Title

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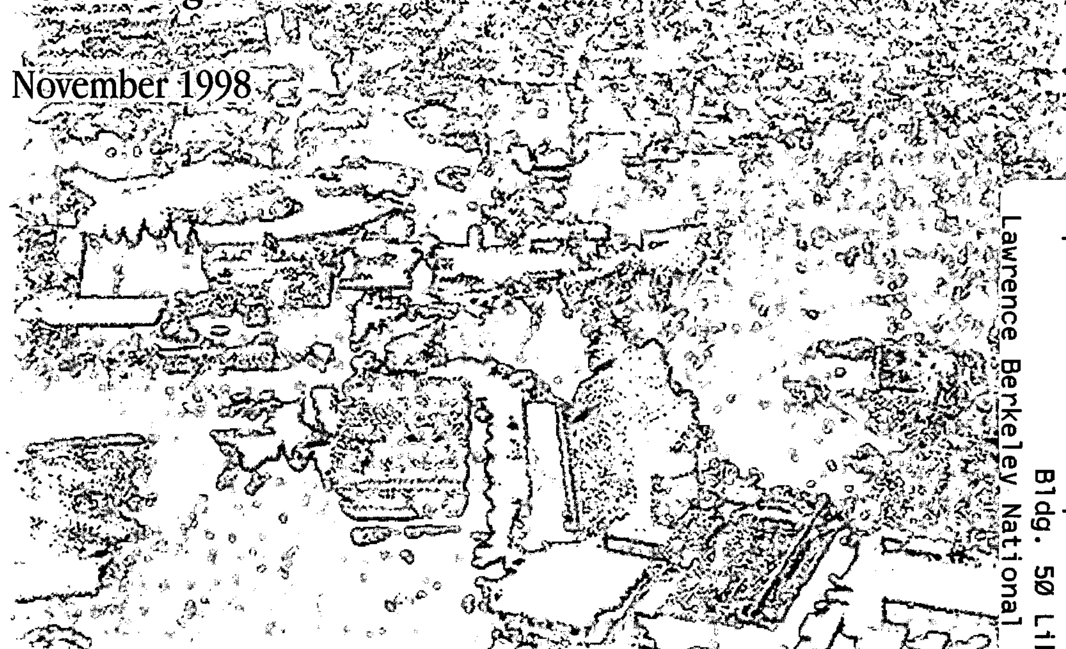

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ABSTRACT

The concept of joint implementation as a way to implement climate change mitigation projects in another country has been controversial ever since its inception. Developing countries have raised numerous issues at the project-specific technical level, and broader concerns having to do with equity and burden sharing. This paper summarizes the findings of studies for Brazil, India, Mexico and South Africa, four countries that have large greenhouse gas emissions and are heavily engaged in the debate on climate change projects under the Kyoto Protocol. The studies examine potential or current projects/programs to determine whether eight technical concerns about joint implementation can be adequately addressed. They conclude that about half the concerns were minor or well managed by project developers, but concerns about additionality of funds, host country institutions and guarantees of performance (including the issues of baselines and possible leakage) need much more effort to be adequately addressed. All the papers agree on the need to develop institutional arrangements for approving and monitoring such projects in each of the countries represented. The case studies illustrate that these projects have the potential to bring new technology, investment, employment, and ancillary socioeconomic and environmental benefits to developing countries. These benefits are consistent with the goal of sustainable development in the four study countries. At a policy level, the studies' authors note that in their view, the Annex I countries should consider limits on the use of jointly implemented projects as a way to get credits against their own emissions at home, and stress the importance of industrialized countries developing new technologies that will benefit all countries. The authors also observe that if all countries accepted caps on their emissions (with a longer time period allowed for developing countries to do so) project-based GHG mitigation would be significantly facilitated by the improved private investment climate.

KEY WORDS: activities implemented jointly (AIJ), joint implementation (JI), Kyoto Protocol, country case studies, evaluation.

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1. INTRODUCTION

In response to the increasing concern about global climate change, projects for reducing greenhouse gas emissions (GHGs) by sources and for their removal by sinks are being implemented worldwide. These projects may be undertaken within a country seeking to reduce its own emissions, or in another country, in which case the resulting GHG emissions reductions can be shared by the participating countries. The concept of sharing emissions reductions originated in carbon offset projects, in which emissions in a developed (investor) country were offset through projects implemented in another (recipient or host) country where the reduction could be achieved at lower cost than in the investor country. These offset projects led to the inclusion of the concept of emissions reduction sharing, called joint implementation (JI), in Article 4.2 of the United Nations Framework Convention on Climate Change (FCCC) in 1992. In principle, JI entails full or partial financial support from an investor country, which receives credits for some of the GHG emissions reduced by projects it undertakes in a recipient country. The credits may eventually be used toward the investor country's emissions-reduction commitment under the FCCC and the subsequent Kyoto Protocol of December 1997.

Ever since its inclusion in the FCCC, JI has been controversial (Zollinger and Dower, 1996). Concerns are particularly strong regarding investments by Annex I (industrialized) countries in projects in non-Annex I (developing) countries (CNE 1994, Andrasko et al. 1996). Opponents have suggested that Annex I countries reduce their own emissions prior to resorting to JI projects, and raised technical concerns such as the transfer of obsolete technology and social concerns about the negative impacts on the local population.

In order to examine the validity of these concerns, authors from four developing countries – Brazil, India, Mexico and South Africa -- examined their applicability to JI or potential JI projects/programs on a case-by-case basis. Four papers (Imaz et al. 1998, LaRovere 1998, Ravindranath et al. 1998, and van Horen et al. 1998) were written using the same format and addressing the same basic set of issues for each case study (see Table 1 for the issues examined by each author). The 12 case studies included energy efficiency, renewables, bioenergy, and forestry projects. The primary conclusion is that most technical concerns about JI/AIJ were adequately addressed in the case studies, with a few exceptions : baselines and additionality, guarantees of performance, risk of leakage, permanence of forestry projects, and host country institutions to evaluate and monitor projects. In the next few sections, we provide background information on the current status and concerns about JI/AIJ, and then summarize the findings from the case studies.

Table 1: Developing Country Technical Issues and Findings for Climate Change Projects

Technical Issue	Description of concerns	Description of findings
1: Obsolete technology	Investor countries may transfer obsolete technologies to recipient countries (technology dumping) locking host countries into more GHG-intensive paths than desirable.	More important for energy and bioenergy projects. In each case, new technology/ know-how is being or will be transferred. UNFCCC, South Africa, and Mexico guidelines discourage transfer of obsolete technology.
2. High cost of technology	Experimental technologies may have higher than normal capital costs and saddle developing countries with high payments. National governments, eager to accept new technology, may accept these.	In all cases, new technology offered has been proven elsewhere, and the extraordinary first costs, e.g., ILUMEX and South Africa housing, are covered by the foreign investors in anticipation of favorable long-term returns.
3: Negative local impacts, local input neglected	Local considerations, including environmental regulations and social impacts, will not be respected in the design of climate change projects, resulting in negative impacts.	Difficult to implement rural projects w/o local agreement. India, Mexico projects will create jobs in rural areas, improve watershed management, reduce soil erosion.
4: Additionality of funds and avoidance of GHG emissions	Funds provided for climate change projects will simply be diverted from existing foreign development assistance. Baseline for determining net GHG emissions avoided may be difficult to establish.	Difficult to prove; case studies indicate ways in which additionality of funds can be subverted. Difficult to determine for forest protection projects. Easier but still uncertain for other forestry, and energy, projects.
5: Infrastructure for project formulation, evaluation and monitoring, and government acceptance.	No national evaluation/ acceptance process or infrastructure exists to support JI project assessment. Lack of monitoring may result in poor record of GHG reduction or carbon sequestration.	India, South Africa and Mexico have initial guidelines and an early-stage assessment process. No national evaluation or acceptance process exists in Brazil. Much more effort is needed to address this issue.
6: Guarantees of performance (Leakage and permanence)	Risks associated with project performance may fall on host countries who may be saddled with non-performing assets whose carbon benefits have been given away.	Difficulties related to the establishment of baselines and risk of leakage. Post-project sustainability (permanence) may be enhanced if local groups receive direct monetary/ other benefits, as illustrated by India and Mexico case studies.
7: Sharing carbon credits	Developing countries feel pressured to share a large proportion of carbon credits with investors.	Mexico and India would prefer guidance on ways to share carbon credits. South Africa illustrates economic implications of alternative carbon sharing arrangement.
8: Macroeconomic impacts	Macroeconomic impacts of project(s) may be large if hard currency issues dominate for a large project or a project leads to many similar projects .	Macroeconomic impacts in India and Brazil would be positive. Growth of fuel and timber imports would be reduced. Large production could decrease prices leading to cyclical fluctuations.

2. BACKGROUND

A pilot phase for trying out JI-type projects, known as activities implemented jointly (AIJ), was agreed to at the first meeting of the participants in the FCCC, in Berlin in 1995. During the debate leading to the decision about establishing AIJ, developing countries argued that industrialized investor countries should reduce greenhouse gas emissions at home first, and, if industrialized countries are allowed to undertake JI projects as offsets, JI emissions credits should only count toward a small fraction of their total emissions reduction commitments (Andrasko et al. 1996). JI projects have also been viewed by some observers as a thinly veiled attempt by industrialized countries to maintain continued high standards of living at the expense of developing economies. Developing countries are also concerned that JI investors would take advantage of all the cheapest options to reduce emissions abroad, leaving recipient countries with only the most expensive options to pursue on their own in the future when developing country GHG emissions are likely to be capped (e.g., Ojwang and Karani, 1995; CNE, 1994; Andrasko et al., 1996).

AIJ projects are designed to allow investors and recipient countries to gain experience with project implementation, to help clarify conceptual and methodological issues associated with projects, to identify institutions to participate in future JI projects, and to learn about ways to reduce project transaction costs. No GHG emissions reductions credits are awarded from AIJ projects for transfer from one country to another to be used toward meeting FCCC commitments; however, some AIJ projects have negotiated specific agreements for eventual credit sharing. The AIJ pilot phase is to be reviewed by the year 2000, as agreed at the first meeting in 1995 (Dutschke and Michaelowa, 1998).

Thus far, 113 AIJ pilot projects have been planned or are under way; about 95 of these have been accepted and reported to the FCCC AIJ Secretariat by the participating governments (JIQ, 1998; UNFCCC AIJ, 1997). Of these, two are in Africa, ten are in Asia, five are in South America, and 23 are in Central America (with about half in Costa Rica). The rest are in Eastern Europe and the Russian Federation. The small number of projects in Africa, Asia, and South America, regions that will contribute the bulk of future increases in greenhouse gas emissions, is indicative of the concern that governments on these developing continents have about JI/AIJ, and lack of investor interest in these regions.

The limited availability of funding for AIJ projects in the absence of crediting is another important reason for the small number of projects so far (Michaelowa 1998). Most Annex I countries, particularly the U.S., seek a strong role for the private sector in JI projects (Zollinger and Dower, 1996). Among the objectives of the U.S. Initiative on Joint Implementation (USIJI, the US government's JI program, begun in 1994 and now comprising 32 accepted projects in 14 countries) is to encourage private-sector investment in non-Annex I countries and to disseminate technologies to reduce GHG emissions or sequester carbon (USIJI, 1998). Currently, the private sector's primary incentives for undertaking AIJ projects are the opportunities to: (1) learn about implementing climate change projects in host countries, (2) minimize transaction costs, and (3) position individual companies for access to new markets as economies grow and environmental considerations become more widely addressed (Michaelowa and Greiner, 1996). A small number of projects would suffice to fulfill these goals. The private sector is likely to have much more incentive to participate in emissions reduction investments in the post-Kyoto FCCC environment, depending upon whether the Kyoto protocol is ratified and implemented and the extent to which it encourages the evolution of a "mature" JI regime (Michaelowa and Dutschke, 1998). Such a regime includes national emissions caps (by the years 2008-2012), trading emissions for credit among Annex I countries, and transfer of emissions credits that could begin in the year 2000.

3. COUNTRY CASE STUDIES

The papers in this collection offer perspectives from four developing countries -- Brazil, India, Mexico, and South Africa -- on the technical issues as well as other concerns associated with JI/AIJ projects. These papers present case studies of implemented or proposed climate change mitigation projects and/or programs in each country, which form the basis for the authors' analyses of JI/AIJ concerns for their countries.

The four countries – Brazil, India, Mexico and South Africa -- are important with regards to JI/AIJ, and projects, because of: 1) their active role in the debate on JI/AIJ since the 1992 FCCC conference in Rio de Janeiro; 2) their large contributions to carbon emissions; India (232 Mt C), South Africa (96 Mt C), Mexico (86 Mt C), Brazil (71 Mt C) rank sixth, thirteenth, fourteenth, and eighteenth among all countries in the world in emissions from the consumption and flaring of fossil fuels (US DOE /EIA, 1998), and Brazil is the one of the world's largest emitter of carbon dioxide from forests; and 3) their significant potential to engage in GHG mitigation activities.

Each author examined the same set of issues and technical concerns with respect to selected case studies. Table 1 (Ojwang and Karani, 1995; Andrasko et al., 1996) describes the technical concerns addressed in the papers, and summarizes the authors' findings and Table 2 lists the 12 climate-change projects/programs that were selected by authors as case studies. The technical concerns that each author was asked to evaluate are listed in Table 1, Column 1. There are some issues of particular concern to investors, such as the determination of baselines. Leakage and permanence are the other two issues, which can reduce or negate the carbon sequestered by forestry projects. The India and Mexico forestry studies, however, report on the link between local socioeconomic benefits, which can serve as a way to ensure the permanence of the carbon benefit.

Table 2. Case Studies: Climate-Change Projects and Benefits

Case Study	GHG Benefits	Economic Benefits	Social & Institutional Benefits	Environmental Benefits
Brazil: Forest Conservation to slow Amazon deforestation	Not estimated	Positive income from carbon offsets; possible rural job loss.	Complex interplay among social costs & benefits.	Reduced deforestation & soil erosion; biodiversity protection.
Brazil: Charcoal production from renewable sources of wood	90 Mt C/yr in 2025 for FLORAM project	Minimal: incremental cost over imported coke; local jobs generated.	Aids transition to sustainable steel industry.	Reduced natural forest harvest & soil erosion; reclamation of land.
Brazil: Ethanol production for vehicles	188-209 Mt C per year by 2010	Negative: net cost over imported oil base case.	Rural job retention until mechanization.	Significant air quality improvements.
Brazil: End-use Energy efficiency increases	2.6 Mt C by 2010 in abatement scenario 1	Increased employment.	Not addressed	Reduced air pollution.
India: Teak plantations for carbon sequestration	145,000 t C cumulative by 2040	Jobs and income generated; reduced wood imports; reduced need for foreign exchange.	Capacity building.	Land reclamation via soil & water conservation; reduced pressure on natural forests.
India: Agroforestry, raising tamarind trees	119,000 t C cumulative by 2040	Income generated.	Capacity building: technical assistance introduced	Land reclamation via soil & water conservation; reduced pressure on natural forests.
India: Bioenergy for rural electricity	62,000 Mt C by 2040	Local employment & income generated.	Capacity building.	Reduced air pollution; land reclamation.
Mexico: High-efficiency household lighting (ILUMEX CFL pilot project)	198,308 t C by 2005	Urban jobs created in CFL manufacturing; local jobs and income generated.	Higher lighting level at reduced cost for consumers; avoided investment in 100 MW power generation.	Reduced NO_x (206 t/yr), SO_2 (959 t/y), particulate matter (470 t/y) & hydrocarbons (66 t/y).
Mexico: Carbon sequestration/ sustainable forest management: Chiapas agroforestry project	330,000 t C by 2030	Increased income for farmers; development of forest-based enterprises.	Capacity building: farmers' credit union strengthened; improved women's welfare.	Reduced deforestation from migration; biodiversity conservation.
Mexico: Carbon sequestration/ halophyte plantation: Salicornia	660 TC in Phase I; Phase II (Not yet in place)	Fiberboard industry created in Phase II; food products for export. livestock feed.	Not addressed	Increased soil carbon.
South Africa: High-efficiency lighting (CFLs)	Range is 0-244,000 MTC, depending on type of power backed out	Net economic value is $119-135 million NPV over 5 years. Reduced operating costs of CFLs.	Build CFL industry in country eventually.	Reduces emissions from coal power plants.
South Africa: EcoHousing Efficiency	40-50 thousand tC saved from 6000 homes over 50-year project period	$2.6 million project incremental cost	Local firms and community training will create jobs. Increased occupant comfort.	Reduced fatalities from house fires; and indoor air pollutants and respiratory infections

3.1 Description of Projects and Their Benefits

Each of the case studies listed in Table 2 is expected to result in economic, environmental and social benefits in addition to the reduction of greenhouse gases. In all cases, these projects would be worth pursuing for one or more of these benefits, although these benefits may still not guarantee that the project would have happened without JI/AIJ. The external investment will bring local benefits in terms of creating rural or urban jobs depending on the project location, reduced deforestation and/or emissions to air, and in the case of national programs, a significant reduction in oil imports. We describe the projects and their benefits by country below.

Brazil

Brazil has no AIJ projects, nor is there an assessment or government acceptance process in place. However, several ongoing programs in Brazil, including the ethanol fuel program, could benefit from JI/AIJ support. La Rovere (1998) examines four types of projects that might be suitable for AIJ/JI in Brazil: forest conservation, ethanol fuel production, charcoal production from plantations, and energy conservation (Table 2). The burning of trees to clear land for agriculture in the Amazon region is a major cause of Brazil's carbon emissions; on average, about 1.4 million hectares were cleared per year between 1992 and 1994. La Rovere (1998) analyzes possibilities for containing deforestation through forest protection, supported by JI/AIJ investment. Brazil's government-subsidized program to produce ethanol vehicle fuel from sugar cane, which has withered in the face of low gasoline prices, prevents carbon emissions from gasoline burning; this program could be revived with AIJ/JI support. Charcoal used for producing steel in Brazil is derived mainly from natural forests. La Rovere (1998) discusses the potential for JI/AIJ-supported plantation forestry, which would create a renewable source of wood for charcoal. In addition, he examines options designed to increase end-use energy efficiency, such as high-efficiency lighting, which have been shown to be technically cost effective in Brazil.

India

Several candidate AIJ projects have been developed in India and submitted to the USIJI or Canadian AIJ programs; these include a dairy-cow methane emissions reduction project in Gujarat, a community agroforestry project in Karnataka, an electric transmission line efficiency improvement project, several bioenergy projects, and a municipal solid waste project. Ravindranath, et al. (1998a) examine the JI/AIJ issues identified above for three bioenergy or afforestation projects: generating bioelectricity for rural power supply, agroforestry for raising fruit (tamarind) trees, and establishing teak plantations (Table 2). A formal proposal is being prepared for submission to the Global Environment Facility (GEF) for the bioenergy project. The bioenergy project is expected to offset coal-based electricity production and its associated carbon emissions. The Tamarind Orchards project (Table 2) (Ravindranath et al., 1998b) would grow tamarind trees, which are highly valued for fruit (and thus unlikely to be abandoned once the JI/AIJ project is over). It was favorably reviewed on its technical merits by USIJI and the task force of the Indian Ministry of Environment and Forests, and is currently in the process of being reviewed for acceptance by both governments. The Teak Plantation project is intended to grow high-value teak, of which there is a shortage. The rural benefits of each project are tangible and likely to make a significant contribution to the welfare of local communities (Table 2). The three AIJ case studies for India are already on the list of development activities defined by the Indian Planning Commission. Thus, they have already been determined to be consistent with national development goals.

Mexico

Of the four countries represented in this volume, Mexico has most actively explored AIJ. We report on three of these projects below (Table 2). One project, Ilumex, is funded by the GEF, and by Norway as an AIJ project. Ilumex substitutes efficient compact fluorescent bulbs (CFLs) for incandescent light bulbs (DeBuen and Masera, 1994, Sathaye et al., 1992, Vargas, 1996). The project was originally initiated by Mexico's national electric utility company (CFE) and received funding through the World Bank. The project also received funding from the Norwegian government. Ilumex will reduce local air pollutant emissions, create urban manufacturing jobs and will save electricity costs to consumers (Table 2). Four official AIJ projects have been formally accepted by the government of Mexico and the USIJI program and reported to the FCCC AIJ program: (1) A salt-tolerant plant (halophyte)/soil carbon enrichment project in Sonora (Dunn, 1997) and (2) an agroforestry project in Chiapas (Tipper, Taylor and de Jong, 1996), (3) Oaxaca Community Forestry Project and (4) Baja Renewable Energy Mini-Grid Project. The halophyte plantation products could be used for making particle board, cooking oil, and possibly an oil additive for diesel fuel. However, only the soil carbon benefits of the current small-scale pilot version of this project are being claimed by the developer, which is small (Table 2). The Chiapas agroforestry project will increase local farmer's income and reduce deforestation.

South Africa

Several transport and housing efficiency projects from South Africa, including the EcoHousing Efficiency Project listed in Table 2, have been submitted for USIJI consideration. The housing efficiency project was approved by USIJI in June 1998. Van Horen, Simmonds, and Parker (1998) examine two case studies of potential JI projects: (1) a CFL lighting project in the service area of the major utility company, ESKOM, and (2) a passive solar energy-efficient housing project in a low-income township. In the first case, the utility plans to replace 1.25 million incandescent bulbs with CFLs during a five-year period. Because ESKOM's primary fuel source for generating electricity is coal, such a reduction in electricity demand could decrease carbon emissions by up to 244,000 million tonnes of carbon. The CFL lighting project has been accepted as a GEF project. The second case study, the low-income thermal efficient housing project, was approved by the USIJI program in June 1998. The project developer plans to deliver 6,000 energy efficient homes at a cost of US $425 per house above the government subsidy for new housing construction. The project is expected to save between 40 and 50 thousand tonnes of carbon dioxide over its 50-year life. The large majority of the homes currently being built under the government subsidy program have no thermal insulation and lack efficient features such as light bulbs and cook stoves, doing nothing to address the already grave problems with indoor air pollution and fatal cooking fires.

3.2 Discussion of Technical and Other Concerns

Investigators contributing papers to the current collection have examined 12 ongoing and potential JI/AIJ projects to determine whether the concerns identified in Table 1 below are valid. The answer is that a majority of concerns were addressed by the project developers or were not critically important, with the exceptions of additionality of funds, guarantees of performance and host country institutions. The key findings from the case studies in each paper are summarized in relation to the technical issues and other concerns identified below. Some issues were more important to some countries than to others, so not every country is included in the summary of concerns for each issue.

3.2.1 Technical Concerns

Transfer of obsolete and/or high-cost technology

The transfer of obsolete technology was not considered a major issue for any of the projects analyzed by the authors. In most cases it was not applicable because the technology was indigenous, and in others it was thought to be of minor importance since practices, and not hardware, were being transferred. This could become a concern if projects are done on a large scale with inadequate attention to this issue.

In one (Salicornia, Mexico) of the 12 case studies, high cost of technology was observed to be an important barrier. In other cases, either this was not an issue, e.g., Tamarind Orchards, India, or project implementers had found ways to overcome it, e.g., the Ilumex project in Mexico.

On the issue of transfer of obsolete technology, the Indian authors point out that the FCCC AIJ guidelines clearly suggest a global process for acquiring technology, which, if properly implemented, would make transfer of obsolete technology difficult. Dumping of old or inappropriate technology, for example poorly manufactured CFLs, on a recipient country could set an AIJ program back many years. Consumer acceptance of the technology could be negatively affected if poor-quality products were offered, which would not be in the interests of an investor hoping to build a profitable long-term market for these products in the recipient country. In Mexico, CFLs are being manufactured in the country to specifications more stringent than the ones for industrialized countries in order to withstand the poorer quality of electricity supply. Imaz et al. (1998) point out that investors in all three Mexican projects are taking extraordinary risks that local private developers would likely not have taken; that is, they are gambling on high-cost "technologies" (including agricultural and forestry methods) that would otherwise probably not have been tried in Mexico.

Negative local impacts

Eight of the 12 projects identified no negative local impacts. Indeed, in several cases the project would have a positive impact by reducing local air pollution and/or creating jobs in rural areas. For the other projects, the main impact is related to the displacement of local dwellers that a forest protection project might cause, or an increase in environmental impacts, e.g., from charcoal use or the production of ethanol in Brazil. For the India teak plantation project, the concern is that widespread planting may lead to cultivation of monoculture, which would be susceptible to pest infestation leading to loss of timber and the release of sequestered carbon.

Although international investors may not be fully aware of the local benefits of JI/AIJ projects, the three Indian case studies show that local benefits are unlikely to be ignored. If projects rely on government or community land, the local community's awareness will be key to ensuring sensitivity to local needs. The biomass projects described for India involve planting trees on farmers' private lands; farmers are unlikely to participate in a project unless they are convinced of its benefits. Each of the Mexican projects reviewed will have strong local benefits. The forestry project in Chiapas and halophyte farming in Sonora are expected to provide local employment and reduce migration of rural residents to urban areas as well as create positive environmental benefits through watershed management and improved control of soil erosion. Both projects will add to rural incomes, and developers have taken steps to ensure that benefits continue after project completion. However, an issue that remains unclear is whether the projects will become part of the lives of the local communities and will be sustained after the developers leave.

Additionality of funds and avoidance of GHG emissions

Additionality of funds was not reported to be an issue for half the projects analyzed by the authors. In some of the other cases, additionality of funds may be difficult to establish. For Mexico, the authors use the Chiapas forestry project to demonstrate the difficulty of determining whether funding is truly additional; overseas development funds from the United Kingdom, which were not clearly additional, were used to do feasibility research for the project. However, project implementation is to be supported by the Federation Internationale de L'Automobile (FIA), whose funds are considered additional. La Rovere (1998) cites an example from Brazil regarding the difficulty of assuring true additionality of JI/AIJ funding; he offers a rather dismal description of the whittling down of several hundred million dollars of aid promised by G-7 countries through the GEF and other donors. The promised sum was eventually reduced to a fraction of the original commitment. If JI/AIJ monies were forthcoming for the programs originally targeted by the G-7 monies, the JI/AIJ funding could be seen as simply fulfilling previously broken promises of aid rather than supplying truly additional support. In the case of South Africa's potential CFL AIJ project, the electric utility company, ESKOM, has the funds and is willing to take a risk with the CFL program. ESKOM would most likely target consumers with higher income where the potential for savings is likely to be high because of their higher electricity consumption. Thus, unless a JI/AIJ investor targeted low-tariff electricity customers, which may not be served by the ESKOM program, the funds for this project would not be additional. For South Africa's housing project, the additional support is clear, in the form of technical assistance with no directly proposed transfer of funds.

The concern about setting appropriate baselines to describe the growth of GHG emissions in the absence of an AIJ project is important to investor entities and countries. Investors and governments are concerned about baselines in order to ensure that GHG reductions or carbon sequestration achieved by a JI/AIJ project are above and beyond the GHG emissions reductions that would have occurred even without one.

The papers from Brazil and Mexico allude to the difficulty in establishing baselines. La Rovere (1998) suggests removing Brazilian forest protection projects from consideration as AIJ/JI projects. For each of the three Mexican projects, projected reductions of GHG emissions were established through analysis of available data. For Ilumex, however, many questions remain about the assumptions that were used in preparing the baselines, and about whether utility GHG emissions could be accurately monitored. A recent paper suggests that coal-fired generation would be displaced, but it is not clear how a lighting project that saves electricity on-peak would displace coal which fuels base-load generation (Quintanilla, 1997).

For the three India projects, establishing baselines was easier since degraded lands or rainfed marginal croplands constituted the areas considered for planting teak, tamarind or bioenergy plantations. The baseline included minimal carbon sequestration on such areas. The teak from plantations is likely to substitute for imported teak whose origins are difficult to trace. If the imported teak is derived from virgin forests, then the plantation teak would offset the emissions from the unsustainably harvested teak trees. The bioenergy project would offset electricity generated by coal or diesel fired units and thus displace their associated carbon emissions.

Infrastructure for project formulation, evaluation and monitoring, and government acceptance

The following discussion of this topic covers two separate issues. One related to the formulation, monitoring and evaluation of projects for which technical capacity is lacking in the study countries, and the second related to the process of government acceptance of AIJ projects, which has been established to more or less degree in India, Mexico and South Africa. Like many other potential recipient countries, Brazil has not yet established a government office to accept and monitor JI/AIJ projects. In addition, although many Brazilian institutions and experts have the capacity to provide the technical support for project assessment, few are trained to evaluate and monitor the performance of climate-change projects. If Brazil is to pursue JI/AIJ, it will have to address these shortcomings. The situation is similar in India, where an important problem is the lack of institutional capacity to formulate, monitor, evaluate, and verify the GHG implications of a JI/AIJ project. Training and certification of GHG auditors is needed.

Until recently, there was no government process for acceptance of AIJ projects in India. The Indian authors had stated that it would have been in the country's interest to devise such a process, in view of the considerable economic and social benefits of biomass projects in India, aside from their global GHG emissions benefits. Methods for assessment of GHG reduction need refining in South Africa; more detailed data collection and analysis are needed to assure that a CFL program would displace coal-fired rather than gas-fired or hydro-based power generation. Similarly, for the South African housing project, assessment methods are needed to monitor and verify energy and carbon savings.

In Mexico, the evaluation and monitoring of the performance of the three case studies analyzed by the authors was not seen to be a problem. In each case, the projects had adequate monitoring and evaluation plans and technical experts were available to conduct these activities. The Mexican authors also noted that the quality of the many proposals submitted for AIJ projects reveals that the preparers lacked basic understanding of (1) JI/AIJ and (2) methods of estimating GHG reduction compared to a baseline. In addition, as in the other three countries, Mexican institutions need to be designated and their staff trained for monitoring and evaluating project proposals and performance. Mexico does not have a full-fledged process for accepting proposals at the moment although general guidelines have been issued for a voluntary AIJ process overseen by a temporary committee. Although Imaz et al., 1998 suggest that much of the monitoring could be done by project developers. They suggest that Mexico should also have trained outside auditors to assess whether the carbon credits that are ultimately shared reflect each project's actual performance.

Leakage and permanence

These are valid concerns for most of the projects. In forest protection projects particularly, it is conceivable that dwellers who are prevented from deforesting a protected area could migrate elsewhere in neighboring forests and continue their past livelihood, which required the felling or burning of trees. The question of permanence is also worrisome since in all types of forestry projects, the benefits of carbon sequestered may be lost after some years if there is a change in land use and the planted trees have to be removed. In principle, this loss of carbon should be treated as a "debit" against any carbon credit that might have been claimed for the project.

The leakage issue is relevant to protection projects in the Amazon. LaRovere (1998), for instance, argues that these two issues are reasons why forest protection projects should not qualify as candidates for AIJ/JI. On the other hand, in two of the India projects, there is reason to believe that permanence will not be an issue. In the India Tamarind Project, the tamarind fruit is highly valued, and there is a cultural tradition of not felling these trees for decades, if ever. In the case of the India Bioenergy Project, the generation and use of bioelectricity will permanently secure the carbon saved from not burning fossil fuel to generate electricity. In the third project, the teak trees could potentially be destroyed to make way for other land uses, but continued high demand for teak may prevent this from happening.

The involvement of local groups who receive direct monetary or other benefits as illustrated in India and Mexico case studies will be important to ensure sustenance, and replicability of projects. Indeed, the main role of associated benefits in forestry projects for carbon mitigation would be to secure the permanence of carbon sequestered in such projects. The creation of rural jobs and income, soil conservation and watershed enhancement, if sustained, will be a strong reason for local farmers to maintain these projects. In South Africa, where the local utility company ESKOM is the sole implementer of the CFL project, it would be easier to ensure project sustenance provided ESKOM views the benefits to be adequate.

Sharing carbon credits

On the issue of sharing carbon credits, Imaz et al., 1998 agree with Ravindranath, et al., 1998a that carbon credit sharing is essential to unlocking the flow of investment funds for JI projects. Imaz et al., 1998 suggest that Mexico needs to develop a strong framework, either through bilateral agreement or through a tradable-offsets mechanism. These observations are consistent with the use of certified emissions reductions by Annex I parties as suggested in the Kyoto protocol. For the South Africa CFL case, the authors explore three different formulas for sharing carbon credits among investor and recipient countries. One approach would be to use a percentage of initial investment by each country, a second would be for South Africa to set a standard percentage for all projects, and a third would be to base the percentage on the avoided costs in the investor country. In the case of the EcoHousing project in South Africa, the participants have devised an arrangement for sharing, whereby the local community gets 45%, investors get 45%, and the international facilitating agency receives 10% of the credits.[1]

Macroeconomic impacts

Except in three cases, macroeconomic impacts were considered to be of importance. In four cases these were deemed to be of major importance since expansion of projects or programs, such as Brazil's ethanol program or the teak plantations in India, could reduce imports of fuels or timber.

Projects in three of the four areas that La Rovere (1998) discusses for Brazil have significant potential to reduce oil and natural gas import payments, which would help Brazil's macroeconomic performance. Substituting ethanol for gasoline and implementing energy

1 For additional discussion of sharing of carbon credits see Dutschke and Michaelowa, 1998.

conservation measures could reduce oil imports, and production of charcoal from renewable sources of wood could displace imports of petroleum coke. As demonstrated by Brazil's ethanol program, JI/AIJ has the potential to develop significant new technologies and/or implementation programs. Pursuing AIJ/JI projects may benefit the rich disproportionately, however, contributing to the unequal distribution of wealth in Brazil. This has been the case with the ethanol program, which benefits vehicle owners, who constitute the richest 10% of Brazilian society.

An earlier study by Ravindranath and Kadekodi (1997) shows that carbon sequestration projects in India could triple the output value of forest products thus increasing forestry's contribution to GDP by 50%, add 67% to employment in the sector, and reverse the forest products trade flow in India's favor ($400 million) by 2020. A nationwide teak planting program could reduce teak prices, which, if not anticipated by teak farmers, could lead to bad publicity and a backlash on teak planting.

In 1996, the South African currency (the Rand) depreciated 25%, and foreign exchange reserves declined. CFLs for the ESKOM project would have to be imported because no South African manufacturer makes them today. A small program would not have a serious impact on the country's balance of payments, but unless domestic manufacturing capacity is developed, a nationwide program over many years would place a burden on South Africa's trade balance. Of equal importance is the effect on domestic manufacturers of incandescent bulbs as CFLs displace these bulbs. The example of Ilumex in Mexico suggests that CFL programs can be effective; Ilumex has thrived despite the currency devaluation in 1994, which reduced the purchasing power of low-income households.

3.2.2 *Other Issues*

In addition to the technical project-specific issues addressed by each author, the authors also made several observations and comments that are noted below.

The importance of emissions caps

La Rovere (1998) suggests that it is important for all countries to commit to GHG emissions caps in order to keep global GHG emissions from continuing to increase despite JI/AIJ projects. Countries currently in FCCC Annex I, i.e., OECD and other industrialized countries, are committed to stabilize GHG emissions at 1990 levels in 2000, and will take on binding commitments for differing emission reductions during 2008-2012 after the ratification of the Kyoto Protocol. Non-Annex I (developing) countries have no stabilization commitments. He proposes that a time period be allowed for developing countries to reach caps once they agree to take on commitments. In addition, La Rovere (1998) and Imaz et al. (1998) feel strongly that Annex I countries should be limited in the percentage of their emissions that could be offset by credits from JI/AIJ projects. Without such a limit, they argue, Annex I countries will be slow to develop innovative GHG-reduction technologies, which will in turn slow the transfer of these technologies to developing countries. A limit would also help allay non-Annex I countries' concerns since it will confine the amount of inexpensive GHG emissions reductions options that foreign investors will be able to access through JI/AIJ projects.

Time horizon of AIJ

Ravindranath et al. (1998a) stress that the AIJ pilot phase is too short for a full evaluation of some projects, such as biomass projects, which have long gestation periods. Afforestation or reforestation projects typically exhibit a noticeable increase in above-ground biomass only after five years or so for most tree species. The AIJ pilot phase is anticipated to end in 2000 after a period of about five years, which is too short to ascertain the carbon benefit of a project. The authors thus call for extending the AIJ pilot phase beyond the year 2000 for biomass projects. At a minimum, the monitoring and evaluation phase should be extended several years beyond a project's completion date to ensure that the sequestered amount of carbon matches the *ex-ante* estimates.

3.3 Summary

The 12 studies from four countries presented here recognize jointly implemented climate change projects as a promising alternative to reduce global greenhouse gas emissions. Many technical concerns about JI/AIJ are being realistically and sensibly addressed in the projects and programs examined as case studies in this report. The transfer of obsolete technology was not considered a major issue for instance and eight of the studies identified positive local impacts. The case studies illustrate that JI/AIJ projects have the potential to bring new technology, investment, employment, and other ancillary socioeconomic and environmental benefits to developing countries. These benefits are consistent with the goal of sustainable development in the four study countries. It is, however, important to guard against inequitable distribution of the benefits from such projects.

The case studies illustrate the differences between forestry and energy projects. Both types of projects have benefits associated with them. The forestry projects bring rural jobs and incomes, reduce soil erosion and rehabilitate degraded lands. The energy projects provide urban or manufacturing jobs, bring better energy technology, and reduce local air pollutants. Both types of projects can reduce a country's import bill if implemented widely. There is concern about the permanence of the stored carbon for forestation projects and about leakage of carbon benefits for protection projects. The former can be minimized if projects focus on tree species that are highly valued by local populations, and provide them with socioeconomic benefits.

Key issues identified where further effort is still needed include: additionality of funds, guarantees of performance (including the establishment of baselines and the risk of leakage) and host country institutions to evaluate and monitor projects. They also note that clear international and national guidelines to address issues such as carbon sharing, monitoring and verification, etc. are key for a sound JI/AIJ system. Clear guidelines will also avoid that official development assistance would be channeled away from other deserving causes. All the papers agree on the need to develop institutional arrangements for approving and monitoring JI/AIJ projects in each of the countries represented. The studies' authors note the importance of (1) Annex I countries to limit the use of JI/AIJ as a way to get credits against their own emissions at home, and (2) industrialized countries developing new technologies that will benefit all countries. The authors also observe that if all countries accepted caps on their emissions (with a longer time period allowed for developing countries to do so) project-based GHG mitigation would be significantly facilitated by the improved private-investment climate.

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