepared to do this either now or, in all probability, in the medium-term, JI projects represent the only source of new environmental policy resources for developing countries. As this has become apparent, the developing countries have gradually changed from complete rejection to a more open position towards the concept. This process has gained extra momentum by individual countries leaving the common position and even key countries like and India giving up their original opposition. As a result the G 77 was no longer able to formulate a common position on the subject at the Berlin conference. Thus, the pilot phase was accepted.

Table 1: Institutional options for Joint Implementation projects

Institution	Function	Activity
Project exchange	to identify potential project participants	makes it easier for investors and project instigators to contact each other
Broker	to help effectuate a project	brings investors and project instigators together; tries to effectuate efficient projects
Consultant	to support project development	offers technical, legal, engineering, financial and management advice
Approval authority	to accept the project	determines whether the project conforms to international criteria
Financial intermediary	to ease finance	offers projects as investment opportunities; bundles projects and sells shares in project bundles
Insurance	to safeguard the reduction	bears the losses sustained by the government and the investor in the case of project failure
Verification authority	to verify the reduction	verifies the reduction and issues confirmation
Dispute settlement authority	to mediate in disputes and impose sanctions	conducts conciliation procedures; decides who is responsible for the failure of a project and imposes sanctions

(Source: Wexler et al.: Joint Implementation: Institutional options and implications, College Park, 1994, p. 7; own additions)

1.5 Institutional issues

A functioning JI scheme relies on a number of institutions (see Table 1). These institutions can be created from scratch or be offspring of existing institutions. It is important to keep in mind different interest groups and to create institutions that minimize distortions. Politicians and state bureaucrats will try to divert funds out of JI transfers. They will be interested in large-scale projects as the rent seeking opportunities are higher and their transaction costs will be lower than with many small projects. Company owners will be eager to submit project proposals as they profit from technology and know-how transfers. They fear for their independence, though, and will therefore be interested in projects which involve a maximal amount of transfer but minimal direct interference of the investor. The local population and local authorities will be interested in maximal positive externalities, e.g. reduction of dust and toxic emissions as well as new jobs. They will protest against projects which diminish their incomes such as afforestation without the right to gather forest products. Therefore, they prefer small-scale projects with NGO involvement (Michaelowa/Greiner, 1996).

In host countries with authoritarian regimes, the interests of politicians and bureaucrats will generally prevail. This applies especially if the private sector is small and fragmented.

Evidently JI projects, as they run for terms between 10 and 100 years, require a stable and reliable background on the host country's side. Environmental protection needs to be a publicly approved policy objective, thus conditioning the presence of a process of democratic exchange of ideas. Institutions are needed to assess project primary and secondary results. Decision-making by competent actors can only rely on a national inventory of greenhouse gas (GHG) emissions. The strive for sustainability must be backed by interest groups and economic incentives.

2 Costa Rica as JI host country

In order to evaluate the Costarican JI policy, a brief introduction to the country's geographic conditions and ecological problems will be given. Special attention will be paid to tourism that made ecology an export factor for Costa Rica.

2.1 Environmental conditions and policy

Costa Rica forms part of the geographical bridge both between North and South America and between Atlantic and Pacific oceans. It is among the ten countries with the highest amount of precipitation, but the precipitation patterns differ from region to region. Within the territory a remarkable variety of climatic regions can be found thanks to its mountain range that ascends from sea level up to nearly 4.000 meters.

This complexity in geographic circumstances is reflected in Costa Rica's huge biodiversity. Although Costa Rica represents only 0,035% of the earth's territory, scientists presume between three and seven percent of all species to be living within its boundaries (e.g. Fuchs 1997, p. 38). The extreme weather conditions on the other hand lead to erosion problems. Over 60% of its territory is not suitable for agricultural use (LeBlanc 1997, p. 2).

Compared to other countries of the subcontinent, there is a remarkable public awareness for environmental matters in Costa Rica. This observation is due to different reasons:

Although social climate has become rougher in recent years, poverty is not as big a problem as it is in other parts of Latin America. As the army was abolished in 1949, a major share of public budgets is destined to social welfare. Since then no coup has taken place. A peculiarity of the Costarican democratic system is the *consensualismo*, which

means embracing the political opponent. Thus nongovernmental organizations (NGOs) find themselves integrated in the fulfillment of state functions, namely in nature conservation and environmental politics.

The right for a healthy environment was laid down as a constitutional amendment in 1994 (Saborio Valverde 1997, p 8, 38).

Protected areas now cover nearly 25% of the national territory. Eleven percent of the territory belong to the strongest protection category which is the declaration as national park in state property. Once declared, a national park cannot be removed, not even by law. Problems arise between protection of nature and the constitutional protection of private property (Art. 45). In some cases where compensation was only paid in state endowments the High Court ruled out the already declared national park. This led to the undesirable situation that some areas within national parks stay in private property until the end of the litigation. Specialists distinguish seven legal statutes, depending on kind of owner (private, NGO — willing or unwilling to transfer property, state organization) and progress of litigation. As a consequence, the owner is eventually tempted to make the most of the land while it still belongs to him or her and fell all the rest of the valuable trees in a short span of time. This is why Costarican Government has desperately been seeking funds for buying ground within these "paper parks".[5]

Ecology was made a compulsory subject at primary school. Classes undertake excursions to the national parks to learn about nature conservation. Sustainable development has been a mayor policy goal for the Government of President José María Figueres Olsen. The Costarican Planning Ministry has created a powerful system of sustainable development indicators (Sides, Internet — URL: http://www.mideplan.go.cr/sides) which allows measuring the fulfillment of this civil right. It includes social, economic, ecological and climate data.

2.1.1 Deforestation and forestry policy

In former times, all of Costa Rica had been covered by different kinds of forests. Although logging was already begun by the pre-Columbian indigenous people and then proceeded by the Spanish colonists, it was not until the second half of this century that massive lumbering destroyed the largest part of the virgin forests. Projections from the year 1992 foresaw complete deforestation between the years 2015 to 2033 (Notimex 1993, p. 21). Latest numbers given by the *Ministerio de Planificación* indicate a decrease in deforestation from 17.000 hectares in 1992 to 8.000 in 1994 (MIDEPLAN 1997).

[5] The question is, if there is no legal alternative to this high commitment of state capital.

Nowadays there remain about 1.8 million hectares of primary forest, most of which is under some kind of protection (for 1994: MIDEPLAN 1997).

Reasons for deforestation, apart from the tropical timber business, are

- the expansion of plantations of coffee and bananas,
- export-orientated beef production
- and the dislocation of subsistence farming to less productive areas not claimed by the big land owning companies.

The beef export boom starting in the 1960s offered opportunities even for smaller farmers because investment needs are low as cattle are kept outside all year. Most of the beef is produced for export. Because of the high prestige of cattle farming — the "cattle subculture" (LeBlanc 1997, p. 18) — high incentives are required to counteract its expansion. Each kilogram of beef produced implies the loss of 2,5 tons[6] of soil (Fuchs 1997, p. 29). This results from the fact that half of the national territory (Lara 1995, p. 116; Santiago/ Schmidt 1995, p. 2) is covered by pastures, while only eight percent of it are regarded as suitable for cattle grazing (Lara, ibid). Much of the farmland lies on steep hillsides and in areas where tropical rainfalls easily wash away the soils. On the other hand, beef exports only account for 1.4% of export revenues (for 1996: MIDEPLAN 1997), while the World Resource Institute estimates the value of nature's resources lost between 1970 and 1989 to be US-$ 4.1 billion (Tenenbaum 1996, p. 17).

Subsistence farming on marginal grounds results from the unequal land distribution. Costarican law tries to compensate for this at the expense of primary forests: after two years of occupying land the *precaristas* are given possession rights, after ten years the "squatters" can claim a property title (LeBlanc 1997, 10). The vicious circle consists in the fact that previously tropical woodlands are rapidly exhausted and degraded by erosion as roots no longer hold them together. Thus farmers see themselves forced to clear more virgin forests.

There are different measures taken by the Costarican Government to prevent deforestation. A tax reduction on wood selling benefits from 30 to 20% is granted if the area has been reforested. This is neither an instrument to prevent logging of primary forest nor is the incentive for reforestation strong enough to take effect (LeBlanc 1997, p. 3). Since 1986 there have been reforestation subsidies. The *Certificados de Abonos Forestales (CAF)* are certificates that give the right for tax exemption in the first five years of reforestation up to the amount of the total costs. This subsidy is equivalent to about US-$ 1.000 per hectare and is aimed at big land-owners. In 1988 a revolving forestry fund, the

6 The authors always refer to metric units.

Fondo de Desarrollo Forestal was created in context with a debt-for-nature agreement with the Netherlands. It is meant to encourage small forestry, crediting US-$ 644 per hectare for the first five years, which are to be repaid as the wood is harvested. The CAF certificate system was remodeled in 1991. Now it is linked to the pursuit of a sustainable forest management plan for each piece of forest. Access was made easier for small land-owners and responsibilities for CAF were transferred to the now restructured *Fondo Nacional de Financiamiento Forestal* - FONAFIFO (LeBlanc1997, p. 3).

These instruments indeed created incentives for reforestation, but showed some significant shortcomings:

- Primary forests were logged in order to give way for tree planting.
- The certificates were traded by investment companies that did not care about the long-term protection of the new forests.
- Forest direction restricted the number of species to be planted. Most indigenous trees were excluded because there were no data available on growth and output. The ecological effects of this policy are hard to foresee (Butterfield 1994, p. 319).

In April 1996 the forest law was renewed, transferring the part of the logging allowances to the municipalities (Muñoz 1996, p. 2) and private forestry engineers. This regionalization led to an 16% increase in logging permissions (Quesada 1997, p. 6A). Permits more than doubled from 431,566 to over one million cubic meters (Escofet 1997, p. 12). This is only partly due to the fact that permissions are now being granted for several years. The main problems are the lack of work-force and skills in the regional administration and the increased temptation for bribery. Critics state that Costa Rica lacks a systematic measuring of its forest covers (ibid.). The estimation that "50% of the logging in Costa Rica is done without the required permit" (LeBlanc 1997, p. 3) can neither be proven nor denied. Logging can not even be impeded within national parks because the administration — the *Sistema Nacional de Áreas de Conservación (SINAC)* — does not have enough rangers to control the areas. Yet there is great public awareness about the item. Lately, the abolishment of a lumber shipment tag has been reversed, because of many complaints against transports of allegedly illegally cut-down trees (Escofet 1997, p. 12).

2.1.2 Agriculture and environment

Starting in the middle of the 17th century, plantations have become predominant in agriculture. The first crop was cacao, later came coffee in the high plains and bananas in the Caribbean lowlands. Organic waste is one problem. Seventy percent of the overall organic products of coffee and 40% of banana plants are dumped, in many cases into the rivers, a practice which is illegal since 1938 (Oakes 1996). Coffee and Banana growing

are often linked to an abusive use of pesticides which actually lies seven times above world per capita average (Saito/Odenyo 1997, p. 2) thereby endangering farm workers' health and the water resources. The massive use of agrochemicals in cultivation of banana and new non-traditional crops (tropical fruit, macadamia nuts and flowers) and Tannic acids stemming from coffee processing are mayor threats for ground and surface water. Since a new sun-resistant coffee bush was first planted in 1980 the shadowing trees are being cut down which leads to the disappearance of 90% of the birds living in coffee plantation and to higher soil erosion (Oakes 1996). Recently, much attention has been paid to diminishing hazardous use of pesticides in banana plantations. After years of lawsuit Dow Chemical offered an out-of-court settlement for the banana workers affected by sterility having employed DBCP (Avalos Rodríguez 1997, p. 8A), a pesticide banned in the US since 1979 (Saito/Odenyo 1997, p. 2ff). Chiquita Corp. and other banana producers have tried to install an own eco-label which is being certified by the New York Rainforest Alliance and the Costarican *Fundación Ambio* (Anonymous 1997b, Anonymous 1997c). Critics object that the "Better Bananas"-principles reflect more or less the requirements of the law on solid and liquid wastes, enacted in January 1995 (Scharlowski 1996).

2.1.3 Population and settlement structure

Population growth endangers sustainability as well. Although the density of 67 inhabitants per square kilometer does not indicate over-population the habitable part of the territory is relatively small and that two thirds of the 3.4 million population lives in the central valley. Population grows by annual rates around 2.5%, 3.2% in urban areas. This arises problems from inadequate infrastructure, air pollution and settlement competing with agriculture use of the most fertile soils of the country.

2.1.4 Energy production and policy

Today's share of renewable energy sources is 82.4%, 75.2% alone stemming from the Arenal hydroelectric plant. The first block of the geothermal plant Miravalles is operational since March 1994, the second one was said to be going on-line in the middle of 1997 (ICE 1997; Cordero 1996), but it has not been finished yet. An operator for the third block has been found by tender, using the model of BOT (build-operate-transfer) for a span of 15 years (Cordero 1996, Segnini 1997). In 1994 the minister for natural resources, energy and mining (MINAE) promised a phase-out in fossil energy production by the year 2001. MINAE officials are very unhappy about this prematurely set aim be-

cause it is by no means rational. Firstly, it assumes that electricity consumption remains constant. Instead, power demand grows by approximately 8% per year (OCIC 1997, p. 1). Secondly, there is not yet a technically viable substitute for burning fuel or gas in the quantities needed during peak load.

The Energy Savings Act in 1996 introduced a 15% tax on all fossil fuels. It provided for one third of the revenues to go to the national forestry fund FONAFIFO. As the ministry of finance considered itself unable to fulfill the requirement of contributing US-$ 15 million to the fund in 1996 there has recently been a treaty between both institutions to guarantee an annual 2.7 billion colones[7] for five years starting in 1997.

2.1.5 Industry and environment

Industry is relatively backwards concerning waste management and energy efficiency. Although already 47% of industrial energy demand is covered by the use of agricultural waste 37% still stem from burning fuel. Case studies for five typical Costarican enterprises led by the German society for development cooperation (GTZ) found out large potentials for reduction and substitution of energy use. Put in practice, the proposed changes could lead to an annual climate benefit in the dimension of 4,000 tons of CO_2 and 80 tons of SO_2. At the same time, cost saving potential would range between 10 and 13% (GTZ 1996, p. 25).

The wood processing industry still receives its raw material at low prices from settlers, which motivates them very little for sustainable forestry. On the other hand, cheap raw material leads to squandering. The nature conservation NGO *Fundación Neotrópica* estimates that only 54% of the logged wood reach the sawmill, where half of the wood delivered are wasted by unproductive processing (Butterfield 1994, p. 318).

As far as CO_2 -emissions are concerned, the highest growth occurred in the transport sector: "From 1983 to 1993, the number of vehicles in use doubled from 190,000 to 390,000, with the number of automobiles increasing from 66,000 to 150,000." (LeBlanc 1997, p. 4) Lately the Costarican Government eliminated the 40% consumption tax on electric vehicles, in order to make them more competitive. An enforced use of electric vehicles in public and private transport could on the long run ease pollution in urban areas and at the same time lower the CO_2 -emissions caused by transport (Muñoz 1997, p. 3), given the above-mentioned structure of electric power production.

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7 This amount is equivalent to 11.5 million US$ in the present. According to the treaty, is secured against falling below 7 million US$ due to devaluation.

2.1.6 Tourism

In its boom years by the end of the 1980s and in the beginning of the 90s, tourism rates grew by 25 to 30% annually. 1994 was the first year foreign currency earnings generated by tourism surpassed those from banana exports. Today tourism employs 17% of the active population (Burkard 1996, p. 20). Most tourists come from US and Latin America (41% each). The share of eco-tourists to Costa Rica is estimated to be above 40% (Panos Institute 1996). The term ecotourism or sustainable tourism is not clearly defined. In any case, ecologically aware travelers choose the country because of its natural beauties and, on the contrary, would not visit it without them. Within this range, scientific visitors or bird watchers can be found as well as white water rafters who tend to consider nature a scenery for their recreational activities. Worldwide ecotourism is the fastest growing market share within tourism with a growth rate between 10 and 15% (Panos Institute 1996). After an initial phase of skepticism, the government of Costa Rica decided to strongly support ecotourism. Minister Carlos Rösch advocates the integration of a clause concerning sustainable tourism into Agenda 21. The average eco-tourist spends more money on his or her vacation than normal tourists do. In 1995 every traveler to Costa Rica left US-$ 840 within the country. This number rose by 71% within only eight years which reflects a rise in quality. Ecotourism relies very much on regulation in order to prevent destroying its own bases. The Tourism Ministry gives priority to small and medium enterprises and takes care for the offers being benign to the environment. In 1993, for instance, a German investor was expelled because of irregularities in constructing a hotel complex. He was charged of having eradicated valuable vegetation, killed animals of protected species and having damaged a coral reef (Anonymous 1993).

The village of Longo Mai is an example for an ecologically and socially orientated tourism development. It lies next to La Amistad National Park in the south-east mountain region near the Panamanian border. Longo Mai has specialized in hosting educational travelers and solidarity workers (Burkard 1996, 21). Regional effects of tourism can as well be studied in La Fortuna, near the Arenal volcano. The village not only by its name resembles a gold digger town. Practically all of its 800 inhabitants are in some way or the other dedicated to tourism. The typical hostel does not exceed five rooms or cabins. Small supermarkets and restaurants provide food for the visitors; handicraft gift shops offer guided tours to the volcano and the hot springs beneath.

The national park entrance fees for foreigners were raised overnight from 1.3 (Panos Institute 1996, p. 10) to US-$ 8 which at the same time increased the tourists' participation in conservation and halted the crowding of the areas. In some places now the number of visitors at one time is limited. Small farmers and land workers find jobs as rangers

or guides in the parks, thus ensuring the support of the local population for nature conservation . Tourism also has its share in Central American cooperation. Guatemala, Belize, El Salvador, Honduras, Nicaragua, Costa Rica and Panama plan the installation of a 1,500 mile biodiversity corridor, the *Paseo Pantera* (Stevens 1996).

2.2 Joint Implementation in National Politics

External financing of nature conservation policy is not new to Costa Rica. It started with to the so-called debt-for-nature programs, which canceled external debts under the condition that their value, converted into national currency, was to be invested in national parks. Another creative means to generating income from preservation of primary forests is its use as a resource for genetic material. The first time its exploitation was put on a regular basis was in 1991 with the cooperation between the US based pharmaceutics enterprise Merck&Co and the National Biodiversity Institute INBio, founded as a NGO by the Costarican Government in 1989. The agreement implies the systematic collection and documentation of samples from the rain forests by INBio specialists and their use by Merck's research laboratories. Merck paid about one million US-$ as a fixed sum on every renewal of the treaty[8]. A license fee between one and tree (in some cases up to ten) percent of the revenue is granted in case drugs basing on Costarican genetic substances get on the market. The gene database is made available to the public by the company by Internet (URL: http://www.merck.com). INBio is to use only half of this income for its operative purposes while the rest goes to the preservation of the forests (Tenenbaum 1996, p. 19). The rights of author stay within the country (Anonymous 1997b). This contract, the full text of which is kept secret, has widely been criticized for selling out a country's natural resources. Still it has to be considered that the "traditional" way to generate income is by destroying one's own resources. Costa Rica's attempts to preserve its natural beauties as a way to have the cake and eat it too: Whole sectors of the economy are living on the survival of the indigenous flora and fauna.

On the basis of its prior experience, Costa Rica was among the first countries to play an active role in JI, taking the chance to promote its sustainability policy. It offers all the necessary requirements for successful JI: strong and lasting democratic institutions and wide acceptance of the goal of climate protection. JI may help to counteract pressures of exploitative industry and farming. The measures financed do not induce a new path of development, they just foster and stabilize a process already begun by Costarican politics. Climate cooperation can set further economic incentives to realizing the value of

8 The initial payment is said to have been 1.14 million US$. There have been two renewals up to now, one in 1993, the other in 1997.

nature's resources. In contrast to JI theory, this is no transfer of know-how in the north-south direction. In the field of nature conservation Costa Rica is working out knowledge transferable to other tropical regions.

2.2.1 Legal and Institutional Issues

Costarican JI cooperation started in September 1994 with a "Statement of intent for bi-lateral sustainable development cooperation and joint implementation of measures to reduce emissions of greenhouse gases" (USIJI 1994), followed one year later by a similar document between the US and all Central American States. The aims of cooperation are best described in the bilateral statement. The following items are explicitly but not exclusively listed: " … biodiversity conservation and ecosystem protection, reduction of local pollution, sustainable land-use practices, improved rural income opportunities, and local participation in project planning and execution." (USIJI 1994)

2.2.1.1 The Costarican JI Office and its Guidelines

In April 1994, the Costarican JI Office (*Oficina Costaricense de Implementación Conjunta*, OCIC) - was created as a result of the cooperation between the later Ministry for Environment and Energy (MINAE)[9], the privately organized Costa Rican Investment and Trade Development Board (CINDE) and two NGOs. One is the FUNDECOR, an NGO dedicated to nature conservation, whose president, Franz Tattenbach, at the same time heads OCIC. The other is the ACOPE, the Association of Independent Power Producers. OCIC receives additional funding from CRUSA, the Costa Rican — US Foundation for cultural exchange. OCIC was established by a presidential decree. It reports to the MINAE and executes the authority to formulate JI policy, evaluates and approves projects (LeBlanc 1997, p. 7). Nonetheless, it is not located clearly within the system of separation of powers. OCIC consists of only seven persons, many of whom are constantly representing the institution in international meetings. Five of them are scientists.

The OCIC's guidelines for project criteria are:

- Minimize red tape.
- Be experience based.
- Meet current international standards.
- Represent Costa Rica's particular interests (Lay et al. 1996).

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9 In 1994 its name was *Ministerio de Recursos Naturales, Energía y Minas* (MINIREM).

Project proposals are to be decided upon within six weeks. There are different sets of criteria, which can be grouped by general criteria, climate priorities and feasibility items.

The general criteria state that projects should be according to Costarican laws and sustainability goals. They should offer "enhancement of income opportunities and quality of life for rural peoples and members of certain vulnerable groups including cultural minorities" (Lay et al. 1996). The communities involved have to support the project. Transfer of skills and technology is requested as well as to keep negative influences of the project on an acceptable level.

Criteria cited from the UN Framework Convention on Climate Change (UNFCCC) are reinforced by OCIC and exceeded as far as verification by a "qualified, non-participating organization" (ibid) is requested. Financial additionality to development assistance or any other obligations by industrialized countries is called for, according to the UNFCCC. All costs related to the project have to be considered, including those of non-participants. Institutional feasibility is demanded on the Costarican side. Political, administrative or scientific institutions must be able to indeed administer the project as well as the proponent. Previous JI experiences on the proponent's side are highly appreciated.

2.2.2 Developing the Instrument of Cooperation

From the very beginning, Costa Rica has handled JI in a very autonomous way. The first projects stemming from cooperation with USIJI are being financed or are still seeking funding on a project-to basis. The investors are directly involved in proposal, planning and implementation. For these projects the transaction costs are high, return on investment as well as the real GHG effects are submitted to considerable entrepreneurial risk. This is why Costa Rica has developed an alternative model of financing climate cooperation.

The invention of so-called creditable, tradable offsets (CTOs) was the unilateral anticipation of an international crediting system. Once crediting will be agreed upon on an international level, CTOs can be regarded as emission allowances. Each CTO stands for an amount of GHG reduced or sequestered in vegetation, expressed in carbon equivalents[10]. MINAE guarantees the amount to the CTO buyer for the period of 20 years. This means that, if any of the financed projects fails or does not produce the expected GHG effects, the State of Costa Rica will provide for other projects to take the same effect. This is done by selling only a part (approximately 17%) of all possible carbon reductions (90 million tons) as CTOs. Each single CTO (equivalent to 1 ton of carbon) is sold for 10

[10] One ton of carbon equals 3.67 tons of CO_2.

US-$. As soon as emissions trading is begun, the price will be derived on stock markets. The whole mechanism depends on the two conditions:

1. The home country of the buyer will recognize CTOs as valid.
2. CTOs are of economic use for their bearer (e.g. entitles him or her to tax exemptions).

Proceeds from selling CTOs go to the above mentioned National Forestry Finance Fund FONAFIFO[11], which is responsible for the so-called umbrella projects. In theory, these projects only need the approval of the Costarican JI office but not of the investor's country. On the contrary, CTOs would not be transferable. In practice, the State of Norway as the first buyer of CTOs developed two projects together with OCIC. The overall project volume being 3.4 million US-$, Norway obtained 200,000 CTOs for the first 2 million US-$ invested in forest conservation and reforestation. But there are actually three "real" umbrella projects being financed by fuel tax and CTO selling. These include the *Proyecto Forestal Privado*, which "aims to compensate farmers for forest conservation, reforestation or sustainable management efforts" (Foundation JIN 1996, p. 2), the *Proyecto de Áreas Protegidas* serves the national park administration primarily for purchasing land, and the Costa Rican Renewable Energy Export Program which totals 215 MW of capacity to offset 0.35 million t carbon per year in the importing neighboring countries (LeBlanc 1997, p. 12f). In July 1997, the US Initiative on Joint Implementation (USIJI) bought 16 million CTOs, 11 million of which are to be achieved by forest conservation and the rest by reforestation. An independent verification of all CTO-related projects by the Swiss company SGS has been agreed upon, which is financed by the World Bank. Up to the present, there is no private bearer of CTOs, except for the US based company Center Financial Products which bought a 1,000-ton CTO at a price not revealed to the public (Liddell/Escofet 1997, p. 12) and placed it at the Chicago Stock Market.

Which are the advantages of CTOs over a "normal" JI procedure?

Investors can enter cooperation on a very small budget because virtually the minimum investment could be US-$ 10 for one CTO. No administration is required and there are no external costs. The investor takes no risk if one project fails or is delayed; the only risk lies is the stability of the constitutional system of Costa Rica, which in turn has proved stable over the last 50 years. On the other hand, there is no free riding for the investor by linking the engagement to supply contracts. This goes in line with the restrictions set by the UN Framework Convention.

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11 In other publications reference is made to a "National Carbon Fund" (i.e. Foundation JIN 1996b, p. 2). This fund is not clearly defined. It seems to be just a part of FONAFIFO.

The benefits for Costa Rica consist in realizing projects according to its own economical necessities and political preferences, thus fully conserving its sovereignty. This is reflected in the decision of OCIC to withdraw projects that have not yet received financing from the project-to-project basis and to carry them out under the Forestry Finance Fund's umbrella.

3 Current JI Projects in Costa Rica

Nine bilateral JI projects have been approved in Costa Rica. Although many different kinds of GHG mitigation projects could be thought of, in Costa Rica there are but forestry and renewable energy projects. The total amount to be invested in forestry projects is ten times higher than in energy projects, its volume in terms of carbon offsets is expected to be 73 times higher than in the energy projects (Gorbitz 1997, p. 55).

Of the five forestry projects approved by USIJI only one project is fully financed. Another one has received just enough funding to realize a pre-feasibility study. One out of four energy plants is definitely operational. The lack of finance is as typical for the JI pilot phase as the fact that all participants tend to hide this fact from the public. A blatant example for this behaviour is the latest report to the UNFCCC where projects that are not financed are described to be operational. Cooperation with Norway is special in the way that projects are not only approved but also financed by the guest country's JI body.

The project descriptions are structured as follows: Once the objective is outlined, participants are listed, climate effects and project costs are calculated and possible externalities are taken into consideration. At the end of each description, additional information and a short summary will be given.

3.1 Forestry Projects

Regarding climate effects, there are two possible forestry project forms: One consists in the preservation of existing forests in order to prevent adding GHG from deforestation to the emissions from the combustion of fossil fuels. This means that no imminent emission reduction is taking place. The other is reforestation. In theory, constant reforestation could for some time sequester emissions of industry and traffic, thus winning time for a change of patterns in production and use of energy. The problem is that pests, fire or simply logging and changes in land use can revert the progress made in all the years of forest growing. In contrast, emission reductions once achieved from efficiency gains cannot be reverted in the future. The aspect of future losses makes forestry projects difficult

to handle in context with JI. Although most projects combine preservation and reforestation, a distinction will be made according to the main aspect.

3.1.1 Preservation Projects

3.1.1.1 BIODIVERSIFIX / Guanacaste Conservation Area

In the northwestern province of Guanacaste migration away from the countryside is prevailing (Altenburg 1992, p. 62). The landscape is marked by pasture. Most of the lands outside the national parks belong to big land owners. The pacific side often suffers from water shortages (Fuchs 1996, p. 107).

BIODIVERSIFIX was approved in July 1995. It is to be carried out within a conservation area covering 1,200 square km near the Nicaraguan border. It lies on either side of the meteorological divide of the mountain range. This is why the sub-projects are called WETFIX and DRYFIX.

WETFIX consists in restoring 13,500 hectares of abandoned marginal pasture within an area of 40,000 hectares of middle-aged to primary rain forest. DRYFIX is aimed to consolidate a 80,000 hectares forest cover by regenerating 45,000 hectares of marginal pastures and semi-natural dry forest using natural dissemination. Finally, 9,000 hectares of pastures will be purchased and turned to a sustainable forestry zone by planting slow-growing hardwood (USIJI 1996, p. 51ff). The whole project has a 50 year lifetime.

a) Participants

There have been three NGOs and the Environment Ministry MINAE participating in the project development. On the US side, The Nature Conservancy is a non-profit membership organization. Costa Rican participants are the above mentioned INBio biological institute, investigating the area, and there is MINAE, represented by the national park administration SINAC and the CGA park itself as a semi-official organization. Yet no investors have been found. Costa Rican Government "strongly supports" (USIJI 1996, p. 46) BIODIVERSIFIX.

b) Climate Effects

Participants will monitor the measures' success and report the outcomes on Internet. Calculation of CO_2 parts from the assumption that in the reference case (the "baseline") car-

bon fixation on the pastures would be zero. Net offset calculation from fixation is shown in Table 2. Objections to this calculation might base in the fact that the soil involved is "marginal cropland, abandoned pastures or otherwise unused lands, form which forests had been cleared over the last 100-400 years" (USIJI 1996, p. 49). They are located within a forest reserve and have been out of agricultural use for years. Most lands are in state property. So it would have been more honest to only assume constancy in the reference case for the areas to be newly acquired (7,400 ha in the WETFIX case and 9,000 ha for DRYFIX). The rest of the land would have some chance to renaturate naturally and to fix carbon without the action of BIODIVERSIFIX. This would lower profitability in terms of carbon fixation per US-$ invested.

c) Costs

Project developers hope to cover part of the costs by commercial activities like ecotourism, biological prospection or sustainable forestry use. Minimum requirements were initially cited as US-$ 35,098,000 for DRYFIX and US-$ 29,675,795 for WETFIX (USIJI 1996, P. 44). Latest estimations lowered the costs by 12%. The project developers expect the hectare of wet land to cost 700 US-$, dry lands will be purchased for 500 US-$. Together with contributions for semi-natural planting, administration and management, the average ton of fixed carbon comes for US-$ 11.46 (US-$ 10.82 in the DRYFIX case, US-$ 12.53 for WETFIX) (UNFCCC 1997, own calculations). If OCIC decided to make BIODIVERSIFIX an umbrella project, its benefits in terms of CTO would have to be sold below price, unless the projects produce revenues.

d) Externalities

The remaining 30% carbon benefits for the years 51 to 100 might be considered a positive externality, but they lie far in the future. Guanacaste Conservation Area is a regional development project whose effects go beyond the confines of the GCA national park. Today, there are 131 direct employees, 91 of whom work full time. This number is expected to increase to over 200. The region is undergoing a structural change and BIODIVERSIFIX could be beneficial to its social-economic circumstances. As its scientific advisor, Daniel H. Janzen, sees it: "The GCA does not recognize a buffer zone or buffer community, but rather strives for high-quality land use both inside and outside of its formal boundaries." (Janzen 1995)

Table 2: Project scenario for Biodiversifix

	factor	DRYFIX	WETFIX	
(total in 100 years	100%	4,500,000 t C	2,700,000 t C)	
Decade 1	10%	450,000 t C	270,000 t C	
Decade 2	15%	675,000 t C	405,000 t C	
Decade 3	20%	900,000 t C	540,000 t C	
Decade 4	15%	675,000 t C	405,000 t C	
Decade 5	10%	450,000 t C	270,000 t C	
total after 50 years	***70%***	**3,150,000 *t C***	**1,890,000 *t C***	***5,040,000 t C / ha***
CO2-Equivalent	3.7	16,650,000 t CO2	9,990,000 t CO2	18,648,000 t CO2
UNFCCC numbers:				18,480,000 *t CO2*

Source: UNFCCC 1997, own calculations

e) Observations

The regional economic benefits described are a good example for positive externalities from JI theory. If GCA succeeds in erecting a certain material wealth on the basis of the forest, it is probable that the population will support the measures beyond the project lifetime.

3.1.1.2 ECOLAND / Esquinas National Park

ECOLAND is the acronym for Esquinas Carbon Offset Land Conservation Initiative. The 13.4 square km Esquinas delta is located on the Golfo Dulce, opposite to the Osa peninsula in the extreme southwest of the country. In 1994 it was declared a national park under the name of Piedras Blancas. The project is aimed to purchase nearly 20% of the privately owned park area and to convey it to the national park administration. All except 350 hectares out of the total of 2,500 hectares to be bought are currently forested (UNFCCC 1997). Although the commercial participants will not be linked to the operation of the park, ECOLAND is the only conservation project to be fully financed. It started in January 1995 and has a lifespan of 15 years.

a) Participants

ECOLAND is managed by Trexler and Associates, Inc. (TAA), an US based consultancy, which tries to specialize in JI operations. In the latest report to the UNFCCC (1997) TAA is not mentioned any more. In the ECOLAND case, MINAE cooperates with five US

enterprises and three NGOs. Tenaska Washington Partners, Ltd. is the managing partner among four different power companies. The NGO participants include the US National Fish and Wildlife Foundation, the private Costarican forest conservation foundation COMBOS (*Conservación y Manejo de Bosques Tropicales*) and *Regenwald der Österreicher*, an Austrian non-profit organization which supports an ecotourism project bordering on the park (USIJI 1996, p. 63f) and will also provide for monitoring the project (UNFCCC 1997). According to USIJI, ECOLAND was among the first projects being initiated by the Costarican Government in December of 1994.

b) Climate Effects

The baseline calculation assumes that under normal circumstances within 15 years the area would be completely deforested: "Some landowners hold logging concessions, a number of which are active, and many owners face economic pressures that encourage deforestation" (USIJI 1996, p. 64). There is no further explanation of this statement. Calculation refers to "general soil and vegetation carbon content literature" (USIJI 1996, p. 65). Numbers cited in this context are put in italics (see Table 3).

The prevented fixation loss is added to fixation gains from the project, which makes a total carbon offset of 366,200 tons.

Unlike in Table 2, different fixation quotas, according to decade and vegetation zone are not considered. ECOLAND is the only project to take carbon fixation in the soils into account. There is very little knowledge about annual growth of the so-called humus soils in the tropical rainforest. Numbers between 0.8 and 5.1 tons per hectare have been found (Nilsson/Schopfhauser 1995, p. 267ff). In one Costarican case after 18 years of regeneration, no significant growth of humus soil could be proven (Herold 1995, p. 30). Refraining from speculation on humus growth would result in lowering the estimates by 44%.

Of the total carbon offsets, only 250,000 tons are "credited" to Tenaska. This is done at once, although annual results are no higher than 23,037 tons. This does not matter during the pilot phase, but will be a problem as soon as GHG crediting will be effective.

Table 3: Total carbon sequestration ECOLAND

Reference Scenario				
total extension	2,500	ha		
without forest	350	ha		
forested area	2,150	ha		
deforestation time	15	years		
annual deforestation	135.73	ha		
soil fixation / ha	*143*	*t C/ ha*		
released by logging	*60%*	equivalent to	75	t C/ ha
carbon fixed in vegetation / ha	*110*	*t C/ ha*		
released by logging	*80%*	equivalent to	88	t C/ ha
complete carbon fixation	235	t C/ ha		
released by logging		total	163	t C/ ha
annual loss	23,363	t C		
total loss in 15 years	**350,450**	**t C**		
Project Scenario				
annual growth fixation/ hectare.	*3*	*t C/ ha*		
growth extension	350	ha		
annual fixation	1,050	t C		
total gain in 15 years	**15,750**	**t C**		

(Source: USIJI 1996, p. 65 ff., UNFCCC 1997, own calculations)

c) Costs

Land purchases cost US-$ 910,000, which is about US-$ 380 per hectare. An endowment of US-$ 40,000 for annual implementation costs was created. Project development and representation, i.e. transaction costs, were US-$ 150,000 (UNFCCC 1997) or 14% of total project costs, which were covered by Tenaska. The project turns out to be quite cheap, with net costs per credited ton of carbon sum up to 4.4 US-$, even cheaper for Tenaska when discounting the US-$ 450,000 which were contributed by the NGOs.

d) Externalities

Contrarily to the project approval criteria of both national JI bodies, no information is given about the side-effects. However the following data is missing:

- How many owners are there within the newly declared national park?
- Is the land inhabited?
- Which part of the park area has already been logged?
- What made developers chose the actual project area?

e) Observations

It is remarkable that only the ECOLAND developers came up with the idea to calculate carbon fixation in soils thereby nearly doubling the expected climate effect. Social and regional economic effects have not been taken into account. It would be interesting to know where the money goes. Will it generate work or will it migrate to the capital? Another problem is the lack of independent third-party monitoring.

3.1.2 Reforestation Projects

3.1.2.1 CARFIX / Central Volcanic Range

CARFIX stands for Carbon Fixation in management and enlargement of an existing nearly 3,000 square km buffer zone called Central Volcanic Range Conservation Area (ACCVC), declared UN World Biosphere Reserve in 1988 (Fuchs 1997, p. 181). A forest reserve and four different national parks are located within the ACCVC, among them the well-known Braulio Carillo. The project extension is of 71,551 hectares within national parks, 20,502 hectares of primary forests to be regenerated, 17,000 hectares of cleared lands, 11,000 hectares of which for regeneration of nature forest and 6,000 hectares for sustainable forestry management. Investment will be used for increased control against illegal logging, purchase of private land within the national parks and subsidies to private landowners proportional to the carbon fixation achieved by them. Training and advice will be provided for farmers. Monitoring will include in-situ-inspections twice a year, annual growth controls and an analysis of satellite images every three years. CARFIX has a lifetime of 25 years.

a) Participants

The project will be managed by the FUNDECOR NGO, which has been organizing the ACCVC together with the National Park administration since 1989. ACCVC and the park administration represent the MINAE Ministry as another participant. Therefore, the Costarican government "strongly supports" (USIJI 1996, p. 53) the proposal. An investment partner has not been found yet. US based Wachovia Timberland Investment Management "has expressed a definite interest in investing in future harvests from the project" (USIJI 1996, p. 51), but obviously this interest has not materialized up to the present. A donation of US-$ 25,000 was made to ensure a pre-feasibility study (LeBlanc 1997, p. 13). In October 1997 participants reported that they had started off in January

1996 already (UNFCCC 1997). Nevertheless this is the first time the starting date was mentioned. Apparently CARFIX is now under the CTO "umbrella". Costa Rican government participates in financing with 3.8 million US-$ (UNFCCC 1997). Wachovia takes a share of 5 million US-$ and there are 12.6 million US-$ financed by utility companies. There are no names given for the latter and the question in the UNFCCC's uniform reporting format "Is This Funding Assured?" remains unanswered.

b) Climate Effect

The project claims that the baseline is derived from observation for the past years. They indicate a deforestation rate between 2.8% and 4.1% within the national parks, and 6% outside the Parks. The baseline calculation for the national park area nevertheless assumes a deforestation rate of 4.14%, which is higher than any of the observed values. In comparison to some other forestry projects, this baseline is more realistic though, as it does not assume linear losses. Total carbon fixed in primary forests is estimated to be 99.4 tons per hectare without net variations in time. Regeneration of the natural forests is assumed to be 1 m^3 per hectare annually.

The complexity of the sub-projects and the few data given do not allow to retrace the complete calculation of mitigation effects. Although parts of the project area will be harvested once or even twice during the project lifespan, no subsequent carbon loss is considered. As payments and crediting depend on the values obtained through monitoring inconsistencies in the sequestration projection probably will be uncovered. But the baseline has to be as exact as possible because it cannot be adjusted over time. It seems that both official JI organizations did not take the trouble to verify the details. There is a multiplication error in the baseline for the first year; the overall error for avoided deforestation losses understates the effects by 14%. For example, the first year carbon loss in the national parks *without* the project would be (71,551 ha * 4.14% of deforestation * 99.4 t C / ha =) 294,444 tons.[12]

[12] In the first report (USIJI 1996, p. 54), the same calculation equals 294,243 tons.

Table 4: Given data for CARFIX carbon calculation

project area	
National Parks (NPARK)	71,551 ha
Natural Forests (NF)	20,502 ha
cattle lands (REFOR)	6,000 ha
abandoned past. (SFREG)	11,000 ha

reference case	
REFOR	constant
SFREG	constant
total carbon fixation	99.4 t / ha
annual loss in NPARK	4.14%
annual loss in NFMGT	6.00%

(Source: USIJI 1996, p. 54f)

The formula for calculating the percentage of forest lost (L) is

$$L_n = 1 — (1 — p)^n.$$

The overall forest losses after 25 years are (65.3% of 71,551 ha =) 46,688 ha in the case of NPARK and 78.7% of 20,502 ha =) 16,137 ha in the NF forests. Multiplying the sum of 62,825 ha with the carbon fixation per hectare of 99.4 t, the mitigation benefits for avoided emissions of both sub-projects are 6,244,809 t of carbon. A total phaseout of illegal logging within five years is assumed for the natural forest, leading to losses of only 122,274 t of carbon. These two sub-projects make up the lion's share within total climate effects.

Project developers expect a total of 5,939,113 t of carbon stored and sequestered by the whole project. Taking only the results of the NPARK and NF project part, all the rest of the projects (the project case) would have to be counter-productive as far as carbon effects are concerned; a calculation error which goes to the project developers' own detriment. The underlying assumption that all the carbon stored in vegetation is removed in the process of deforestation would only be correct if the forest was burned which is not the normal case in the wet areas of Costa Rica.

Still, and to make confusion complete, an article written by FUNDECOR member Marielos Alfaro (1997) departs from a much lower carbon fixation per hectare of forest (26.1 t) and expects an annual deforestation in the national park area *without* CARFIX at rates arbitrarily varying between 1.19% and 4.14. Nevertheless, he is the only one to speak of the possibility to update the baseline: "A learning effect in the buffer zone is possible as a result of the project: overall deforestation rates may decline in those areas not directly incorportated in the project." (Alfaro 1997, p. 209) This is the first time a dynamic baseline is taken into consideration for a Costarican JI project.

c) Costs

Total costs estimations only in the second report were broken down by factors. They sum up to 12,499,765 US-$[13]. The projected climate effect would lead to a carbon price of 2.12 US-$ per ton. Revenues from timber sales and government incentives are expected to be 39,311,623 US-$[14], 9.4 million US-$ of which are governmental forestry incentives.

d) Externalities

Advantages for the host region lie in the field of capacity building. There are 1,878 farmers to undergo forestry education. Sustainable forestry is expected to offer them a stable income and an incentive to preserve the forests beyond the project lifetime. The experiences gained will be of use in other parts of the country (UNFCCC 1997).

There is a variety of ecological benefits of biodiversity for the region, like the prevention of erosion and the protection of water resources. Thus the project will protect the watershed for the 80% the Costarican population who live in the Central Volcanic Area. Prospects for ecotourism in the central volcanic area are very good, once the present security problems for hikers will be settled.

e) Observations

The CARFIX participants show high interest in a better protection of the ACCVC buffer zone, and they take advantage of any source of financing available. This brings them in conflict with the fundamental condition of additionality expressed in the JI principles, especially the financial additionality. In autumn 1996, FUNDECOR was granted 1.5 million US-$ by the Global Environmental Facility (GEF). This fund finances projects with beneficial effects for world climate and / or biodiversity. According to the World Bank, "FUNDECOR will be financing up to 150 separate projects of two basic kinds - sustainable forestry and reforestation - both on a very small scale". (World Bank 1996). The USIJI report gives mention to the GEF funds, playing down their role to a mere support for monitoring and carbon offset calculation, "but not for project implementation" (USIJI

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13 The exact number given is 12,499,765 US-$ but even in the addition there is a small calculation error.

14 Further revenues are expected from the sale of carbon offsets, "expected to generate an additional $ 5,970,607" (UNFCCC 1997). There in no explanation given, neither for the amount, nor for the expectation expressed.

1996, p. 56). Cooperation with the US Agency for International Development (USAID) was even suspended explicitly in order to enable the recognition as JI project:

> "In order to raise more support for Carfix, FUNDECOR found itself an American partner. The American development organization USAID submitted the Carfix project for approval under the first round of the USIJI. … USAID, which has supported FUNDECOR for some time will cease to do so when JI investors take over so that there will be no doubts over the additionality of funds." (Tattenbach 1995)

Taking the criterion of financial additionality seriously, this open-hearted confession would have led to the disapproval of the project. Perhaps USIJI compensated this clear breach of the criteria with the high engagement demonstrated by the proponents, which can be seen as the best guarantee for long-term success of a project.

CARFIX seems to us beneficial in terms of ecology and regional economics. However too little attention has been paid to the documentation of climate effects to make it a good example for a successful JI cooperation.

3.1.2.2 KLINKIFIX Reforestation Project

KLINKIFIX was approved in November 1995. It stands for carbon fixation as fast and as efficient as possible. The fast-growing pine species Klinki (araukaria hunsteinii) is planned to be cultivated on former marginal pastures in forestry plantations. The conifer originates from Papua-New Guinea and produces wood suitable for utility piles or plywood (WBCSD 1997). It shall provide a new source of income for the farmers who market their carbon benefits in a kind of joint venture with the main project developer. The projected lifetime has lately been extended from 40 to 46 years, 6 of which count as implementation phase. Implicitly the carbon calculations indicate that between year 41 an 46 nearly all trees will be cut. Project location is the Turrialba Valley, 30 km bee-line east of the capital. Although there is no substantial funding yet, the project is reported to have started in June 1997 (UNFCCC 1997).

a) Participants

The project developer is Reforest the Tropics Inc., referred to by USIJI as "a not-for-profit, non-stock organization" (USIJI 1996,68). It is a subsidiary of the Connecticut based forestry enterprise Newton Treviso Corporation (IUEP 1995) and also established the Macadamia nut in Costa Rica as a cash-crop some years ago (WBCSD 1997). For 29 years, it has been operating a model plantation of Klinki in Turrialba, east of San José. The Cantonal Agricultural Center of Turrialba (CACTU) will manage and monitor the

project. The CACTU finances itself by selling utility poles (WBCSD 1997). Its board of directors is constituted by representatives of farmers, local banks and cooperatives (USIJI 1996, p. 68). Yale School of Forestry and Environmental Studies, The Forest Products Laboratory, which is a department of the US Agriculture Ministry and their Costarican counterpart, the *Centro Agronómico Tropical de Investigación y Enseñanza* (CATIE) will collaborate in the project (ibid, p. 69). Last but not least, a survey among the farmers resulted in 40 farmers who declared themselves inclined to plant Klinki trees on 2,750 hectares. The Costarican Government does support the measure, although the adverb "strongly" is left out in this case (USIJI 1996, p. 71).

Table 5: Klinki Project Case

year	annual growth	cumulated	ann. growth	cumulated
1	100 ha	100 ha	t C	t C
2	500 ha	600 ha	820 t C	820 t C
3	1,000 ha	1,600 ha	4,920 t C	5,740 t C
4	1,300 ha	2,900 ha	13,120 t C	18,860 t C
5	1,525 ha	4,425 ha	23,780 t C	42,640 t C
6	1,575 ha	6,000 ha	36,285 t C	78,925 t C
7	0 ha	6,000 ha	49,200 t C	128,125 t C
(...)				
41	0 ha	6,000 ha	49,200 t C	1,800,925 t C
42	-649 ha	*5,351 ha*	47,944 t C	1,848,869 t C
43	-991 ha	*4,360 ha*	43,881 t C	1,892,750 t C
44	-1,288 ha	*3,072 ha*	35,755 t C	1,928,505 t C
45	-1,511 ha	*1,561 ha*	25,191 t C	1,953,696 t C
46	?	*?*	12,799 t C	**1,966,495 t C**

(Source: UNFCCC 1997, own calculations)

b) Climate Effects

In the first year, only 100 hectares are to be planted, because the Costarican production capacity of the seedlings is very limited. Annual carbon fixation per hectare is said to be 8.2 tons, referring to the model plantation. The growth is consciously overestimated for the first years and underestimated for later years. This simplification is not acceptable, because the project developer could well offer exact data for the first 30 years from the

Turrialba model plantation of Klinki pines. After an even more simplistic calculation model in the first report to the UNFCCC (USIJI 1996, p. 73), project developers adapted carbon calculation, time schedule and costs. Carbon calculation now takes into account the result of first year plantations in the second year etc. As cost estimations nearly tripled, project lifetime was extended. In the last five years carbon sequestration slows down due to massive cutting. Year 45 sees the 6,000 ha pine forest reduced to 1,561 ha (UNFCCC 1997).[15]

Carbon profits are not balanced against losses, because the reference case is zero. The carbon content of pastures is supposed to be stable, and carbon emissions in cutting, processing and consumption of the wood are not taken into account.

c) Costs

The developers expect US-$ 10,666,017 project costs, 30% of which are transaction costs like inventory (9.1%), monitoring (8.6%) and project management (11.8%). The derived price is US-$ 5.42 per ton of mitigated carbon.

d) Externalities

The implementation of new, non-traditional agrarian products that help to reduce dependence on coffee and banana production certainly is beneficial for the Costarican economy, as are increased incentives to forestry and against cattle growing. Still there is no estimate of viability for the farmers. Commodity prices for wood are so low that sawmills can afford to waste 50% of the raw material during the processing (Butterfield 1994, p. 318). There is no information given about the soils needed for Klinki, nor about the water demand of the plants.

Project developers did not care about indirect employment effects, process capacities or the integration of the project within the regional structure in general.
Most of all, there is real doubt about the Klinki forestry from the ecological point of view. The sole fact that Klinki can be grown in mixed species plantings is praised to be "contributing to biodiversity and plantation stability" (WBCSD 1997). This is exactly not the case with the exotic Klinki species which is to be planted massively. The 30 years of experiences in the model planting not even account for one generation of trees. There is no knowledge about water absorption capacity of the soils cultivated with the pine nor how it reacts to forest fire. It is quite probable, they will be subject to infestation and will

15 This number is obtained by dividing the projected carbon sequestration in year 46 by 8.2 tons.

themselves damage other organisms within the tropical ecosystem by secretion of needles, raisin or seeds . The rapid growth will deplete the poor soils of the pastures. The use of pesticides and fertilizers will be indispensable. An uncontrolled spreading into the ACCVC buffer area adjacent to Turrialba can lead to unpredictable consequences. As there are no new plantings projected in the later years, Klinkifix might leave behind 60 square km of fallow land.

e) Observations

In the Klinki case, the criterion of program additionality is not fulfilled. On the contrary, the program has been planned and prepared for three decades before it was submitted for JI approval. The task of JI is to encourage measures that otherwise would not have taken place. Klinki developer Reforest the Tropics, Inc. freely compares the program to its foregone experience with the implementation of the Macadamia in Costa Rica, which did not need external financing either. An investment which would have been placed anyway is expected to be "sweetened" by JI. In our opinion, Newton Treviso Corp. alias Reforest the Tropics, Inc. has to be regarded as the typical free rider in the JI process. The company is the only provider of the seedlings, contractor of the farmers for planting and for marketing of their carbon credits. Only the commercial risk for selling the wood harvest is left to the farmers.

CACTU is too closely involved in the project outcomes to be suitable for independent monitoring.

Obviously those are the reasons why the Costarican Government only gives its lukewarm support. In a personal conversation, Franz Tattenbach admitted that he did not feel too sure about KLINKIFIX, but the project developer had been so enthusiastic about it, OCIC did not want to disappoint him. Perhaps, the fact that two national bodies have to decide on the applications, the odd job of refusal is mutually left to the other side.

3.2 Energy Projects

Power production is dominated by the state-owned electricity and telecommunications monopoly *Instituto Costaricense de Electricidad* (ICE) with its regional subsidiaries. Although Costa Rica has a large potential for renewable energy, the indebtedness of ICE and legal constraints against private generation hinder the power grid to keep pace with the steadily growing demand (LeBlanc 1997, p. 3). Privately-owned renewable energy facilities are limited to 20 MW and in total are not allowed to constitute more than 15% of system capacity. Another maximum 15% can be covered by tender for no more than

20 years. Only companies with at least 35% of national participation are allowed to compete, and the cumulated limit for each provider is 50 MW. After the period has run out, ownership of the plant is transferred to the ICE. This procedure is known as build-operate-transfer (BOT) scheme (InterAm 1995). A recently proposed amendment limits small private renewable energy production to 5 MW for each plant and to 5% of system capacity (LeBlanc 1997, p. 4). If this proposal is turned to law, prospects are bad for small energy projects. However, if the new government to be elected in February 1998 should decide on the long discussed privatization of the ICE, these restrictions could be made obsolete.

Due to the phase-out plan mentioned above, baseline projections are very restrictive for all power projects. In the USIJI report, each project has its own baseline, based on different data. In order to make emission reduction comparable to each other, the *Aeroenergía* baseline was chosen, because its cumulated bias was lowest, when applied to the other projects. The given data are set on a gray background.

Table 6: Reference case fossil energy production

Year	phase-out plan	fossil production [GWh]	carbon emissions [t]
1994	0,0%	829.8	235,048
1995	0,0%	829.8	235,048
1996	0,0%	829.8	235,048
1997	0,0%	829.8	235,048
1998	44,0%	464.7	131,627
1999	86,0%	116.2	32,907
2000	99,0%	8.3	2,350
2001	100,0%	0.0	0
C-emissions / GWh [t]:			*283.2586*

(Source: USIJI 1996, p. 40, own calculation)

Neither of the projects gives out tenders for goods and services. Contracts usually include provider commitments.

3.2.1 Wind Power

The pacific rim of Guanacaste is best suited for wind power generation. All the three projected facilities are located in the surrounding of Tejona de Tilarán. The hilly plateau

has been a cattle-farming area for centuries. Winds are extreme in the dry period between January and August, thus making wind power an ideal match for hydropower.

The *Aeroenergía* (AE) wind park is the smallest with a capacity of 6.4 MW. *Plantas Eólicas* (PE) and *Tierras Morenas* (TM) both are projected for the maximum level of 20 MW. All of them are strongly supported by the Costarican Government. Although OCIC official Adalberto Gorbitz (1997, p. 53) states, all energy projects were fully financed, PE is the only project whose realization has been confirmed.

Up to the present, home markets for wind power stations are mainly Northern Europe and Northern America. Manufacturers are therefore interested in gaining experience under tropical conditions and to find market entry to the southern countries. The main features of the three wind power projects are listed in Table 7.

a) Participants

See Table 7.

Table 7: Features of the wind energy projects

	Aeroenergía	***Plantas Eólicas***	***Tierras Morenas***
Approval	July 1995	November 1994	July 1995
Participants	- Aeroenergía S.A., CR - Energy Works (subsidiary of US based Bechtel Corp. - Power Systems Inc., US - Bluefields international, US - Micon A/S, Denmark	- Plantas Eólicas S.A. (joint venture between Merril International, US and Charter Oak Energy, subsidiary of Northeas Utilities, both US) - Kenetech Windpower, US	- New World Power Corp., US - Molinas de Viento del Arenal S.A., Costa Rica - MINAE (CR Ministry for Environment and Energy
Suppliers	Micon A/S	Kenetech Windpower	Enercon, Germany
Monitoring	Aeroenergía S.A.	Plantas Eólicas S.A.	MINAE
Ann. Production	30.0 GWh/year	98.0 GWh/year	90.0 GWh/year
Starting date[16]	May 1997 (?)	June 1996	-
Lifetime	21 years, 1 month	15 years	13 years, 11 months
Costs	US-$ 8.85 million	US-$ 27 - 30 million[17]	US-$ 31.5 million[18]
Financing	- Central American Economic Integration Bank: 75% - Aeroenergía Partners: 25%	- Charter Oak Energy Tejona Corp.: 65% - Manuel Emilio Montero Anderson: 35%	- Molinos de Viento del Arenal S.A.: 30% - Commonwealth Development Corporation: 24% - International Finance Corporation: 24% - commercial banks: 22%

(Source: USIJI 1996, p. 36-88, UNFCCC 1997)

16 Beginning of operation.

17 Total funding of the plant is kept confidential by the developer (UNFCCC 1997). Gorbitz (1997, p. 55) gives the number of 30.4 million US-$.

b) Climate Effects

Calculations for emission reduction achieved can be seen in Table 8. The Costarican fossil-fuel phase-out plan leads to a double disadvantage of the projects: first by comparing it to the baseline, secondly by discounting the reduction. The reason for this extremely conservative calculation is that the reduction shall not be claimed by several plants. There is no computation of the cumulative effect. Each wind park is assumed to be the only *additional* plant.

c) Costs

In contrast to the other projects, there is little sense in calculating the value per ton of carbon reduced, because — due to the unrealistic phase-out plan for fossil fuels — only the reductions achieved until 2001 could be considered. For the three projects, had they been constructed according to their schedules, carbon prices would vary between US-$ 400 (PE) and US-$ 900 (AE). This is why the projects themselves have to be economically viable in order to be realized (See Table 7, 8).

Table 8: Project cases for wind power

	Aeroenergía			Plantas Eólicas			Tierras Morenas		
year	annual capacity [GWh]	total carbon emissions with AE [t]	weighted difference [t C]	annual capacity [GWh]	total carbon emissions with AE [t]	weighted difference [t C]	annual capacity [GWh]	total carbon emissions with AE [t]	weighted difference [t C]
1994	started								
1995	in								
1996	June '97			98.0	207,289	27,759			
1997	15.8	230,587	4,461	98.0	207,289	27,759	76.0		
1998	27.0	123,979	4,283	98.0	103,868	15,545	76.0	110,099	12,055
1999	27.0	25,259	1,071	98.0	5,147	3,886	76.0	11,379	3,014
2000	27.0		24	98.0			76.0		
2001	27.0			98.0			76.0		
		total AE	9,838		total PE	74,950		total TM	15,069

(Source: USIJI 1996, p. 36-88, own calculations)

d) Externalities

Apart from environmental benefits, renewable energy production serves both development and social objectives. Resistance against the privatization of ICE can be understood in this context. According to the 1984 census, an average of 18.1% of Costarican households were not connected to electricity. In some regions, this rate amounted to over 50%

18 Gorbitz (1997, p. 55) gives the number of 27.0 million US-$.

(Hein et al. 1994, p. 134). Investment in infrastructure is needed as a prerequisite for the creation of employment.

Direct effects on the Tilarán region will be very few. Wind power stations do not require a lot of labor. Investment in property acquisitions for the wind installation will not be important.

e) Observations

Neither of the JI bodies of both countries took much trouble in the baseline calculation, maybe because the carbon reduction is not the incentive in this case. Apart from the different databases used (while always referring to the MINAE), there were several calculation errors, and they were even sometimes understating the emission reduction.

First experiences with PE show that the project developers underestimated the fact that Guanacaste is a strong wind area. Although wind harvest was higher than expected, there are serious technical problems with the Kenetech generators. One of them was blown down, and all towers suffer from strong vibrations.

Another problem related to the Kenetech is that the company went into bankruptcy in April 1997 and is currently winding up its operations. Presently nobody knows neither who will take the place of Kenetech in the management of the project, nor if spare parts and services will be available in the future.

Again in this case there are doubts about financial additionality. On 20th of December of 1995, the Inter-American Development Bank announced a US-$ 18.7 million loan for PE, given partly (US-$ 7.2 million) as a normal loan and the rest provided by a commercial bank, under subscription of participation agreement with the IADB. It also mentions a adjacent "sister plant" which would be operated by the ICE and financed both by an IADB loan and a GEF grant of US-$ 3.3 million (IADB 1995). As IADB spokesman Daniel Drosdoff stated in September 1997, the loan was actually never signed, but the project was financed by Charter Oak. This makes Plantas Eólicas comparable to the CARFIX project, where the project developers renounced to USAID funds. The only difference is, that financing in this case was finally achieved. As the application to the USIJI was placed in November 1994, applicants evidently followed a double-tracked strategy.

The Aeroenergía project is reported to have started operation in May 1997. This fact was not known to Paulo Manso, the OCIC consultant specialized in renewable energies in July 1997.[19]

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19 This statement refers to a private conversation held on July 11th of 1997.

Finally Tierras Morenas does not give the impression of a JI project any more. It is mainly financed by the ICE subsidiary Molinos de Viento del Arenal and two multilateral development corporations.[20] Perhaps project developers decided to stop waiting for JI investors and took advantage of existing alternatives for funding. Once this funding will be assured, TM should be removed from the UNFCCC listing.

3.2.2 Water Energy

3.2.2.1 Doña Julia

The only US hydroelectric project was approved in July 1995. The 16 MW plant *Doña Julia* is to be constructed in Horquetas de Sarapiquí, in the Heredia region. This has reportedly up to 8,000 mm of annual precipitation. The plant will be located on the rivers Puerto Viejo and Quebrandón. There will be a reservoir for peak load.

a) Participants

The project was developed jointly by MINAE and the New World Power Corp. Participants agreed on monitoring on a regular basis and cooperation with the ICE for development of offset information.

b) Climate Effect

The reported baseline estimate was replaced by the one for Aeroenergía again. Doña Julia was originally planned to come on-line in October 1996. But it will not be able to really claim the carbon credits calculated unless an investor has been found. There is no evidence that the time schedule has been fulfilled and the plant is really operational. The second report to the UNFCCC from October 1997 appears to have been elaborated on the basis of the 1996 report.

Table 9: Project case for Doña Julia

year	annual capacity [GWh]	total carbon emissions with AE [t]	weighted difference [t C]
1994			
1995			
1996	22.5	228,675	6,373
1997	90.0	209,555	25,493
1998	90.0	106,134	14,276

[20] According to the UNFCCC report this funding is not yet assured (UNFCCC 1997).

1999	90.0	7,413	3,569
2000	90.0		
2001	90.0		
		total	**49,712**
		USIJI data	**57,400**

(Source: USIJI 1996, p. 60f, own calculations)

c) Costs

Estimated total costs are US-$ 28 million. This amount is not broken down by its factors. "The full capitalized costs of the project have been financed with a combination of debt (70%) and equity (30%)." (UNFCCC 1997) Both reports do no name any creditor and/or investor.

d) Externalities

An Environmental Impact Study was carried out by MINAE in April 1994 (USIJI 1996, p.59). The second report to the UNFCCC says:

> "The negative effects include obstacles to fish migration, disruption of natural ecosystems by changing river regimes, changes in land use via construction of roads and transmission lines, sedimentation upstream of the dam, and river bed erosion downstream. Positive effects include mitigation of floods, creation on new habitats for some animal species, recreation, and the improvement of transport in rural areas by new roads." (UNFCCC 1997)

The project will provide employment during construction and operational phase. Nevertheless it seems difficult to quantify this effect.

e) Observations

USIJI admits, there was no real program additionality in the *Doña Julia* case, because it was conceived several years before. An exception was made in order to get a languishing project off the ground. "In these cases, it should be shown that USIJI was instrumental in overcoming barriers that would, otherwise, have prevented the implementation of the project." (USIJI 1996, p. 13) In cases like this, real incentives would be needed. The mere approval as a JI project is not enough, if investors do not even see a perspective to get carbon credits for it. Costarican energy politics is definitely counterproductive for its goal to become independent from fossil fuels.

3.2.2.2 Virilla River Basin Project

Virilla project is special in many ways. As stated above, Virilla is the only JI cooperation with countries other than the US. It has to be considered a combined energy *and* forestry project. It is financed by the Norwegian Foreign Ministry. Crediting is given in CTO bonds only for the forestry part. The project is located 20 km northwest of San José, near the airport. There is an older 1 MW power plant which will be replaced by the new 28 MW generators. The waters are heavily contaminated by industry of the nearby free-trade zone, so that a Norwegian technical manager preferred to call the project a "sewer power plant" (Anonymous 1997a). A primary forest area of 2,000 ha is being put under protection. A secondary forest of 1,000 ha will be managed and protected, with an annual incorporation of 100 ha, so that the total area will be reached by the year 2006. Another 1,000 ha will be reforested, starting with the year 1999, in annual steps of 100 hectares. The protection zone covers the upper Virilla river basin, limiting to a forest reserve and a national park. Implementation will take 10 years, but quantification and monitoring will go for 25 years.[21] The forestry part of the project is financially administered by the National Forestry Fund FONAFIFO.

a) Participants

The Costarican side is represented by the *Compañía Nacional de Fuerza y Luz* (CNFL), the ICE's power production branch. The lion's share of US-$ 1.7 million comes from the Norwegian Foreign Ministry. These funds are provided by the Norwegian Climate Fund and will not be reported as part of the official development aid (Jepma 1997, p. 18). The *Consorcio Noruego* (CN) is a consortium put together for the occasion by ABB Kraft and Kværner Energy, Statkraft Engeneering, Atlas Copco, Ølsen Stålindustri and Norman Olsen Maskin. CN spends US-$ 300,000 on CTOs and is compensated by a purchase commitment of 65% of all goods and services needed for the power plant to be provided by Norwegian companies (Anonymous 1997a). Financing for these will be facilitated by Norwegian official export credits.

b) Climate Effects

Carbon credits are only given for the conservation and reforestation part of Virilla project. As the zone is very close to the capital, an average estimated deforestation rate of 7.5% may be realistic. It results from Landsat image evaluation of the years 1986

[21] However the CTOs transferred are guaranteed for no more than 20 years, as usual.

Table 10: Virilla — Carbon stored in forest and fixed by plantations

	Primary Forest		Secondary Forest		Plantations		"Cumulative Effect"
	Deforestation Rate **7.5%** Carbon Content per ha [t] **67 t C / ha**		Annual Growth of Carbon Stock [t/ha] **2 t C / ha**		Annual Growth of Carbon Stock [t/ha] **4 t C / ha**		
year	Deforestation [ha]	Carbon Emissions Avoided [t]	Accumulate Hectares	Carbon Sequestration [t]	Accumulate Hectares	Carbon Sequestration [t]	Total Carbon with Project [t]
1996	2,000	-	-	-	-	-	-
1997	1,850	10,050	100	200	100	-	10,250
1998	1,711	9,296	200	400	200	-	9,696
1999	1,583	8,599	300	600	300	405	9,604
2000	1,464	7,954	400	800	400	810	9,564
2001	1,354	7,358	500	1,000	500	1,215	9,573
2002	1,253	6,806	600	1,200	600	1,620	9,626
2003	1,159	6,295	700	1,400	700	2,025	9,720
2004	1,072	5,823	800	1,600	800	2,430	9,853
2005	992	5,386	900	1,800	900	2,835	10,021
2006	917	4,982	1,000	2,000	1,000	3,240	10,222
2007	848	4,609	1,000	2,000	1,000	3,645	10,254
2008	785	4,263	1,000	2,000	1,000	4,050	10,313
2009	726	3,943	1,000	2,000	1,000	4,050	9,993
2010	671	3,648	1,000	2,000	1,000	4,050	9,698
2011	621	3,374	1,000	2,000	1,000	4,050	9,424
2012	575	3,121	1,000	2,000	1,000	4,050	9,171
2013	531	2,887	1,000	2,000	1,000	4,050	8,937
2014	492	2,670	1,000	2,000	1,000	4,050	8,720
2015	455	2,470	1,000	2,000	1,000	4,050	8,520
2016	421	2,285	1,000	2,000	1,000	4,050	8,335
2017	389	2,113	1,000	2,000	1,000	4,050	8,163
2018	360	1,955	1,000	2,000	1,000	4,050	8,005
2019	333	1,808	1,000	2,000	1,000	4,050	7,858
2020	308	1,673	1,000	2,000	1,000	4,050	7,723
2021	285	1,547	1,000	2,000	1,000	4,050	7,597
Total		***114,917***		***41,000***		***74,925***	***230,842***

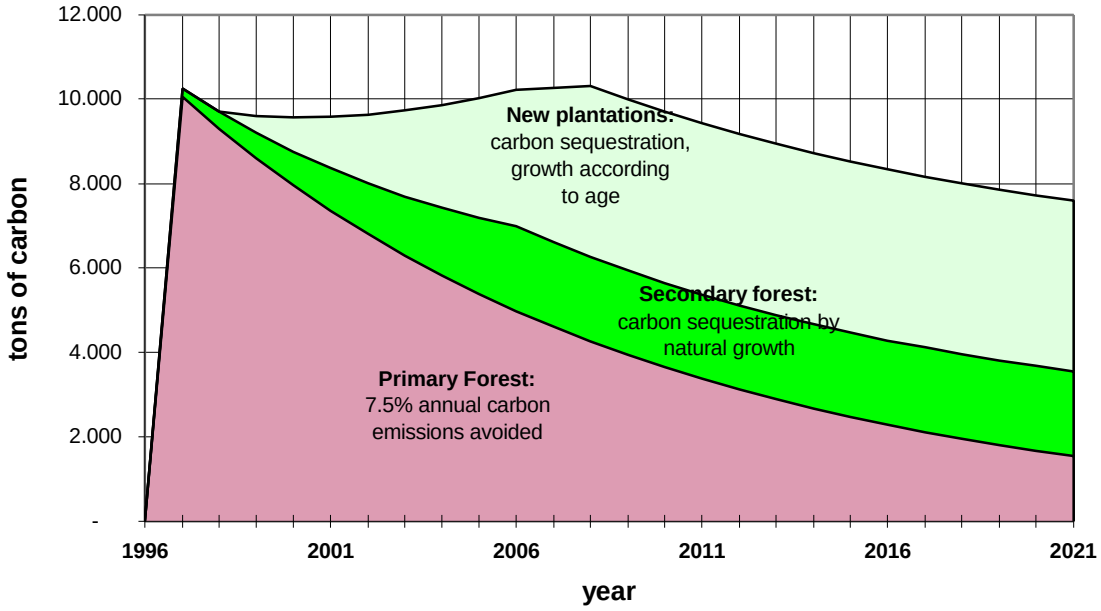
(Source: Jepma 1997, p. 17, UNFCCC 1997, own modifications)

through 1992, confirming theoretical findings of FUNDECOR. Carbon contents per hectare in this case are estimated at only 67 t/ha. Under the condition that the observed annual deforestation of 7.5% went on, over 25 years ($1 — (1 — 0.075)^{25}$ =) 85.7% of the forested area would be lost. Carbon effects seem to have been calculated very carefully, with projected total amounts reaching 230,842 t of carbon in 25 years.

c) Costs

The CNFL will invest US-$ 1.39 million. This is the amount the utility would have spent without the project. CTOs are generated for the investment of the Foreign Ministry and of Consorcio Noruego. Relating carbon benefits from the forestry part of the project to total external financing results in US-$ 8.66 per ton, not taking into account operational returns during the project phase.

Figure 2: Virilla basin project mitigation effects



d) Externalities

Forest and watershed conservation contribute to the improvement of the deteriorated environment of the San José region as well as to the improvement of water quality and the hydrological regime of the area. Both will lead to an increase in energy production, estimated between 7 and 9% (UNFCCC 1997). An estimated 900 landowners will benefit from forestry plan subsidies financed by the Norwegian CTOs. The power plant itself would not have depended directly on forest protection. Given the Norwegian know-how in hydroelectric technology, the Virilla plant may now be more lasting and potent than it would have been without the cooperation. There is an external profit from the watershed protection for the hydroelectric plant resulting from the extended availability of water in the dry season.

e) Observations

Beginning of the works was planned for November of 1996, but they were delayed due to problems with financing and contracts until March of 1997. Another serious problem was red tape: as no heavy machinery could be obtained in Costa Rica, it had to be brought into the country. Custom declaration was highly complicated and costly. Coor-

dination manager Rolf Thorsen heavily complains about Costarican bureaucracy (Anonymous 1997a). Technical problems were posed by the notorious lack of infrastructure and the fact that the 69 m high dam was to be built in an earthquake area.

4 Conclusions

Costa Rica offers far better institutional and political conditions than the majority of the developing countries. This makes the small Central American country an appropriate testing ground for the viability of the instrument of JI. It shows that the standards should not be inferior. The key factor of the Costarican JI policy is that the process is host-country driven (Gorbitz 1997, p. 56). JI requires reliability and longevity from institutions involved, making it a mechanism not applicable to least developed countries, in which open poverty and political risks are prevailing.

Still there are shortcomings of the mechanism itself which ought to be mentioned. They can be found in baseline scenarios, suitable project forms, criteria and procedure of approval.

4.1 Conflicting Baselines

The descriptions of the 15 approved projects (USIJI, 1996, 26ff) include detailed baselines. Despite the criteria, indirect effects have not been covered to any extent. Changes in the legal framework are only covered in some projects, whereas others do not take them into account.

It is particularly interesting that the forestry projects try to both define baselines for afforestation and preservation of existing stocks. With two exceptions (USIJI, 1996, 65, 121) they do not account for sequestration/emission of the soil. In Costarican projects, the extrapolated deforestation rate is taken as baseline (USIJI, 1996, 65). In case there are uncertainties about existing stocks on deforested lands which can easily reach an order of magnitude, one project chooses the upper bound as baseline (USIJI, 1996, 47) while another sets the stock after deforestation to be zero (USIJI, 1996, 54). In the Biodiversifix project, the lifetime is restricted to 50 years though the equilibrium will only be reached in a century, therefore reducing accountable carbon storage by 30% (USIJI, 1996, 48).

Renewable project baselines do not include life-cycle emissions of the plant material. A very interesting aspect of the renewable energy projects in Costa Rica is that because of

the commitment of the Costarican government to phase out fossil fuel electricity production by 2001 the baseline is zero emissions after 2001. USIJI doubts whether this commitment can be fulfilled (USIJI, 1996, 39), but nevertheless requires the baselines to take it into account. This means that renewable energy projects will not become creditable under an full-fledged JI regime after 2000. Therefore, all the renewable energy projects now approved are likely to be "no-regret“ projects as AIJ benefits accrue only for less than half the economic lifetime of the projects.

The pilot phase should be seen as a chance to gain experience with GHG calculations. There are many different approaches as far as reference and project cases are concerned. While project cases can be monitored during the realization, the baseline problem remains crucial. Usually baselines are static and remain valid for the whole project lifetime. Only in the CARFIX case the possibility is considered to keep the baseline dynamic by monitoring the surrounding deforestation. This proposition is a new approach to the baseline discussion which should be observed in the future.

Sometimes the JI institutions involved seem to have neglected the importance of the climate effect calculations and therefore did not even take the trouble to check them. They should consider that after the actual pilot phase these carbon credits might entitle the bearer to GHG emissions in his/her home country. There is also a need to issue credits only when they actually accrue — not in advance. The CARFIX investor receives the credits right away, long before the carbon benefits are achieved. Up to now, it is not pointed out very clearly whether CTOs have been sold in advance in order to finance the projects. In this case the 20 years of state guarantee would not cover the existence of the preserved forests beyond this point. On the contrary, this guarantee would make sense if CTOs were given out according to the annual carbon offsets, so that the last CTO emitted would stand for the preservation of the whole carbon stock for at least 20 years more.

4.2 Project Forms

In Costa Rica there are but energy substitution and carbon sequestration projects, although, as mentioned before, a lot of alternatives could be thought of. In terms of GHG reductions, forestry projects have been preferred. There are several reasons for this observation:

1. Forestry projects offer vast carbon mitigation benefits, when comparing reduction, sequestration and non-emission on an equal basis. In the future, when crediting will

be possible, distinctions should be made in order to encourage technological reduction which cannot be reversed.

2. A political declaration — the phase-out plan for fossil energy — was taken as the baseline for the energy projects, thus punishing the good intention by obstructing investment.
3. Most projects were proposed by or in close cooperation with the Ministry of Environment and Energy MINAE which is very much concerned with conserving the remaining forests and uses JI as one instrument of international financing among others.

4.3 Criteria

There are a lot of emission reduction opportunities which are profitable either for a company or for a country as a whole. The latter includes externalities such as the reduction of other pollutants. Now the question arises whether these so called micro- or macroeconomic "no-regret“-projects are included in the baseline. So far, the question of "no-regret“-opportunities has led to heated debates in the economist community. While some say that there can be no "no-regret“-projects as such opportunities would have been grasped immediately (e.g. Sutherland, 1996), others estimate that 10-30% of today's emissions could be reduced via "no-regret“ projects (IPCC, 1996).

These differences come from the fact that despite of the theoretical profitability of many options there are regulatory and juridical obstacles, lack of information and skilled personnel as well as organizational rigidities. It is often reported that managers do not invest in raising energy efficiency even if its internal rate of return is much higher than the prevailing market interest rate. The main reasons are probably short planning periods, requirement for a minimal rate of return much higher than market interest and lack of capital. It is not surprising that private households have even higher thresholds for internal rates of return. This applies particularly to countries in transition (Nordic Council of Ministers, 1996, 28) and developing countries. Often an investor cannot appropriate a gain as it is an externality accruing to others. Therefore, it seems that pure microeconomic "no-regret“-opportunities are rather scarce whereas macroeconomic "no-regret“ abounds.

So far, emission reduction projects have not been funded by countries even if they are a clear macroeconomic "no-regret“. In Costa Rica this applies to the wind power projects which would have started without JI as well as the wind resource is very good with average annual velocities of 10 m/s. The "no-regret“-issue has been markedly neglected in the

JI debate. It is mainly referred to in very general terms. While some authors say that all "no-regret“-projects have to be included in the baseline and therefore excluded as JI (van der Burg, 1994, 82f) others would accept all of them as JI (Bedi, 1994).

A possible criterion could be whether a project is a microeconomic "no-regret“-project. If those projects would be excluded from JI, an investor would have an incentive to artificially raise costs to demonstrate that his project has positive net costs (Torvanger et al., 1994, 21). Therefore, even that distinction cannot be applied.

In practice program and financial additionalities can hardly be separated from one another. The objectives of MINAE have been realized in different project forms, none of which was induced by the JI cooperation. Some, perhaps most of the projects, had been developed before and were proposed under the JI regime. Would it be different, chances for realization and subsistence were considerably lower. The same applies to financing: from the host country's perspective JI is but another opportunity to raise funds for projects that bear positive externalities. If the rules for the JI pilot phase had been observed strictly, many Costarican projects would have been disapproved because the proponents showed too much engagement and consequently might as well have found other ways of financing. In two cases financing was withdrawn in order to clear the way for approval as JI projects. The rational alternative would have been to pool the money and to enlarge the projects. This is how CTOs were created. They guarantee each investor a certain amount of carbon offsets, without interfering in the rights of any other investor. These "carbon bonds" need to be confirmed by an international clearinghouse if a carbon trading system will be established in the future.

A critical point is the lack of information. In our opinion a project should not be approved if the developers hold back relevant data. This refers to source and amount of funding (like in the case of Plantas Eólicas), baseline and project case calculations (CARFIX), ecological and local economic side-effects or post-project prospects (KLINKIFIX).

4.4 Procedure of Approval

It is hard to understand, why two national JI bodies need to approve each project applying the same set of criteria. It could be demonstrated that the double approval has nothing to do with an efficient control. As both bodies are interested in carrying out the program, even a kind of complicity may arise. Supposing the guest country is interested in climate effects, while the host country is interested in positive externalities, each of them should confirm the relevant components.

Nearly all reports to the UNFCCC try to give the impression that the project is currently in progress, even if funding is not assured. It would be no disgrace for project developers to admit that without a decision on incentives for climate investment on the Kyoto conference to take place in December 1997 most of the projects will not be carried out.

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