

EC Environment and Climate Research Programme
(1994-1998): Research Theme 4
Human Dimensions of Climate Change

Contract No: ENV4-CT96-0210

**ACCOUNTING AND ACCREDITATION
OF
ACTIVITIES IMPLEMENTED JOINTLY**

EXECUTIVE SUMMARY

March 1999

Key words: Joint implementation, Activities Implemented Jointly, emissions trading, UN Framework Conference on Climate Change, Kyoto Protocol, greenhouse gases.

Reporting Period: 1st June 1996 – 31st January 1999

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Executive Summary

I. Objectives

The principal objective of this study was to examine the concept of joint implementation (JI) as an institutional instrument relevant to the fair and efficient abatement of greenhouse gas emissions and sulphur dioxide emissions.

During the course of the study it became apparent that interest in the use of JI in sulphur abatement had waned in the policy arena. By contrast, the period of study coincided with extensive and significant developments in the use of JI in climate change policy. In particular, a variety of JI-type instruments were established under the Kyoto Protocol in December 1997. Consequently, the bulk of the work carried out under this study has been concerned with JI in the context of greenhouse gas emission reductions. Specifically, this study set out:

- to gather information and data relating to specific "pilot phase" JI projects set up between Northern and Eastern European countries under the United Nations Framework Convention on Climate Change (FCCC);
- to carry out a broad-based analysis of the data collected from these pilot projects under the following criteria: in economic terms, in terms of risk and uncertainty, in terms of distributional and institutional consequences, and including ethical considerations;
- to examine - on the basis of this analysis - the methodological difficulties of *accounting* for greenhouse gas emission reductions - with particular attention to the counterfactual¹ context;
- to examine - again, with reference to case studies - the complexities involved in *assigning credit* to "donor" nations for investments carried out in "host" nations, in the context of international commitments to reduce greenhouse gas emissions;
- to explore the economic, environmental, social, and ethical impacts of joint implementation projects; and
- to report on these examinations - carefully and with due reference to the broad range of evaluation criteria - with a view to informing European Union policy and national policies within the European Union (EU) in relation to commitments under the FCCC.

¹ Counterfactuality enters the discussion because of the need for a "baseline" against which to assess the emissions reductions and costs of a joint implementation project. This baseline is "counterfactual" because it attempts to describe what would have happened if the joint implementation project had not been carried out – a situation which in fact will never occur.

II. Methodology

This study has approached the evaluation of JI from a broad perspective, recognising that policy instruments in the international arena are informed by multiple underlying objectives. In the case of JI, these objectives include at least: environmental effectiveness, equity and economic efficiency. Furthermore, it has become clear that different institutional and technical circumstances define different operational forms of JI. Consequently, the approach taken in this study is to develop a holistic evaluation framework in which each operational form of JI is to be evaluated individually against the range of underlying objectives.

The study has collected and collated data on a number of real case-study projects, chosen from amongst certain activities implemented jointly (AIJ) between EU member states (specifically Austria, Denmark and Sweden) and Eastern European economies in transition (specifically the Czech Republic and Estonia).² For the most part, these case studies have been concerned with the conversion of heating boilers from heavy fuel oil or coal to biomass or natural gas. The study has also examined two electricity supply projects (wind farms), one gas-fired cogeneration project, and one demand-side efficiency project in the heat sector.

The study has defined four “critical accounting variables” which inform an evaluation of the environmental effectiveness and the economic efficiency of a JI investment. These variables are:

1. the total emissions reduction achieved by the JI project over its lifetime;
2. the specific emissions reduction achieved by the project per unit of energy output;
3. the incremental cost of the abatement option over and above the cost of the baseline; and
4. the specific incremental cost of the abatement (per unit of emissions reduction).

Values of these variables are calculated for each case study project by comparing the JI project against an appropriate baseline. It is a primary contention of this study that the counterfactual nature of baselines introduces an element of irreducible uncertainty into these accounting procedures. Rather than pre-selecting a single baseline for the case study calculations, therefore, each project is assessed against a range of credible baselines. Consequently, a range of values for each of the critical accounting variables is presented for each case study project (see Section III below).

This study also assesses the impacts of three other kinds of uncertainty in the calculation of critical variables: project performance (including the impact of changing energy demand on the success of the project), measurement uncertainty, and uncertainty in background factors such as fuel price projections. The study carries out sensitivity

² Not all of these projects have been classified as Activities Implemented Jointly (AIJ) under the FCCC pilot phase. However, all of them involve investment by a donor country in emissions reduction in a host country, and are in principle of the same form as that defined by the AIJ pilot phase.

analyses and a stochastic simulation exercise to determine the impact of these uncertainties on the evaluation of critical accounting variables. Sensitivity analyses are also used to estimate the variation associated with the use of different discounting practices.

One of the contentions of this study is that the evaluation of JI must take adequate account of the broad environmental and social aspects of JI investments, as well as their success in reducing greenhouse gas emissions. The importance of accounting for non-GHG-related environmental impacts follows from the underlying objective of environmental effectiveness, while the importance of accounting for social impacts arises mainly from considerations of equity. This study sets out a methodological framework based in part on the EC's Environmental Impact Assessment Directive (35/85/337). This methodology is then used to assess the environmental and social impacts of selected case study projects.

The evaluation of the case study projects provides the basis for a broad conceptual examination of JI as an institutional instrument relevant to the fair and efficient abatement of greenhouse gas emissions. This examination has three main components.

Firstly, the study introduces the idea of operational frameworks for JI which combine streamlined assessment procedures (such as the standardisation of baselines) with certain institutional safeguards (such as partial crediting and lifetime limiting). Such frameworks are designed on the one hand to simplify operating procedures (and thus reduce transaction costs) and on the other hand to protect the environmental objectives of the Convention.

Next the study examines the implications of the crediting regimes introduced in the Kyoto Protocol, highlighting in particular the impacts of "early crediting" or "banking" of credits allowed under the Clean Development Mechanism. It also analyses the potential of partial crediting as a mechanism for managing uncertainty and minimising environmental risk.

Finally, the study sets out the basis for a holistic evaluation of JI mechanisms. This holistic evaluation proceeds by defining specific operational forms of JI. Each such operational form is defined by specifying the actors involved in the trade, the status of those actors under the Convention, the accounting procedures employed in assessing the projects, and the degree of stringency or leniency in the institutional framework. The study then illustrates the use of decision analysis methods to evaluate these operational forms against the underlying objectives of environmental effectiveness, equity and economic efficiency.

At the time at which this study was conceived, no mechanisms existed for transferring credit between host and donor as a result of JI investments. In December 1997, mid-way through the study, the Kyoto Protocol established two specific project-level mechanisms through which donor countries could be accredited for emissions reduction investments in host countries: Article 6 project-level JI in which both donor and host countries belong

to Annex I of the FCCC; and the Clean Development Mechanism defined under Article 12, in which the host is non-Annex I. Strictly speaking, the case studies examined in this study fall under Article 6 JI, since the host countries are Annex I. However, the original intention of this study was to carry out a rather broad evaluation of JI-type mechanisms. Consequently, the study has included both Article 6 JI and the Clean Development Mechanism in its evaluation.

III. Main Results

The study evaluated five boiler conversion projects in Estonia (Aardla-Tartu, Haabneeme, Türi, Valga and Võru), four boiler conversion projects in the Czech Republic (Kardašova Recice, Mratokin, Staré Mesto and Velesin), two combined building energy efficiency projects in Estonia (at Mustamäe), a cogeneration project in the Czech Republic (Decín) and two electricity supply projects, one in the Czech Republic (Jeseník) and the other in Latvia (Lettland).³ A range of possible baselines was established for each project, and the critical accounting variables (emissions reductions, specific emissions reductions, incremental costs and specific incremental costs) were evaluated for each project against each baseline.

Evaluation of Critical Accounting Variables

Calculated values for emission reductions and specific emission reductions from the case study projects varied considerably according to the different assumptions adopted in the accounting procedures. Typically, low estimates are less than 50% of the high estimates. In particular, the variability associated with different baseline assumptions was dramatic. There are generally several reasonable options for baseline choice for any given JI project, involving the use of different technologies and fuels; differences in the timing of changes in such factors; and different assumptions about the project lifetime. Figure S.1 illustrates this variability for selected case study projects.

³ Although the Lettland project is in fact located in Latvia, it was evaluated for the purposes of this study as though it were operating in the Czech Republic.

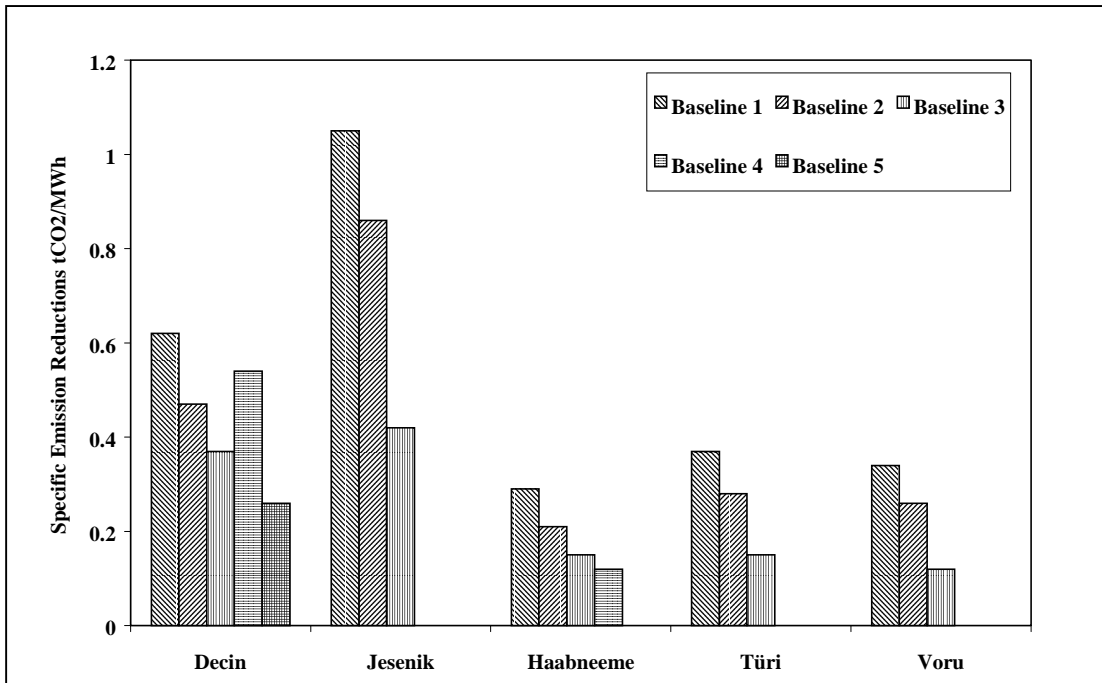


Figure S.1 – Specific Emission Reductions for Selected Case Study Projects (tonnes of carbon dioxide equivalent per megawatt hour of output)

In addition to the counterfactual uncertainty associated with the choice of baseline, a number of other factors can influence the values of critical accounting variables. These factors include the technical performance of the project (including the impact of changing local demand on the output of the plant), uncertainty in engineering measurement parameters, uncertainty in background factors (such as fuel prices) and variability in discounting procedures or discount rates.

An assessment of the five Estonian boiler conversion projects shows that the uncertainty from all sources in evaluating emissions reductions is $\pm 115\%$. The study has also shown that these uncertainties can be reduced to around $\pm 80\%$ by using monitoring-based data in place of feasibility study data to calculate the emission reductions, and the recommendation to use measured data when assigning emission reduction credits is a key policy conclusion from this work.

Standardisation plus Safeguards – Towards the Management of Uncertainty

In view of the significant uncertainties associated with JI project evaluation, and the incentives for gaming which these uncertainties present, this study has proposed an approach to the operationalisation of JI which combines the use of standardised assessment procedures with the introduction of specific institutional safeguards.

Four standardised baseline types have been formulated. Type 1 baselines make simple assumptions about the plant which has been replaced and the separability of the JI project from the rest of the energy system; but compensates for these simplistic assumptions by

using a short crediting life. Type 2 baselines also assume separability but include more complex assumptions about the timing of replacement plant over a longer crediting life. Type 3 baselines adopt an average mix for situations where the replaced plant is difficult to define explicitly, and again incorporate the possibility of revising this mix to account for unforeseen changes in technology over time. Type 4 baselines are constructed from an average of other baseline types.

The use of such standardisation procedures has the advantage of reducing the potential for gaming by JI participants, but does not altogether eliminate the risk of compromising the environmental objectives of the Convention. To reduce that risk, a number of possible institutional safeguards have been suggested. These include:

- the use of project approval criteria and verification procedures
- a complementarity cap
- baseline revision
- limited crediting lifetimes
- the use of operating data (rather than feasibility data) for crediting purposes
- discounting emission reductions
- verification of existence, operation and output
- partial or discounted crediting
- environmental and social assessment

Typically, it has been argued, the operational form of a particular JI situation should be defined by a “package” of measures which includes a combination of standardised assessment and institutional safeguards. Each such package (and each such situation) is likely to perform differently with respect to environmental effectiveness, equity and economic efficiency, and must be evaluated separately to determine their success or failure in meeting these objectives.

Environmental and Social Assessment of Case Study Projects

It has proved difficult to make a comprehensive retrospective assessment of the selected case study projects, partly because of problems in attaining sufficient data. Nevertheless, it is estimated that there has been no significant change between the reference and the project in many impact categories. These categories include water, land use, soil, visual impact, noise, forestry, energy consumption and socio-economic aspects.

The main benefits from the selected projects include: significant reductions in sulphur dioxide and nitrogen oxide emissions – by at least an order of magnitude in certain project types; and reductions in particulate emissions for conversions from coal to gas or biomass. The main disbenefits include: some increases in carbon monoxide emissions for conversions from oil to biomass; increases in waste production for oil or gas conversions to biomass; increases in transport requirements for some biomass conversions.

In some cases, it has been clear that environmental or social benefits which are deemed secondary in terms of the aims of the FCCC have in fact been the principal motivation for local involvement in the projects.

Accreditation of JI Projects

This study has identified a number of important considerations in defining appropriate crediting regimes for JI projects. In the first place, it has become clear that credits for JI projects should be awarded on the basis of annually monitored operating data not feasibility data. *Ex post* crediting of this kind can substantially reduce the uncertainty associated with emissions reductions from JI projects. Next, it has become clear that partial crediting (or some form of discounting of credits) offers several advantages in operationalising JI. Specifically, partial crediting could be used:

- to compensate for counterfactual uncertainty;
- to reduce the leeway for gaming by JI participants;
- to penalise donors for negative local social and environmental effects;
- to provide an incentive for greater domestic action; and
- to compensate for interim period banking, or early crediting (see below).

Credit-sharing between the donor and host may be considered for two reasons: firstly, to reward the host if it decides to contribute to the investment costs of the JI project; and secondly, to compensate the host in the event of the JI project causing unforeseen negative local social and environmental effects.

Early crediting (or interim period banking), as currently allowed under Article 12 of the Kyoto Protocol, creates a disincentive to take domestic action or to engage in Article 6 JI, effectively relaxes donor country targets, and leads to emissions leakage which risks compromising the environmental objectives of the Convention. Extending early crediting to A6JI would not only exacerbate this leakage effect but would also create problems of distributional equity. A quantitative analysis reveals that partial crediting (using a crediting fraction between 40% and 70%) can be used to counteract the deleterious effect of interim period banking.

Holistic Evaluation of JI

The principal justification for the use of “flexibility mechanism” in global climate policy has been the argument from economic efficiency. However, it is clear that there are other crucial objectives informing policy under the FCCC. First and foremost, the Convention operates under an over-arching environmental objective; next, it requires clear commitments to inter- and intra-generational equity; additional objectives concern, for example, the diffusion of technology and the development of institutional capacity in less-developed countries. It might legitimately be argued that policy objectives from

outside the Convention are also influencing policy within the Convention. So, for example, some of the attraction for flexibility mechanisms like JI arises from ideological commitments to trade liberalisation.

It is typical of multi-objective contexts, such as those exemplified by JI, that conflicts arise between different objectives. The analysis carried out in this study confirms that the existence of underlying conflicts has dogged both the development of JI and the implementation of climate policy from the earliest days. This study has argued that these conflicts are unlikely to be resolved except through explicit identification of the tradeoffs involved in individual situations.

This study has shown further that different operational forms of JI perform differently with respect to the underlying objectives. Some operational forms seem to offer clear advantages in terms of economic efficiency, and appear more attractive to market investors; yet these operational forms often risk compromising the environmental objectives of the Convention and may also have unfavourable implications in terms of equity. Other operational forms ensure greater security in terms of environmental targets, but offer fewer attractions to market investors, and risk losing the advantage of economic efficiency. Typically, policy-makers find themselves in the situation of having to trade-off advantages in relation to one objective against advantages in relation to another. This study has illustrated the use of decision analysis techniques in performing this task.

IV. Scientific Interest and Novelty

This study has carried out extensive economic, technical, environmental and social evaluations of pilot-phase JI projects between donors from Western Europe, and hosts in Central and Eastern Europe. Site visits have been undertaken to collect and to verify good quality operating data for the selected projects. This data has been used to calculate the values of four critical accounting variables for each of the case studies against a range of credible baselines. Scenario analysis and stochastic simulation techniques have been used to estimate the impact of uncertainty on these variables. In addition, the study has performed broad environmental and social assessments of the case study projects. It is believed that this evaluation represents the most detailed and wide-ranging assessment anywhere of bilateral energy-sector investment projects carried out during the FCCC's AIJ "pilot-phase".

This study has carried out a thorough analysis of the crediting arrangements established under the Kyoto Protocol. It has drawn attention in particular to the implications of the potential for "interim period banking" of emission reduction credits under the Clean Development Mechanism. This analysis represents the first quantitative assessment of the environmental cost of introducing this degree of flexibility into global climate policy.

This study has taken a unique approach to the operationalisation and to the evaluation of JI. The work has highlighted that JI operates under multiple objectives and is defined by

a variety of operating parameters. It has shown that each operational form of JI offers different incentives for gaming, and performs very differently in terms of underlying objectives such as environmental effectiveness, equity and economic efficiency. This study is unique in illustrating how decision analysis techniques could be applied to the evaluation of different operational forms of JI. In addressing the management of irreducible uncertainty in the evaluation of emission reductions and costs, this study has proposed an innovative operational framework in which standardised procedures are combined with institutional safeguards.

V. Policy Relevance

The concept of JI has become increasingly important in the international policy arena in the time since this project began. It will continue to be important in the approach to (and in the wake of) the 6th Conference of the Parties to the FCCC in the year 2000. This Conference must define the modalities for operationalising JI, and bears the burden of ensuring that the institutional procedures which are set in place do not compromise the environmental objectives of the Convention. The lessons learned from this study are central to that task.

The language associated with the use of “flexibility mechanisms” has changed several times during the course of this study. Early terminology referring to JI and AIJ has given way to the terminology of emissions trading, transfer of emission reduction credits, and the Clean Development Mechanism. These kinds of linguistic shifts are confusing in policy terms. This study has shown that the new terminology in fact refers to mechanisms which bear many of the same characteristics referred to by earlier terminology. It has argued that the linguistic shifts are themselves evidence of the existence of contentious and still unresolved features of the underlying mechanisms. The names may have changed but the problems remain.

This study has argued that JI-type mechanisms are all haunted by the existence of an irreducible epistemological uncertainty. Evaluating how well abatement investments perform in environmental and economic terms requires an evaluation of what would have happened in the absence of the investment – ie it requires a counterfactual baseline. It may be possible to establish more or less credible or defensible hypotheses about this counterfactual context; but it is epistemologically impossible to verify these hypotheses, even in retrospect; nor is the situation necessarily improved by employing complex models or increasingly data intensive assessment procedures.

This situation requires careful policy management. The approach advocated in this study is three-fold. Firstly, there is a need to identify those situations in which the counterfactual nature of the evaluation process offers opportunities for gaming or cheating by participants in the process. These opportunities will vary according to the operational context. Next, the evaluation process can in certain circumstances be aided by the adoption of streamlined or standardised assessment procedures. Finally, an appropriate balance between underlying objectives can be achieved by combining these

standardised procedures with certain institutional safeguards. These institutional safeguards must be established through policy intervention in the “market” for JI, and include:

- the establishment of appropriate approval criteria for JI investments;
- the use of common accounting and assessment methodologies;
- the requirement for broader environmental and social assessment of JI projects;
- limitations on the crediting life;
- the use of partial or discounted credits; and
- appropriate verification and audit procedures.

This study has carried out a thorough examination of the crediting regimes implied by the Kyoto Protocol has highlighted the dangers of allowing early crediting under the Clean Development Mechanism, and suggests that an extension of interim period banking to Article 6 JI should not be countenanced.

Finally, this study presents a clear warning to policy-makers against hard and fast generalisations about the efficiency of flexibility mechanisms. The seductive premise that JI represents an economically-efficient means of achieving an environmental goal is not sustained by a closer examination of the philosophical, technical, social, economic and institutional complexity involved. Although this study set out to evaluate JI as a fair and efficient instrument for abating greenhouse gas emissions, it has become clear that no such overarching evaluation is possible: *each combination of institutional procedures in each situation must be assessed on its own individual merits against the range of underlying objectives.*

VI. Collaborations

There have been numerous opportunities for collaboration during the course of this study. Specific initiatives include the following:

- collaboration with Dr Martin Wietschel at Karlsruhe University on the methodological aspects of establishing a complex energy systems model for baseline construction;
- collaboration with Dr J. Spitz at VUPEK on the Czech EFOM model;
- contribution to the Conference on Science for a Sustainable Society in Roskilde, Denmark, Oct 1997;
- contribution to a workshop on AIJ in Tashkent organised by the United Nations Environment Programme, November 1997;
- contribution to the European Society for Ecological Economics Conference in Geneva, March 1998;
- contribution to expert meeting in Callantssoog, Netherlands, May 1998 on Dealing with Carbon Credits after Kyoto;

- contribution to AWMA 2nd International Speciality Conference, “Global climate change: science, policy and mitigation/adaptation strategies”, Washington DC, October 1998.
- invited participant in the ENRICH Programme Knowledge Database Meeting on “Flexible Mechanisms and Climate Change Policy in Eastern European Countries: Experience and Technology response from EC research”, IIASA Laxenburg, Austria, December 1998.
- invited participant at the workshop on “Baselines for the CDM”, Tokyo, February 1999.
- participation in the concluding workshop of the DGXII project “To Enhance Policy-Making Capacity under the FCCC and the Kyoto Protocol”, FIELD, London, March 1999.

VII. List of Publications

Contributions in books

- Bailey, P. and T. Jackson (1999) Joint Implementation for Controlling Sulphur in Europe and Possible Lessons for Carbon Dioxide. in Skea, J., and Sorrell, S., (eds) *Pollution for Sale: Emissions Trading and Joint Implementation*, Edward Elgar, Aldershot.
- Begg, K., and S. Parkinson (1999) Contributing authors to Chapters 3 and 5 in Dixon, R., (ed) *Lessons from the AIJ Pilot Phase*, in preparation.

Articles in Scientific Journals

- Jackson, T., Begg, K. and Parkinson, S. D. (1998). The language of flexibility and the flexibility of language. *International Journal of Environment and Pollution*, vol 10 (3/4), Special issue on EU climate policy: the European Commission policy/research interface for Kyoto & beyond.
- Jackson, T. and Bailey, P. (1997). Transboundary Initiatives for controlling Sulphur in Europe and Possible Lessons for CO₂, *International Journal on Environment and Pollution*, vol 8, Nos 1/2.
- Parkinson S.D., Begg K.G., Jackson, T. 1999. Crediting for Joint Implementation under the Kyoto Protocol: Does 'Interim Period Banking' help or hinder GHG emissions reduction? *Energy Policy*, in press.

Other

- Begg, K. G. (1997). Integrating Environmental and Sociological Considerations into Activities Implemented Jointly under the FCCC, UNEP Workshop on AIJ held in Tashkent , Uzbekhistan, Nov 17-19 1997

- Begg K., S. Parkinson, T. Jackson, P-E. Morthorst and P. Bailey (1998) Accounting and Accreditation of Joint Implementation Under the Kyoto Protocol. Presented at 'AWMA second international speciality conference - Global climate change: science, policy and mitigation/adaptation strategies', Washington DC, USA. October 13-15th.
- Begg, K., S. Parkinson, T. Jackson, P-E. Morthorst, and P. Bailey, (1999) Overall Issues for Accounting for the Emissions Reductions of JI Projects, paper presented at a workshop on "Baselines for the CDM", Tokyo, Japan, February 1999.
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- Parkinson, S., Begg, K., Bailey, P., and Jackson, T., (1998) Accounting and Accreditation of Activities Implemented Jointly, paper presented at second *European Society for Ecological Economics* conference, Geneva, March 1998.
- Parkinson, S., 1998, An exploration of possible crediting regimes for the Clean Development Mechanism, presented at the workshop '*Dealing with Carbon Credits after Kyoto*', Callantsoog, The Netherlands, 28-29 May, 1998.

VIII. Other Information/Activities

As a result of work carried out under this project, members of the project team have subsequently been contracted to carry out a study of the implications of the Clean Development Mechanism for the UK Department for International Development.

IX. Other Observations

A key part of our approach since December 1997 has been to relate the analysis directly to the outcome of the Kyoto Protocol. Lessons from this project are directly relevant to on-going deliberations about flexibility instruments under the FCCC.