

**Energy, Environment
and Development
Programme of the
Stockholm Environment
Institute**

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Cooperation, SAREC**

Energy, Environment and Development Programme of the Stockholm Environment Institute

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Sida Evaluation 97/37

**Department for Research
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Acronyms

Acronyms	Description
AFREPREN	African Energy Policy Research Network (HQ: Nairobi, Kenya)
CTH	Chalmers Institute of Technology
EEDP	Energy, Environment & Development Programme
DoE	Department of Energy (various countries)
Field Projects	Sida/EEDP Supported Implementing Projects in Africa
GEF	Global Environment Facility
GERA	Gender and Economic Reforms in Africa
IRA	Institute for Resource Assessment (University of Dar es Salaam, Tanzania)
KTH	Kungl Tekniska Högskolan (Royal Institute of Technology)
LCHS	Lund Centre for Habitat Studies
LTH	Lund Institute of Technology
KCJ	Kenya Ceramic Jiko (improved cookstove used primarily in Kenya)
NGO	Non-Governmental Organization
NCSR	National Centre for Scientific Research (Lusaka, Zambia)
PV	Photovoltaics
RED	<i>Renewable Energy for Development</i> , newsletter of EEDP
RET	Renewable Energy Technology
SEI	Stockholm Environment Institute
SADCC	Southern African Development Coordination Conference
Sida	Swedish International Development Authority
TANESCO	Tanzania Electric Supply Company, Limited
UECCO	Urambo Electric Consumers Co-operative Limited
ZESCO	Zimbabwe Electric Supply Company

Executive Summary

Introduction: The Environment and Development Context of EEDP

Work in the area of energy, development and conservation takes place in a difficult environment where many of the central issues of household, community, and regional resource management and human capacity all face a paradox of juxtaposed institutional neglect and widespread importance. This arena of applied science and development, has thus been problematic for university, NGO, and multinational development groups to approach and to sustain, as the record of failed or abandoned projects, unfunded proposals, and inappropriate marriages of technological or economic 'fixes' with pragmatic needs attests.

Despite high hopes and expectations for this sector, far too little in the way of long-term support for integrated research efforts, pilot projects, and training exists. This is true in both in developed and developing nations. The Stockholm Environment Institute (SEI) and the Energy, Environment & Development Program (EEDP) in particular provides one of the few implements in the crucial nexus between academic interests, development support and finance, and development practice in the energy and renewables sector. The uniqueness of the EEDP appears in the flexibility of project formats permissible, the long duration of support possible, and the ability of EEDP to undertake applied projects in *collaboration* with the grant recipients.

A Mandate for Energy, Environment & Development Work: Integrating Research and Development

This evaluation of the EEDP is based on five avenues of project observation: (1) the authors own decade of research and practical field work in energy and development, much of it in East Africa; (2) a 10 day focused study tour in Sweden of SEI itself, and government, industry and academic resources that EEDP can access; (3) a 15 day study tour of EEDP supported field programs in Kenya, Tanzania, Zambia, and Zimbabwe; (4) the review of a multitude of project documents; and, (5) as an informal survey questionnaire administered to over 30 individuals worldwide who either were or are involved in EEDP projects, or work in the general area of energy, environment and development at universities, in private companies, in NGO's, or in government offices. The information gathered from each of these sources was remarkably consistent in the reaction to the value of, and the problems with, the EEDP. This consistency strengthens the conclusions presented below.

The fundamental finding of this review is that the work of EEDP is tremendously important and should be *increased* in scope, human and capital resources over the next several years. Like any review, the focus here is on areas of potential improvement and there are many problems that EEDP must address. At the same time EEDP makes a real contribution to the energy and environment development community, a fact evidenced by:

- 1) The volume of publication requests that EEDP receives for its literature is very high -- for example in 1995 was more than that received by any other SEI program (Rosemarian, 1996);
- 2) The work of EEDP is reasonably well known by scholars and development practitioners in the international community, and within Africa;
- 3) In the majority of cases the project recipients and external reviewers are pleased with not only the individual projects, but with the process and the linkages that developed out of the EEDP/SEI/Sida contacts; and,
- 4) The costs associated with the EEDP are similar to that of other Sida sponsored efforts in Africa, and appear generally reasonable.

At the same time, there are a number of important areas where the EEDP is in need of restructuring and the development of a clearer mission. These issues fall in several interrelated categories.

The first problem is that the management of the program as distinct individual projects impedes efforts to generate program coherence, produce generalized scientific or policy conclusions, or build lasting interdisciplinary regional capacity in Africa. EEDP currently has insufficient human resources to generate organizational coherence or to consistently provide real 'value added' to the Africa-based projects. With additional resources this could be done by conducting: scoping studies; engaging in comparative studies that generalize the work of particular field projects; or by working to build active partnerships for the various field projects with the academic, donor, or policy communities.

These issues are outlined below, and explored in greater detail in the body of the report.

EEDP Management

The EEDP exists as a set of largely distinct projects -- many of which are important and well conceived -- but that exist in isolation from each other, and from other similar efforts in Africa, Latin America, or Asia.

It is impossible to successfully run a program such as EEDP with multiple field projects in multiple countries in Africa without, at minimum, a full time (100%) program director, and assistant, and one or more program staff members devoted to serious research, scoping studies, and to identifying new project development and potential avenues for external support, commercialization, and other means of generating long-term sustainability in EEDP initiated or sponsored projects. A tremendous amount of time and effort is needed simply to communicate with the African program offices and officer, to respond to the diverse financial and logistical issues, and to provide research support to increase the generalizability and sustainability of projects. At present the EEDP core staff is allocated at less than one full time individual.

Most EEDP projects have associated external Swedish consultants. In general these consultants are quite talented, dedicated to the projects, and are an important resource. Project management within EEDP, however, has largely devolved to the consultants. In some cases this is necessary due to the close relationship between project management and scientific or practical output, but this causes serious problems on several levels:

- 1) Project administration is a poor use of the time of these researchers. They should be attached to projects to provide intellectual contributions, leaving project accounting, contractual issues, administration and finance to the EEDP core staff.
- 2) The EEDP itself becomes little more than a pass-through point for project funds, with little incentive to work closely on an intellectual level with the African project coordinators.
- 3) Project management via consultants introduces problems of a lack of financial and political transparency to the recipient groups and to outside scholars and development practitioners interested to interact and learn from the projects.

Recommendation: Administrative project management should be handled by EEDP staff, not contracted out.

Recommendation: The EEDP core staff should be increased. There needs to be a purely administrative post in the program.

EEDP Research and Development Mission

The true value added of the EEDP lies not in simply supporting the field projects logistically, but more importantly in contributing intellectual capacity, resources for program growth, and comparative studies of the energy-development interface. The combination of access to resources within SEI, and to the community of development scholars and policy makers outside of Africa gives EEDP a unique opportunity to perform directed applied research to build on the results of the particular projects. EEDP could, for example:

- (1) Present successful pilot projects for replication by multinational donors,
- (2) Develop active partnerships and provide support for commercial operations and vendors who are working to commercialize viable renewable energy technologies.

EEDP could do far more in this capacity. A larger staff with significant training and experience in energy issues is critical to performing this function. With the departure of Lars Kristoferson leaving no disciplinary 'energy expertise' in the program, the capacity of EEDP to perform this central task is in question.

Recommendation: EEDP must not only rebuild its internal energy and development expertise, but also grow beyond the former internal program strength in energy and development research. If this is not possible, the utility of the program is questionable.

Recommendation: EEDP must consult and collaborate more closely with the African project groups to identify and then undertake capacity building and research efforts that will generalize, compare, or extend the work of specific projects. These projects should become the focus of research and scoping study projects by EEDP core staff.

These recommendations lead directly to a closer examination of the needs of the field projects.

Program Coherence?

One criticism raised of EEDP is that a sense of overall program coherence is lacking. A number of avenues to build greater program integration and synergism, however, need to be developed. These constitute a set of related recommendations:

Recommendation: EEDP supported project staff members should meet regularly as a group. A tremendous resource for internal project review and replication exists within the community of African energy and development researchers supported by EEDP, and yet virtually no formalized discussions take place between the groups. Regular regional conferences could be used to review projects, identify promising new avenues, and build networking connections and capacity.

Recommendation: EEDP with Sida should convene an international energy experts advisory group that would meet regularly to provide recommendations and guidance on program direction. This group could not only provide technical, social scientific, and economic input on new and proposed projects, but could examine avenues to extend or replicate successful EEDP projects through other financing mechanisms.

One striking means to foster program coherence is to develop new methodologies at both the project-specific and more general levels. These could then be used for comparative project design and evaluation.

Recommendation: Methodologies emerging from, or relevant to, EEDP supported projects should be explored from a research and development perspective by *both* EEDP core staff, and the field project staff, ideally in collaboration.

Program coherence would also be increase through greater presence within EEDP and SEI staff offices of African research and development scholars and interns. A continuous flow of internships and practical training periods where African researchers gain experience development research and in the politics of development grantmanship contributes a great deal to nurturing indigenous capacity.

Recommendations for the Future of Sida and EEDP Operations

One bureaucratic problem that has hindered the SEI/EEDP-Sida relationship is simply that of clarity of goals. Despite a steady stream of documents presenting the mission statements and policy goals of both groups, frustration persists on both sides over the clarity and consistency of the messages and mandates received from the other. An external, advisory panel of experts working with both groups to plan the EEDP mission and develop projects could be one means to address this problem.

At another level, a general problem in Africa is that despite years of aid and assistance effort, the sustainable development, or maturation, of few renewable energy or energy efficiency programs has taken place. While a number of technologies may be close to 'take off', arguably only improved cookstoves and perhaps photovoltaics can really be counted in this category. What can EEDP do to more rapidly facilitate this process? A number of options exist that should be jointly evaluated by Sida and EEDP, ideally through the International Energy Experts Advisory Group. These include:

- 1) Moving a primary EEDP office to Africa, where it would both facilitate collaboration with the individual projects, and serve as a nucleation point for regional meetings and workshops.
- 2) Develop an active Working Group to explore the means to make particular projects and technology development efforts sustainable and autonomous of EEDP as a direct step toward local commercial independence. This might be termed the 'commercialization' group, and would involve a *team* of academic, development institution and private sector interests.

The bottom-line message of this review is that the EEDP occupies a vitally important but underdeveloped research-implementation niche in the international development and conservation community. EEDP has underachieved in some respects, but this is hardly surprising given the sub-critical size of the core program. The best of the EEDP supported projects have built regional capacity and demonstrated specific energy and development alternatives. More human resources do not guarantee greater success, but with them a more coherent program with a greater body of important publications and replicated project models is possible.

To build this into a major program, Sida, SEI, and others are urged to provide the necessary support, and EEDP is in turn urged to: (a) engage in project-directed basic research; (b) utilize an African and international advisory and assessment boards to help give the program a clear focus and set of core questions; (c) develop and test hypotheses in a field where this takes place far too infrequently; (d) develop but then permit the field projects to set their own course; (e) utilize the Europe-Africa axis to turn pilot projects into seeds for the multinational community; and (f) integrate academic, private sector, and community approaches to development and environmental conservation.

Introduction: The Problematic Environment and Development Context of EEDP

Efforts to foster environmentally sustainable development are much discussed by the international community, but have not received commensurate sustained attention in terms of research efforts, scoping studies, pilot and demonstration projects¹. Investigations into a diverse set of energy resources, technology options, and management policies are a critical component of any attempts to build the capacity of nations to meet their emerging set of economic, social and environmental needs and demands. In light of this importance, it is troubling that size or number of interdisciplinary energy research, policy, and development organizations has not expanded to meet this demand. By some measures, the activity in this sector has paradoxically decreased over recent years.

Work in the area of energy, development and conservation takes place in a difficult environment where many of the central issues -- woodfuel and charcoal management, shallow wells design and exploitation, waste management, household economics, indoor air pollution, food storage and transportation, decentralized power, demand-side energy management, non-grid and mini-grid applications, and infrastructure for small-scale and informal enterprises -- all face a paradox of juxtaposed institutional neglect and widespread importance². This arena of applied, or 'mundane' science and development, has thus been problematic for university, NGO, and multinational development groups to approach and to sustain, as the record of failed or abandoned projects, unfunded proposals, and inappropriate marriages of technological or economic 'fixes' with pragmatic needs attests.

A number of approaches and policy options exist to place sustainable development on a firm research and policy foundation. These include: 1) increasing the support for academic-industry and academic-practitioner partnerships; 2) extending academic boundaries to encompass the full range of human-environment interactions; 3) breaking down the often antagonistic division between development 'professionals' and academia, and instituting a more open review process for development publications, projects and institutions; 4) breaking the barrier between development planners and subjects, and; 5) recognizing and addressing the frequently counterproductive tension between pure and applied research. Sida, the Stockholm Environment Institute (SEI) and the Energy, Environment & Development Program (EEDP) in particular provide one of the few vehicles in the crucial nexus between academic interests, development support and finance, and development practice in the energy and renewables sector.

Expanding our commitment to mundane science requires that we overcome a 'Catch-22': these everyday issues are seen as beneath interest until a crisis emerges, at which point a solution is expected at once, precisely because the problem appears to be so (deceptively) simple. Unless the bias against mundane science can be overcome, we are inevitably wedded to shortsighted, partial solutions to emerging issues in development and the environment. Serious research requires a commitment to sustained periods of training, preparation, and support, which mundane science rarely receives. A useful principle in the design and evaluation of sustainable development initiatives is that of *use-inspired basic research*, which itself requires a commitment to conducting both research and practical projects in concert with each other. This mixture also increases the degree to which university research teams will not only explore, but remain engaged with development questions.

¹ Nomenclature: *program* refers to the overall work of EEDP while *project* refers to the specific field efforts EEDP supports, such as the Miombo Ecology and Management project, or the Bioenergy Options project.

² Indeed, there is a great irony in the comparison that we may know relatively more about the dark side of the moon than the dynamics of resource management in millions of poor homes and communities around the world.

In spite of these difficulties, important advances in renewable energy technology, and in particular social outreach and financing are taking place worldwide. Examples include: technological and financial improvements in solar thermal and photovoltaic systems, improved cookstoves, windmills, small and intermediate-scale hydro plants, and potentially biomass energy systems as well. Advances in the social, behavioral, and assessment sciences include participatory assessment, recognition of gender issues in resource and technology management and training, and donor-recipient partnership agreements. Micro-credit programs are now recognized as an important vehicle for technology adoption (Microcredit Summit Secretariat, 1997, and some international institutions are even finally guaranteeing renewable energy loans, such as the 'Solar Bank' for Latin America to expedite investment and reduce the risk to customers and vendors alike.

The EEDP Mission

The EEDP defines its objectives as follows:

The ultimate goal of SEI's EEDP is to improve the living conditions of the poor through the provision of reliable, affordable, and environmentally acceptable energy in developing countries. SEI will contribute to the dissemination of renewable energy technologies in order to promote sustainable development (SEI, 1995b).

This mission statement is entirely appropriate as a starting point for the program. The only caution might be to not take the focus on renewables as overly strict. Energy efficiency, selection and adoption of best practices for traditional or fossil fuels are both certainly part of the broad energy and development mandate. In keeping with this broader spirit, at present the EEDP has projects in the areas of low cost electrification (Zambia) and energy efficiency (Tanzania). This diversity of technologies and project types is an important compliment to the traditional program emphasis on renewables and should be continued, or expanded. This wider mandate requires a commensurate increase in the range of expertise both within the EEDP core staff (for project evaluation as well as to make substantive contributions), as well as careful selection of the technologies and energy systems to explore. Given the vast number of directions that such a program could take, the EEDP staff should determine how to focus these non-renewable energy efforts so that they complement the renewables. This evaluation process should take place through discussions with the current African partner institutions and projects, private sector entrepreneurs, and international advisors.

A Mandate for Energy, Environment & Development Work: Integrating Research and Development

This evaluation of the EEDP (the terms of which are described in Appendix A) is based on five avenues of project observation: (1) the authors own decade of research and practical field work in energy and development, much of it in East Africa (Appendix B); (2) a 10 day focused study tour in Sweden of SEI itself, and government, industry and academic resources that EEDP can access (Appendices C and D); (3) a 15 day study tour of EEDP supported field programs in Kenya, Tanzania, Zambia, and Zimbabwe (Appendices C and D); (4) the review of a multitude of project documents (Appendices H and I); and, (5) as an informal survey questionnaire (Appendix E) administered to over 30 individuals worldwide who either were or are involved in EEDP projects, or work in the general area of energy, environment and development at universities, in private companies, in NGO's, or in government offices³. The information gathered from each of these

³ A word of the methodology of the questionnaire is in order. Throughout this review quotes from the questionnaires (Appendix E). This is not meant to suggest that this review is a compendium of survey responses. Quotes are used to *illustrate* points found to be true by the reviewer. As noted in the text, there was a great measure of coherence in the questionnaire

sources was remarkably consistent in the reaction to the value of the EEDP, as well as the problems with the program. This consistency strengthens the conclusions presented below.

The fundamental finding of this review is that the work of EEDP is tremendously important and should be *increased* both in scope, and in terms of human and capital resources. This growth should take place slowly over the next several years. EEDP is at present an innovative program composed of distinct projects. The strengths and weaknesses of the individual projects will be discussed at length in later sections of this report, but it is worth highlighting the aspects of the EEDP structure and project selection that are generally novel in the field of energy and environmental programs.

For example, EEDP exists as a core research and management team that can support and, ideally, collaborate with African researchers on the specific projects. This two-phased approach of selecting, evaluating, as well as working with project teams extends the traditional donor/evaluator-client relationship into what can be working partnership. This dynamic has particularly been in evidence in the *miombo* woodlands project in Zambia and in the rural electrification work in Tanzania. In terms of EEDP staff, these partnerships have so far existed primarily between Swedish consultants and the African counterparts, but could be expanded if the EEDP core staffing or support increased.

Secondly, the EEDP exists in a unique capacity, very different that both the one-off research-only or pilot projects, and the large-scale implementation efforts characterized by support from the largest multinational donors and lending groups. Several EEDP supported projects, or partnerships with African groups, have existed for over twice the duration of typical individual investigator grants (which are often only 36 months).

Financially, the costs associated with the EEDP are similar to that of other Sida sponsored efforts in Africa, and appear generally reasonable⁴. EEDP makes a significant contribution to the energy and environment development community, a fact evidenced by:

- (1) The volume of publication requests that EEDP receives for its literature is very high, and for example in 1995 was more than that received by any other SEI program (Rosemarian, 1996);
- (2) The work of EEDP is reasonably well known by scholars and development practitioners in the international community, and within Africa;
- (3) In the majority of cases the project recipients and external reviewers are pleased with not only the individual projects, but with the process and the linkages that developed out of the EEDP/SEI/Sida contacts; and,
- (4) The costs associated with the EEDP are similar to that of other Sida sponsored efforts in Africa, and in that light appear generally reasonable.

At the same time, there are a number of areas where the EEDP is in need of restructuring and developing its mission. These issues fall in several categories, that are of course intimately connected, and range from recommendations as to how EEDP might better serve the field programs, to the research and development 'value added' that the program itself provides, to the

responses, and indeed with the opinions of the reviewer. In the places where there was significant disagreement between the survey respondents, that is noted, as is the case when this reviewer disagreed with the the majority of survey responses.

⁴ Additional comments on the finances of particular projects appear in the following sections.

relationship with Sida, or by the very nature of the mission of the program. These issues are outlined and discussed in the following sections.

Current EEDP Management

The EEDP exists as a set of largely distinct projects -- many of which are important and well conceived -- but that exist in isolation from each other, and from other similar efforts by other institutions in Africa, Latin America, or Asia. Appendix F presents the EEDP project areas and current thematic foci.

It is impossible to successfully operate a program such as EEDP with multiple field projects in multiple countries in Africa without, at minimum, a full time (100%) program director, and a full time administrative assistant, and one or more program staff members devoted to serious research, scoping studies, and to identifying new project development and potential avenues for external support, commercialization, and other means of generating long-term sustainability in EEDP initiated or sponsored projects. A tremendous amount of time and effort is needed simply to communicate with the African program offices and officer, to respond to the diverse financial and logistical issues, and to provide research support to increase the generalizability and sustainability of projects. At present the EEDP core staff is allocated at less than one full time individual.

It is often difficult to appreciate just how much work is required to simply maintain the necessary lines of communication, track financial issues, let alone make a significant intellectual contribution to the programs in Africa. Anders Arvidson received very high praise from all interested parties for his ability and commitment to making this difficult process work, and for being particularly helpful and flexible in harmonizing the goals, needs, and expectations of Sida, EEDP, and individual projects.

The fact that the EEDP staff do little research, scoping study work, providing critical reviews of documents written by the project team members, or entrepreneurial project promotion to outside donors -- even though these activities are major interest expressed by each core staff member -- is a testament to the degree to which the program is under staffed and supported to engage in research. Thus, many of the criticisms of the EEDP to be explored in this review are best solved by increasing program support, not decreasing it.

A number of project members also, however, noted in their questionnaire responses that the turnaround time to receive substantive, as opposed to logistical or bureaucratic, input on proposals or reports they submit to EEDP is too long to be significantly useful. Part of this stems from the small size of the EEDP staff, some from the current lack of energy expertise within EEDP, and some from the logistical complexity of sending reports to EEDP consultants and/or EEDP core staff members and being uncertain whose response takes priority on a given issue.

Technical Consultants

Most EEDP projects have associated Swedish consultants that are external to EEDP. At present Anders Ellegård and Bjorn Kjellström are the consultants with that have the greatest share of project responsibilities. In general these individuals are very talented, dedicated to the projects, and an important resource. Project management within EEDP, however, has largely devolved to the consultants. This causes problems on several levels:

- (1) Project administration is a poor use of the time of these researchers. They should be attached to projects to provide intellectual contributions, leaving administration and finance

to the EEDP core staff to the extent possible (some involvement is necessary, but the detailed duties of which should not fall to the consultants).

- (2) The EEDP itself becomes little more than a pass-through point for project funds, with little incentive to work closely on an intellectual level with the African project coordinators.
- (3) Project management via consultants introduces problems of a lack of financial and political transparency to the recipient groups and to outside scholars and development practitioners interested to interact and learn from the projects. This arrangement also adds a level of bureaucratic uncertainty as to who a given question should be addressed. A full 40% of the African project staff raised the issue of confusion as to where questions should be directed, who has the 'final say', and who can they count on to review and provide feedback of all sorts of documents.

For example, several of the African research groups saw opportunities to extend an EEDP project from pilot phase to a larger operation with commercial potential. To do this, a source of support beyond EEDP/Sida would be necessary. The question arose within several groups as to how to do this? Should the consultant be asked to guide a proposal to outside donors, and if so, would the resultant grant be to the African group, or to the consultant? If, instead, the African team approached EEDP for assistance and advice in this process, what of the relationship with the consultant? A clearer demarcation of technical advice and support on the one hand, and managerial support on the other would clarify things for many of the Africa-based project members.

A response typical of those received through the questionnaires distributed confirms this conclusion. In response to question (Appendix E, Question G6), "What are the weaknesses of the EEDP?":

This would be management. The reason for this is partly that consultants have done the management. There has always been a policy [at] SEI to have a co-ordinator that is more interested in the research than in the administration. Administration has been seen as something that could be done by the professionals (accountants, secretaries). In my view, this is completely wrong. There needs to be a purely administrative post in the program, to keep track of developments, [manage] current budget status and outstanding tasks. Communication and planning is a major undertaking of such a program, so why should we assume that it can be done by amateurs, or professionals in their spare time?

Indeed, three or even four people fully involved in the program is probably the minimum necessary to create an environment for fruitful development, tracking of important comparable efforts in other parts of the developing world, and an active research effort on issues related to field projects. The group would also be complemented by visiting researchers, African scholars and development practitioners, and students writing their thesis work.

Recommendation: Administrative project management should be handled by EEDP staff, not contracted out.

Recommendation: The EEDP core staff should be increased. There needs to be a purely administrative post in the program. (As discussed in the section of the future of EEDP, multiple options exist, however, for where this increased capacity might be based.)

Current EEDP Costs

The overall EEDP budgetary allocations over the past two years have been:

01-01-96 to 31-12-96:	SEK 4,010,000
01-01-97 to 31-12-97:	SEK 4,390,000

The initial proposal for 1996 - 1997, presented by SEI in May 1995, contained a large portfolio of projects. After various meetings and discussions, EEDP was asked to (i) concentrate on Eastern and Southern Africa and (ii) work out a two-year plan to a maximum of SEK 16,000,000. This resulted in a workplan of 18 December 1995.

INEC agreed to finance half of the workplan dated from December 18. INEC's half would then be SEK 8,000,000 for two years. These resources were to be matched by another SEK 8,000,000 from SAREC for the same workplan. SAREC did not approve the whole workplan and decided to finance only the continuation of earlier projects. A contract was then written with a budget of SEK 8,400,000 for 1996-1997.

In the original proposal of 18 December, 1995, EEDP budgeted 50% of a full time for a manager and two slots at 50% of a full-time for two research assistants. The other 50% of the three positions were to be filled by other projects. In the case of the manager, it would be filled by other projects at SEI and in the case of the research assistants, by projects in the EEDP. In the finally approved reduced budget EEDP received 40% of a manager position and 50% of a position for one research assistant.

This back and forth, and seemingly complex discussions between partner agencies -- Sida, INEC, and SAREC -- generates a level of uncertainty that is problematic for the program. On several occasions EEDP and SEI have been very unclear on: (a) what policy direction Sida is encouraging; and, (b) at what point can they discuss long-range plans with the African partner groups for fear of the funding and mandate they receive changing. Thus, while the goal of this review is primarily to examine the functioning of SEI/EEDP, the dynamics of the relationship to Sida -- and thus Sida's operational policies -- must be considered as well.

Budgetary Comparisons

The uniqueness of each Sida sponsored program precludes any simple budget comparison between the various sponsored efforts, nor would such an exercise prove useful. What is useful, however, is to observe the *broad* fund allocation decisions between programs. Table 1 provides such a side-by-side snapshot of several very different efforts in Africa.

The Mazingira Institute, for example, is an independent applied research and networking institute focused on issues of gender, urbanization, and the environment. The '96 budget summarized here includes a large component of sub-grants (22% of the total budget) that Mazingira allocated to African groups to begin to build a regional network that in some sense may be comparable to AFREPREN. The Women and Law Network for East Africa is designed to foster cooperation and collaboration on gender issues between roughly 20 researchers in East Africa.

The purpose of the EEDP core office in Stockholm is to provide logistical, research, and outreach support to the field projects. The advantage of this arrangement, as discussed throughout this review, is through the North-South networking and applied research support that can be provided to the Africa-based Sida projects. Indeed, the scarcity of such applied research units in Africa makes the SEI arrangement potentially of tremendous value to groups struggling to connect to useful global resources. This is an important component of the capacity building process (for both LDC and OECD nations), and provides a support and collaborative network of considerable value.

One would expect that the high costs of operating in Europe would unavoidably drive overall program costs up. In fact, in comparison to the Women & Law and Mazingira Institute efforts, the EEDP costs are quite reasonable, with similar percentages in a number of categories. On a practical level, simply some of the administrative expenses have been geographically shifted, and the need for travel support is higher as is natural. Again, I feel that line-item criticisms or suggestions for marginal changes in budgetary allocations are not particularly useful. The difficulty in building regional networks, and the financial volatility in parts of Africa strongly argue for donor flexibility in budgetary allocations. A 10 - 15% cost overrun or cost savings, for example, will not be remembered over even a short time-horizon compared to overall project success or failure.

In general, the EEDP budget and that of the specific projects are quite reasonable to accomplish the proposed tasks, which in many cases involves both particular field pilot and demonstration efforts, and a broader mandate of training, networking, and capacity building. Sida is to be commended for the commitment to these efforts, as is SEI, EEDP and the African partner groups and individuals.

In fact, the core funding provided EEDP is, if anything, unrealistically small given its mission. EEDP operates with a very low rate, estimated in real terms to be eight - 14% (EEDP, 1995). The volume of communication to Africa, staffing expenses, and other infrastructure costs is certainly higher than this. At present core funding to institutions such as SEI receive smaller and smaller core funding blocks, so project overheads must support the base costs; the rate charged by EEDP is unlikely to be sufficient to meet these expenses.

There are a variety of areas where EEDP project financial management could be improved. While a number of these issues stem from the difficulties in international financial management -- particularly with remote project teams -- a number of consistent problems within the direct control of SEI/EEDP or Sida did appear. In particular:

1. Contracts to African partner institutions sometimes lapse (e.g. the TANESCO rural lighting project), yet the project work is incomplete. This leaves the African partner group working without a clear contract, and thus in an uncertain situation.
2. The "Women in Energy" project apparently began without complete agreement between SEI and Sida. As a result applications for the visiting research position in Stockholm (see Appendix F) were received and processed but no resources yet existed to implement the project.
3. Several African partner groups expressed frustration over the level of financial micro-management (including their hiring decisions) that SEI at times exerted.

Budget Category	EEDP (SEI) '96/97	EEDP (SEI) '93/95	Women & Law '97	Mazingira Institute '96
Management & Overhead "Administration"	20%	16%	23%	12%
Salaries: Africa	16%	20%	28%	19%
Salaries in Sweden	16%	24%	--	--
Equipment/Computer Services	14%	9%	2%	1%
Workshop/Training Activities	13%	8%	37%	8%
Printing & information	11%	8%	7%	8%
Contingency	4%	3%	--	--
Travel	6%	12%	1%	--
Sub-grants & temporary staff	--	--	--	22%
<i>Budget Total (US\$):</i>	<i>\$571,400</i>	<i>\$240,000</i>	<i>\$520,621</i>	<i>\$90,000</i>

Table 1: Budgetary Comparison of EEDP and Selected other Sida-sponsored Projects in Africa. Note: (1) for the EEDP management & overhead refers to the SEI Program; (2) for the Women and Law project management and overhead is divided between the Regional and National office, and is not a simple comparison to that for the SEI Program in that Women & Law project is a regional network based entirely in Africa without a research and administration component in Sweden that is comparable to that of SEI/EEDP.

Overall, however, the project budgets are quite reasonable and sound financial arrangements have been developed for each project so that payment can take place in local currency in a timely fashion (generally via local bank accounts administered by project financial officers).

Managing the finances and making arrangements for fund transfers to Africa for these projects is a significant undertaking, and has been handled particularly well by SEI/EEDP.

Gender and EEDP

The EEDP has not yet successfully integrated gender concerns into the overall thematic mission. At the same time, very few donor-based groups working in energy and development can claim to have a successful record in this area.

Various *gender-focused* projects have been implemented in Africa by aid and development groups, such as targeted employment opportunities for women or explicit inclusion of women in meetings on fuelwood management or charcoal production (Boserup, 1970; Bradley, 1991). But most of these have been criticized, rightly so, for isolating women from the 'real' economy more than actually integrating them into it (Shiva and Mies, 1993). Emerging methods of micro-credit management and participatory resource management may be useful tools to empower women or to promote greater gender equity, but certainly no magic bullet has been found, nor is it obvious that externally generated 'solutions' are particularly likely to have a sustained impact.

At present participation by women in EEDP sponsored projects is not high, but it is not generally lower than in other similar development efforts. AFREPREN, for example, reports that 15% of its members are women (1997a). At last word, the 'Women and Energy' position at EEDP remains empty, although as mentioned above, this may be in part due to bureaucratic factors not fully within the control of SEI/EEDP.

The lack of women in programmatic leadership or decision-making positions in EEDP sponsored field projects can not easily be resolved while the number of women in such positions throughout the energy and development field is so low. In this respect, a basic capacity building-role needs to be adopted by SEI and Sida. Internship, training, and degree-course opportunities represent the only meaningful means to foster long-term change. A program of training at African, European and North American universities, as well as internship placement in Swedish private sector, NGO and multinational institutions is the logical plan, but it is a 'second-step' in a larger process. First, it is necessary to interest women in preparing for such a career path, and to demonstrate that the investment of years of practical and formal training is likely to lead to a meaningful position. To initiate this process, Sida/SEI might develop with one or more African project partners short seminar courses, month-long paid pre-internships at agencies already working in Africa (for example, see the list of institutions in the section below, **Building Program Coherence; Regional Conferences and Project Coordination**).

The more formal 'second step' education and training support program would logically be combined with the broader, non-gender specific, effort to build capacity and form linkages with groups in developed nations. A variety of internship and studentship locations could be made available beyond the traditional ones of universities, NGO's and multinational institutions. Private-sector positions are particularly valuable because: (a) very little training exists in entrepreneurial aspects of renewables (on any scale); there is growing interest worldwide in non-university and non-agency approaches to development and environmental conservation; and (c) this represents a route to involve more fully Nordic, European and North American partner institutions. Partnerships with Swedish institutions, such as BITS, Stockholm Energi, Swedish universities and notably Sida itself all provide excellent environments for these internships. In addition, private sector experiences are often particularly valuable, and suitable linkages with Svensk Vindkraftverk at the small-scale, and within larger financial and development institutions. Experience in such training programs is virtually always enhanced if the trainee is not isolated from potential role models, such as women supervisors, other Africans working in the same institution. One means to build this 'community within the institution' would be to provide internships in pairs so as not to isolate, but to build support, friendship and partnership contacts in what can sometimes be a disorienting experience.

In light of the slow progress in integrating women into managerial and significant positions in development projects, what other broad policy steps might be taken? While success stories are rare, one approach that has been productive is to design an *integrated* strategy for both research on the issue of gender (and in this case energy), and explicit activism. This approach requires sustained coordination between research and outreach components; in the development field, however, this is just what EEDP is designed to accomplish.

One example of an institutional effort to coordinate research and activist policy approaches to the gender question is that of the North South Institute. The Institute began by offering small seed grants explicitly for women, and has at the same time developed a series of research questions that highlight gender inequality in development practice. The goals and methods of the Gender and Economic Reforms in Africa (GERA) program are further outlined in Appendix G. This two part approach has the advantage of bringing women and those interested in addressing gender inequality in contact on more equitable terms: not the traditional subject-observer relationship that characterized so many early projects (Boserup, 1970).

EEDP may wish to consider studying or potentially supporting such development partnership-research arrangements. The small-grants program and subsequent capacity building of the North-South Institute program could have a natural correlate within the network of African groups that EEDP already maintains. Women working in TANESCO or UECCO, AFREPREN, the Zambian

National Council for Scientific Research, and Border Timbers are all excellent candidates for this program.

Publications and Activities: the International Environment and Development Community

The Renewable Energy for Development Newsletter

The EEDP publishes or facilitates the publication of a impressive array of documents. These represent an significant contribution to the field. At the same time, a greater emphasis needs to be placed on publication in peer-reviewed journals and books. This is the same concern raised by Mothander and Barnett in the last review of the EEDP (1993).

The EEDP newsletter, *Renewable Energy for Development* (RED) is widely circulated, with roughly 3,000 copies printed and distributed each edition (see Table 2). It is also the case that since the advent of WWW publishing, some additional subscribers only receive the Newsletter in electronic format, via the www address: <http://www.nn.apc.org/sei/red/redindex.html>.

<i>Distribution of RED Newsletter</i> (paper version only, excludes www distribution)	<i>Number of Copies</i>
Sweden	781
other Nordic nations	85
Europe	524
Australia & New Zealand	45
USA & Canada	250
Africa	400
Asia	330
Central America	60
South America	350
TOTAL	2,825

Table 2: Per issue distribution of the Renewable Energy for Development newsletter. The total of 2,790 copies is in addition to the electronic distribution. Current and past newsletters are available on the WorldWideWeb, and some subscribers now only receive it in that form (Arvidson, 1997).

The news articles published are primarily by EEDP staff, with longer project reports by EEDP staff as well, with some by Swedish, African, or other researchers. The Newsletter is clearly appreciated by energy and development scholars and practitioners alike. Almost all survey respondents from individuals with a connection to SEI cited the Newsletter as useful, and perhaps more importantly, the majority (almost 75%) of survey respondents who had no direct linkage with the program agreed with that assessment. It is clear that the RED serves an important function, as does the AFREPREN newsletter which is similar in format.

As noted previously, the volume of publication requests that EEDP receives for its literature is very high, and for example in 1995 was more than that received by any other SEI program (Rosemarian, 1996). At one level this suggests that the SEI/EEDP publications are well read and regarded. The content of many of the Energy, Environment and Development Series Reports is excellent, and contain a tremendous amount of primary data and some useful analysis.

Serving the Development Community: the Need for Peer Reviewed Publications

In particular the series of publications from the EEDP projects in Zambia on wood and charcoal use, and the resulting health effects form a coherent and important body of work (e.g. Energy, Environment and Development Series Reports No. 14, 21, 24, 32, 33, 38, 39; See Appendix H for a full listing of the papers), and a range of basic and applied ecology publications (e.g. Chidumayo, 1988, 1989, 1991a,b, 1992a,b; Hibajene, 1993; and Hibajene and Kalumiana, 1996). These publications lead to important policy documents which in many ways exemplify the goal of a science-based development and policy program. For example the publications listed above and more importantly the authors (A. Ellegård, H. Egneus, S. H. Hibajene, C. Mwanza, and W. Serenje) all played roles in developing the Zambian national energy plan (Ministry of Energy and Water Development, 1994; Banda *et al.*, 1996). This is an impressive and thoughtful document, which evaluates renewable and non-renewable energy resources and options for the national economy.

The continuation of the work and publication process in Zambia has also been excellent, and includes a practical *Manual for Charcoal Production in Earth Kilns in Zambia* (Hibajene and Kalumiana, 1996), versions in three local languages and Portuguese, and plans for four more.

This broad range of results from basic ecology to stove technology to national energy policy and training manuals provides an excellent account of what is possible in such a program⁵. This record of research, policy and outreach stands as an example for programs everywhere as to what is possible when a broad interdisciplinary program is thoughtfully constructed and supported. It is important to note that the Zambian project has active members from government (Ministry of Energy and Water Development), academia (University of Zambia), and community representative who participated in the planning workshops and in the testing of the practical format of the manual. Few international development projects meet this standard. The integrated work of the Zambian team, the Swedish consultant (Anders Ellegård) and EEDP/SEI is well worth a review and analysis process to identify the features of this collaboration that worked so well.

Two additional issues of general importance emerge from a review of the Zambian project. The first is that this project is largely unique in the range of peer-reviewed publications produced (Chidumayo, 1988, 1989, 1991a,b, 1992a,b). The lack of peer-reviewed journal publications from EEDP sponsored projects is a long-standing concern, also identified as such by the last program review (Mothander and Barnett, 1993). Despite the high-quality production of EEDP Series Reports⁶, and the wide distribution reflected in the number of report requests (see above), the lack of peer-reviewed output is a major issue.

⁵ In addition, the Zambian team also organized a workshop on forestry and energy issues, held in Lusaka from November 11 - 17, 1995. This meeting is one of the few regional meetings to be held in association with the EEDP. Participants came from Zambia, Zimbabwe, Mozambique, Tanzania, Malawi, Angola, and Namibia. Questionnaires sent to conference participants uniformly cited the meeting as a tremendously useful event both in terms of scientific and forestry management content, but also as a means to learn of successes and pitfalls in the politics of forest resource planning.

⁶ In the opinion of this reviewer many of the EEDP non-peer reports (Appendix H) are, in fact, outstanding or very good. I base this judgement on a decade of work as reviewer for *Science*, *Nature*, *Physical Review*, *Scientific American*, *Environmental Science & Technology (EST)*, *Chemosphere*, *Energy Policy*, and other journals. They contain important material that is presented clearly, in proper context, is not overhyped, and often is produced in collaboration with African project members. At the same time, most of this material is not initially suitable for journal publication. Explicitly providing EEDP core staff and projects members the time and resources to take reports to publication has tremendous value added for SEI, the project members, Sida and the international community. The cynicism of the World Bank, US AID,

The reason for the concern over this is not simply one of academic interest, or to develop citation lists for career advancement. (Of course, it should be noted that building indigenous capacity in energy and development *does* require a level of journal publications to build the careers of researchers and policy analysts alike.) Further, the capacity and contacts that many African researchers have to accomplish this is minimal, and Sida/SEI/EEDP should make explicit plans to afford these emerging scholars the time and resources to take manuscripts from the status of project reports to journal quality publications. Team members in over 60% of the EEDP sponsored projects made it very clear that the time and financial resources made available to them through the projects was insufficient to produce any publication-quality publications. By extension, similar resources are not provided, but also must also be made available to EEDP staff to accomplish the same goal⁷.

The importance of peer-reviewed publications resulting from the EEDP projects is to broaden the scope of EEDP interaction with the development community generally. Despite the number of EEDP reports, and the efforts made to distribute them, they remain 'gray' literature in a field swamped with project reports and unpublished studies. In fact, an argument can be made that this very over-production of under-reviewed material is a major stumbling block to developing a clear set of methodologies and a set of theoretical models that can be applied to environment and a development research and policy work worldwide.

An example of the lack of information dissemination from EEDP reports as opposed to peer reviewed journal publications is found in the questionnaire responses the author received from individuals working in the development field, but who did not have any clear connection to SEI or the EEDP. Questionnaires were sent to 16 such individuals, five of who provided written responses, and seven of whom provided partial responses via phone interviews conducted by the author. In this small sampling, only three could identify EEDP Series reports by title or by subject, and only two stated that they had read one or more. By the same token, ten of 12 cited the 1993 special issue of *Energy Policy* (Volume 21, No. 5: Urban energy and environment in Africa) published in collaboration with SEI and edited by Richard Hosier as a document they had read or seen referenced. Similarly, seven of 12 identified as useful and important the AFREPREN Energy Policy Research Series published by AFREPREN and Zed Books⁸.

This raises a further important point concerning the potential for impressive knowledge and technology transfer from EEDP projects. The results of the miombo project in Zambia, with its

British ODA and other large agencies is that the 'rush to move projects' and the fact that promotion is not based on peer reviewed publications precludes time and resources devoted to writing scholarly articles. While this may be true for these agencies, there is no reason that it must be the case in the SEI/Sida relationship. Sufficient funding does exist, and the burden of projects is not so great that explicitly allocating time and resources for this within project budgets and time lines could not be done.

⁷ It can not be overstated that far too little provision or incentives are given to encourage the research that is expected of EEDP and of African partners such as the Zambian team or AFREPREN. EEDP staff are burdened with administrative duties to the detriment of research, and AFREPREN is engaged in so many studies and reports that follow-up analysis and the conversion of reports to research papers is stifled. The energy and development field is largely lacking in research methods and efforts to generalize project findings. The EEDP could change this pattern, but will require resources to do so. A decision must be made to either address this need, or to re-evaluate what is expected from, and what resources are provided to, EEDP. It is the authors opinion that it would be a serious mistake to curtail and not expand the commitment to bringing lessons from the projects to journal quality standards and publications.

⁸ The six current volumes in this series have been edited by M. Bhagavan, O. Davidsson, D. O. Hall, S. Karekezi, G. MacKenzie, Y. S. Mao and V. Ranganathan.

extensive publication record, the work on stoves and emissions in Mozambique, and the report dissemination carried out by AFREPREN are all high-profile efforts that are cited in the international literature

On a similar note, one concern raised by Sida and others of the work of SEI/EEDP is that it is 'too insular', and does not make sufficient contact with researchers and policy makers outside of a relatively small group of individuals. This insularity also partially accounts for the lack of theoretical or methodological advances that could have been sparked or emerged from the work of the EEDP core staff and from the various projects. The generalizing and construction of holistic understanding that is implicit in

At the same time it is vital to keep in mind that 'theoretical or methodological advances' in this field are not only difficult to define. It is also important to note that there have been some examples that *have* emerged from the work of SEI/EEDP, such as the case of the gap theory of biomass supply and demand (see below). A second example, that of a newer and less developed theory of "Critical Mass" in renewable energy industries, is highlighted in this report. The greater exposure of project results, increased level of critical feedback, as well as simply the demand to formulate findings in more academic terms for journal readership would assist in this generally difficult process.

The second major observation on the functioning of the EEDP that emerges from the Zambia case is that the need for *research* within the EEDP central office is one again exposed. The work on *miombo* woodlands raises the basic question that could be generalized in the study of a variety of woodland systems:

Given the extent of widespread use of wood and charcoal fuels, and the policy interest in biomass energy sources, what is known about the ability of woodlands to regenerate as a function of the degree of biomass extraction?

This remarkably simple question -- which indeed appears to be fundamental to most of the work on biomass fuels and conservation in Africa generally -- seems to have received far too little *direct* attention by the environment and development community. The *miombo* effort is an important step in this direction, and in fact, this area has been one of particular interest, activity, and major impact by past SEI and EEDPs (Leach and Mearns, 1989; and the issue of *Energy Policy* edited by Hosier cited above). To make this work of even greater importance,

In response to my questionnaire survey questions, one respondent (who is not associated with SEI/EEDP) who works in the Sahel lamented that:

Over the past thirty years environmentalists and international donor agencies have added their voices to the cry to save West Africa's forests from the axes of woodcutters. The fears of deforestation have led to policies to manage woodcutting and woodfuel markets. But, in this area almost the size of the U.S., there have been only a handful of studies of forest regeneration after woodcutting. While fears of deforestation have led to costly policies of forest management and protection, the question of whether woodcutting actually leads to deforestation (a permanent state of affairs) or just temporary clearing, *has never been asked. (Emphasis added).*

This is as remarkable as it is tragic. If the EEDP had sufficient human resources for research and scoping studies, a global review of work on this topic would be a natural and top priority project. The information gathered from the *Zambian miombo* study provide the natural starting point to which results from other efforts worldwide might be compared. How, for example, are the efforts at reforestation in northeast Brazil, or Costa Rican highland forests, or north American parry and alpine systems similar or distinct from that of the *miombo* system? How do the lessons of biomass and animal recolonization compare between these regions? In fact given the lack of such a study,

(Appendix I)¹⁰. A selection of AFREPREN documents, including several major publications resulting from the RETs study are published in refereed journals as well as in the AFREPREN/SEI/Zed Books Series. AFREPREN publications and the newsletter are widely distributed, and many of the country and other reports are very useful at understanding regional energy decision making. Both in terms of African networking and capacity building this program is excellent.

The topics of primary current interest to AFREPREN are institutional and employment issues in RETs dissemination, market barriers faced by system vendors, assemblers, and manufacturers, training courses, and the role of innovative financial institutions. This is a logical focus given that AFREPREN is not set-up to conduct multiple field studies and that they maintain a remarkable researcher network across the continent who *are* positions to do the necessary field work.

AFREPREN sees research and development focusing on thermal and mechanical energy technologies as under-researched, particularly in terms of commercial viability (van de Ven, 1995; Kozloff, 1995). This is largely true, and would make an excellent focus area for future work given that AFREPREN is well versed in assessments of institutional capacity, commercial networking and market barriers. AFREPREN has been exploring the concept of 'Critical Mass' (detailed below; See Table 3) to describe the viability of the manufacturers and assembler companies in a given industry. This potentially useful theoretical construct -- although currently untested and not yet used practically -- is well worth exploring in a variety of industries, which AFREPREN is well situated to undertake given their regional network of scholars and researchers.

AFREPREN Working Paper 114 (Karekezi and Ranja, 1996) is an example of this work at it best. WP 114 contains detailed inter-country comparisons of technology performance, human capacity, as well as some limited market prospect analysis. These papers set the stage for what would be an ideal EEDP-AFREPREN follow-on effort: analysis of the required inputs and potential outputs of uniquely small-scale cogeneration systems. The non-grid context in much of African calls for energy diversity, but households and small-scale industries struggle to adopt even one commercially competitive renewable energy technology (e.g. windmills for water pumping, or small biomass combustion systems. How to move beyond this? AFREPREN compiles data on many of these systems, and could explore the means for households, groups of shops, villages or large units to pool energy production resources arising from different production resources (e.g. wind-powered water pumps for irrigation and cattle watering may work well in partnership with fixed or moving-bed biomass combustion systems). It would be particularly useful to energy scholars and to planners in Africa if a greater quantitative and analytic capacity could be developed. Neoclassical energy economics is certainly a flawed tool, but combined with discussions of resource management, household and community decision making and tariffs, it can become a useful predictive tool.

¹⁰ In the Nairobi office Stephen Karekezi, the Executive Director, works tirelessly with an virtual army of student interns and young scholars. This is a critical role given the lack of avenues for young energy scholars in Africa to receive training and research opportunities. At the same time, the volume of students and the huge range of reports that Stephen Karekezi is simultaneously writing with students is an impossible load. As a result, a number of the AFREPREN reports are simply descriptive, and below the quality level of best of the AFREPREN documents. In time some of the junior researchers at AFREPREN may be able to share some of Stephen's burden of directing the projects. At present, however, AFREPREN, and EEDP by providing necessary resources, should consider bringing in a second senior scholar to the program. This would be particularly valuable if this could result in additional analytic analysis of the tremendous volume of data that AFREPREN does collect, as well as a larger number of peer-reviewed publications. The report series (Appendix I) is certainly a useful data resource within the AFREPREN network, but more could be done in terms of policy and option analysis.

The 1996 - 1997 EEDP Workplan does not contain an itemized budget breakdown for A1 and B1.

B2: Electrification Cooperatives in Tanzania (TANESCO)

This project has had a very slow development phase, but has now resulted in a fascinating case study of rural electrification cooperatives and willingness to pay. Households connected to the mini-grid pay over ten times the price of electricity in Dar es Salaam, for a service that is available far less frequently. One question in need of immediate study is the willingness-to-pay based on service parameters.

In the pilot village (Urambo) a viable cooperative (of roughly 100 members, and a waiting list of five to ten) exists to manage the generator¹¹, discuss and evaluate collection strategies, and consider types of metering systems. The last two issues form part of the core economic concern of the community. Payment enforcement mechanisms are difficult in a small community, where the only apparent means of penalty is disconnection from the mini-grid. This is obviously not a socially viable strategy in a self-policed network.

As a first attempt at rural energy cooperatives, this project was not surprisingly somewhat expensive when evaluated on the basis of people provided with power (US\$ 228,500/(80 homes x 5 people/home) = \$500/person). It is also unclear why an external consultant sociologist was required, and not a local consultant.

A number of ideas exist that could be explored to guarantee payment without social alienation. It is somewhat troubling that the sociologists from the University of Dar es Salaam who were active in the initial community surveys have not discussed these various means with the community for potential experimentation or adoption. One model, of course, is to organize the homeowners into 'cells' and to implement the Grameen Bank-style group credit guarantee system. Not only has this proven effective for loans of various sizes (Microcredit Summit Secretariat, 1997), but there is current interest in extending the Grameen concept to infrastructure (Kammen and Dove, 1996) of which rural energy would be a perfect example. This study might not only enhance the economic viability of the project, but also connect the work of EEDP/TANESCO to larger theoretical debates over credit and rural development. In any case, a broader exploration of these options is in order.

At this point, the Urambo cooperative is relatively stable, but is in need of further analysis of alternate payment and power distribution strategies (e.g. current limited supply, addition of meters; added generating capacity). The community interest exists in several areas of Tanzania to replicate this experiment, and this should be done at once. The Urambo site is just that, a sample of one, and is the pilot project where many of the management techniques were developed. A parallel project at another location as well as a follow-up study of the Urambo community are therefore both important.

At each location a long monitoring process is necessary to assess the degree of community decisionmaking on how to select new cooperative members and -- potentially -- how to increase the generating capacity. Five years is not unreasonable for such a project lifetime.

A second important reason to test this process at another site is to build local capacity (presumably some UECCO members would participate as trainers, discussants, or observers) in this next stage.

¹¹ As an aside, it is worth commenting that this project does not deal with renewable energy; the power source is a reconditioned diesel station. Far from being a negative, or stepping outside the EEDP mission statement, this sort of work is to be encouraged. This is an excellent example of when to focus on, "social needs, not just energy needs" as one questionnaire respondent commented. The only way to evaluate the relative benefits of fossil and traditional fuels, and renewable energy is to undertake similarly framed and managed efforts.

This iterative participant-observer-teacher process is particularly effective when working with new technologies: the experiences of the first group are often the most meaningful and most relevant to the discussion and planning that takes place in later communities. This is also a way to explore -- and potentially even to foster -- the development of entrepreneurial activity around what was initially a pilot project.

B3: Miombo Ecology and Management (UNZA and DoE)

In many respects, this project exemplifies what is possible in a well coordinated research effort where different disciplinary strengths are combined. This project was discussed at length in the **Publications and Activities** section, above. The exploration of ecology, biomass management, and the consistent emphasis on practitioner-oriented documentation and materials in the Zambia project provides an exemplary model for future EEDP activities, and indeed for development groups generally. The reason for this is not simply that the individual publications and results are important (they are), but that the integrated assessment of charcoal is not a topic that any of the traditional development research and practitioner agencies would explore in such a comprehensive fashion.

The work in Zambia has consistently produced important documents scientific papers (e.g. Chidumayo, 1993), practical materials for practitioners in the field (e.g. Hibajene, 1994; Hibajene and Kalumiana, 1996)¹², and policy papers for use by mid and high-level government officials, development planners, and NGO's (Ministry of Energy and Water Development, 1994). In addition, environmental impact assessments produced as part of the program not only further explored integrating issues in development management, but they provide clear models of how to produce an EIA (Serenje, *et al.*, 1994): something that has consistently been misunderstood, and short-changed in development and conservation programs worldwide. This project moved relatively rapidly, partially because the range of project members served to facilitate a number of bureaucratic hurdles.

This EIA, for example, ranges from the obvious questions such as the impacts of protracted kiln combustion on surrounding vegetation, to the economics of the charcoal industry from the perspective of primary producers to urban vendors, to the very unconventional, such as the potential physical injuries from production to the changes in rural road quality from use by large collection lorries. A further notable feature of this program is that a number of the documents produced were co-sponsored by the Zambian Government (e.g. EEDP Series Reports No. 21, 33, 38, and 39). The lessons and insights from this sort of extended analysis model are numerous, and as with many 'mundane' issues, are largely unanticipated and serendipitous. Current trends to focus on, market-oriented partnerships are interesting, but are simply not going to explore the integrated environmental-social-economic system in sufficient detail to capture these insights. It is important that Sida and EEDP remain committed to identifying and supporting these long-term integrative ventures.

As a result, it would be well worth exploring the factors that contributed to the success and productivity of this project.

This project was both cost-effective, and dominated by in-country expenses. Networking and training benefits of this work will become increasingly clear as the charcoal manuals are disseminated in local languages. The intellectual and managerial infrastructure developed in this project is impressive; subsequent projects in the region to exploit this capacity are a natural next step.

Bioelectrification (1993-95 Workplan)

¹² The major criticism is that the reports in some cases too far too long for production.

Before exploring the Sawmills project (C1, below), a precursor initiative on 'Bioelectrification' from the 1993-95 workplan warrants discussion. The Bioelectrification project was an entirely applied effort to evaluate the types and efficiencies of various biomass based fuels for use in generally small to mid-sized (500 kW - 20 MW) gas turbine power plants. The goal of the project was to examine and learn from the experience at plants in Sweden, and then utilize that knowledge base in the exploration of fuel and turbine combinations at particular sawmills in Africa. Capacity building among African energy planners was a central goal of the project, and the primary publication, a collaborative effort between Mohamed Gabra and Björn Kjellström (1995) reflects that goal. Further, the natural connection to C1 provides an example of the types of functional linkages between projects that builds EEDP coherence.

This was a modest project (annual budget of ~ US\$ 80,000/year) that explicitly addressed practical instead of scientific objectives. This mission, including the sawmill energy generation and utilization workshop, is particularly important, and often overlooked. Indeed, EEDP and partner groups and individuals in Africa would benefit if more such training and networking activities took place. These are important for a number of reasons: they provide an important chance for the EEDP core staff to evaluate the training provided to project members; they are an opportunity to gather information on potential new projects, and to 'sound out' local groups as potential future project partners.

This type of project may appear to some to have little tangible 'product' or technology transfer outcomes. This is an erroneous view. A number of participants in the sawmills project (C1) commented on the value of the networking, training sessions, and energy economics that took place at the workshop, some claiming that it sparked their interest in continuing to pursue bioenergy projects at all. This project could be described as one of 'intermediate transfer'; it involved those already interested in the technology, but provided information and options without the inadvertent 'hard sell' that sometimes takes place when a development group is convinced they have the ideal technology or management practice for a recipient community. This niche is largely ignored in the development process, and is one that EEDP could well fill in a unique (but often unsung) fashion.

C1: Sawmills as Energy Producers in Developing Countries

The Sawmills as Energy Producers in Developing Countries project is an important initiative in many respects, and is one that should be pursued vigorously to answer a number of managerial, technical, and financial questions. This project is also an exciting step in the direction of private-sector partnerships that have been largely absent from past EEDP efforts. At present this project is on hold, although some preliminary work has taken place.

This project illustrates yet again the important role in of 'project-oriented support research' that EEDP can and should play. Mr. Spence at Border Timbers noted how useful to any potential woodfuel energy industry a manual or workbook on biomass waste management would be. There is a strong tradition in Zimbabwe of such manuals playing an important role in standardizing and disseminating useful results in the commercial sector; this is precisely the role that the government produced *Farm Management Handbook* has played for years to inform farmers across the country of the 'state of the art' in a wide range of very practical productivity issues. A similar 'Wood Waste Handbook' produced or supported by EEDP would:

- a) clarify what is and what is not known about wood energy;
- b) demonstrate to the private sector that EEDP is committed to a serious private sector energy initiative;
- c) at the same time, open new doors to the private sector for EEDP supported researchers, and

- d) lay the groundwork for a second, critically needed volume, on techniques in biomass energy production.

For example, studies commissioned by Border Timbers Inc., suggests that biomass as an energy supply is not economically viable if the transport distances extend more than roughly 50 km (Fridén and Strömberg 1993; Cochrane, 1995; Palm and Mellquist 1996), a result that is dramatically smaller than some of the other commonly cited estimates of the break-even distance for biomass fuels (Johansson, *et al.*, 1993). An important project, and useful opportunity for EEDP's core staff, would be a global inventory and evaluation of the various economic and ecological assessments of biomass energy viability. That is not to say that work already done in this area should be duplicated, far from it. But what has not taken place is any systematic comparative work on the economic, hydrologic-climatological, and sociological conditions that have resulted in past successes and failures¹³.

A second level of literature review and intellectual digestion is vitally needed, and generally ignored: that of side-by-side comparative evaluation. For example, the results from studies of biomass fuel silviculture from nations such as Brazil, Malawi, and Indonesia are almost never reviewed for consistency, contrasts, and applicability to other settings. This type of work is one area where EEDP core staff and field project members could perform an important service that would at the same time increase the generalizability and technology transfer from EEDP projects.

At present, EEDP has discussed and outlined such a project with Border Timbers, but has yet to initiate a full-scale effort. A number of EEDP projects have had slow 'take off' times, often for perfectly good reasons. It is particularly important, however, that when dealing with the private sector to initiate, undertake, and come to conclusions in a timely fashion or to risk not seeming 'serious' about the work. Industry moves rapidly, and if EEDP wishes to make a positive contribution to the private sector (an important goal), then these delays are to be avoided at all costs. As noted above, some of the delays in EEDP project evolution stem from ambiguities and discussions within Sida, and between Sida and SEI. This process needs to be streamlined.

A second critical project would be to investigate the optimum electricity rate structure for biomass industry viability in rural vs. urban settings. The rates charged by many utilities in developing nations involve set tariffs if a threshold load is exceeded (ZESCO, 1996) at any point during the billing period. This often generates economically irrational equipment operation schedules, and could well be rationalized given sufficient understanding of the economics of various rate schemes. This area might be of considerable interest to environmental and development economists, an area where EEDP, and SEI generally, has few active researchers. One means to address both issues would be through expanded collaboration with environmental economists at Swedish universities and utilities. Logical candidates to approach with this project include the groups of Prof. T. Sterner and Prof. K.-E. Eriksson at the University of Gothenburg, and L Bakeus at Stockholm Energi.

Bioenergy Project, University of Dar es Salaam

This project has been both plagued by bad fortune (the death of key researchers) and is disappointing in the volume and diversity of output (Sawe, 1995; Kauzeni, *et al.*, 1996). At the same time, there have been constant problems in the administrative interaction of this project with EEDP, so that both sides point to deficiencies on the part of the other.

The final report (Kauzeni, *et al.*, 1996), however, is an interesting document, containing a number of useful integrating ideas about interdisciplinary work. Given the diversity in background of the

¹³ The fuelwood plantations in Malawi and Ethiopia, as well as biomass energy plans for Brazil all contain interesting lessons that could be explored and applied to this situation.

team members, however, far more could have been done to quantify the findings of quantitative methods in village-based biofuel management. The final report stands as a solid example of participatory assessment, but does little to add to the body of academic or practical field manuals that already exist (see e.g. WRI, 1993). The various intermediate project papers listed in the EEDP Quarterly Progress Report No. 32 were not available for review.

Through this project little to no capacity building or outreach appears to have taken place. The final (academic) report has not been matched with associated documents or materials for practitioners or local community use. This insularity may be due to the preponderance of academics -- and from the same institution -- involved, and if so stands as an example of the benefits of diversity in maintaining the impetus to meet both research and immediate practical benefits. The budget is far too large for such a limited range of outputs (~ US\$ 170,000/year), which does not include extensive materials for the target populations, equipment, or other capital expenses.

Woodfuel Efficiency in Small-scale Industry: Brick Making in Tanzania

This project is intriguing in design and goals, but could not be fully evaluated at the time of the January 1997 field visit because several important project reports were still in draft stages. This project appears to fit well with the objectives stated by Sida (Appendix A: §5.1): to support projects relevant to other EEDP projects (in this case the connection to the charcoal work in Zambia); to strengthen analytical capacity in Africa; and to establish or expand linkages between the production of research results and dissemination or implementation efforts. The project also fits with local goals to provide a research base for the evaluation of significant patterns of national resource use (in this case both biomass fuels and bricks for construction). The need is certainly acute; in one study region, Iringa, for example, some 3,000 tons of biomass is consumed annually for brick production, which in turn has contributed to significant deforestation up to 60 km from Iringa town (Mwihava, *et al.*, 1997).

At the analytical level this project has done a credible job of supporting local scientific capacity building. The analysis of the brick making process in the draft report is, on paper, impressive, covering everything from fuel (tree) selection, to firing methods to combustion efficiencies and evaluation of the resulting brick quality.

As early as spring 1996 the project team identified several problems of data reliability and comparability between field locations. The resolution of this situation remains unclear even in recent project documents (Mwihava, *et al.*, 1997), making full project evaluation impossible.

Should this data problem be resolved and to then capitalize on the anticipated results of this project the EEDP staff will need to engage in long-range policy planning and scoping work in other countries. The results of the Mwihava, *et al.*, (1997) report may potentially benefit artisans and district planners in Arusha and Iringa (if the results are made accessible in forms similar to that of the *Manual for Charcoal Production in Earth Kilns in Zambia*, Hibajene and Kalumiana, 1994)

The critical questions of the transfer of project results and technology(ies) is more ambiguous. While the project results were still in draft, and thus are not likely to have been widely disseminated, one important linkage with similar efforts in Zimbabwe (see the next section for particulars) did take place, although greater benefit might have been realized if this connection had been made sooner.

Proposed Projects

In addition to project C1, Sawmills as energy producers, three other projects were included in the proposed workplan 1996-1997 of December 18, 1995 but were not granted funding from SAREC's research board. They are currently on hold. These projects are: (B4) Standards and

Information Techniques for Household Appliances in South Africa; (C1) Saw-mills as Energy Producers in Developing Countries; (C3) Electrification of a Low-Income Area in Zambia, and; () PV-technologies for Selected Loads in Isolated Rural Areas. The author only visited C1, (which is reviewed above) but offers comments below on the others based on the written material and discussions with SEI and project representatives.

B4: Standards and Information Techniques for Household Appliances in South Africa

The proposal for this project is to evaluate both technical and managerial/policy means to improve household energy efficiency through a variety of traditional demand-side measures (standards-setting, price/efficiency analysis of commercially available household technologies, and an analysis of barriers to further efficiency increases faced by private sector appliance manufacturers, installers and maintainers). This goal is critically important for development in South Africa, where the government and the utility, Eskom, are committed to tremendous numbers of new connections (estimated at > 200,000/year), many of which are *proposed* for rural and remote areas where the quality of the appliances can dramatically impact the effective service provided by new grid, off-grid, or mini-grid systems (including various non- or partial-metering methods). The partner organization, the Energy Development Research Center (EDRC) is world class, and this project would develop a direct EEDP-EDRC relationship, an important goal in itself.

This project should certainly take place. The only question is how to maximize the benefit to other African nations and utilities. The expertise at Eskom and EDRC is impressive, and the process of DSM planning and management proposed here could be a great learning experience for members of TANESCO, ZESA, as well as smaller-scale community energy organizations, including UECCO. The work plan and budget for this project call for two workshops, although it does not appear that members of these non-South African groups are to be invited. It would make sense to include them, potentially even to offer longer-term internships for representatives from Tanzania, Mozambique, Kenya, etc. ... to participate and learn as project B4 evolves. This regional training role also provides an important avenue for technology and information transfer, and a means to evaluate the long-term impact of this project. Without these linkages this important project will not facilitate the EEDP/Sida mandate of advancing activities in the region generally.

The budget for this project (~US\$ 115,000) as well as the particular items are in line with other Sida and EEDP projects, and if anything could be increased to include non-South African observer/participants. With the delay in Sida support SEI-Boston and EDRC are seeking, or have secured, alternate sources of project funding.

C3: Electrification of a Low-Income Area in Zambia

This project will use a revolving fund to enable households in a low-income area in Ndola, Zambia, to acquire a connection to the electricity grid and appliances to be repaid with an interest over a five year period. The fund is managed by a private bank, with ZESCO and the Department of Energy the implementing and evaluating agencies (with SEI).

The number of revolving fund projects in energy, agricultural, water and other development projects worldwide is currently skyrocketing, and a comparative review of the practices and outcomes of these efforts would be of great value, and would serve to generalize the results of this project. Again, a larger EEDP core staff could take on this type of project-relevant and supportive research.

The potential to build synergistic linkages with other EEDP projects (notably the Urambo and Mbinga, Tanzania) appears to only appear through the involvement of Exergetics, for which one week of time is allocated. Even if the settings are dissimilar, it would seem logical to build greater functional or training linkages with project (B2), Electrification Cooperatives in Tanzania.

This project fits not only the sort of applied investigation that is perfect for EEDP to pursue, but also fits with the current international interest in micro-credit and private-sector linked projects. A large fraction of the budget (~US\$ 160,000) is allocated for equipment (to be recovered for the revolving fund) or consultant salaries, but given the multiple research questions involved, this is easily justified. Experience with PV programs in other nations suggests that the effects of training programs are often subtle and slow to 'take off'. Many World Bank and US AID investments in PV in Kenya in the early 1980's appeared to the program managers to generate little activity. A decade later, however, the industry is thriving. This is certainly not only (or even primarily) due to these early investments, but they do play a role. A number of individuals exposed to PV systems, or involved in electrician training courses later re-entered the PV field as the economics became more favorable. For these reasons a long commitment to this project -- and in particular the training phases -- is essential.

C4: PV-technologies for Selected Loads in Isolated Rural Areas

This project, based on the installation of roughly 100 PV sets, could test several ideas concerning the function and organization of local renewable energy service companies. Too few project details have been fleshed out in the 1996-1997 workplan for a meaningful pre-review (the country, type of community, training materials, local partner groups, and so forth are not specified in published documents¹⁴). Far more extensive justification needs to be given for spending 65% of the program total in Sweden (35% for personnel, travel and publications, and 32% for PV equipment to be *exported* from Sweden). The PV system export is particularly troubling given that there are viable PV industries in several African nations. Granted that panels in these markets are themselves imported, but working through industries on the continent would seem far more likely to have positive spin-off effects.

The budget, while large (~US\$ 320,000), does include training courses which are seen by many researchers (e.g. Hankins and Best, 1994; Acker and Kammen, 1995; Karekezi and Ranja, 1997) as a critical to long-term success. Training is chronically under-supported in development projects, ironically even in cases when it is explicitly budgeted. For example, the global experience with donor-driven PV projects is poor, at best. What plan exists to build a service, maintenance or vendor community that could service these systems and carry a donor-initiated program to commercial viability? How will the publications target the needs of local groups? Will manuals similar to that of Hibajene and Kalumiana (1994) be produced, and will the training materials produced by Energy Alternatives Africa and EDRC in Cape Town, among others, be utilized?

A considerable amount has been published on the various means to evaluate system performance, customer and vendor satisfaction, but at this stage the formal project plan lacks these crucial details. South Africa and Zambia have had considerable experience with school and clinic PV systems, and the private market is active in Kenya and other nations. It is again unclear from the project report how these experiences will be internalized in this project. Even though the subject area and dynamics of this project are potentially fascinating and important, the need to resolve these questions raises concerns with this initiative.

¹⁴ For example, it makes little sense to import PV equipment from Sweden given the current markets in Kenya, Zimbabwe, South Africa and other African nations. Even though components of these systems are themselves imported, the 'chain of sustainability' is far stronger if direct importing from Europe is avoided.

Building Program Coherence

Project Development and Selection

One criticism of EEDP raised by Sida is that the program lacks overall direction or coherence. This is a valid and important concern in a diverse field such as energy and development. At a very general level, simply the focus on renewable energy and development provides some focus. A number of avenues to build greater program integration and synergism, however, need to be developed. These constitute a set of related recommendations. First is the clear need for integration and coordination of project resources. This can come in many forms, from distribution of reports and proposals between EEDP sponsored projects for review and commentary, to soliciting proposals for new initiatives from current member groups in Africa, to holding regular regional meetings to facilitate this sort of dialog and exchange. Second, overall program coherence would be greatly enhanced if a number of methodologies and development models were used to evaluate and define projects. This does not mean that projects must, for example, all be focused in the same technical sector, but only that a coherent set of ideas (e.g. participatory vs. centralized management; true-cost vs. ability-to-pay pricing, etc. ...) were used to test and refine individual projects. In the sections below, we consider opportunities for both broad coordination, and theoretical integration of the EEDP.

Regional Conferences and Project Coordination

The value of conferences and workshops, specifically the lack thereof, was the single most common issue raised by the African project teams in the questionnaire responses. Virtually every project participant or manager mentioned the benefits of meetings both with the members of the *other* EEDP sponsored projects, with EEDP staff, and with other academic or development assistance groups that attended the meetings. *Every* group mentioned that in the last several years, there had only been one meeting of all the EEDP sponsored projects (April 27 -28, 1995; SEI 1995a). Two other more informal meetings took place where some of the project members had the opportunity to meet and discuss projects with each other: a meeting AFREPREN arranged at the Harare Solar Summit in September 1995, and a smaller regional meeting on biomass energy resources held in Lusaka.

The EEDP and its partner institutions and projects have already begun identifying many of the groups in Eastern and Southern Africa active in the area of energy and environmental research, development, and implementation. The list included (EEDP, 1996a, p. 8):

- AFREPREN
- Department of Energy, Lesotho
- Department of Energy, Ministry of Energy and Water Development, Zambia
- Energy Affairs Bureau Division, Seychelles
- Energy and Development Research Centre, University of Cape Town, South Africa
- ESKOM, South Africa
- Institute for Resource Assessment, University of Dar es Salaam, Tanzania
- Makerere University, Kampala, Uganda
- Ministry of Energy and Minerals, Tanzania
- Mwerekwa Zambia Forest College, Kitwe
- Rural Industry Promotion Company, Botswana
- Southern Center, Zimbabwe
- TANESCO, Tanzania
- University of Zambia
- ZERO, Zimbabwe
- ZESCO, Zambia

A regularly scheduled regional workshop or conference on renewables, energy, and development to review projects, discuss emerging issues and identify new projects should be a regular part of the Sida/SEI/EEDP mission. IT is somewhat striking that this has not so far been an ongoing program activity. The list above provides a natural beginning for that group, and could be augmented with:

- 1) the many institutions identified in the RETS database compiled by AFREPREN (Karekezi and Ranja, 1996);
- 2) the growing number of private and commercial renewable energy manufacturers, assemblers, and vendors active in Eastern and Southern Africa;
- 3) additional university and government agency groups as they demonstrate an interest in project design or participation in individual projects.

These regional meetings would also be the best source of feedback, criticism, and networking for the individual projects due to the similarity of experiences between the groups. Further if held regularly these meetings:

- 1) Provide a forum to invite, critique and adapt project ideas;
- 2) Provide a meeting ground for EEDP project members and invited guests, who might either submit proposals to EEDP, or who might collaborate with current project groups; and,
- 3) Provide a means for the dissemination of project results and the development of collaborative or comparative efforts between teams.

An example of the need for this sort of regional coordination (item #3 above) is the experience of Mr. B. Mrindoko, Director of the Renewable Energy Section of the Ministry of Energy and Minerals, Government of Tanzania, Mr. N. Mwiha, and the EEDP sponsored Energy Efficiency in Small-Scale Industries project. A team appointed by Mr. Mrindoko, consisting of Mr. N. C. X. Mwiha and several forestry officials undertook the project particulars and then found out only after the project was completed that Nyabeze, *et al* (1995) at ZERO in Zimbabwe had conducted a virtually identical study of brick-making techniques. The Nyabeze study was quite exhaustive, and duplicated many of the tests that the Tanzanian group had already confirmed (in fact, the kiln recommended is a model common in Tanzania). This duplication of effort is on occasion difficult to discover while working on the ground in Africa where information exchange is not ideal. In this case, however, the groups were apparently aware of the activities of the other, at least by the 27 - 28 April EEDP *Review Seminar* held in Stockholm (Mwiha, 1995). It is unclear what was initially done to exploit the fact that parallel research programs existed. After this initial phase, however, the groups then began to correspond.

Paradoxically, however, this duplication would also have been relatively easy for the EEDP team in Stockholm to discover because the ZERO publications are sent to SEI, and because of their knowledge of the Tanzania effort. Regional meetings where guests such as ZERO would be invited would have prevented this duplication and may have generated cooperation and capacity building. The goal of such coordination would not be to remove any duplication of effort -- indeed, that is often central to the scientific process -- but to make the groups aware of the efforts and interim results of the other.

A simple suggestion to begin this process of information exchange and inter-project dialog is for EEDP to take on the role of preprint and preprint clearinghouse for both Sida/SEI sponsored projects, and ideally for papers from selected other groups as well (such as those from ZERO,

ENDA-TM (Dakar), the Southern Centre, EDRC (Cape Town), and so forth). The SEI library and AFREPREN both already attempt to collect many of the publications on energy and development in Africa that are produced. At minimum, EEDP could regularly send update lists of new papers to all the project groups. A more aggressive approach would be to regularly send copies of these new papers to each project team. At present, all of the project groups do not even receive all EEDP/SEI reports on a regular basis.

Recommendation: EEDP supported project staff members should meet regularly as a group. A tremendous resource for internal project review and replication exists within the community of African energy and development researchers supported by EEDP, and yet virtually no formalized discussions take place between the groups. Regular regional conferences could be used to review projects, identify promising new avenues, and build networking connections and capacity.

This process is also logically extended to include international experts who could broaden the range of agencies with which EEDP project members have active ties, contacts, and support services. An international advisory group, for example, could become the conduit through which EEDP projects are brought to the attention of other donor and loan-making organizations, notably the Global Environment Facility.

There are, of course, logistic and financial costs associated with organizing and convening an international advisory group. The benefits, however, are potentially great for EEDP as it functions as a relatively small organization. First, the advisory group, selected from active scholars and practitioners in the field, will likely have direct information on the activities of both similar and complementary studies, pilot projects, that would be of value to the EEDP core staff and field project managers. The extent to which project reports and summaries in the field of development are often only available as 'gray' literature, and even then often only after projects are completed argues for this first-hand networking function of the advisory group. Second, the advisory group is likely to suggest projects and directions that they feel have been overlooked or prematurely rejected by the major multinational donors, such as the World Bank group. EEDP has the capacity to explore non-traditional projects, management methods, and interdisciplinary perspectives that do not find support in the often times homogenized approaches of the largest lenders and development organizations. Third this group represents another avenue of contact for the EEDP supported African project teams to build international support networks both for funding, and for the infusion of new and different ideas.

Recommendation: EEDP, in collaboration with Sida, should convene a truly international energy experts advisory group that would meet regularly to provide recommendations and suggestions for program direction. This group could not only provide technical, social scientific, and economic input on new and proposed projects, but could examine avenues to extend or replicate successful EEDP projects through other financing mechanisms.

This group would assist in defining and maintaining a programmatic focus of EEDP activities, and would combat the tendency of the SEI 'community' to become insular. One model is the Science, and Technology Advisory Panel of the GEF. The STAP panel evaluates projects, suggests new directions, and -- when motivated -- also engages in analytic and scoping studies to help guide project selection.

Program Coherence: Energy & Development Hypothesis Testing

One striking means to foster program coherence is to utilize, or better yet, develop new methodologies at both the project-specific and more general programmatic levels. The need to consider diverse projects based on very sometimes conflicting criteria (e.g. in terms of capacity

building, micro-economic theory, financial viability and the potential for growth, and environmental concerns) is a difficult but often productive process.

For example, the concept of 'critical mass' in the number of renewable energy commercialization groups (the number of assemblers and installers of a given technology) may prove to be particularly instructive in evaluating the viability of a given renewables industry. AFREPREN is exploring this concept at a regional level (Karekezi and Ewagata, 1996; Karekezi and Ranja, 1997), and EEDP staff could conduct similar scoping studies and analysis at a global level to determine the viability of the concept in predicting: (a) market strength; and (b) the opportunity for Sida/EEDP investment in, for example, the windpower or photovoltaic R&D or market in a nation or region to significantly enhance the spread of that renewable energy technology. The exploration of this question in both formal and informal economies is one logical way to bring greater contact between Swedish university and industry groups and the EEDP field project groups in Africa.

Augmenting the Field Projects with Integrating Research Initiatives and Global Scoping Studies

The true value added of the EEDP lies not in simply supporting the field projects logistically, but more importantly in contributing intellectual capacity, resources for program growth, and comparative studies of the energy-development interface. The combination of access to resources within SEI, and to the community of development scholars and policy makers outside of Africa gives EEDP a unique opportunity to perform directed applied research to build on the results of the particular projects. EEDP could, for example:

- (1) Undertake global or regional comparative studies of issues, technologies or management options raised by individual EEDP projects;
- (2) Present successful pilot projects for replication by multinational donors; and,
- (3) Develop active partnerships and provide support for private sector operations and vendors who are working to commercialize viable renewable energy technologies.

EEDP has underdeveloped and underutilized this role that could result in greater impact on energy-based development policy globally. Partially this is due the small size of the EEDP staff, and the large management burden discussed previously. A larger staff with significant training and experience in energy issues is critical to performing this function. In particular, a larger program staff would mean that individuals from the Stockholm office could work for longer periods with particular field projects as active research partners (both at the field locations and by analyzing comparative information from projects outside the region).

With the departure of Lars Kristoferson the capacity of EEDP to perform this central task is currently in question. In the past EEDP had strengths in several specific technical areas relating to renewables. That capacity is currently lacking. Identifying a new EEDP director, and potentially a pair of researchers (for example one based in Africa, one in Europe) is critical for EEDP. There are a variety of individuals who could fill this role, with important criteria including:

- (a) broad experience with traditional, fossil fuel, and renewable energy technologies and management methods;
- (b) a clear and ongoing research program of his/her own; and,
- (c) interest and experience in moving projects to larger funding sources so that EEDP projects can be expanded by partnership or utilization by multinational or private funding sources.

Each of these are equally important, and it is vital that condition (b) not be lost in the process. Programs with directors who simply direct often lose intellectual rigor.

Recommendation: EEDP must recoup and build beyond the former internal program strength in energy and development research. If not, the utility of the program is questionable. An expansion to a core research staff of three, an administrative staff of one, and one or more administrative and research assistants would be sensible.

There are, of course, multiple ways to finance this considerable expansion of staff, and several options could be considered for the long-term stability of the program. In the short-term, however, it is important that action be taken to expand the staff or risk the stagnation of EEDP as an administrative, not proactive research and development group.

Recommendation: EEDP must consult and collaborate more closely with the African project groups to identify and then undertake capacity building and research efforts that will generalize, compare, or extend the work of specific projects. These projects should become the focus of research projects by EEDP core staff.

Developing Methodological Tools

A shortcoming common to such of the work on energy, environmental, and science and technology projects, has been the lack of general methods that have emerged from the research. In fact, this field has been described as, 'a set of fascinating, individual, cases disconnected by theory'. While the process of meaningfully generalizing results from one project to the next have proved particularly challenging in this field, promising results do exist. Many of the innovations in this regard have come from areas where applied work and more academic analysis has been conducted in concert. The EEDP program is poised to perform just this sort of research, and one of the important goals for the future of the program should be to identify areas where this combination can be achieved. In addition to the work on the 'fuelwood gap' hypothesis discussed above (Leach and Mearns, 1989), there are other preliminary examples emerging from EEDP supported projects such as that of AFREPREN.

Among the issues that AFREPREN has been pursuing, one in particular may help to unify research on a wide range of renewable energy issues: critical mass theory. AFREPREN researchers are in the early states of utilizing critical mass theory to try and understand the viability of specific renewable energy industries in East Africa.

Technology	Numbers in Kenya		Critical Mass Estimate		Critical Mass?
	Units	M & A	Units	M & A	
Improved Cookstoves	~ 800,000	30	7 - 10,000	7 - 10	Yes
Photovoltaic Systems	40 - 60,000	20 - 30	1 - 2,000	5 - 7	Yes
Windpumps	350 - 450	2	600	5 - 7	Near Threshold?
Solar Water Heaters	~ 2,000	P/T	4 - 5,000	5 - 7	No
Micro-Hydro Systems	~ 100	P/T	600	5 - 7	No
Biomass Digesters	~ 1,000	P/T	2 - 4,000	7 - 10	No

Table 3: Critical Mass estimations for various renewable energy technologies in Kenya.

Abbreviations:

M&A: Manufacturers and Assemblers.

P/T: Several companies manufacture these units either from time to time, or in response to individual orders.

Despite the difficulty, the Part-Time (P/T in Table 3) renewables manufacturers and assemblers could be targeted for increased research and project outreach by EEDP and other development agencies. This P/T or informal activity in the renewables industry represents a rational response by producers to the lack of market education on the part of many potential consumers, and is a natural Part-time manufacturers may also represent the embryonic or newborn stages of the industry, and are rarely considered or supported by aid and development efforts (Kammen, 1996; Kammen and Dove, 1996). In fact, they warrant *more* attention and support than formalized industries because expanded support for networking, marginal increases in orders, added human and infrastructure resources can all dramatically increase their commercial participation in the renewables sector.

Some of the fascinating research issues that EEDP staff and affiliated technical experts could pursue in support of in this area include:

- How does the process of institutional learning progress in informal sector, part-time industries? As a research question this area is almost totally overlooked. Past research efforts have largely been focused on technology diffusion and market expansion where the price elasticity of sales is relatively high, commensurate within a well-established market where alternative supply options exist for potential customers. This bias is seen in both engineering and economic studies. The 'functioning market' model is frequently inapplicable in poorer nations, and for emerging technologies¹⁵ where information about the technology is minimal and mis-information is large (e.g. for micro-hydro or windpumping in Kenya) or where willingness to pay is sometimes very large (such as in PV sales to some affluent rural customers where the price elasticity is effectively zero, Hankins 1991, 1993; Hankins and Best, 1994; Acker and Kammen, 1996).
- Do donor dominated sales distort both the manufacturing and demand aspects of the market, or do they spur growth through increased awareness or sales? What, if any, are the barriers between donor-based sales and the commercial industry and how can they be reduced?

Both of these issues open new research ground in micro-economic and development economic theory, and would be of great interest to academic researchers if they saw avenues to acquire the necessary data. Few mechanisms exist to collect this material on a consistent and long-term basis. This in turn has been a major stumbling-block for the academic community to pursue these topics that are often seen by traditional academic funding sources as 'too mundane' or applied. Here again EEDP has a tremendous opportunity to build research and development linkages.

If EEDP had a core research staff then they could: (a) identify issues such as this; (b) explore the potential university linkages with groups such as that of Professor Sterner at the University of Gothenburg; and, (c) then remain engaged as the project evolved. This project dynamic would benefit the project recipients directly, Sida, EEDP, and the university research groups in Sweden and elsewhere. Further, it would provide concrete case-studies to the multinational lending and development community that has not built enough interdisciplinary research and development teams, and also lacks successful pilot studies in sustainable energy development for large-scale emulation and dissemination.

¹⁵ Markets for emerging technologies are in some cases *clearly* pre-economic, violating by definition the parameters of the functioning market model.

Recommendation: Methodologies emerging from, or relevant to, EEDP supported projects should be explored from a research and development perspective by *both* EEDP core staff, and the field project staff.

Recommendation: There is insufficient presence within EEDP and SEI staff offices of African research and development scholars and interns. For example, the visiting researcher program discussed and planned for EEDP in the area of 'Women and Energy' should become active.

A continuous flow of internships and practical training periods where African researchers gain experience development research and in the politics of development grantmanship contributes a great deal to nurturing indigenous capacity.

Taken collectively, these last four recommendations plus an active research team within EEDP would ensure a high degree of both program coherence and would generate synergistic learning between the particular field projects.

Comparisons to Other Programs

The niche of the EEDP is to develop, test, and then present new and sometimes risky projects for evaluation and potential adoption by development organizations. While direct group to group comparisons are often misleading, this does provide some measure of 'product'.

One of the most widely known of the major development project energy technology dissemination cases in Africa is the improved cookstove projects in several nations. While debate of the success of these programs, as well as issues of credit continues to be debated both of these cases, it is interesting that each was the result of large-scale agency activity. The Kenya Ceramic Jiko (KCJ) involved, at least, USAID, Care, KENGO, the Bellerive Foundation, several private groups and many others. The total budget has never been tallied, but in the course of roughly 20 years it is fair to say that a transformation has taken place in household cookstove technology (almost one million KCJ's have been sold in Kenya, with impressive totals in several other nations as well; Hankins and Best, 1994; Karekezi and Ranja, 1997). The lesson in this story (Kammen, 1995) lies not in the details, but in the collaborative process.

The diversity of cooking styles, stove types, and implementation and training programs could not have been accomplished by one group, no matter how large. A single large team would invariably try the same protocol in too many dissimilar settings. This case represents a triumph of diversity (not to gloss over some very brutal internal battles). EEDP is engaged in virtually no large consortium research and dissemination efforts (unless the Maputo coal stove work is to be counted, e.g. EEDP publication No. 42). It may be worthwhile to try such an approach. The charcoal kiln work in Zambia, and the proposed PV dissemination effort (C4) work are logical candidates, as is rural electrification, mechanical windmills, and in some areas household or farm-based biogas plants. Large team-based approaches are invariably bureaucratic and frustrating, but Sida/EEDP's long-term relationship and relatively stable funding make them an ideal player in this work. The added benefit for EEDP would be closer ties with organizations and programs that could, in turn be customers or evaluators for EEDP projects.

Recommendations for the Future of Sida and EEDP Operations

Programmatic Recommendations

One bureaucratic problem that has hindered the SEI/EEDP-Sida relationship is simply that of clarity of goals. Despite a steady stream of documents presenting the mission statements and policy goals of both groups, frustration persists on both sides over the clarity and consistency of the messages and mandates received from the other. This tension is generally counterproductive -- as opposed to

an intellectual discussion -- and is apparent to many of the African project teams. An external, advisory panel of experts working with both groups to plan the EEDP mission, develop projects, and identify potential areas of collaboration with other development groups or commercial organizations would be one means to address this problem.

A general problem in Africa is that despite years of aid and assistance effort, the sustainable development, or maturation of few renewable energy or energy efficiency programs have emerged. While a number of technologies may be close to 'take off' arguably only improved cookstoves can really be counted in this category. What can EEDP do to more rapidly facilitate this process? A number of options exist that should be jointly evaluated by Sida and EEDP, ideally through the International Energy Experts Advisory Group. Several of these possibilities are discussed below.

• *Build Collaborative Links and Support the Private Renewable Energy Sector*

In many ways it is this last group that many of the activities of EEDP and Sida are generally intended to support given the overall program mission to aid in educational, design, dissemination and commercialization activities focused on renewables. In fact, it is impossible for Sida, EEDP and the other partner institutions to succeed in their long-term mission without these private groups who represent the means to bring projects from pilot phase testing and refinement to the economic mainstream. Emerging EEDP sponsored efforts such as the proposals by AFREPREN to 'reverse engineer'¹⁶ various technologies and to build manufacturer and assembler information networks, and possible future EEDP projects involving private power generation from biomass waste in Zimbabwe (with Border Timbers) are useful beginnings.

However, considerably more effort should be devoted to this area, particularly because in developing economies with large informal sectors many of the simple market mechanisms relied on in so many multinational development projects are not yet applicable. Many companies active in the renewables sector are not dedicated to single technologies. As a result, they may not be aware of market opportunities, may welcome assistance in educating customers, and likely have a diverse range of suggestions and proposals that have not been considered by the traditional mixture of academics, multinationals, and consultants who in the past have *de facto* set much of development and technology policy.

A variety of mechanisms exist to build these private sector partnerships, many of which may be of interest for future EEDP activities, including:

- Examining the successes and failures of past efforts to commercialize renewable energy technologies. Examples include the success at commercializing improved efficiency stoves (Barnes, *et al.*, 1993; Karekezi, 1995; Kammen, 1995), and studies of the renewable energy vendor communities. Aspects of this work could logically be undertaken by EEDP core staff, Africa project partners, and new private sector groups as well. For example, with the completion of the *Directory of Renewable Energy Agencies in Eastern and Southern Africa* (Karekezi and Ranja, 1996)
- Directly funding some projects based at, or in collaboration with, commercial ventures. One partial example is the Swamills as Energy Producers project EEDP has initiated with Border Timbers in Zimbabwe (Appendix E, item C1). It is unwise, however, to conduct such a project without an explicit research partner. The time pressures and issues of proprietary control faced

¹⁶This is the term used by AFREPREN to describe not the technical process of system design, but the analysis of the manufacture to market to customer chain. This goal, focusing on the dynamics of the dissemination process via collaboration with private sector groups, is important and should be supported. 'Reverse engineer' is in the view of the author not an accurate description of the process.

by private enterprises largely precludes the type of investment in research findings that will be disseminated easily beyond the sphere of the initial project. Partnerships of private enterprises with university or NGO-based research groups, or with EEDP itself if it had the necessary research resources are recommended instead.

An Example Project: Windmills in East Africa

The conditions outlined above can be summarized as: (a) engage the private renewable energy sector in research and dissemination projects and provide them with a clear value-added from EEDP; and, (b) test the Critical Mass hypothesis.

Analysis and consumer education in the sale of windmills is an ideal combination of these goals. In East Africa, two main windmill manufacturers and vendors are operating, Kijito Windpumps¹⁷ and Pwani Engineering. There are roughly 280 Kijito machines, and perhaps 150 Pwani systems in place, and each are clustered (see the map in Appendix J for Kijito; Pwani machines are clustered along the coast, as per the Swahili name, *pwani*). Both manufacturers comment that, "there is a big customer base for our machines, but the ideal of operating your own windmill -- even if all you have to do is 'add grease' (Harries, undated) -- is a major hurdle." Both manufacturers could benefit by a workshop or training course with development groups, a potential client pool, and researchers interested to explore the questions of renewable energy markets, financing, and credit (Borg and Odén, 1995). At the same time, there must be a clear benefit to these commercial groups, as one put it, "I've been interviewed, poked and prodded more times than I've sold windmills!"

This program would build private sector bridges (including potential internship locations for short courses), and could be used to address several basic questions, including: (a) how important is the critical mass concept (Table 3)?; (b) how do learning dynamics differ in the informal sector industries (c) can user education program or renewable energy credit guarantees overcome technological uncertainty on the part of manufacturers or customers? (d) Kijito windmills, at least, exhibit clustering in sales (Appendix J), what size clusters are necessary to support regional training and maintenance centers, and can these be used to seed an industry?

• *A more formal and systematic consultation process with researchers and policy makers in developing countries is needed.*

The African project participants uniformly commented that meetings between the various project teams were far too infrequent, but were particularly valuable in providing program feedback, and in building local capacity.

• *Structural changes for Sida/SEI/EEDP to consider:*

1. Moving a primary EEDP office to Africa, where it would both facilitate collaboration with the individual projects, and serve as a nucleation point for a variety of activities. In particular, an Africa-based center might be expected to function more as:
 - (i) A technical assistance center that will allow members to share best practices and various skills amongst each other;
 - (ii) A clearinghouse that makes available to its members publications, research results, and other information;

¹⁷ Mike Harries (M. A.), Managing Director, Bobs Harries Engineering Ltd., Karamaini Estate, P. O. Box 40, Thika, Kenya, Tel: (254) 2-47234, 47250.

- (iii) An organization point for work/study groups that facilitate high-quality networking through collective learning, problem solving and resource sharing;
- (iv) A logical center for conferences, forums and workshops for the membership to promote cross-fertilization and to increase the knowledge base of the membership.

Maintaining an African project office should in no way compete with the individual projects. In fact it would not. The staff at such an office would serve as a central hub where the African researchers could spend days or weeks working on project documents (reports, papers, further proposals) with the advantages of networking, increased contact with visiting experts, and education for junior researchers and team members. Interaction with EEDP core staff could also be increased.

2. Develop an active Working Group to explore the means to make particular projects and technology development efforts sustainable and autonomous of EEDP as a direct step toward commercial independence.

Conclusions

EEDP or a New Model?

An implicit and explicit (Appendix A, §6) task for this review was to explore alternative models to the current Sida-SEI-EEDP structure that would also address the overall development objectives of Sida and of EEDP as well. As has been stressed throughout this review, by combining research and implementation goals and capacity within one group, EEDP is relatively unique among active development institutions. While alternative models are easy to propose, this combination of research and activism is difficult to realize. One alternative to EEDP would be to support African university departments and private/NGO groups directly. Some of this is, of course, done already via direct contracts to university departments in one case, and AFREPREN in another. This has in cases proved to be a productive relationship, and one that should be supported. This linear donor-client model is far from unique, of course, and does not represent a unique and innovative institutional dynamic. EEDP represents a chance to do more.

The EEDP has been criticized on two key points: the lack of clear in-house research accomplishments; and the failure of some projects to build significant local capacity or to themselves be replicated. Instead of suggesting elaborate new managerial schemes, we suggest here that the EEDP model itself has not truly been tested. To truly test the EEDP model, a certain critical mass within the program is necessary. To date EEDP has not been afforded the resources to achieve this critical mass, and thus the model of field projects linked by a supporting research network has not been fully tested.

Program Building

Despite tremendous solar, wind, micro-hydro, and biomass potential and some promising cases of technology development, adaptation, or diffusion, virtually no policies or long-term renewable energy strategies exist for sub-Saharan Africa at the community, national, regional or multinational levels. At best, short lists of individually interesting but disparate projects have been cobbled together in the hope that a coherent program will somehow emerge (Clement-Jones and Mercier, 1995). The African region is not alone in this problem, but may lead the world in the degree of energy and economic stagnation. The irony of this energy and environmental impasse is that while technological, managerial, and financial innovations in the renewables area are taking place at a remarkable rate (Williams, *et al.*, 1993), a number of important efforts to forge a coherent

research, outreach, and implementation policy are meeting active disinterest (Anderson and Ahmed, 1995).

The EEDP has all the resources necessary to flourish in contrast to this incoherent image: the prospect of long-term support for worthwhile projects; a bi-modal organization with field projects in Africa and a central research and management hub in Europe with access to extensive data on energy, development, and emerging financial issues; and access to skilled researchers. To date EEDP has developed several interesting projects, including several that are linked in important synergistic ways, but still has far to go in building program coherence and in consistently generating self-sustaining projects or widely emulated programs.

These concerns do not amount to a recommendation that the EEDP be curtailed. Just the opposite, the EEDP is sub-critical in size. An increase in human resources would permit EEDP to better serve the field projects logistically and in terms of synergistic research and scoping studies that could be performed.

To build this into a major program, Sida is urged to provide the necessary support and EEDP is in turn urged to: (a) engage in project-directed basic research; (b) utilize an African and international advisory and assessment boards to help give the program a clear focus and set of core questions; (c) develop and test hypotheses in a field where this takes place far too infrequently; (d) develop but then permit the field projects to set their own course; (e) utilize the Europe-Africa axis to turn pilot projects into seeds for the multinational community; and (f) integrate academic, private sector, and community approaches to development and environmental conservation.

References

- Acker, R. and Kammen, D. M. (1996) "The quiet (Energy) revolution: the diffusion of photovoltaic power systems in Kenya," *Energy Policy*, **24**, 81 - 111.
- AFREPREN (1997) Presentation on January 15 as part of EEDP Review, Nairobi.
- Anderson, D. and Ahmed, K. (1995) *The Case for Solar Energy Investments*, World Bank Technical Paper No. 279 (World Bank: Washington, DC).
- Arvidson, A. (1997) Personal communication, March 15.
- Banda, A., Kalumiana, O. S. and Shakachite, O. (1996) *Woodfuel Task Force Findings* (Zambia Forest Action Programme [ZAFP] Secretariat, Lusaka).
- Barnes, D. F., Openshaw, K., Smith, K. R., and van der Plas, R. (1994) What makes people cook with improved biomass stoves? World Bank Technical Paper No. 242 (World Bank, Washington, DC).
- Bhagavan, M. R. and Karekezi, S. (eds.) (1992) *Energy Management in Africa* (Zed Books: London, UK).
- Boserup, E. (1970) *Women's role in economic development* (Allen and Unwin: London).
- Bradley, P. N. (1991) *Women, woodfuel, and woodlots* (Macmillan Ltd.: London).
- Clement-Jones, R. and Mercier, J.-R. (1995) *Towards a Renewable Energy Strategy for Sub-Saharan Africa*, Paper No. 9 (Environmentally Sustainable Development Division, Africa Technical Department, AFTES: The World Bank, Washington, DC).
- Chidumayo, E. N. (1988) "Early post-felling response of Marguesia woodland to burning the Zambian copperbelt", *J. Tropical Ecology*, **4**, 361 - 372.
- Chidumayo, E. N. (1991a) "Wood biomass structure and utilization for charcoal production in a Zambian miombo woodland", *Bioresource Technology*, **37**, 43 - 52.
- Chidumayo, E. N. (1991b) "A reassessment of effects of fire on miombo regeneration in the Zambian copperbelt", *J. Vegetation Studies*, **2**, 21 - 26.
- Chidumayo, E. N. (1992a) "Seedling ecology of two miombo woodland trees", *Vegetation*, **103**, 51 - 58.
- Chidumayo, E. N. (1992b) Effect of shoot mortality on the development of *Afzelia quanzensis*", *J. Applied Ecology*, **29**, xx - yy.
- Chidumayo, E. N. (1989) "A reassessment of effects of fire on miombo regeneration in the Zambian copperbelt", *Agroforestry Systems*, **5**, 15 - 25.
- Chidumayo, E. N. (1993) *Responses of Miombo Harvesting: Ecology & Management* (EEDP Series No. 24: SEI, Sweden).
- Cochrane, E. (1995) *Energy Study: Border Timbers, Ltd.; Mutare, Zimbabwe* (E. Cochrane & Associates: Consulting Engineers, 11 Linda Road, Claremont 7700, RSA).

- Cohen, L. R. and Noll, R. G. (1991) *The Technology Pork Barrel* (Brookings Institute: Washington, DC).
- EEDP (1996a) *Guidelines for the Management of the EEDP at SEI* (Stockholm Environment Institute: Stockholm, Sweden).
- EEDP (1996b) *EEDP Strategies: 1995 - 2000* (Stockholm Environment Institute: Stockholm, Sweden).
- EEDP (1995 - 96) *Minutes of Meeting of the EEDP Advisory Group* (various).
- EEDP (1995 - 96) *Quarterly Progress Reports* (various), Numbers 28 - 32.
- Fridén, E. and Strömberg, M. (1993) *Pre-project study regarding power generation from sawmill waste in Zimbabwe* (Charter Sawmills, Chimanimani, Zimbabwe).
- Borg, C. and Odén, H. (1995) *The Kijito Windpump: A private Initiative in Kenyan Rural Water Supply* (Msc. Thesis, Department of Industrial Marketing, Chalmers University of Technology, Goteborg, Sweden).
- Hankins, M. (1991) *Small Solar Electric Systems for Africa: A Guide for Planning and Installing Solar Electric Systems in Rural Africa* (Motif Creative Arts, Ltd., Nairobi).
- Hankins, M. (1993) *Solar Rural Electrification in the Developing World; Four Case Studies: Dominican Republic, Kenya, Sri Lanka, and Zimbabwe* (Solar Electric Light Fund, Washington D.C.).
- Hankins, M. and Best, M. (1994) "Photovoltaic Power to the People: The Kenya Case," UNDP & World Bank Energy Sector Management Assistance Program, Nairobi.
- Harries, Bobs Engineering, Ltd. (no date) *The Minimal Maintenance of Kijito Windpumps* (Bobs Harries Eng., Ltd: Thika, Kenya).
- Harries, M. (1997) Private communication, 15 January.
- Hibajene, S. H. (1993) "Assessment of earth kiln charcoal production technology", EEDP Series No. 39, Ministry of Energy and Water Development, Lusaka, and SEI, Stockholm.
- Hibajene, S. H. (1994) *Assesment of Earth Kiln Charcoal Production Technology*, EEDP Series Report No. 39 (Stockholm Environment Institute: Stockholm, Sweden).
- Hibajene, S. H., Chidumayo, E. N. and Ellegard, A. (1993) *Summary of the Zambia Charcoal Industry Workshop: Policy and Management Challenges for the Future* (May 10 - 14, Sivonga, Zambia), EEDP Series Report No. 21 (Stockholm Environment Institute, Stockholm, Sweden).
- Hibajene, S. H. and Ellegard, A. (1994), *Charcoal Transportation and Distribution* EEDP Series Report No. 33 (Stockholm Environment Institute: Stockholm, Sweden).
- Hibajene, S. H. and Kalumiana, O. S. (1996) *Manual for Charcoal Production in Earth Kilns in Zambia* (Department of Energy, , Lusaka, Zambia, and SEI, Stockholm Sweden).
- Johansson, T. B., Kelly, H., Reddy, A. K. N. and Williams, R. H. (eds.) *Renewable energy: sources for fuels and electricity*, (1993) (Island Press: Washington, DC),

- Kammen, D. M. (1995) "Cookstoves for the developing world, *Scientific American*, 273, 72 - 75.
- Kammen, D. M. (1996) "Household power in a new light: Policy lessons, and questions, for photovoltaic technology in Africa", *Tiempo: Global Warming and the Third World*, 20, 1 - 8.
- Kammen, D. M. and Dove, M. R. (1997) "'Mundane' Science: The missing link of sustainable development research", *Environment*, in press [and PU/CEES Report No. 298 (Center for Energy and Environmental Studies/Princeton University: Princeton, NJ)].
- Karekezi, S. and Ewagata, E. (1996) *Renewable Energy Technologies in Kenya: A Study of the Maendeleo Stove and Power Alcohol Programme*, AFREPREN Working paper No. 150 (AFREPREN: Nairobi, Kenya).
- Karekezi, S. and Ranja, T. (1996) *Directory of Renewable Energy Agencies: Who's Who in RETS Dissemination in Eastern and Southern Africa*, AFREPREN Working paper No. 115 (AFREPREN: Nairobi, Kenya).
- Karekezi, S. and Ranja, T. (1997) *Renewable Energy Technologies in Africa* (Zed Books and AFREPREN: London and Nairobi).
- Karekezi, S. and Turyareeba, P. (1994) "Renewable Energy Technologies: Research for Dissemination and Implementation in Eastern and Southern Africa," Nairobi.
- Kaoma, J., Kasali, G. B. and Ellegard, A. (1994) *Efficiency and Emissions of Charcoal Use in Improved Mbaula Cookstove* EEDP Series Report No. 38 (Stockholm Environment Institute Stockholm, Sweden).
- Kauzeni, A. S., Masao, H. P., Sawe, E. N., Shechambo, F. C., with Ellegård, A., (December, 1996) *Multidisciplinary Participatory Method for Assessing and Planing Bioenergy: Draft Final Report No. VII*. (Institute of Resource Assessment, University of Dar es Salaam: Tanzania).
- Kozloff, K. L. (1995) "Rethinking development assistance for renewable electricity sources", *Environment*, 37, p. 6 - continues.
- Leach, G. and Mearns, R. (1989) *Beyond the Woodfuel Crisis* (Earthscan: London).
- Microcredit Summit Secretariat (1997) c/o RESULTS Educational Fund 236 Massachusetts Avenue, NE Suite 300, Washington, DC 20002 USA, <http://www.igc.apc.org/results>.
- Ministry of Energy and Water Development (1994) *National Energy Policy: Republic of Zambia* (Republic of Zambia: Lusaka, Zambia).
- Mothander, B. and Barnett, A. (1993) *An Assessment of the Long-Term Cooperation between the Swedish International Development Authority (Sida) and Stockholm Environmental Institute (SEI)*, Sida Report, 5 February.
- Mwihava, N. C. X. (1995) "Woodfuel efficiency in small scale industries in Tanzania", *Proceedings from the review seminar on the EEDP Programme*, Stockholm, Sweden, 27 - 28 April.

- Mwihava, N. C. X., *et al.* (1997) Draft report, *Woodfuel use in small industries: A study fo brick kilns in Tanzania* (January).
- Nyabeze, W., Maboyi, B. and Chigwada, J. T. (1995) Energy Efficiency Measurements of Improved Technologies in the Brick Firing Industry, ZERO/SADC Project Report AAA.15: Document 6.
- Palm, L. and Mellquist, F. (1996) *Draft Version: Pre-feasibility study on a power plant in Chimanimani, Zimbabwe*, processed (version date: 18.1.96).
- Rosemarian, A. (1996) Presentation at SEI/EEDP Review Meeting, November 2.
- Sawe E. N. (1995) "Bioenergy based industries in Tanzania", *UNIDO Bioenergy for Industrial Development Programme in Africa*, February.
- Serenje, W.*et al.*, (1994) *Environmental Impact Assessment of the Charcoal Production and Utilization System in Central Zambia*, EEDP Series Report No. 32 (Stockholm Environment Institute, Stockholm, Sweden).
- SEI (1995a) *Proceedings from the review seminar on the Energy, Environment & Development Programme*, 27 - 28 April, 1995.
- SEI (1995b) *Energy, environment and development long-term cooperation programme between SEI and Sida: Workplan 1996 - 1997*, December 18.
- SEI (1994 - 1996) *Newsletter* (various).
- SEI (1996a) *Energy, Environment and Development Programme Workplan 1996 - 1997, Appendix I*, June 10.
- SEI (1995) *Energy, environment and development long-term cooperation programme between SEI and Sida: Workplan 1996 - 1997, Appendix II*, August 20.
- Shiva, V. and Mies, M. (1993) "The myth of catching-up development," in *Ecofeminism* (Zed Books: London, UK), 70 - 90.
- Sida (1996) *Sida's Energy Strategy*, draft document.
- Ven van de, H. (1995) "The sustainability of the small scale and medium scale brick industry, with special attention to biomass energy consumption", *Report 1* of a provisional draft MSc thesis for the University of Eindhoven the Netherlands.
- Williams, R. H. and Terzian, G. (1994) "A benefit/cost analysis of accelerated development of photovoltaic technology," *Center for Energy and Environmental Studies Paper PU/CEES 281* (Princeton University: Princeton, NJ).
- World Resources Institute (1993) *Participatory Rural Assessment: Field Lessons and Manual* (World Resources Institute: Washington, DC).
- ZESCO (1996) *Zimbabwe Electricity Supply Authority Standard Prices for the Supply of Electricity*, FLO407 A33, Document.

APPENDICES

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Appendix A: Terms of Reference for the Evaluation of the Sida-supported EEDPme

25 October 1996

Ref. No.

SAREC-1996-0516

**Terms of Reference
for the Evaluation of the Sida-supported
"Energy, Environment and Development Programme"
at the Stockholm Environment Institute.**

1. Background

In the 1980s, the former SIDA and the former SAREC provided support to the former Beijer Institute in Stockholm to undertake energy projects in selected developing countries, with an emphasis on projects in the East and Southern African regions. The focus was on renewable energy. SAREC support was in the form of core funding. The activities were of two kinds:

1. The development of replicable pilot projects which could be scaled-up to development projects, usually involving the transfer and adaptation of renewable energy technology, and
2. The execution of policy-oriented studies involving surveys, analyses and research. Broadly speaking, SIDA's main interest lay in the first kind, while SAREC's was in the other, although there was some overlap between the two.

With the establishment of the Stockholm Environment Institute (SEI) in 1990, the energy programme of the Beijer Institute moved to SEI (see Enclosure 1 for SEI's current structure, organization and programmes). By that time SAREC's support had ceased. SIDA, however, continued its support, but now to a revamped programme under the title "Energy, Environment and Development Programme (EEDP)", for the period 1990/91 - 1992/93. After an external evaluation by a team of two consultants (Enclosure 2), SIDA's support was extended to the period 1993/94-1994/95, for an EEDP that had undergone considerable revision in comparison with the earlier one (Enclosure 3). At this stage, SAREC became a co-funder of the EEDP for the same two year period.

As of July 1995, the earlier SIDA and SAREC were merged, together with three other Swedish development assistance agencies, into one new organization The **Swedish International Development Cooperation Agency (Sida)**. Within the new **Sida**, the energy section of the earlier SIDA became the energy section under the Department for Infrastructure and Economic Cooperation (**INEC**) and the earlier SAREC, the Department for Research Cooperation (**SAREC**). While INEC is in effect empowered to take decisions about the projects and programmes it funds at the level of its own directorate, those funded by SAREC have to be approved by Sida's Research Council (See Enclosures 4 and 5 for brief presentations of INEC and SAREC).

In Spring 1995, SEI submitted an application to Sida for continued support to the EEDP for the period 1995/96 - 1997 (As of 1 January 1997, the Swedish fiscal year, which hitherto ran from July to June, becomes the same as the calendar year). This application was in the form of a first draft of a workplan, to be further developed in consultation with INEC and SAREC. In November 1995, INEC approved the workplan dated 22 November 1995 as the basis for providing half the total funding requested by SEI, subject to some modifications being incorporated. A revised proposal was then submitted to Sida in December 1995. A letter of agreement was signed between SEI and INEC to allow the programme to continue pending a decision by Sida's Research Council.

Following the decisions by Sida's Research Council in April and June 1996, Sida approved continued support to only the **ongoing** projects and associated ancillary activities. The Research Council deferred its decision on the **new** projects and their associated ancillary activities, as presented in SEI's application of December 1995 and clarification thereof in June 1996 (Enclosure 6), until an external evaluation has been conducted of Sida's support to EEDP over the period 1993/94-1994/95.

2. Contents and Objectives of the EEDP for the past period 1993/94-1994/95, and for the current period 1996-1997

The EEDP for the period 1993/94-1994/95 comprised the following projects (Enclosure 3):

1. Renewable Energy Technologies: Research for Dissemination and Implementation
2. Methods for Exploring Bioenergy Options
3. Charcoal Management
4. Energy Efficiency: Woodfuel Use in Small-scale Industry

5. New Approaches to Electrification
6. Bioelectrification
7. Information and Dissemination Activities
8. Programme Management and Scoping Studies

According to this programme proposal, the main overall objectives of the programme were:

- * to facilitate environmentally sound energy systems in developing countries;
- * to develop proposals, for submission to Sida, on implementable projects;
- * to improve human resources and build capacity in counterpart institutions;
- * to improve South-South cooperation and to strengthen regional networking, including building links with the non-governmental sectors such as industry and NGOs.

The EEDP proposal for the current period 1995/96-1997 consists of the following (Enclosure 6):

Continued support to four ongoing projects:

1. Regional Programme on Solar Photovoltaics
2. Energy Efficiency in Small-scale Industries
3. Electrification Cooperatives
4. Miombo Forest Ecology and Management

Support to four new projects:

5. Solar Photovoltaics for Selected Loads
6. Saw Mills as Energy Producers
7. Efficiency of Household Electrical Appliances
8. Electrification of Low Income Areas

Support to associated ancillary projects common to both the ongoing and the proposed new projects:

9. Information and Dissemination Activities
10. Programme Management and Scoping Studies

This proposal lists the following as its major overall objectives:

- * Supporting institutional, managerial and technical capacity building in the energy sector in developing countries;

- * Implementing technical improvements in the field in order to promote efficiency in traditional biomass energy technologies and to promote modern renewable energy technologies;

- * Providing support for electrification in rural and urban areas of developing countries.

The programme proposal goes on to point out that in its design "both research and development projects complement each other. ---- Research projects are considered essential to provide an analytical frame and serve as the basis for examining accumulated experiences and existing projects, and for identifying new projects or new elements in on-going activities. This analytical frame will help guarantee the design and implementation of relevant field projects ----"

In addition to the overall major objectives summarized above, the two programme proposals (Enclosures 3 and 6) also list specific and detailed objectives and expected results under each of the individual projects that make up the programmes.

3. Sida's main objectives in supporting the EEDP are as follows:

- * To strengthen institutional, analytical and research capacities, in selected developing countries, in particular in East and Southern Africa, in the problem-complex of renewable energy, energy efficiency and energy-environment;

- * To establish and reinforce linkages between the production of research results, their dissemination and their implementation in the form of pilot projects;

- * To promote a multi-disciplinary and policy-oriented approach in achieving the above-mentioned objectives, which takes due account of technological, economic, social and institutional factors.

- * To provide a basis and a set of guidelines for Sida for generating energy projects within Sida's bilateral programmes in East and Southern Africa.

4. The purpose of and the reasons for the evaluation

SEI has applied to Sida for continued support to the EEDP programme over the period 1995/96-1997. As explained above, the Research Council of Sida has approved continued funding for the ongoing parts of EEDP, but has decided to defer a decision on the new parts, pending the outcome of the present proposed evaluation.

In addition to evaluating the performance of EEDP over the period 1993-96, the evaluation exercise should also focus on the question

of what role SEI and other Swedish institutions, as well as African institutions, can play in the future in assisting Sida to implement, in East and Southern Africa, the objectives and strategies contained in the recently adopted Sida's Energy Policy (Enclosure 7). Central to this concern are questions about energy-professional capacity and competence, quality of research output and project implementation, cost-effectiveness, impact and sustainability. In the section on Assignment below, these questions are spelt out in terms of specific tasks that the evaluators will have to address.

5. The Assignment

In conducting the evaluation, the evaluators will keep in mind, firstly, the major overall objectives, as well as the specific project-wise objectives, of the EEDP, and, secondly, Sida's overall objectives in supporting EEDP, as outlined in the preceding sections. **The evaluators will assess the following:**

5.1 The relevance and character of the programme

- * The relevance of the individual projects comprising EEDP to the context of the African host countries. How have they been identified? How far have they been genuinely driven by the demand of the host countries?
- * The degree of integration of the various projects into a coherent programme.
- * Identification of the character of the individual projects in terms of the following categories: research; technology transfer; studies; surveys; and dissemination and implementation of results obtained by research, studies and field projects. The degree of linkage between the projects.

5.2 The performance of the programme

- * The degree of success of the programme in achieving the overall objectives and the specific project-wise objectives of the EEDP.
- * The scientific and technological quality of the output, including publication in refereed international journals and publication of project reports and training material..
- * The research, institutional and other professional capacities built up, and/or strengthened, by the programme in the host African institutions.
- * The quality and effectiveness of project implementation and dissemination of results obtained, paying particular attention to

technology transfer and the application of research results to problem-solving.

5.3 Capacity and competence harnessed to the programme

- * The energy-professional competence and quality of the project management at SEI in Stockholm, and its impact on the selection and design of the individual projects, as well as on the overall performance of the projects.
- * The capacity and competence of SEI to identify the counterpart institutions and project leaders in Africa.
- * The magnitude and quality of the back-up service, in terms of energy expertise as well as managerial and coordinating tasks, provided by SEI programme management in Stockholm to host African institutions and professionals involved in the programme.
- * The relevance of SEI's network of energy professionals to the EEDP, and its role in the design and execution of EEDP .
- * The range of Swedish expertise and institutions involved in the programme.

5.4 Impact and sustainability

- * The importance and impact of the programme in the host countries of East and Southern Africa.
- * The sustainability of the EEDP-initiated projects in East and Southern Africa, in terms of the indigenous personnel and institutional capacity and competence that the programme may have built-up and strengthened, the anchoring of the projects in the national and local institutions, the prospects for local financing as and when external donor financing is phased out, and the integration of sustainability criteria into the energy policy and development process at the level of the national authorities.

5.5 Gender dimension

- * To what extent has the EEDP taken account of the gender dimension and gender relations in the design and implementation of the individual projects, and in analyzing the impact of the programme on the supposed beneficiaries.

5.6 Cost-effectiveness

- * The structure and purpose of the major components of the programme budget, and the relative shares that go to African and

Swedish recipients, and how these have affected the achievement of the stated programme and project objectives.

- * The appropriateness of the levels of the programme management and administration costs.
- * Cost-effectiveness of EEDP in comparison with other comparable programmes in sub-Saharan Africa funded by other donor agencies.

6. Recommendations by the Evaluators

In addition to their detailed and in-depth assessment of the performance of EEDP over the period 1993-96 and the recommendations ensuing therefrom, the evaluators are also specifically invited to present their recommendations on the changes and improvements required in the approach, the design and the execution of EEDP in the future, including the four new projects proposed under the 1995/96-97 proposal, as well as suggestions on how to formulate measurable objectives.

Further, in the context of the energy needs in the East and Southern African regions, and within the framework of the energy policy of Sida, the evaluators are requested to present their suggestions on how best to promote sustainable energy projects in East and Southern Africa.

7. Methodology, Evaluation Team and Time Schedule

The Methodology

The evaluators will study the published and unpublished written output produced by the EEDP over the period 1993/94-1995/96, including the Project Documents (Work plans) submitted by SEI to Sida in November 1993 and December 1995, and the additions and clarifications submitted during Spring 1996.

They will conduct in-depth interviews in Stockholm with the concerned programme officers in SEI and Sida in Stockholm, and with the Swedish experts and consultants contracted by SEI to participate in the various projects that constitute the EEDP. They will visit a few selected institutions in Sweden, identified by Sida, to acquaint themselves with the competence and capacity that these institutions have to offer in the subject areas covered by the EEDP.

They will pay field visits in Kenya, Tanzania and Zambia to see the EEDP projects in operation, and conduct in-depth interviews with the African project leaders and other project personnel.

The Evaluation Team

The team comprises the following two international experts:

Mr Jean Michel **Durand**, Manager, Reflexe Energie, Monetais sur Allier, France;

Dr Daniel M. **Kammen**, Assistant Professor, Science, Technology and Public Policy Program, Princeton University, Princeton, U S A;

Dr Kammen will act as the team leader.

(Note by Sida, May 1997: Unfortunately, Mr Durand fell ill at the start of the assignment and withdrew from the evaluation exercise.)

The Time Schedule

The evaluation will take a maximum of five weeks of work per evaluator, spread over the period October 1996 to March 1997. The evaluators will spend one week in Sweden (27 October - 2 November) and two weeks in Africa (12-26 January 1997). The remaining two weeks will be spent studying the written material and drafting the evaluation report .

The evaluators will submit a single, joint draft report in English to Sida before the 15 February 1997. This will be sent by Sida, for comments, to SEI and SEI's counterpart project leaders and institutions in Kenya, Tanzania and Zambia. These comments, together with Sida's, will be sent by Sida to the evaluators, who will dispatch the final version of their report to Sida not later than two weeks after receiving the comments.

8. Reporting and Publication

The length of the final report will be at least 20 single-spaced typed pages (approximately 8000 words), but should not exceed 40 pages (16,000 words), excluding annexes. It should lead with an Executive Summary of not more than four pages (single-spaced, 1600 words) Further, the evaluators will submit a one page (single-spaced, 400 words) summary of the evaluation for publication in Sida's "Evaluation Newsletter".

The final version of the single joint report shall be submitted in two copies and on disk in WordPerfect 6.1 for Windows or a compatible format. It should be presented in a form that enables publication without further editing. Subject to decision by Sida, the report will be published and distributed as a publication within the Sida Evaluation Series.

The final responsibility for submitting the evaluation report according to the criteria and format mentioned above rests with the team leader, Dr D Kammen.

9. Administrative matters

The evaluation will be administered by the Centre for International Technical and Educational Cooperation (**CITEC**) of the Royal Institute of Technology in Stockholm. CITEC will subcontract the two evaluators, make payments to them in respect of travel costs, subsistence allowances (per diems) and remunerations for the evaluation work, make travel bookings and arrange for field visits in Sweden and provide them with essential logistical and administrative assistance to facilitate the evaluation exercise. The draft and final versions of the evaluation report will be submitted to Sida through CITEC.

The Stockholm Environment Institute (SEI) will make available to the evaluators copies of the EEDP Applications to Sida over the period 1993-1996, and copies of the published and unpublished written output produced by EEDP during the period 1993-1996. It will also facilitate the evaluators' field visits to the individual projects under the EEDP in Kenya, Tanzania and Zambia.

Appendix B: Biographical Sketch of D. M. Kammen

Daniel M. Kammen is an Assistant Professor of Public and International Affairs and Co-chair of the Science, Technology & Public Policy Program in the Woodrow Wilson School of Public and International Affairs, Princeton University. His research is focused on energy resource management, technology policy and environmental issues in developing nations. His interests include gender and community-based development, technology transfer, risk assessment, and regional and global environmental change. Kammen, initially trained as a physicist, was the Weizmann Postdoctoral Fellow at the California Institute of Technology (1988 - 1991) and a Lecturer at Harvard University prior to his current position at Princeton University. He is currently also a Permanent Research Fellow of the African Academy of Sciences, and a past Visiting Lecturer at the University of Nairobi, where he directs a field program on sustainable development. This program, supported by UNESCO and Green Cross International, trains 20 - 40 African researchers, community activists, and students each year in technical and policy areas of energy management and development. He is the author of over 60 publications, and has been featured on NPR and BBC radio, and PBS and NHK (Japan) television. Kammen received the 1993 21st Century Earth Award, recognizing contributions to rural development and environmental conservation.

Resume and publication list:

<http://www.wws.princeton.edu/~kammen.html>

Appendix C: Study Tour(s)

This report was based on two dedicated study trips, October 30 - November 3 in Sweden and January 13 - 28 in Africa and the reviewer's prior research experience in Africa. Mr. J-M. Durand participated in the Sweden study tour but not the Africa tour.

J.-M. Durand:
Réflex Énergie
Manoir de la Chaise
03500 Monétay-sur-Allier
France

Tel: +33-470-42-04-42
Fax: +33-470-42-88-33
Email: REJMD@AOL.COM

Itinerary listings of the 30.10.96 - 3.11.96 and 13.1.97 - 28.1.97 trips appear below:

Sweden Program: October 30 - November 3, 1996

Sunday, October 27

Morning Arrival in Arlanda (Stockholm)

Monday, October 28 - Stockholm

09.30 - 12.00 - Visit to Sida/SAREC

12.00 - 13.00 - Lunch hosted by Sida/SAREC

Visit to the Royal Institute of Technology (KTH)

13.00 - 14.30 - CITEC - Meeting about practical details of the assignment

14.30 - 15.30 - Dept. of Chemical Technology, Dr. Truls Liljedahl, Associate Professor

15.30 - 16.30 - Dept. of Heat and Furnace Technology, Dr. Włodzimierz Blasiak, Assoc. Professor

17.00 - 18.00 - Visit to the Stockholm Environment Institute (SEI)

Tuesday, October 29 - visits in Stockholm

09.00 - 10.30 - NUTEC, Lars Tegnér

11.00 - 12.00 - Stockholm Energi, Leif Bakeus, Heléne Blomberg

12.00 - 13.00 - Lunch hosted by KTH/CITEC

14.00 - 15.00 - Elforsk, Ulf Arvidson (Lars Stolt, Uppsala Univ.)

17.30 - Departure to Arlanda

19.05 - Departure to Gothenburg (by air)

20.05 - Arrival in Gothenburg

Wednesday, October 30 - Gothenburg

Visit to the Chalmers Inst. of Technology (CTH)

09.00 - 10.30 - Dept. of Energy Conversion, Prof. Bo Leckner, Dr Björn Heed

10.30 - 12.00 - Dept. of Energy Systems Technology, Prof. Clas-Otto Wene

Visit to the University of Gothenburg

13.00 - 14.00 - Dept. of Economics, Prof. Thomas Sterner, Energy-Environment Economics

14.30 - 15.30 - Physical Resource Theory, Prof. Karl-Erik Eriksson, Thomas Kåberger

16.50 - Departure to Lund (by train)

Thursday, October 31 - Lund

Visit to the University of Lund/Lund Inst. of Technology (LTH)

09.00 - 13.00 - Dept. of Heat and Power Engineering, Prof. Bengt Sundén

11.00 - 12.00 - Dept. of Environmental and Energy Systems Studies, Dr. Lars J. Nilsson

13.00 - 14.00 - Lund Centre for Habitat Studies, Hans Rosenlund

14.00 - 15.00 - Meeting with Ms. Anne Marie Lundsberg, Svensk Vindkraftverk

16.00 Departure to Sturup (Malmö/Lund airport)

17.35 - Departure to Stockholm (by air)
18.45 - Arrival in Arlanda (Stockholm)

Friday, November 1 - Stockholm
09.00 - 17.00 - Visit to SEI

November 2 and 3
Departures from Stockholm

Africa Program

Kenya Host Institute:
AFREPREN
Contact person:
Stephen Karekezi
Address:
Elgeyo Marakwet Close
P.O. Box 30 979
Nairobi, Kenya
Fax: +254-2-561464/566 231/740 524
Phone: +254-2-566032

Tuesday 14.1.97
20.50 : Arrival in Nairobi

Wednesday 15.1.97
08.45-09.30 : Meet AFREPREN Project Staff
09.30-10.15 : Presentation by Mr. Karekezi
10.15-12.00 : Visit AFREPREN RETS Exhibit
14.00-15.15 : Visit wind turbine installation at Ngong Hills (Kenya Power & Lighting Co.)
15.45-17.00 : Visit Kijito Windpumps (Thika)

Thursday 16.1.97
14.15 : Depart Nairobi

Tanzania Host Institute:
TANESCO
Contact person:
Maneno Katyega
Address:
Tanzania Electric Supply Company
Box 9024
Dar es Salaam, Tanzania
Fax: +255-51-36 247/36 246
Phone: +255-51-27281

Thursday 16.1.97
14.15 : Depart Nairobi
15.30 : Arrival in Dar es Salaam

Friday 17.1.97
08.30-12.00 : Meet TANESCO Research Department
12.00-14.00 : Discussion session with Sociology Department, University of Dar es Salaam
14.15-16.00 : Meet Ministry of Energy and Minerals

Monday, 20.1.97

06.00-08.10 : Fly to Tabora

09.00-12.00 : Meet TANESCO Tabora

12.00-13.00 : Lunch at Tabora

13.00-15.00 : Drive to Urambo

16.00-20.00 : Meet UECCO officials, visit plant and distribution network

Night in Urambo, Urambo Guest house

Tuesday, 21.1.97

08.00-11.00 : Charter flight Urambo to Dar es Salaam

13.00-17.00 : Discussions with IRA

Zambia Host Institute:

Department of Energy

Contact person:

Oscar Kalumiana

Address:

P.O. Box 36 079

Lusaka, Zambia

Fax: +260-1-252 339/254 491

Phone: + 260-1-251 337/ 252 339

Wednesday, 22.1.97

08.00 : Depart from Dar es Salaam

10.40 : Arrival in Lusaka

12.00 : Mr. S. H. Hibajene, Ministry of Energy

16.00 : Mr. O. S. Kalumiana/Ms. Mwanza, Department of Energy

Thursday, 23.1.97

09.00 : Prof. Chidumayo, University of Zambia

10.30 : Dr. J. Kaoma, National Centre for Scientific Research

12.25 : Departure for Zimbabwe

13.20 : Arrival in Harare, Zimbabwe

Friday, 24.1.97

Departure to Mutare

Meet Mr. Spence in Mutare and visit Border Timbers Ltd.

Saturday, 25.1.97

Leave for Chimanimani

Visit Charter Sawmill in Chimanimani

Sunday, 26 & Monday 27.1.97

Departure to Harare and to Europe.

Appendix D: Persons Met in Connection with EEDP Review

<u>In Sweden:</u>		<u>In Africa:</u>	
<i>Organization</i>	<i>Individual</i>	<i>Organization</i>	<i>Individual</i>
CITEC	B Barune R Candia	AFREPREN	S Karekezi R Owino
SEI	A Arvidson L Krisstoffersson A Rosemarian S Silveira N Sonntag C Heaps		T Ranja M Muthoni J Karanja J Hamala L Mujoro
SEI (Boston)		African Acad. of Sci.	I. Kone
SEI Consultants	A Ellegård B Kjellström G Leach	Border Timbers Ltd. Gov. of Tanzania MP, Urambo East	S Spence B Mrindoko Dr. A Mshina
Sida	M R Bhagavan A Jennervik	Gov. of Zambia	S H Hibajene O S Kalumiana
CTH	Prof. B Leckner Dr B Heed		M Mwanza
Elforsk	U Arvidson	B Harries Eng. Ltd.	M Harires
LCHS	Prof. H Rosenlund		
LTH Univ. of Lund	Prof. B Sundén	NCSR (Zambia) TANESCO	J Kaoma M Katyega D E P Ngula
Univ. of Gothenburg Svensk Vindkraftverk KTH NUTEC	Prof. T Sterner A M Lundsberg Dr. W Blasiak L Tegnér	TANESCO (Tabora) Min. of Energy & Minerals (Gov. of Tanzania) UECCO Urambo	F Mpanduji J M Mawege N. Mwihava
Stockholm Energi	L Bakeus H Blomberg		M Chambala Y Waziri
Uppsala University	L Stolt	Univ. of Zambia	E Chidumayo

Appendix E: Evaluation Questionnaire

This questionnaire was sent to 47 individuals and organizations working in the area of international energy and environmental research and development. All groups or individuals targeted had some connection to work in or about Africa. Full or partial responses were received from 31 groups or individuals (14 of these were partial responses, either by email or fax, or through a brief phone interview conducted by the author).

CONFIDENTIAL QUESTIONNAIRE

EVALUATION OF: THE ENERGY, ENVIRONMENT AND DEVELOPMENT PROGRAM (EEDP) OF THE STOCKHOLM ENVIRONMENTAL INSTITUTE

Date: January 8, 1997

From: Prof. Daniel M. Kammen, Co-Director,
Science, Technology and Public Policy Program
Woodrow Wilson School of Public and International Affairs
Princeton University, Princeton NJ 08544 USA
Email: kammen@princeton.edu
Fax: 609-258-6082

EXPLANATION:

Part of the review process of the EEDP is to evaluate the range of views of the program by its funders, participants, and recipients, and to solicit criticisms and recommendations. This is a critical part of the process, so we ask that you take the time to respond fully, and to add any additional information or opinions that you think would prove useful.

Your individual responses will be kept in * strict confidence * by the reviewer, Daniel M. Kammen. I ask for your name and address should I need to contact you later for additional information. The review of field projects in Africa will take place from January 13 - 28, 1997, with a final report due soon thereafter. I therefore ask that if possible, you return this survey as soon as possible, and that if possible you respond by both email and fax.

In addition to any written response you care to make, you are encouraged to use a 5-point scale:

1) Bad 2) Poor 3) Fair 4) Good 5) Excellent

**** NOT ALL QUESTIONS WILL APPLY TO ALL INDIVIDUALS ****

Thank you for your assistance.

Name: _____

Address: _____

Email: _____

Fax: _____

Project Questions (Skip those projects for which you have no opinion or information)

Please provide your comments or assessment of the following programs (issues to evaluate may include: local environmental or economic impact; income and employment generation; reproducibility; self-sustainability).

General Questions

The EEDP defines its objectives as follows:

The ultimate goal of SEI's EEDP is to improve the living conditions of the poor through the provision of reliable, affordable, and environmentally acceptable energy in developing countries. SEI will contribute to the dissemination of renewable energy technologies in order to promote sustainable development.

G1. What, if any, is your connection to the EEDP?

G2. How would you rate the overall impact to the EEDP?

Indicate: Bad 1) 2 3 4 Excellent 5)

G3. Does the EEDP fill a unique role, or is it one of many similar initiatives?

G4. Compare the work of the EEDP to one or more other development program(s) in terms of effectiveness. (Please specify the comparison programs)

G5. What are the strengths of the EEDP?

Research? Development? Training? Management? Other?

G6. What are the weaknesses of the EEDP?

Research? Development? Training? Management? Other?

G7. What, if any, opportunities is EEDP missing?

G8. How would you rate EEDP in terms of building local capacity?

Indicate: Bad 1) 2 3 4 Excellent 5)

G9. What are the greatest constraints on EEDP?

G10. Can you identify one or more programs that you recommend EEDP to initiate?

G11. How would you rate the overall impact of the Stockholm Environmental Institute?

Indicate: Bad 1) 2 3 4 Excellent 5)

G12. Compare the work of SEI to one or more other environment and development institutes in terms of effectiveness. (Please specify the comparison institutions)

G13. Other

Specific EEDPs

Please provide any comments on these specific 1996/7 EEDPs. You may want to discuss the program design, importance, or impact of one or more of these initiatives.

The overall SEI and EEDP Effort to Collect, Produce and Distribute books, reports and other material on renewable energy technologies.

- A1. Regional Program of Renewable Energy Technology (RETs) Applied Research
Local institution: African Energy Policy Research Network (AFREPREN); started 1994.
- B1. Training Program on RETs for Eastern and Southern Africa
Local institution: AFREPREN; started 1994.
- B2. Establishment and support to electrification co-operatives in Tanzania
Local institution: TANESCO; started in Urambo, 1994
- B3. Miombo Ecology and Management (Zambia)
Local institutions: UNZA, DoE, Mwekera Zambia Forest College
- B4. Standards and Information Techniques for Household Appliances in South Africa
NOW CANCELED
Local institutions: EDRC
- C1. Sawmills as Energy Producers in Developing Countries
Newly initiated project in Mozambique, Tanzania and Zimbabwe
- C2. Energy Efficiency in Small-Scale Industries - Tanzania
Local institution: National Ministry for Energy
- C3. Electrification of a Low-Income Area in Zambia
Newly initiated w/ZESCO
- C4. PV-technologies for Selected Loads in Isolated Rural Areas
Newly initiated.

New Directions

Please provide any commentary or evaluations of new directions that the EEDP might usefully adopt. You may want to discuss:

- the project identification, development, implementation and review process; the degree of local project control;
- the suitability of the funding levels and the breakdown in the use of funds;
- the advisability of the focus on renewable energy technologies generally
- the staffing levels both at SEI-HQ and/or at the project locations.

Please return to:
Prof. Daniel M. Kammen
Email: kammen@princeton.edu
Fax: 609-258-6082

Appendix F: Energy, Environment And Development Program, 1996 - 1997

type of project focus	A. Research, analysis and synthesis work	B. Institutional, managerial and technical capacity building	C. Technical projects in the field
<i>modern renewable energy technologies</i>	• Regional program of RETs applied research AFREPREN, Kenya Coordinator • Women and energy Visiting researcher - to be appointed	• Training program on RETs AFREPREN, Kenya Coordinator	• PV technologies for selected households Makerere University, Uganda
<i>biomass technologies</i>	• Bioenergy options Institute of Resource Assessment, University of Dar es Salaam • Women and energy Visiting researcher - to be appointed	• Miombo ecology and management Dept. of Energy, Ministry of Energy and Water Devel.; Univ. of Zambia, Mwekera Forest College in Kitwe • Saw-mills as energy producers Border Timbers Ltd., Zimbabwe; Tembo Chipboard, Tanzania; Min. of Forest and Wildlife, Mozamb.	• Energy efficiency in small-scale industries Ministry of Energy and Minerals, Tanzania
<i>support to electrification</i>	• Financing mechanisms for RETs Projects • Solar PV Products - update IT Power, England (coord.) • Standards and information techniques for appliances EDRC, Univ. of Cape Town	• Electrification Cooperatives TANESCO, R&D Department, Tanzania	• Electrification in Zambia ZESCO, R&D Department, Zambia

Appendix G: The Gender and Economic Reforms in Africa (GERA) Program

The Gender and Economic Reforms in Africa (GERA) mission and research statements are listed below:

GERA (Gender and Economic Reforms in Africa) Advocacy and Capacity Building Priorities:

1. Increase economic literacy among African NGOs to more effectively analyze, monitor influence and transform government and donor policies and institutions from a gender perspective;
2. Provide training for post-graduate work in gender analysis;
3. Disseminate research results (e.g. through seminars and press conferences) in order to educate and influence different publics;
4. Provide gender training for policy-makers, researchers and advocates so that the concept of gender (as opposed to that of women), becomes better understood;
5. Build capacity among NGOs to lobby donors and governments;
6. Provide economic training for gender experts;
7. Develop structures which support grassroots participation in macro-policy making;
8. Support community organizations in their own analyses and solutions to local problems in ways which do not increase their dependence on outside resources; and
9. Provide legal, civic, and economic education for girls and women, especially with respect to their rights.

GERA Research Priorities:

1. Alternative economic frameworks and models that will support sustainable and equitable human development;
2. Gendered economic models to promote gender equity from the design stage;
3. Macro-meso-micro linkages of economic reform from a gender perspective;
4. Gendered analysis of financial sector reforms, trade liberalization and regionalization, privatization, market and price deregulation, investment policy, exchange rate policy;
5. African debt and gender equity;
6. Women's coping and survival strategies and/or informal sector responses to reforms;
7. Gendered national policy frameworks (as opposed to project-level gender policies);
8. The politics of economic policy making, (e.g. study and identify who benefits both within and outside the country from particular economic reform policies);
9. The impact of globalization on African women's work, including labor laws;
10. Improving World Bank lending processes from a gender perspective;
11. The correlation between gender equity and agricultural and/or land reform;
12. The impacts of privatization of the health and education system on gender equity;
13. The impact of economic reforms on AIDS (including sex trade); and
14. The impact of globalization and the changing role of the state on gender, class, and race relations.

To facilitate this process, the GERA program not only offers grants to African women scholars, but also small 'pre-grants' to individuals wishing to develop proposals.

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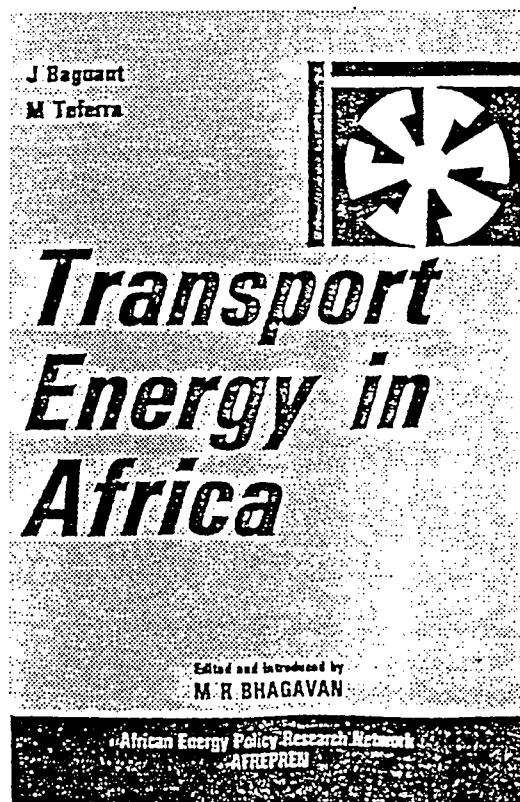
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3. "A New Environmentally-Sound Energy Strategy for the Development of Sub-Saharan Africa - Final Statement of the African Energy Experts Meeting". Stephen Karekezi and Ogunlade Davidson, Nairobi: AFREPREN (1992)
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6. "Energy Options for Africa: Environmentally Sustainable Alternatives". edited by Stephen Karekezi and Gordon Mackenzie, ZED Books Ltd., London: (1993)
7. "Biomass Energy and Coal in Africa". edited by D.O. Hall and Y.S. Mao, ZED Books Ltd., London: (1994)
8. "Energy Utilities and Institutions in Africa". edited and introduced by M.R. Bhagavan, ZED Books Ltd., London, UK: (1996)
9. "Transport Energy in Africa". edited and introduced by M.R. Bhagavan, ZED Books Ltd., London, UK: (1996)



1. "The KCI - From Artisan to Factory". Stephen Karekezi and Dominic Walubengo., In Boiling Point No. 31., August 1993.
2. "Smoke in the Kitchen". Stephen Karekezi and Patience Turyareeba., In Boiling Point No. 34., September 1994.
3. "Reforming Energy Policies and Institutions: The Challenge of Long-Term Capacity Building". Stephen Karekezi., In Science in Africa: Energy for Development Beyond 2000., February 1994.
4. "AFREPREN - The African Energy Policy Research Network: An Evaluation". J.M. Christensen and M.K. McCall., SAREC, Stockholm: (1994)
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8. "Disseminating Renewable Energy Technologies in Sub-Saharan Africa" Stephen Karekezi, In Annual Review of Energy and the Environment. Volume 19. Palo Alto, California: (1994)
9. "Biomass Energy Use in Developing Countries: An African Perspective" Stephen Karekezi and Esther Ewagata., In Sunworld, Volume 8 No. 3., International Solar Energy Society, Caulfield East, Australia: (1994)
10. "Certification and Registration of Joint Implementation Projects" Stephen Karekezi. In Workshop Summary on Structuring Joint Implementation to Support National Development Priorities in Africa., Stockholm Environment Institute, Stockholm: 9th December 1994.
11. "Capacity Building for Policy Analysis and Implementation in Developing Countries". Stephen Karekezi. In Research for Development, SAREC 20 Years. Swedish Agency for Research Cooperation With Developing Countries., April 1995.
12. "Small Hydro Power in Africa". Stephen Karekezi, Timothy Ranja and Francis Ottieno. In Renewable Energy for Development, Volume 8, No. 3, Stockholm Environment Institute, Stockholm: October, 1995.
13. "Environmental Implications of Small-Scale Use of Biomass". Stephen Karekezi & E. Ewagata, In Local and Regional Energy-Related Environmental Issues: Report 1995, World Energy Council, London: 1995.

14. "An Energy Strategy for Environmentally-Sound Development of sub-Saharan Africa". Stephen Karekezi, In African Development Perspectives Yearbook 1992/3 - Volume III Energy and Sustainable Development, Research Group on African Development Perspectives, Bremen, Munster, Hamburg: 1994.
15. "Energy Efficient Institutional Stoves in sub-Saharan Africa". Raphael Owino, In Energy Efficient News Vol. 1 No. 4, December, 1995. Center for Energy Efficiency and Management, Plumstead, South Africa.
16. "Future Energy Requirements for Africa's Agriculture". Prepared for the African Energy Programme of the African Development Bank. M. Lazarus, E. Hansen, D. Hill, S. Karekezi, L. Majoro, G. Best, J. Tschirley; FAO, Rome: 1995.

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- 76.0 "Renewable Energy Technologies Dissemination in Kenya: The Case of the Maendeleo Stoves". S. Karekezi, E. Ewagata, S. Bii, K. Kibua and J. Guyo. Working Paper No. 76.0 Nairobi: AFREPREN (1995). Prepared for Solar World Congress, Harare, September, 1995. pp. 14.
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AFREPREN (1996) pp. 20.

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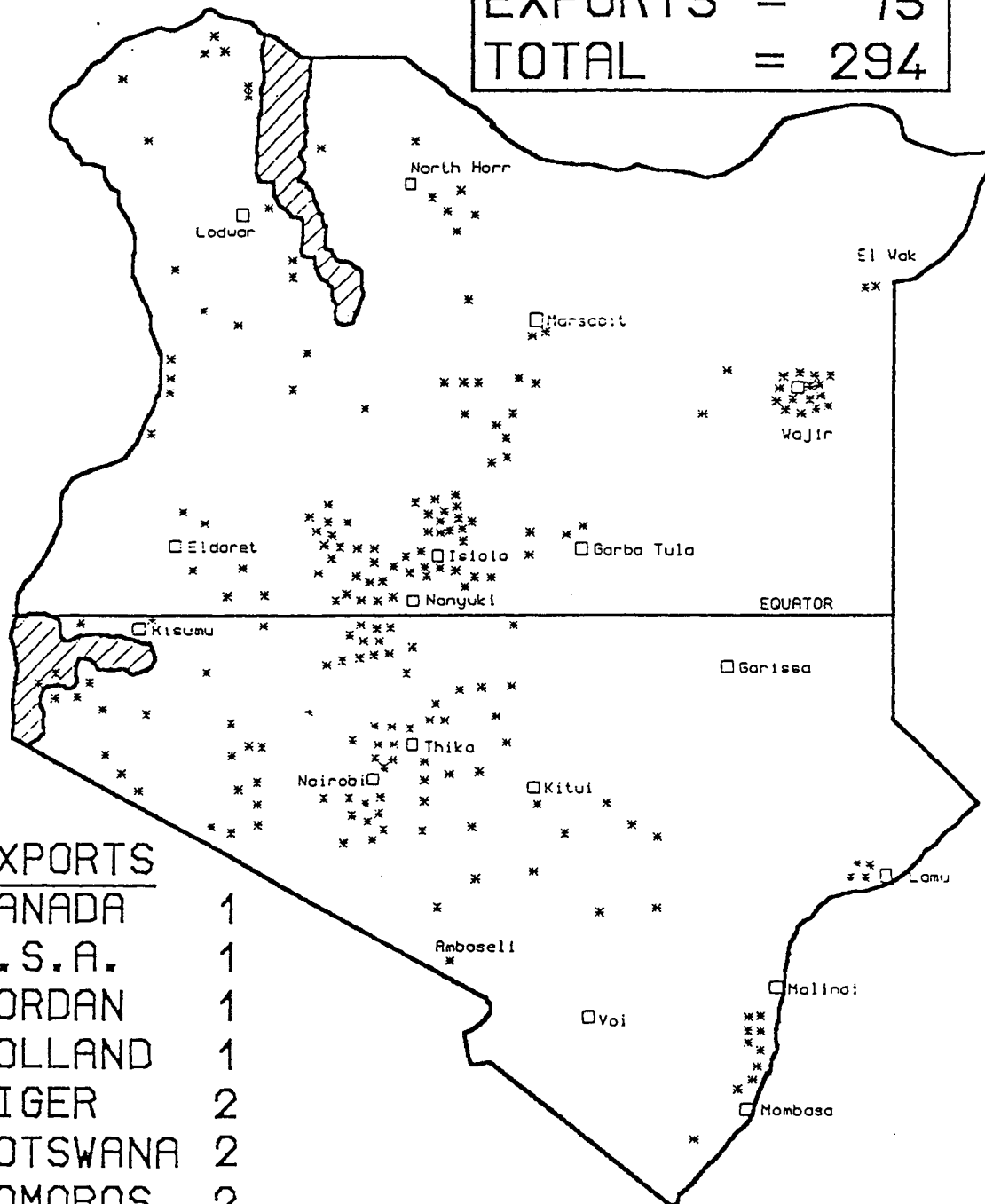
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Appendix J: Kijito Windmills installed in East Africa

(hard copy only; 1 page)

KIJITO SALES

KENYA	=	219
EXPORTS	=	75
TOTAL	=	294



EXPORTS

CANADA	1
U.S.A.	1
JORDAN	1
HOLLAND	1
NIGER	2
BOTSWANA	2
COMOROS	2
BRITAIN	3
NIGERIA	4
SUDAN	7
UGANDA	10
SOMALIA	15
TANZANIA	26

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