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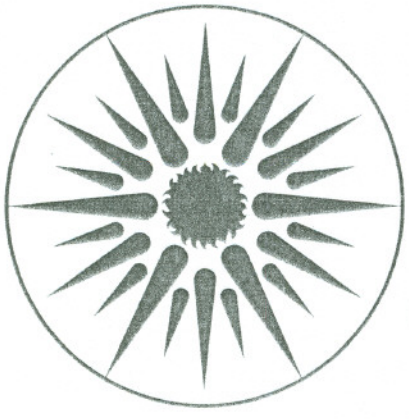
Perspectives on the Institutional Needs of Joint Implementation Projects for China, Egypt, India, Mexico, and Thailand

O. de Buen, O. Masera, I.A. Gelil, N.H. Ravindranath, D. Zhou, J. Li, and D. Intarapravich

October 1995



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PREFACE

One avenue for reducing the net emissions of greenhouse gases (GHG) under the Framework Convention on Climate Change (FCCC) is the joint implementation (JI) of policies and projects by signatories to the Convention. Although debate on the practical aspects of JI projects is relatively young, it already includes issues concerning the ability of governments to accept JI projects as well as the project participants' capacity to monitor, evaluate, and verify the financial and GHG benefits.

The focus of this paper is an in-depth, country-by-country analysis of current and conceivable institutions in potential host countries. To understand these concerns better, in August 1994 we asked colleagues in five developing countries to evaluate their countries' institutional capacity for JI projects. Their perspectives are presented here as individual country case studies. We chose the five countries—Mexico, Egypt, Thailand, India, and China—because each has significant potential for JI projects.

To focus the case studies, we sent each author a set of questions pertaining to the Conference of Parties' (COP) potential criteria for JI projects and to the US Initiative on Joint Implementation (USIJI) criteria and considerations. The questions posed to the authors are included below and are organized around five topics: JI project acceptability, project assessment, long-term project monitoring, identifying and quantifying project benefits, and external verification of GHG reductions.

In preparing their responses, authors were asked to think about energy efficiency or forestry projects planned or currently under implementation in their country that could serve as a JI project, and to focus their answers on specifics related to that project. If no appropriate

project was underway or planned, the authors were asked to consider a JI project that could be implemented in their country. The five country case studies not only offer comments specific to the project(s) chosen by the authors for discussion, but also offer insights and perspectives applicable to more general JI projects.

The companion to this paper, "The Institutional Needs of Joint Implementation Projects" (Lawrence Berkeley Laboratory Report LNL 36453), discusses how the COP and signatories to the Framework Convention on Climate Change might create the institutional capacity for an effective JI regime. That paper considers what institutional structures for implementing JI projects currently exist in host and investor countries, what JI tasks these structures are capable of filling, and how they can be adapted (or how other institutions can be created) to fill the gaps for a feasible and reliable JI institutional structure.

The views expressed in the country studies are those of the authors, based on information they gathered from various ministries and other institutions in each country. The authors have participated in national and international JI workshops and conferences and discussed JI with representatives from the ministries of environment, forests, and energy in their countries. Nevertheless, the views expressed cannot represent a consensus, since a common voice on JI has not emerged within each country.

QUESTIONS POSED TO COLLABORATING AUTHORS ABOUT JOINT IMPLEMENTATION

1. Sample Project

Question

- Briefly describe the potential energy efficiency or forestry JI project you are addressing, including the environmental and non-environmental impacts and benefits of the project.

2. Project Acceptability

Relevant COP and USIJI Criteria:

- "Joint implementation is a voluntary activity under the responsibility of two or more Parties; such activity must be undertaken or accepted by the Governments concerned." (COP)
- "Joint implementation should be beneficial to all Parties involved, and be consistent with their national priorities for sustainable development." (COP)
- A USIJI project "is acceptable to the government of the host country." (USIJI)

Questions:

- What alternative governmental "acceptance" procedure(s) would you envision for this project if it were a JI project?
- Is there a government agency that could handle evaluating and "accepting" JI projects or would a structure have to be created? Who would assess benefits and compatibility with national priorities?
- What particular types of energy efficiency or forestry JI projects would your government be likely to favor and/or be less supportive of? Why? What issues would be most important?

3. Project Assessment

Relevant COP and USIJI Criteria:

- "Joint implementation activities should bring about real and measurable results, determined against reasonable baselines." (COP)
- A USIJI project "involves specific measures to reduce or sequester greenhouse gas emissions initiated as the result of the US Initiative on Joint Implementation, or in reasonable anticipation thereof."(USIJI)

- A USIJI project "provides data and methodological information sufficient to establish a baseline of current and future greenhouse gas emissions: (a) in the absence of the specific measures referred to in A.(2) of this section; and (b) as the result of the specific measures referred to in A.(2) of this section." (USIJI)
- A USIJI project "will reduce or sequester greenhouse gas emissions beyond those referred to in A.(3)(a) of this section." (USIJI)
- A USIJI project "contains adequate provisions for tracking the greenhouse gas emissions reduced or sequestered resulting from the project, and on a periodic basis, for modifying such estimates and for comparing actual results with those originally projected." (USIJI)

Questions:

- What institutional structures (governmental, non-governmental, and private organizations, etc.) would be necessary for the assessment of this project?
- Which of these institutions currently exist and are adequate?
- What data and methodological information woudl be needed to assess the project?
- How is the project currently being assessed?
- Is that current assessment mechanism adequate for JI?
- Who should pay for the project assessment?

4. Project Long-Term Monitoring

Relevant COP and USIJI Criteria:

- "Joint implementation activities should, where appropriate, be accompanied by measures to ensure their long-term environmental benefits." (COP)
- A USIJI project "provides adequate assurance that greenhouse gas emissions reduced or sequestered over time will not be lost or reversed." (USIJI)

Questions:

- Describe two long-term monitoring mechanisms, including the necessary institutions, for the project: one at the project and one at the country level.
- Are there existing institutions that are capable of implementing these mechanisms?
- Would you rather that the project continues for a long time or that it ends and a new similar JI project is started?
- If a new similar JI project were started to replace an old one, could the carbon credits of the previous project be transferred to the new project?
- If so, what institution could monitor such a transaction?

5. Identifying and Quantifying Project Benefits

Relevant COP and USIJI Criteria and Considerations:

- "The benefits of joint implementation activities may be shared between the Parties involved." (COP)
- The USIJI Evaluation Panel will also consider "the potential for the project to lead to changes in greenhouse gas emissions elsewhere." (USIJI)

Questions:

- If a system emerges that allows "credits" for JI projects, how would you recommend that credit be assigned between the project parties, (via negotiations, government policy, let the parties decide, etc.)?
- Should your government be consulted during the project parties' negotiation of credit assignment?
- Should any other institutions be involved?
- What institution could track "leakages," i.e. reductions in greenhouse gases at the project site leading to increases in greenhouse gases elsewhere in your country?

6. External Verification and Project Evaluation

Relevant COP and USIJI JI Criteria:

- A USIJI project "contains adequate provisions for external verification of the greenhouse gas emissions reduced or sequestered by the project." (USIJI)

Questions:

- What external reviewer would be acceptable to your government?
- Should there be a separate institutional structure or mechanism for external verification?
- If so, should it be composed of both internal and external experts?
- What institution should handle enforcement if the external reviewer finds that the project has not met its greenhouse gas commitments?
- What are examples of external verification that have worked for similar projects?

CHAPTER 1: CASE STUDY OF MEXICO

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1.1 Sample JI Project: ILUMEX Energy-Efficient Lighting

ILUMEX, the Project for the Rational Use of Lighting in Mexico, is a good example of a JI project for two reasons: its promotion for grant funding by the Global Environment Facility and its size—ILUMEX is the largest demand-side management project to date in Mexico. Mexico was chosen for a Global Environment Facility project because 75 percent of the electricity used is derived from fossil fuel resources.

ILUMEX aims to promote energy-efficient residential lighting over a two-year period through the introduction of at least 1.7 million compact fluorescent lamps (CFLs). Because CFLs use 75 percent less power than incandescent bulbs, they reduce power demand, electricity use, and as a result, carbon emissions. The Federal Electricity Commission, the national utility, estimates that about 150,000 tons of carbon will be saved over the lifetime (10,000 hours per lamp) of the compact fluorescent lamps at a negative cost of 0.28 $US/kg of carbon. ILUMEX will disseminate CFLs among residential customers in Guadalajara and Monterey, the two largest cities served by the Federal Electricity Commission. Under project guidelines, residential customers will be eligible to purchase as many as five CFLs.

ILUMEX will target customers with low electricity-consumption levels. Doing so will reduce lost revenues for the Federal Electricity Commission because electricity consumption by these customers is currently subsidized at prices much below the Commission's marginal cost.

Since the project is designed with low distribution costs, the lamps are sold at existing Electricity Commission offices. The project will be managed through a *fideicomiso,* which will be directed by local and national Electricity Commission managers. The *fideicomiso* will grant loans, negotiate purchase contracts with customers, and collect money from the Electricity Commission.

1.2 Project Acceptability

Joint implementation is currently controversial in Mexican government circles. The dominant opinion that emission credits should not be shared, i.e., all credits should remain in Mexico, is based on the arguments that developed nations produce more emissions than developing nations. There is, nevertheless, growing support in Mexico for JI projects.

Governmental acceptance procedures would likely involve several steps. First, a preliminary agreement would need to be reached and a document prepared. This agreement would be more a letter of intent than a commitment. The document should contain an analysis of project impacts on GHG emissions, a description of the monitoring methodology and protocols, a technical and economic feasibility analysis, and an analysis of credit distribution.

Second, a formal request that includes the preliminary agreement would be presented to a government body, such as a multi-ministry government council, which would include the foreign ministry, the energy ministry, the national energy utility, and the environmental protection ministry. Third, the government body would analyze the request according to three criteria: (i) size, since there should be a lower limit to GHG emissions, (ii) project economic and technical feasibility, and (iii) commitment of national emission credits. Finally, if accepted, the project would be registered and an account in a fund for monitoring would be established.

There currently is no Mexican governmental agency with the specific institutional function to "accept" JI projects. The probable next step would be to establish a council, as suggested, composed of members of at least three ministries (foreign affairs, energy, and environment). One of these ministries would have an office where JI projects would be registered.

Forestry projects, however, are among the types of JI projects the Mexican government is less likely to accept. Official representatives of Mexico's poor peasants often do not have the political legitimacy to commit entire peasant communities to support such long-term projects as large-scale tree planting. This lack of legitimacy was dramatically demonstrated by the events of 1994 in the southern state of Chiapas. There, large areas of forests are inhabited by poor Indians, people who were believed to support the government based on election results, but who turned out not to support the government at all.

Although "top-down" forestry projects could be implemented in forested peasant communities, the more impoverished the community, the more likely the people will use the JI forest resources as fuel and fodder for survival. As the initial attention to JI projects wanes, project corruption may result in forest communities not receiving remuneration for creating carbon sinks, thus eliminating whatever sense of ownership and commitment communities may have to the project. The Mexican government might reject a JI forestry project to avoid sanctions resulting from the failure of a project.

1.3 Project Assessment

Assessment Institutions

Assessment would require two levels of institutional structures: governmental and project-level. At the governmental level, the government would have to assemble the multi-ministry council to assess JI projects. This integrated council would accept and register the

project, manage the funds for monitoring, and periodically assess project evolution. The council would also need the technical capability to analyze the reports presented by those evaluating different types of projects.

At the project level, survey organizations could analyze the power mix data from the household survey and the utility. Private consultants and individuals from non-governmental organizations or universities, that is, people with experience conducting household surveys and evaluating electricity-saving projects, could assist in the project-assessment process. Such expertise already exists in Mexico, though organizations would need to demonstrate their capacity to follow defined methodologies and protocols to evaluate electricity-saving projects.

Data Requirements and Methodology

Beyond the institutional capacity for assessing JI projects, the ILUMEX project data requirements would include information on:

- sales of compact fluorescent lamps;
- wattage of lamps replaced and installed;
- energy consumption of the customers that use CFLs;
- time of use of energy-efficient lamps; and
- power mix at the site and at the time of use.

The current design of the ILUMEX project includes monitoring and evaluation activities that will take place over three years (before, during, and after the project). These include:

- a baseline sales survey, performed three months before the sale of CFLs begins;
- four surveys: two for sales of lamps and two for participants' satisfaction. A set of two surveys (one on sales, one on satisfaction) will be taken three months after the project starts. The second set will take place one year later. The sales survey will determine any shortcomings in the sales process. The participants' satisfaction survey will obtain information on the number and types of CFLs installed, the

characteristics of the incandescent lamps they replaced, the number of hours of use, and other information on the economics of the project;

- two surveys on hours of use, to be taken six and eighteen months after the project begins. Metering equipment will be installed in a selected sample of participants to record the hours of use of the CFLs;
- a mid-term project implementation review to analyze whether targeted sales levels have been met and what to do if expectations have not been reached;
- an end-of-project review to critically review project results; and
- a final project evaluation performed six months after project completion to review participants' satisfaction with the CFLs.

Current assessment mechanisms are not adequate for a JI project because they do not include monitoring the power mix at the location and at the time of use of the CFLs. Without constant monitoring of the mix of power plants that generate the electricity for the locations where the lamps are installed, assessing the emission reductions from power plants that run with fossil fuels is not possible.

One of the greatest institutional constraints for demand-side energy-conservation projects is access to continuous information about the power mix at the project site and the time of use of the energy-efficient devices. The utility that distributes electricity to the location (in the case of ILUMEX, this would be the Federal Electricity Commission) should provide these data. The institutional structure to gather this kind of information already exists, but doing so on a periodic basis creates new institutional functions and new costs for the utility. The national utility would need to develop a group that gathers and reports on the power mix and on the use of the energy-efficient devices. The utility would also need to create a group that reports on GHG emissions from fossil fuel-powered plants and keeps track of energy consumption of customers that have CFLs. This latter capacity has been recently developed, and the utility already has a group dedicated to continuously monitoring and reporting power plant emissions.

JI project demands may pose some problems for the national utility however. In particular, a JI project would require the area of load dispatch of the national utility to keep track and report on the power mix at the project location at every hour of the day, every day of the year. This information is currently available, but how it is collected and reported by the utility is not appropriate for JI project evaluation.

Costs of project assessment should be shared by the parties involved but should be paid in advance to a fund created for the specific purpose of paying for the project's assessment.

1.4 Project Long-Term Monitoring

At the project level, long-term monitoring should be done via household surveys where CFLs have been installed. Surveys should gather data on the persistence of the CFL installation and hours and time of use, as well as include information about the power mix at the location at every hour of the day, every day of the year. There is no need for daily reports on the power mix, but continuous monitoring should enable assessment of the statistical correlation between CFL use and fossil fuel power plant operation.

Recommended long-term monitoring mechanisms are as follows:

- the national utility would provide periodic reports on the hourly mix of electric power generation at the project location and on emissions from the fossil fuel plants serving the project location;
- households that have installed CFLs (one before installation and one for each year the project operates) would be surveyed. A consultant, non-governmental organization, or university could perform these surveys to determine the number of lamps installed, the power of the lamps they replaced, the hours of operation, and the persistence of installation of CFLs; and
- on an annual basis, a consultant, non-governmental organization, or university could correlate information from the surveys, the power mix, and emissions reports from the utility. This statistical analysis would estimate emissions reductions during that period and compare them with assumptions used to make the project a JI project. Universities are

> generally more stable than consultants or non-governmental organizations and should probably perform the long-term monitoring and evaluation of carbon reduction/sequestration. Reports that are prepared in the short term (e.g., by the utility) can be collected and archived by a university for use in later long-term evaluations.

At a national level, the ILUMEX project (together with other active JI projects) should be evaluated periodically by the national council, which would analyze the project's evolution based on the reports prepared by the consultants. The institutions required for implementing such long-term monitoring efforts already exist, with the exception of the government multi-ministry council.

An issue of long-term project monitoring involves the project life and the transfer of carbon credits as old projects end and new ones begin. JI projects account for a given amount of carbon dioxide that is not captured or emitted, which happens over a specified time. Any carbon savings beyond that given amount are not credited. However, given the possibility of a national emissions limit, it would be preferred that projects result in a permanent reduction of GHGs. In the case of CFLs, their widespread incorporation into the market and their acceptance by the customers may result in their continued use well beyond the lifetime of the first CFLs.

If a new, similar JI project were started to replace an old one, carbon credits from one project should not be transferred to a follow-up project of the same type. JI projects are about a fixed amount of carbon, not about a rate of flow of carbon emissions. Once a project is completed, no further credits should be awarded. If a project is interrupted, or if changes occur rapidly in the power mix at the site (e.g., a new hydroelectric plant begins operation nearby), the energy saved by the CFLs may no longer reduce GHG emissions. In this situation, a new project would have to be started to fulfill the initial commitment. This would, of course, imply new costs, and credits could be transferred to the party that covers the costs of the transaction.

Monitoring such credit transactions would not be a problem if the government council already exists. Problems may arise, however, if the utility sets up continuous emissions monitoring for the previous project location only.

1.5 Estimating Project Benefits

Consultants, non-governmental institutions, or universities can estimate the reduction or sequestration of carbon in the short term. A methodology for estimating the reduction of carbon might involve:

- estimating the number of installed CFLs, their power demand, the power demand of the lamps replaced by CFLs, and the number of hours CFLs are in use;
- defining the plant mix or power supply for the location at different hours of the day for typical days of the year;
- gathering and defining emission values already available from the university;
- defining the lifetime of the project;
- correlating the hours of operation and demand reduction by CFLs to estimate energy saved by the hour on typical days;
- assigning emission reductions for each hour for the day for typical days with the hourly power mix from the generating plant for typical days at the project location and the emission factors for the fossil fuel plants serving the project location; and
- multiplying the hourly emissions saved for each typical day of the year by each of the number of typical days in the life of the project.

Not all the carbon credits should go to the party that funds the project. Credits should be shared if the unit cost of GHG emissions reductions is radically higher for the party that makes the investment as compared to the cost to the party that will obtain the reductions. During the project parties' negotiations of credit assignment, the Mexican government must be consulted. The government should approve emission-reductions commitments by national parties with foreign parties that give credit to those foreign parties. Consultation with the national government should be a basic element of the negotiation process. The foreign party's government should also approve the agreement.

Beyond credit assignment, there is also the potential for carbon "leakage," i.e., reduction in greenhouse gases at the project site leading to increases in greenhouse gases elsewhere in the country. For a project like ILUMEX, a leakage could be in the form of changes in the power mix serving the nation. This might occur if the utility decreases its use of fossil fuel plants for delivering electricity to a location, decreases its use of non-fossil fuel plants in the nation, or brings in other fossil fuel plants to compensate for the lost balance of power-generating capacity. The multi-ministry council, through its periodic revision of the project, should be able to track these leakages.

1.6 External Verification and Project Enforcement

With the expectation that an international body will be established to certify JI projects, Mexico would probably accept external JI project review, as long as the external reviewing institution has been appropriately certified. It is unlikely, however, that the Mexican government would permit a foreign national governmental agency to review JI projects unless a bilateral agreement with that country already existed. There is no need to create an independent institutional structure for external reviewers as long as the multi-ministry government council exists. Mechanisms for external verification would create additional functions for the council however, requiring registration of these reviewers and a capacity to revise the verification.

Internal expertise for JI project verification could be provided through the multi-ministry council and would likely interact with the external reviewers prior to project revision by the council. If the external reviewers are foreign to Mexico, the internal experts (with authority from the council) may help the external experts with the institutions involved in the assessment of the project (e.g., surveyors, consultants, and the national electricity utility).

Should the external review find that the JI project has not met its greenhouse gas commitments, enforcement could be done by the SEDESOL or by the *Procuraduría de Protección del Ambiente*. SEDESOL is the ministry in charge of social and environmental policy and the *Procuraduría* its enforcement agency. These are the institutions involved with environmental protection in Mexico. As stated, SEDESOL would be part of the multi-ministry council.

JI project enforcement is a complicated issue for demand-side energy-conservation projects with a lifetime beyond the three to ten years required to install a power plant. If demand-side management projects are not contracted with the utility, but with an energy services company, the energy-conservation goals (reflected in a number of CFLs replacing incandescent lamps and used for a number of hours a day at certain parts of the day) may be reached, but emission reductions may not. As such, changes in the power mix — a decision made by the utility and not necessarily as a result of the start of operations of a new power plant — could alter the estimated GHG emission reductions.

CHAPTER 2: CASE STUDY OF EGYPT

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2.1 Sample JI Project: Industrial Solar Thermal Heating

The use of solar energy as a source of process heat in some industrial applications, a project currently under development in Egypt, would be a good JI project candidate. Egypt's industrial sector – including the petroleum industries – contributes 27 percent of the country's total gross domestic product, accounting for 50 percent of Egypt's total energy consumption in 1992-1993. The Egyptian economy is heavily dependent on gas and oil (93 percent of total commercial energy consumption), and industrial sector consumption represents about 35 percent of the country's consumption of both oil and gas. Industrial activities in Egypt generate as many as 28 million tons of carbon dioxide each year (nearly 35 percent of the country's emissions), and because industrial process heat accounts for most of the demand for oil and gas, industrial strategies to reduce the burning of fuel oil or natural gas could significantly reduce carbon emissions. Energy efficiency, fuel switching, and the use of renewable energy sources are some good examples of such strategies.

The JI project presented here was designed to assess the technical and economic feasibility of solar heating technologies to meet the energy needs of process heat in Egyptian industries. This multi-phase project will include a feasibility study, an engineering design for the recommended technology, project implementation, and monitoring of the project's economic and environmental benefits. Currently under development by the Egyptian New and Renewable Energy Authority, the project will be financed by a grant from the African Development Bank.

Egypt has great potential for developing renewable energy resources. Because of its geographic location, the sun shines throughout the year. Direct solar intensity ranges from 260 to 710 cal/cm. In addition, wind speed mapping shows that Egypt has sites with average annual wind speeds of up to 30 km/hr, i.e., with winds capable of producing significant power with wind turbine technologies.

While the emphasis in this paper is on the potential for industrial sector JI projects, it is important to also note the potential for rural JI projects. The use of non-conventional energy sources in the rural areas of Egypt is relatively small when compared to other developing countries, and the degree of rural electrification in Egypt is among the highest in the developing world (about 90 percent). As such, energy efficiency, fuel substitution, and renewable energy resource are also very much relevant to rural communities.

2.2 Project Acceptability

The Egyptian Environmental Affairs Agency, in cooperation with other Egyptian agencies and institutions, is iteratively developing and refining a national plan to address global climate change issues. For instance, the Organization for Energy Conservation and Planning (OECP), a governmental body that promotes energy efficiency throughout the Egyptian economy, is coordinating energy-related policies. These two institutions, along with the help of other institutions such as the Egyptian New and Renewable Energy Authority, have the capacity to assess the compatibility of JI projects with national priorities and goals.

In the context of Egypt's national energy and environmental policies, the government is likely to favor JI projects that promote the use of natural gas for power generation for the industrial, commercial, and residential sectors. This promotion is part of the country's national energy policy to substitute natural gas reserves for petroleum products to meet domestic energy-consumption needs. Because fossil fuel and hydropower resources are extremely

limited, projects promoting energy conservation and efficiency, as well as the development and use of renewable resources, will be favored by the government. Natural gas, increased efficiency and conservation, and renewable resources are the main GHG abatement options that were presented in the United Nations Environment Program GHG abatement-costing studies for Egypt.

2.3 Project Assessment

Assessment of the industrial solar thermal heating project would be conducted jointly by the Egyptian New and Renewable Energy Authority, the Organization for Energy Conservation and Planning, and the Egyptian Environmental Affairs Agency, along with the industrial facility chosen for implementing the solar heating system. Each of these institutions currently exists and is capable of assessing this particular project as well as other similar energy efficiency projects.

Assessing the project benefits will incorporate future industrial energy demand, particularly for industrial process heat applications, as well as identify appropriate solar technologies to replace conventional energy resources for industrial process heating. This investigation will evaluate the technical, economic, and environmental viability of the recommended technologies. The cost of the solar energy generated will be compared to the cost of an equivalent amount of fossil fuel saved. The cost of the solar technologies will be compared to conventional process heat technologies. In addition, the environmental benefits of using solar energy systems and reducing fossil fuel consumption will be assessed, including evaluation of the reduction in GHG emissions and other pollutants.

Assessment Institutions

The Egyptian New and Renewable Energy Authority is a governmental entity established in 1986 to emphasize Egypt's commitment to the development of renewable energy resources. Among its responsibilities are:

- the assessment, development, demonstration, and field testing of renewable energy resources;
- institutional capacity building; and
- promotion of renewable resources in Egypt.

Following a substantial program of institution-building activities, the Energy Authority is now well established with more than 350 staff. It has an advanced and well-equipped center for the testing and certification of renewable energy products and systems. The Energy Authority also undertook a number of demonstration projects on solar water heating, solar pumping, solar refrigeration, and solar thermal industrial applications and has an ambitious plan to install wind farms with 65 MW capacity.

The Organization for Energy Conservation and Planning (OECP), also a governmental agency, was established in 1983 with a clear set of organizational objectives. These include:

- integrating energy planning into Egypt's broader economic framework;
- promoting energy efficiency throughout the country's economy;
- developing and managing a national energy information system; and
- undertaking professional development activities to strengthen national capacities in energy related fields.

Energy policy planning forms the core of all OECP activities. This includes evaluating primary energy resources, analyzing current and future energy demand, and evaluating energy policy options and their impacts on the country's prospects for sustainable development.

To promote energy efficiency, the OECP has been providing technical assistance to energy users in different sectors to identify energy-consumption patterns, to demonstrate energy-efficient technologies, and to overcome market barriers to commercializing those alternative technologies. The OECP also provides technical assistance to the Egyptian Environmental Affairs Agency on questions of energy and the environment. Recently the OECP coordinated the energy studies of the United Nations Environment Program's GHG-abatement costing study for Egypt and is now involved in the GHG inventory and mitigating

actions of the U.S. Country Studies Program. The OECP is well qualified to assess JI projects, including data collection and analysis, having performed similar activities for more than 10 years. To enhance coordination of JI project activities within the energy and environmental policy framework, we suggest formalizing these many institutional processes, which now take place on an ad hoc basis.

The Egyptian Environmental Affairs Agency is the governmental body responsible for developing and monitoring the country's National Environmental Action Plan. The Action Plan provides a sound framework for government environmental efforts and focuses on needed policy reforms. These might include:

- developing and enforcing environmental standards for air and water emissions;
- relying on market forces and on the private sector (including non-governmental organizations) to resolve environmental problems;
- eliminating subsidies to energy and agricultural fertilizers and pesticides; and
- instituting full-cost recovery policies for disposal of municipal and industrial wastes.

The Environmental Affairs Agency developed the first environmental legislation (passed in 1993) in Egypt. The Agency is now developing environmental standards for air, water, and land use that were outlined in that 1993 legislation. The Agency is also responsible for inspecting and enforcing environmental legislation, working to increase public and private awareness of environmental issues, and developing and maintaining national environmental information systems.

The solar energy project is currently being assessed by the Egyptian New and Renewable Energy Authority, together with consultants from the African Development Bank. No formal mechanism currently exists to undertake joint assessment of JI projects. As a result, some criteria that characterize JI projects will not be evaluated within existing assessment procedures. For instance, the project's environmental benefits and its compatibility with

national priorities call for joint assessment by the Egyptian Environmental Affairs Agency and the OECP. But a mechanism needs to be developed to facilitate institutional cooperation in project assessment. While there is clearly no need to create new institutions to assess JI projects, there is a definite need to develop the institutional structure – using existing institutions – for considering JI projects based on specific criteria. A central institution, either the Environmental Affairs Agency or the OECP, should be identified to adopt this responsibility for energy-related JI projects. The OECP is currently more qualified because it has a reasonable institutional capacity, analytical capability, and expertise for assessing energy projects. The Egyptian Environmental Affairs Agency is still developing and lacks the necessary institutional capabilities and professional expertise.

Because their capacity is weak, non-governmental organizations currently play a very limited role in the development of energy and environmental policy and in the implementation and analysis of projects. This capacity is developing however, and the role of non-governmental organizations is expected to grow accordingly. As such, there is nothing to prevent non-governmental organizations from potential participation in future JI projects once they have the appropriate institutional capacity for JI project implementation and analysis.

The project assessment cost could be considered as part of the total project cost. If there are incremental costs however, they might be paid by the government of the host country as part of its commitment to GHG emissions abatement within the Framework Convention on Climate Change. Incremental cost, as used here, might have the same definition as in the GHG-abatement costing studies, i.e., if the assessment of JI projects introduces additional costs, those costs might be paid by the host country. Another option is to fund the incremental costs using an international or global fund, such as the Global Environment Facility. A third option might be to negotiate sharing the cost of project assessment among the participating parties.

Data Requirements and Methodology

For assessing the JI solar energy project, a comprehensive analysis of industrial sector demand needs to be performed, including collecting data on industrial energy consumption by process application and by fuel type. The potential for using solar energy heating in different industrial facilities should be assessed to identify potential sites for implementation. These data may be obtained through energy audits of candidate industrial plants. Data on available solar technology for industrial heating applications are also needed, along with the availability of other technologies in the Egyptian market. These would include information on the institutional capacity for the analysis, design, manufacture, installation, and maintenance of solar technologies. Cost data for undertaking economic and financial analysis for the project also should be made available. These include the cost of solar heating systems, piping and tie-ins, controls, site works, and installation, together with engineering and design costs. Operation and maintenance costs would also be estimated over the life of the project. Fossil fuel energy savings in monetary values would be estimated using a future fuel-price structure. Finally, to undertake a complete economic and financial analysis, the discount rate should be considered together with the Egyptian currency exchange rate.

Methodologies for economic and financial analysis (e.g., for net present value and internal rates of return) would be required. Techniques for sensitivity analysis would also be needed to evaluate the impacts of some cost parameters on the economic and financial viability of the project. Data on the emission factors of GHGs from burning different fuels should be available to estimate the reduction in GHG emissions as a result of using solar heating technologies, as well as a methodology of GHG-abatement costing.

2.4 Project Long-Term Monitoring

Long-term monitoring of the environmental benefits of the project is required to ensure that the reduction of GHG emissions over time will not be lost. At the project level, the OECP

could develop a monitoring scheme, that, through periodic site visits, could evaluate project performance. Performance related to GHG abatement could be assessed with a set of well-defined and measurable criteria, among which could be (for this particular project) the amount of solar energy generated and the equivalent amount of fossil fuel saved, together with the corresponding reduction in GHG emissions. Site visits might also include field inspections of systems efficiency and data collection and analyses. The OECP has the expertise and institutional facilities to conduct such field inspection monitoring. The OECP is currently monitoring the combustion efficiency of the refinery sector in Egypt. Using a mobile energy laboratory, a team of combustion specialists is visiting six oil refineries to evaluate and periodically report on their combustion efficiency. GHG emissions reduction could be evaluated through similar field visits. An accounting system to monitor the GHG budget of the project over its lifetime needs to be developed.

International organizations might also participate in a joint effort to monitor JI projects. Teams of local experts and representatives of international organizations might be established to undertake such an initiative. Local experts might be government officials from the participating institutions or private consultants.

At the country level, a GHG accounting system could be developed to monitor the environmental benefits of JI projects over time. The institution accepting JI projects might also be responsible for maintaining the proposed accounting system. These institutions already exist in Egypt and have the necessary capacity to undertake such activities. Part of the proposed GHG accounting system might be periodic reporting of GHG emissions of JI projects to the monitoring institution. This procedure might be difficult in developing countries – as are other information-dissemination activities – and might require legislative action to enforce reporting mechanisms. Worth noting is the lack of reporting mechanisms that allow energy users to report their energy consumption on a periodic basis to any of these existing institutions.

Like any other development project, the JI project will continue for a specified amount of time. In this case, the project life will be the life of the solar technology. At the end of the equipment lifetime, new, similar equipment or new, more advanced technology may replace it. In both cases, the economic and environmental benefits of the project would need to be reassessed. Replacement of the depreciated equipment might occur through JI arrangements or through an initiative of the host country. In this specific project, the African Development Bank is not likely to finance the replacement of the solar technology, so for the project to continue the owner will need to find other financial resources. Other concerns include the willingness of the project owner, the industrial facility in this case, to retrofit the technology or to abandon the whole process or the plant itself. Such decisions will have to be based on many considerations, such as the position of the industrial facility in the market at the time, the status of the technology, and the relative costs of the solar thermal heating technology compared to alternative technologies, including fossil fuel. It is clear that at the end of the JI project, the decision whether to continue the same project or to start a new one will be complicated and will involve many project participants.

2. 5 Estimating Project Benefits

Assigning GHG credits among the JI project parties is also a very complex issue. It is understandable that the GHG inventory of any country is determined by the GHG sources and sinks within the geographic territory of that country. JI projects would affect the inventory for the host country if systems emerge that allow carbon credits. Negotiations might be a reasonable way to do this, but "global" guidelines would be necessary to facilitate this process. The assigning process might affect the GHG budget of each party to the project, although the global benefits would remain the same. Consequently, the cost and benefits of the same project will be different from the standpoint of different players.

Since the project parties might be two or more countries, it is clear that the participating governments should be consulted. In many cases, global GHG accounting

systems might be needed as well. In the case of Egypt, while the proposed JI assessment and monitoring institutions are all governmental bodies (OECP, the Egyptian Environmental Affairs Agency, and the Egyptian New and Renewable Energy Authority), the Egyptian government should nonetheless be consulted.

The issue of "leakages" might be treated in the same manner as that of "credits." Tracking leakages could be the responsibility of the institution(s) that monitor JI projects so that the total GHG budget of the country could be tracked over time.

2. 6 External Verification and Project Enforcement

The issue of external verification should be handled within the Framework Convention on Climate Change. External verification would be acceptable if it were carried out by United Nations agencies. A mechanism should be developed to initiate this activity. The external verification might be coordinated with the long-term monitoring of JI projects.

Monitoring institutions in the host countries might participate in the external verification through an international or "global" mechanism. And though bringing local and external experts together would clearly enhance the process of external verification, it is preferable that local expertise be independent.

The process of external verification is a means to ensure that the project has met its GHG commitments and requires an appropriate methodology. If a JI project fails to deliver the anticipated GHG benefits, the project should be reviewed and the necessary data collected and analyzed to identify the problems in an effort to avoid the same problem in the future. Again, the local monitoring institutions should take part in this process. If enforcement is necessary after the review process, it could be performed by the governmental body responsible for

enforcement of the country's environmental legislation. In Egypt, this is the Environmental Affairs Agency.

Conclusion

Based on this project-specific analysis, it is evident that an institutional structure needs to be developed to assess and monitor JI projects in Egypt. This institutional structure would make use of existing institutions that are already functioning and capable of handling the issues of GHG emissions and mitigation options. Further enhancement of the professional capacity of those institutions might be needed in some cases. For long-term monitoring of environmental benefits from a JI project, a GHG accounting system needs to be developed in each participating country. This accounting system could be part of the institutional scheme needed to handle different aspects of JI projects, including the carbon transactions among different projects. It is preferable that host country institutions be involved in the process of external verification if needed.

CHAPTER 3: CASE STUDY OF THAILAND

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The Thai government has not developed an official policy on joint implementation, and Thailand does not have any ongoing JI projects. This paper reports on preliminary research conducted by the Thailand Environment Institute to identify potential JI projects within the Thai forestry sector. The comments in this paper on the approach that the government would take if a JI project were implemented in Thailand should be regarded as the author's point of view.

3.1 Sample JI Project: Conservation and Economic Forestry Plantations

Thailand is facing a serious problem preserving its remaining forest areas. Over the last two decades, forest cover has declined from more than 40 percent to less than 30 percent of the country's total land area. Two forest types are distinguished in the country: conservation forests and economic forests. In conservation forests, comprised of national parks, wildlife sanctuaries, and watershed areas, economic activity is prohibited. In economic forests, a variety of economic activities may take place with permission from the government.

As of 1994, the total area for conservation forests was about 7.6 million hectares,[2] while economic forests comprised about 12.8 million hectares. However, millions of people live in and exploit areas designated as conservation forests, which contributes to forest degradation. Despite the logging ban enacted in 1989, deforestation continues, although at a reduced rate, which aggravates soil fertility problems, water shortages, flooding, and landslides. The government's new forest policy intends to increase forest area to 40 percent of the total

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[1]Thanks are due to Dr. Sopin Tongpan and Mr. Matthew Markopoulous for providing useful information.
[2] Of total conservation forest area, 2.7 million hectares are national forest, 2.6 million hectares are wildlife sanctuaries, and the remaining 2.3 million hectares are watershed areas.

country area, of which 25 percent is designated conservation forest and 15 percent is economic forest. It is obvious, however, that the national target of 40 percent forest cover will only be met through extensive reforestation.

The Thai government has initiated the "Reforestation Campaign," an on-going project to rectify the problem of deforestation. The target is to reforest 0.80 million hectares overall in 1345 degraded conservation forest areas. The Reforestation Campaign is designed for voluntary participation by the Thai people and all friends of Thailand to pay tribute to the Golden Jubilee of His Majesty the King's Ascension to the Throne, and commenced on June 9, 1994, which is the 50th Anniversary of His Majesty the King's Ascension to the Throne, and will end on June 9, 1996. The government's specific targets are to reforest 0.22 million hectares of deforested land in 1994, 0.26 million hectares in 1995, and another 0.32 million hectares in 1996. The reforestation will be carried out in uninhabited areas using a mixture of tree species, with an emphasis on indigenous species. After reforestation, the project areas will be conserved and closed to commercial exploitation, and villagers will not be allowed to encroach upon the land. Participants may volunteer to carry out the forest development tasks (forest planting and its two-year upkeep) or contribute financially at the rate of about $US 750 per hectare to the Fund under the Ministry of Finance. As of September 1994, about 0.54 million hectares were reserved by interested participants, but the area actually being reforested at present is much less.

Developing a JI project for the areas designated in the Reforestation Campaign will have many advantages. First, it will be accepted by the Thai government since it conforms to the national development goal. Second, the project can be operated in a large area (over 1000 hectares), which will make it efficient to manage and monitor. In addition, the reforestation will be protected where it occurs in conservation areas. The plantings will not be subject to any commercial harvesting, but will form a long-term carbon sink. Regeneration of the reforested areas is intended to take place naturally. The differing growth rates of the species used in

reforestation will permit the restored areas to form a secondary forest type with a complex structure similar to that of natural forests. Therefore, more carbon will be sequestered on-site than would otherwise be the case with conventional and simpler plantation systems.

Restoring forest cover to previously degraded areas is expected to provide both on-site and off-site positive environmental impacts. In addition to carbon sequestration, benefits will include soil protection, the enhancement of soil nutrient and carbon status, microclimate amelioration, restoration of the local hydrology regime, and biodiversity conservation. By virtue of their close proximity to natural forests, plantings on degraded areas should be progressively colonized by forest flora and fauna as they mature. Non-environmental benefits will accrue through the involvement of local communities in the protection of the project area. The community fund, if established, will supplement incomes and contribute to more sustainable forms of agriculture on existing land in exchange for participation by the community.

3.2 Project Acceptability

Although the Thai government has not set criteria for JI project acceptance, the issue is currently being considered. Because expanding Thailand's forested area is already a government policy, any reforestation project is likely to be accepted. This is especially true for reforestation projects in degraded conservation forest areas. Accordingly, Thailand is committed to forest-management systems based on sustainable principles to conserve existing forests and to restore degraded ones. A JI forestry project within this context would thus be both accepted by and beneficial to Thailand.

The task of reforesting degraded conservation areas is the responsibility of the State Reforestation Division, which is under the Reforestation Office of the Royal Forestry Department. Reforestation in conservation areas normally consists of the Forestry Department

replanting indigenous trees in the area and continuing the upkeep for the next ten years. The Forestry Department will develop a ten-year budget, allocated in two five-year interval periods. The first five years will be budgeted at a higher amount, due to expected higher expenditures, than the remaining years of the project. The ten-year period was set by assuming that the reforested area will be self-sustaining after ten years, and after that period upkeep will be only to protect the area from encroachment by villagers. Such protection is not the responsibility of the State Reforestation Division, but of the local Forestry Department official. It could be expected that the Thai government would require the same conditions for JI reforestation in conservation areas.

Conformation to the development priorities of the country is expected to be the government's primary condition for accepting a JI project. In addition, the government would prefer to support JI projects that do not incur cost to the government and do not require any obligation beyond Thailand's commitments under the Framework Convention on Climate Change.

3.3 Project Assessment

Assessment Institutions

Project assessment is important to track and verify GHG emissions reductions and to ensure proper credit allocation. So far, the Royal Forestry Department is the only institution responsible for reforestation in conservation areas. The Department will assess, for example, growth rates and survival rates of replanted trees. The assessment will ensure that at least 300 trees survive in each 0.16 hectares of the replanted area. This is the specified condition of the Department budget for this activity. At present there is no assessment of GHG sequestration from any forestry project. Because tracking net emissions reductions is important for JI projects, a group of technical experts in this area is necessary to facilitate the assessment of GHG emissions.

The Royal Forestry Department is expected to be in charge of assessment related to the fertility of replanted trees. Technical experts from academic institutions, such as researchers from the Faculty of Forestry at Kasetsart University or from the Office of Environmental Policy and Planning, can be employed to conduct emissions assessments. The investor may also employ a specialist as part of the team. Additional involvement at the national level, such as from the investor's government, and at the international level, such as from a multilateral organization, might be necessary for project credibility and acceptability.

Costs incurred from project assessment can be shared. The cost of forest assessment, which is normally the responsibility of the Royal Forestry Department, will be borne by the Thai government, while the cost of the emissions assessment, which is not included in a normal forestry project, should be borne by the JI investor as part of the project cost.

Data Requirements and Methodology

Sufficient data and information are required to accurately measure real GHG emissions sequestration. Since the reforested sites will be protected, with the plantings forming a long-term carbon sink, a life-cycle approach to measuring carbon dioxide sequestration should be carried out. Key issues here will include types of indigenous species, the life expectancy of the trees, the degree of resilience to environmental stress, and the effects of drought, fire, soil erosion, and human disturbance. A preliminary survey of planting sites will provide data on existing vegetation and soil carbon status, from which baseline carbon levels and emissions can be calculated.

The actual progress, growth, and survival rate of trees on the project site will need to be monitored periodically. With this information, as well as knowledge of the carbon content of each species, carbon dioxide sequestration can be tracked. In addition, periodic assessments

will be made of such subsidiary environmental impacts as biodiversity conservation and sequestration of carbon through improvements in the soil nutrients. The baseline for GHG emissions, which forecasts emissions without the JI project in place, will define the net emissions reduction arising from the project.

Remote sensing and Geographic Information Systems (GIS) will be useful tools for project assessment. Remote sensing and GIS techniques have been employed in Thailand in such fields as geography, population, natural resources, industry, tourism, and pollution. Examples of GIS activities related to forestry include investigating existing forest areas, forest encroachment, indigenous species in a forest area, and forest utilization. The Comprehensive Planning Division of the Department of Town and Central Planning is also using GIS to indicate forest areas for the purpose of regional planning. In the future, more advanced GIS techniques can be transferred to Thailand, facilitated by the JI investor in the interest of a specific JI project.

3.4 Project Long-Term Monitoring

As previously mentioned, the Royal Forestry Department will maintain the replanted conservation area for ten years, leaving the forest in a natural, self-sustaining form. After ten years, the forest will only be monitored to prevent encroachment into the area. Encroachment prevention is the only long-term monitoring that the Forestry Department has implemented so far. Additional long-term mechanisms are needed for the JI forestry project to ensure that carbon sequestration, carbon leakages, and other environmental benefits are not lost or reversed over time.

Long-term monitoring should be the responsibility of an ad hoc committee comprised of representatives from different organizations, including the project participants (the investor and the Royal Forestry Department) and a third party such as the Office of Environmental

Policy and Planning, the Land Development Department, the Agricultural Promotion Department, a non-governmental organization, academic institutions, or foreign auditors.

The government prefers long-term forestry projects, and in this case the project will create long-term carbon sinks. However, if a short-term JI project is followed by a second JI project with the same goal, the carbon credits of the first project should be transferable to the new project, as long as the credits have not yet been used.

It should also be mentioned that protection of the forests at the project site might simply displace encroachment pressure to nearby forest areas (in a process known as carbon dioxide leakages), thereby negating any benefits of the JI project. Accordingly, to prevent any encroachment or "leakage," the long-term protection of the reforested area will become the responsibility of a community situated close to the project site, under the general supervision of the Forestry Department. In return for protection of the project site from encroachment, fire, and other threats, the community will be provided with remuneration either in the form of direct individual payments or, more suitably, a community fund for agricultural improvements, tree planting, or similar activities. Through the provision of such a fund, pressure to encroach on neighboring natural forests should be eased and "leakages" prevented.

3.5 Estimating Project Benefits

The question of credit allocation has to be decided on a case-by-case basis between the parties involved and will be determined by the nature of the joint implementation activity and the level of GHG emissions reduction or sequestration. For example, "benefits" from credit sharing might not be an important factor for the Thai government's acceptance, if the reforestation JI project is located in a degraded conservation area, because the project would conform to the government's forestry policy. On the other hand, credit allocations might be a prime factor for the government when considering a JI project that is not consistent with the

national development priorities. In all circumstances, the Thai government should be consulted, through an ad hoc committee, during the project parties' credit-assignment negotiation. This can be the same committee that performs long-term monitoring.

3.6 External Verification and Project Enforcement

A provision for external verification of carbon dioxide sequestration is undoubtedly a critical aspect of the proposed joint implementation forestry project to ensure net reduction and sustainability of the project. In addition, verification can benefit the project by providing useful information on whether the project needs to be modified. Verification can be done at any time during a project, but it should take place only when required to avoid unnecessary costs.

During the JI pilot period, experts or representatives from multilateral organizations under the auspices of the United Nations could serve as the principal institutional structure responsible for external verification. Should the project fail to meet its carbon dioxide commitments, this same committee could be responsible for handling enforcement, either by withholding credits or by withholding project funds. This group of external reviewers would certainly be accepted by the Thai government. However, if the JI concept is officially accepted, a separate institutional structure for external verification may be needed.

CHAPTER 4: CASE STUDY OF INDIA

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In this paper an attempt is made to understand the existing institutional structures and to suggest appropriate institutional arrangements for monitoring and assessing JI projects. Two kinds of JI projects that allow consideration of the necessary institutional arrangements are afforestation projects for meeting biomass needs and decentralized bioenergy projects for meeting energy needs and providing a substitute to fossil fuels. India has experience with projects in both of these areas, and these JI project objectives are consistent with India's national development goals.

4.1 Sample JI Projects: Afforestation and Bioenergy Projects

Afforestation

As much as 78 million hectares of land have been degraded in India, much of which can be reclaimed through revegetation. Since 1985, India's afforestation project has created 1.5 to 2 million hectares of forest plantations each year, making it the largest afforestation project in the world. Projected environmental and socio-economic benefits from afforestation include increased incomes, protection of biodiversity, sustainable local energy sources, and reduced carbon emissions. Afforestation initiatives in a densely populated country such as India can be targeted to meet growing biomass needs and to realize global benefits by conservation of existing carbon sinks or forests by enhancing carbon in soils and by increasing carbon in long-term storage (such as in structural timber). Afforestation is proposed for degraded forest and village common lands and for degraded farmland no longer suitable for cultivation.

Bioenergy

In India, 557,000 villages require 100 TWH of electricity each year for lighting and shaft power applications. Centralized coal thermal power plants currently account for nearly 70 percent of electricity generation. The goal of bioenergy projects is to replace coal thermal electricity and kerosene with biomass production as a sustainable source of electric power for home use. Small wood-based producer gas systems generating from 10 to 200 KW tend to meet village electricity needs in a sustainable fashion through decentralized bioelectricity systems. Such projects would involve cultivating forests on degraded lands, installing wood gasifiers for electricity, and building biogas digesters to provide biogas fuel for cooking plants for individual villages or village clusters. Table 1 illustrates some of the local and global benefits from afforestation and decentralized bioenergy projects.

4.2 Project Acceptability

Any JI project must deliver significant local as well as global benefits, with the local benefits as the first priority. Many projects, such as reclamation of degraded lands through afforestation and decentralized bioenergy systems, or renewable energy projects such as wind- and solar-generating electricity systems, can foster important local socio-economic gains as well as compatible village- and international-level environmental benefits. Table 1 suggests some of the potential benefits derived from afforestation and bioenergy JI projects.

Table 1: Benefits from Afforestation and Decentralized Bioenergy Projects

	Afforestation Projects	Bioenergy Projects
Environmental Benefits	Soil and water conservation	Reclamation of degraded lands for biomass energy production
	Biodiversity conservation in situ	Substitution of bioelectricity and biomass liquid fuels for fossil fuel sources
	Carbon sequestration in soil and vegetation	Reduction of reliance on kerosene and diesel fuel
	Production of non-timber forest products to meet local needs	Shift from coal thermal electricity
		Net reduction of carbon emissions
Socio-economic Benefits	Production of non-timber forest products to meet local needs	Fulfillment of village energy needs with sustainable energy sources
	Generation of employment opportunities and income for the local community	Creation of self-reliant village energy systems
		Generation of employment opportunities and income for the local community
		Enhancement of local technical skills

Acceptable JI projects need to be conceived and proposed by local communities, non-governmental organizations, educational institutions, or entrepreneurs. Because India does not yet have an independent institutional structure to facilitate this, the Ministry of Environment should convene a committee of non-governmental organizations, climate change experts, economists, and Ministry expert staff to assist local organizations to prepare acceptable projects. The government would actively support projects aimed at augmenting energy supply and biomass production, since a main concern in India today is the growing shortage of forest products and energy resources.

4.3 Project Assessment

Assessment Institutions

All JI project participants must agree on the assessment, methodology, and monitoring of the flow of local and global benefits from JI projects. Parties need to determine which existing government agencies cannot or should not undertake JI project assessment, since some government departments may not have the technical capacity or motivation for rigorous assessments. Table 2 suggests the institutional arrangement for assessing JI projects.

Assessment of afforestation projects should be performed by a national-level project-specific group of forest ecologists and consultants, including representatives from one local and one international non-governmental organization, one representative from the Forestry Department and one from the Environment Ministry, one or two representatives of village-level institutions, and one from the donor agency. Similarly, assessment teams for bioenergy JI initiatives should include a national JI team of bioenergy experts, energy consultants, local and international non-governmental organizations, donor agency representatives, and representatives from village-level institutions.

Another important need is an independent national agency to monitor periodically the short-term performance of JI projects. Such an agency should be largely composed of individuals not involved in project implementation (e.g., technical experts, representatives from national and international non-governmental organizations, professional consultants, nominees of donor agencies, and government and beneficiary representatives), and the monitoring agency should be selected cooperatively by the host government and participating donor agency(s).

India has no such institutions for assessment and short-term monitoring of forestry or bioenergy projects. World Bank-funded projects are usually assessed by an expert team convened by the Bank. Projects supported by bilateral agencies are usually assessed by an external agency from the donor country, and generally some local experts are included in the assessment process.

Data and Methodology Requirements

Data and methodology requirements for JI project assessment differ for the two types of JI projects proposed. For afforestation projects:

- Data requirements include information on the standing carbon in vegetation and soil before project implementation, annual accumulation of carbon in woody biomass and soil, and carbon emissions from soils and end-use products through combustion and decomposition; and
- Methodologies for emission inventory are available but need to be standardized and disseminated. Methodologies are also needed for selecting and assessing baseline emissions and dynamics of GHG flows and for periodic monitoring of changes in stocks and flows of GHGs in vegetation, soil, and products.

Table 2: Three-Tier System for the Assessment of JI Projects

Team	Members	Role
Joint Team or UNDP/UNEP Team	Joint Team Members	Set broad guidelines and assessment and monitoring criteria
	Top experts from donor and recipient countries	Perform an external review or evaluation of the national team assessment
	UNDP/UNEP Team Members	
	Representatives from participating UN-member developed and developing countries, with 50 percent of each	
National JI Team (a separate team for each JI project)	Host country experts in forestry, energy, and relevant social sciences. Members of national and international non-governmental organizations	Prepare detailed guidelines and methodology to assess project team work.
	Nominated representatives of donor and recipient country governments	Undertake direct and periodic assessment of project parameters.
	The National JI Team Leader should have technical expertise	Provide technical guidelines to JI Project Team
JI Project Team	Experts from local educational or research institutions and local non-governmental organizations	Evaluate assessment guidelines and modify as needed to suit local conditions
	Nominees of beneficiaries, such as village representatives	Implement regular and long-term monitoring of most project parameters
	A nominee of the National JI Team	Interact with local communities and with the National JI Team
	The JI Project Team Leader should be a technical expert from a local educational or research institute	

For bioenergy projects:

- Data requirements include information on the current rate of fossil fuel use; the levels of woody biomass production; the stock and flows of wood and carbon in plantation forests; the extent of production and use of bioenergy; and the extent of fossil fuel use, the substitution by bioenergy, and the amount of carbon emissions avoided; and
- Methodologies are needed for estimating current rates of use of electricity (coal thermal), kerosene, and diesel; the emissions from use in the project area; the carbon stock and flows in biomass production process as feedback for energy on an annual basis; and the emissions avoided through substitution of fossil fuel sources.

To date, development projects in India have not been seriously assessed for global climate-change benefits. No assessment methodology has been developed, and very few people in India's development arena are aware of the methodology used by the Intergovernmental Panel on Climate Change or by the Organization for Economic Cooperation and Development. As such, India has made no assessment of the Intergovernmental Panel's methodology for estimating emissions inventory or sequestration potential at national levels. Nor has there been serious discussion or agreement on a baseline for comparison. Institutional capacity building will likely be necessary to develop the skills and staff to undertake the local and global assessment of GHG flows. Technical expertise is widely available within India, but it is dispersed throughout different institutions and not fully engaged in research on climate change issues.

Currently, such JI project assessment mechanisms do not exist and need to be created. Once these mechanisms are established, the cost of assessment must be built into the project as is usually done in World Bank-funded projects. Further, it is especially important to ensure that funds dedicated to monitoring GHG flows are not used for other purposes.

4.4 Project Long-Term Monitoring

In addition to the need for JI project-assessment mechanisms, there is also a need for long-term monitoring mechanisms to follow the stock and flows of GHGs. Carbon accumulation, emissions, and emissions reduction takes place over many years, often long beyond the project-implementation phase, which can be as short as two to five years.

For monitoring forestry projects, a local project team is necessary. Existing local institutions, like a university college or research institution with adequate funding and human and technical capacity, should be assigned the responsibility of regular and long-term project monitoring. A national JI team could undertake monitoring responsibilities for the more difficult project parameters, such as decomposition rates, and could assist and supervise local institutions as needed. This local and national institutional monitoring structure would also work for bioenergy projects. It is important that monitoring of one project – whether forestry or bioenergy – should be independent of the monitoring of subsequent projects. As additional projects are launched, the GHG stock and flow should be accounted for separately to avoid confusion. A national JI team with donor participation could decide how best to address such issues.

4.5 Estimating Project Benefits

Both the donor and recipient parties must share the global benefits of JI projects. The mechanism for sharing benefits must be mutually agreed upon, and the recipient government must be consulted. The affected and benefiting local communities should be also involved in decisions about how project benefits are to be shared. It is important that the people who contribute to the creation of global environmental benefits through their actions -- such as

protecting the forest -- be recognized and compensated as part of the JI project process. The national JI team or a team from the United Nations Development Program or the United Nations Environment Program created to guide and monitor JI projects could be expected to monitor any leakages in the targeted global benefits.

4.6 External Verification and Project Enforcement

Whether verification of GHG emissions reduction by external agencies would be acceptable to all governments is not clear. A joint team of experts from the donor and recipient countries may provide an alternative. This team could verify the flows of GHGs, in particular, the incremental global benefits above and beyond the baseline, and would only monitor and verify the assessments made by full-time project teams.

An alternative to a joint donor/recipient country team might be a team from the United Nations Development Program or United Nations Environment Program, which would be responsible for external verification of JI projects worldwide. Vesting United Nations agencies with power to enforce certain actions where GHG project commitments have not been met are likely to be acceptable to recipient governments in developing countries. Generally, when India receives financial project support from the World Bank or the Asian Development Bank, the Indian government accepts these organizations' periodic review. This is also common with most Overseas Development Association projects. A World Bank-managed agency may not be acceptable to many developing country governments, but there would likely be no serious governmental objection to periodic project review and recommendations by a verification team from the United Nations Development Program or the United Nations Environment Program, or by a national joint team. Another option may be to have some agency, such as Science and

Technology Advisory Panel, with full-time staff members, verify JI project emissions reduction and sequestration.

Most JI projects are likely to be funded by grants and include components with significant local benefits. As such, recipient countries are likely to be more careful in implementing JI projects. It is also likely that project grant funding will be made available in installments based on interim assessment of project progress.

Conclusion

Most economic development projects are currently implemented through government agencies and suffer well-known implementation problems. India is working to incorporate alternative approaches to implementing development projects. For instance, there is general agreement on the need to empower local communities with the responsibility for project monitoring and implementation. There is also increasing consensus on the need for greater reliance on the private sector for its success in fostering improved project efficiency.

For JI forestry initiatives, India needs to create strong local institutions with adequate financial, administrative, and political commitment for project decision-making, implementation, and enforcement. This would require village-level forest committees with adequate political powers and a district level committee (for several hundred villages) to assist the village-level committees with funding, technology, and materials. With a long-term institutional perspective and commitment, JI afforestation projects are likely to succeed. The same holds true for decentralized bioenergy JI projects. As with forestry projects, village-level institutions would be supported by a district-level institution to implement bioenergy projects.

For both forestry and bioenergy projects, local institutions could decide to implement the projects with the help of private enterprise on a turnkey basis. Local non-governmental organizations could have a significant role in organizing the village-level institutions. All funding could be routed through the district and village organizations. Monitoring of the global benefits, particularly GHG stocks and flows, would be done by the project team, the national JI team, and by the international team from the United Nations Development Program or United Nations Environment Program.

CHAPTER 5: CASE STUDY OF CHINA[3]

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Fuelwood is an important source of household energy in rural areas in China. According to the Ministry of Forestry, total sustainable fuelwood supply in 1990 was about 180 million tons. Total fuelwood consumption in that same year, however, was about 310 million tons for household and rural industrial energy use, resulting in over-cutting by about 130 million tons. Such exploitation of fuelwood supplies leads to deforestation and has become a serious problem for forestry development in China. Options for reducing exploitation of fuelwood resources include improving household stove efficiency, creating fuelwood plantations, and supplying coal to rural households. From the point view of mitigating CO_2 emissions, only the first two are reasonable options.

5.1 Sample JI Project: Fuelwood Plantations and Energy-Efficient Household Woodstoves

To meet the increasing demand for household fuel and to relieve the pressures leading to deforestation in China, our proposed project aims to develop cost-effective and environmentally acceptable methods for producing and conserving fuelwood by focusing on improving household stove efficiency and developing sustainable fuelwood supplies.

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[3]We would like to emphasize that because the Chinese government has not agreed to any specific JI project, none has been prepared for discussion as of now. The potential of JI projects remains a subject of discussion in a very small circle of people closely involved in climate change issues within the government. What we present in this paper is based only on our understanding, and does not represent official opinion, although it may match the official policy when it is developed.

The main elements of the proposed five-year project, to be implemented in Hengnan County, are the following:

- establish 20,000 hectares of fuelwood and timber plantations;
- distribute seeds and approximately two million seedlings to individual households for planting on allocated land;
- strengthen the forestry extension system program of technical assistance for collectively and privately controlled land;
- support a field-oriented fuelwood/forestry research program in Hengnan County to identify cost-effective methods of establishing and managing high-yield fuelwood resources;
- initiate mass production of efficient modular wood stoves for cooking in rural households. Stoves will reflect household demand based on income levels. Production capacity will be based on projected demand in Hengnan County;
- strengthen the local forestry and rural energy institutions to bolster their management, coordination, and monitoring capacities; and
- assist in the planning and preparation of the subsequent phase of fuelwood-development and fuelwood-conservation projects in other counties.

The local benefits of the project will accrue from the production of fuelwood (127,000 tons/year) and other forest products, including:

- construction poles, saw logs, agricultural crops, and tree fodder (16,100 tons/year);
- enhanced soil and water conservation through reduced biomass removal; and
- fuelwood savings amounting to 100,000 tons as a result of more efficient stoves in 100,000 households.

The total project cost is estimated at 40 million yuan or $US 4.7 million (at 8.5 RMB yuan per US dollar), of which $US 2.4 million is to be financed from foreign donor funds. The rest will be financed by local funds.

The proposed JI project has not been assessed formally as a GHG-mitigation JI project. It is currently proposed as a rural energy project to prevent deforestation and to help mitigate the pressures of the energy shortage. The existing technical and economic evaluation of the project was conducted by the Energy Research Institute. We suggest, though, that the project be considered a JI project because reduction and sequestration of GHG is expected from the use of more efficient woodstoves and the development of a sustainable fuelwood supply. The total CO_2 emissions reduction will be about 180,000 tons of carbon.

5.2 Project Acceptability

At present there are neither formal JI projects in China nor any official rocedures for their acceptance. However, there are contradictory opinions concerning JI, and many of the related concepts, such as tradable emissions permits, have not been well defined. Nevertheless, we believe that the acceptance procedures for JI projects in China may include the following steps:

- The Chinese government and concerned governments or international organizations will reach bilateral or multilateral agreement on JI projects, including a set of criteria and terms that identifies the scope and the scale of technical or financial support from a developed country or countries;
- JI project proposals collected from different sectors will be evaluated to determine their compliance with the criteria agreed upon for JI projects. One of the criteria could be consistency with the objectives stated in Agenda 21, a document issued by the Chinese Government that lists its top investment priorities in the areas of environmental and economic development. JI projects should be consistent with the national goal of sustainable development; and
- Projects will be formally approved by a government agency authorized by the State Council, such as the State Planning Commission, STEC, the State Science and Technology Commission, or the NEPA. The selected project proposals will be forwarded for discussion to the concerned foreign governments or international organizations.

To date, no government agency has been designated to evaluate and accept JI projects in China. In our opinion, the State Planning Commission is one of the best organizations to oversee this, since it is among the institutions capable of organizing the evaluation and selection of suitable projects. The Commission is a high-level decision-making agency under the State Council and is in charge of policy aggregation for social and economic development. The Commission's Department of Land Use and Regional Development is in charge of national and international environmental issues; other departments are in charge of project planning in different sectors. As yet, however, no JI project has been evaluated, and China's institutional capacity needs strengthening.

The Chinese government would prefer JI projects that are of high priority for economic development but that have encountered difficulty receiving funding from domestic and foreign sources. Many energy efficiency projects, such as industrial boiler renovations, high-efficiency industrial boiler manufacturing, cement production-process improvement, steel production renovation, or small-scale ammonia plant renovation might be appropriate for JI in the short term.

Over the long-term, investment in the increased efficiency of energy technology and production capacity will present important opportunities for JI projects. In the coming 10 or 20 years, newly constructed production infrastructure will comprise an increasing share of China's rapidly expanding economy. Therefore, investment in the increased efficiency of technological improvements, including the introduction of advanced technology from abroad, is important over the long run, not just for meeting national development goals, but also in response to concerns about global climate change.

As the Chinese economy moves from a centrally planned system to a market system, the private sector will play an increasingly important role in economic development. As a consequence, opportunity for private sector projects will increase. There already exist two kinds of private sector enterprises in China: those owned by private investors, including foreign investors, and those under collective ownership. At present, collectives produce more than 30 percent of China's total industrial output, while nearly all of the agricultural capacity is privately owned. Once the Chinese government accepts the concept of JI, the private sector will become involved and its projects will be assessed and followed by the same institutions as public sector projects. Priority on JI projects probably will not be given to the private sector, however. Despite current economic reform in China, the government still plays an important role in economic development. In the long run, no important economic activity can be successfully developed without support from the government.

5.3 Project Assessment

Assessment Institutions

Many public institutions in China, including academic research institutes, universities, and governmental agencies, are involved in studies on GHG reduction and sequestration, with respect to both policy and technical matters. Local experts are well versed in climate change and related issues. Comprehensive studies that address GHG-reduction measures in China have been carried out in collaboration with the World Bank, the Asian Development Bank, and other foreign institutions. However, except for the chlorofluorocarbon-replacement project conducted in collaboration with the United States Environmental Protection Agency, no specific policy has been formally adopted and put into practice to reduce or sequester GHGs. The current assessment mechanism for JI is not adequate due to a lack of experience with JI,

an absence of institutions assigned to conduct project assessment, and the lack of guidelines for data requirements and methodology.

A first step to remedy this would be the selection of a governmental agency to take responsibility for JI project assessment and policy. This agency could act as coordinator, organizer, and official approval body for the assessment reports. The assessment could be delegated to other institutions that have experience and knowledge of assessing the reduction or sequestration of GHG emissions. Some of the institutions working in the Chinese Climate Change Working Groups may be appropriate candidates for this job, especially research institutes operating under governmental agencies. Because GHG reduction can be achieved by measures undertaken in a variety of fields, such as reforestation, energy substitution, and energy conservation, several institutions may be needed to address the mitigation issue in different sectors. The proposed fuelwood project should be evaluated by a land use-assessment group, for instance.

No institution in China currently addresses these issues central to JI projects. There are, however, governmental agencies and research institutes who could be appropriate. For example, the Energy Research Institute of the State Planning Commission could be responsible for energy-related projects. The Chinese Academy of Agricultural Sciences could oversee agricultural activities. The Chinese Academy of Environmental Sciences could supervise environmental control projects. A high-level governmental agency, such as the State Planning Commission, would coordinate the JI activities, and the lower level organizations would conduct the technical aspects of JI including evaluation, monitoring both short- and long-term results, and calculating emissions of greenhouse gases.

Few non-governmental organizations exist in China, and those that do exist are not influential in the policy-making process. Because JI projects are based on an agreement between country governments, non-governmental organizations and private organizations can contribute, at most, technical assistance. We also expect that the Chinese government will not permit an international organization to play a primary role in a domestic activity.

Data Requirements and Methodology

The results of JI projects will be measured in terms of GHG emissions reduction. In the proposed fuelwood project, the data on greenhouse gas emissions can be measured in terms of energy savings and increased wood storage. Capacity construction projects, on the other hand, present a problem for obtaining real and measurable results. Indirect effects from these projects can be estimated or calculated because capacity construction will help policy improvement or the realization of technical projects that will lead to the direct reduction of greenhouse gas emissions.

No JI projects currently exist in China; nor are there standardized assessment methodologies or institutions with experience in the assessment of GHG-reduction projects. For future assessment of JI projects, guidelines on data collection, criteria, and methodology should be developed and localized to fit the specific conditions of the host country. In addition, both the financial evaluation of projects and the evaluation of emissions reductions need to be standardized. Because projects often have multiple goals and benefits, JI projects need to carefully clarify the components that respond to the JI project goal of GHG mitigation. The criteria for selecting the most effective project should be considered as well. If the concept of least cost per unit emission decrease is considered, the question will be how the national

priority or preference is taken into consideration, since multiple criteria exist. These are only some of the issues that need to be considered.

Identifying the baseline for future GHG emissions is one of the key issues for JI projects and should not be difficult to develop. The reduction in GHG emissions will be subtracted from the host country's future baseline of GHG emissions. Obtaining a baseline calculation for the proposed JI project may be more complex. If we assume that energy service to households will not improve, stove efficiency improvements will lead to a direct savings of firewood or other biomass. At the same time, the afforestation component will increase carbon sequestration. The GHG baseline will thus be determined by the reduced level of biomass consumption and associated carbon emissions. This must be added to the effect of deforestation, which decreases the capacity of carbon sequestration by an increasing annual rate.

China has not yet developed or announced an official national baseline for its total future GHG emissions, but the government strongly advocates that emissions permits be determined based on GHG emissions per capita. At present, China is the third largest emitter of GHGs in the world, and emissions are expected to increase in the future. According to World Bank projections and the State Planning Commission joint study group, total energy use in China by 2020 will be about 3 billion tons of carbon equivalent. Even then, China will remain among the lowest emitters in terms of emissions per capita. The national baseline for future GHG emissions is a sensitive subject for JI, and we suppose its development will occur over a long period of time.

Who pays the cost of JI project assessment depends on the JI agreement between the host government and the counterpart government(s). It is supposed that the assessment costs

of selected and approved projects will be paid for by the counterpart country as part of the cost of the project. One alternative is to have the Global Environment Facility pay the assessment costs for developing countries through the United Nations Development Program's technical assistance program. However, before JI comes into practice, a Priorities List or Country Program should be developed in accordance with the Montreal Protocol. The United Nations Development Program would be a good agency to organize and finance this task.

5.4 Project Long-Term Monitoring

Based on the Conference of Parties' criteria that "joint implementation activities should, where appropriate, be accompanied by measures to ensure their long-term environmental benefits," a monitoring mechanism and institution should be established. In the proposed project, the real and measurable results will be found in the improvements to tree plantations and stove efficiencies. At present, the local forestry-management station and rural energy office are assigned to monitor the results of the project's implementation. The problem is that there is neither an existing institution nor a mechanism for long-term monitoring.

An example of the need for long-term monitoring is the assumption in the proposed project that social conditions will not change much over time. No one can guarantee that the social and economic conditions will not change over the long term and that the designated target of the proposed project will not be greatly influenced. In a previous fuelwood plantation project the objective was to supply fuelwood to rural households. Several years after its implementation, farmers shifted from firewood to coal for energy, because the tree plantation improved the quality of land (due to afforestation) and provided the local people with the possibility of developing fruit production. The fruit production, in turn, significantly helped the local economy, so that farmers could afford to buy coal, which is more convenient than

firewood. If the project had been designed as a GHG-mitigation project, long-term baselines would have had to be recalculated.

The organization responsible for long-term monitoring should have sufficient institutional capacity. An existing agency, such the State Planning Commission, State Science and Technology Commission, or the Ministry of Finance, could be assigned to the task at the national level. We do not think, however, that the Chinese government will create a high-level agency specifically for monitoring JI projects, but if the JI activity involves sufficient money and technology transfer, it will be possible to create a new organization or a new branch under an existing governmental organization. In this case, the newly created or designated organization will probably administer most of the issues related to JI projects.

In addition to a central government organization that is assigned or created to implement JI projects, local governments should be involved to ensure the results of JI projects. Technical monitoring could be delegated to local institutions. A high-level organization should be selected or created to supervise and coordinate long-term monitoring.

5.5 Estimating Project Benefits

Because the Chinese government has not acknowledged specific JI mechanisms for project assessment and implementation, estimating JI project benefits is a difficult issue to address. Whether tradable permits or credits will be accepted by the Chinese government is unclear. Where the credits are accepted, they will be assigned based on government policy and defined in agreements between the Chinese government and the project's foreign counterparts. We expect that any JI project between the Chinese and a foreign party will necessarily involve participation of the Chinese government.

Any proposed JI project should also include analysis of possible GHG "leakages." Most likely, no specific governmental institution will be assigned to track GHG emissions that exceed agreed levels, but we expect that the Chinese government will maintain the right to verify the reliability of information on leakages reported by any institution.

5.6 External Verification and Project Enforcement

Verification institutions that are officially appointed by the counterpart government or by authorized international organizations will probably be accepted by the host governments of most developing countries. A formal mechanism or institutional structure, consisting of both international and domestic experts, should be set up for external verification. The mechanism and methodology of verification should be discussed and agreed upon by all the involved parties and approved by the host government.

In general, we do not expect the Chinese government to react positively toward joint verification with external participants. However, cooperation with international organizations on the subject is possible with, for example, the United Nations agencies. The external review process for the ozone-depleting substances phase-out program, which already exists under the Montreal Protocol, can be considered a precedent for JI projects.

It is our understanding that even a well-designed project may not achieve its expected target, and the JI projects will be no exception in this respect. If a JI project is approved by the host government, the host government is obliged to ensure its implementation. If commitments are not met because local parties have not performed their duties, the host government should enforce the implementation of the project. However, if commitments are not met because of poor project design or other unexpected problems, enforcement will be very difficult.