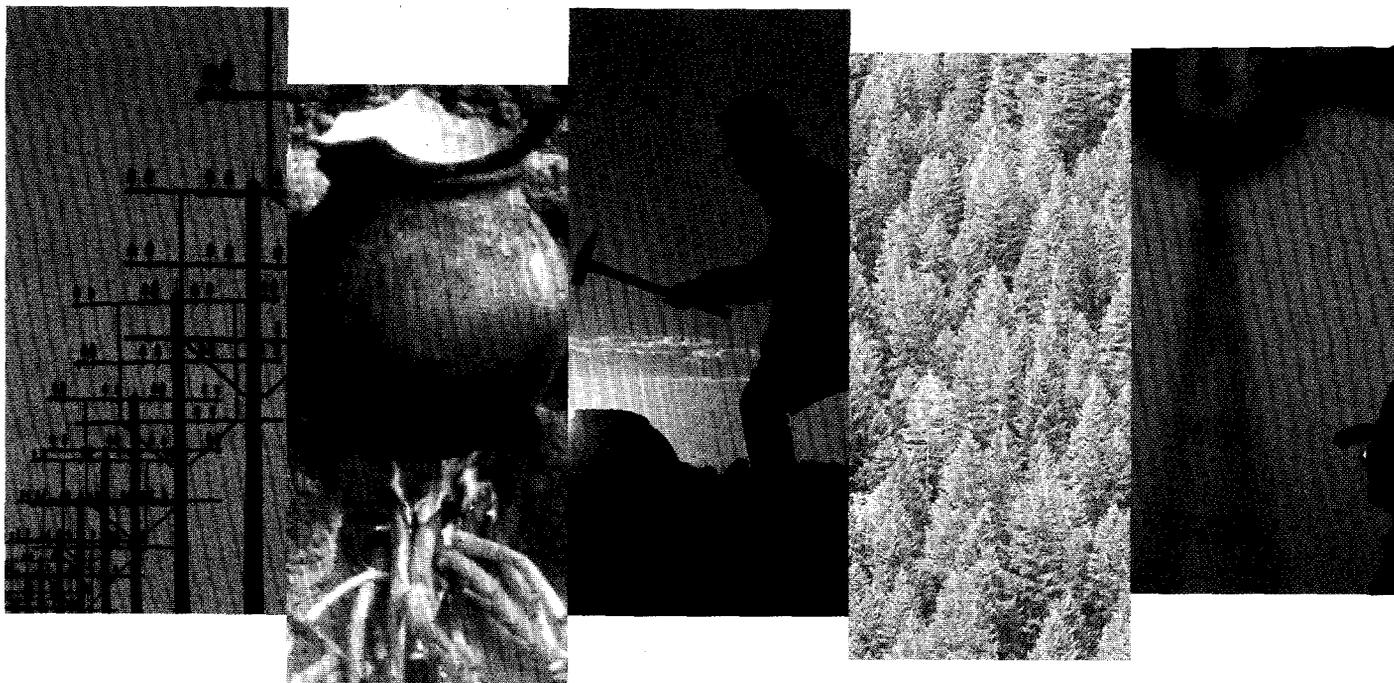


*A Review of the Renewable Energy  
Activities of the UNDP/World Bank Energy  
Sector Management Assistance Programme*

1993 - 1998

ESM223



Energy

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JOINT UNDP / WORLD BANK  
**ENERGY SECTOR MANAGEMENT ASSISTANCE PROGRAMME (ESMAP)**

**PURPOSE**

The Joint UNDP/World Bank Energy Sector Management Assistance Programme (ESMAP) is a special global technical assistance program run as part of the World Bank's Energy, Mining and Telecommunications Department. ESMAP provides advice to governments on sustainable energy development. Established with the support of UNDP and bilateral official donors in 1983, it focuses on the role of energy in the development process with the objective of contributing to poverty alleviation, improving living conditions and preserving the environment in developing countries and transition economies. ESMAP centers its interventions on three priority areas: sector reform and restructuring; access to modern energy for the poorest; and promotion of sustainable energy practices.

**GOVERNANCE AND OPERATIONS**

ESMAP is governed by a Consultative Group (ESMAP CG) composed of representatives of the UNDP and World Bank, other donors, and development experts from regions benefiting from ESMAP's assistance. The ESMAP CG is chaired by a World Bank Vice President, and advised by a Technical Advisory Group (TAG) of four independent energy experts that reviews the Programme's strategic agenda, its work plan, and its achievements. ESMAP relies on a cadre of engineers, energy planners, and economists from the World Bank to conduct its activities under the guidance of the Manager of ESMAP, responsible for administering the Programme.

**FUNDING**

ESMAP is a cooperative effort supported over the years by the World Bank, the UNDP and other United Nations agencies, the European Union, the Organization of American States (OAS), the Latin American Energy Organization (OLADE), and public and private donors from countries including Australia, Belgium, Canada, Denmark, Germany, Finland, France, Iceland, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Sweden, Switzerland, the United Kingdom, and the United States of America.

**FURTHER INFORMATION**

An up-to-date listing of completed ESMAP projects is appended to this report. For further information, a copy of the ESMAP Annual Report, or copies of project reports, contact:

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**A Review of the Renewable Energy Activities of  
the UNDP/World Bank Energy Sector Management  
Assistance Programme 1993 to 1998**

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**April 1999**

Joint UNDP/World Bank Energy Sector Management Assistance Programme  
(ESMAP)

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# Executive Summary

## The Purpose

1. This is a summary report of a brief review of ESMAP's investment in renewable energy since 1992 that was carried out as part of the normal supervisory functions of ESMAP's Technical Advisory Group.

## The Method

2. The study was based on a review of documents, a survey of Task Managers, and interviews with selected Bank Staff. It was not possible to consult client governments in the time available. This omission should be born in mind when interpreting the results. The report necessarily provides an "outsider's" view, and it is recognised that such a brief review is liable to miss or misunderstand many issues in so complex a field in so complex an organisation<sup>1</sup>. The hope is that the report will stimulate discussion and reflection.

## The Portfolio

3. ESMAP's Portfolio of renewable energy projects for the period cost approximately \$8m and represented 10% of total ESMAP expenditure over the period (see Table 3). However one current project in Bolivia (the National Biomass Programme, budgeted in the amount of \$2.6 million) itself represents one third of total value of the sample. If this project is excluded, ESMAP has budgeted a modest \$5m to renewables over the 6 years. 50% of these funds and 45 of the projects were located in Africa (see table 2).

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<sup>1</sup>. The Review team was greatly helped by a number of ESMAP staff, and appreciates the time given by Task Managers and other staff in agreeing to fill in questionnaires, supply documents and answer questions. Without this help, the report would not have been possible. However any errors and omissions that remain are the responsibility of the main author

**Table 1: Summary of ESMAP Renewable Energy activities by Region (including large Bolivia project) 1993-1998**

Region	number of projects	combined budget	% of \$ total
LAC	8	3,819,235	48%
Africa	14	2,668,271	34%
Asia	5	1,103,629	14%
Global	5	351,800	4%
<b>Totals</b>	<b>32</b>	<b>7,942,935</b>	<b>100%</b>

**Table 2: Summary of ESMAP Renewable Energy activities by Region (excluding large Bolivia project) 1993-1998**

Region	number of projects	combined budget	% of \$ total
Africa	14	2,668,271	50%
LAC	7	1,228,977	23%
Asia	5	1,103,629	21%
Global	5	351,800	7%
<b>Totals</b>	<b>31</b>	<b>5,352,677</b>	<b>100%</b>

4. The average contribution by ESMAP is approximately \$170,000, although six projects were less than \$50,000. As the full cost of World Bank staff can be as much as \$6,500 per person week (gross costs including overheads), not only do some of the projects appear under funded, but it is probably the case that work of a similar quality could be obtained outside the organisation at lower cost (though not necessarily with the same "authority"). However ESMAP activities generally draw in other resources, usually through co-financing or in kind.

#### **The Lessons Learned and Conclusions**

5. ESMAP has played a significant role in raising the profile of renewable energy within the Bank and in the wider world. New renewable energy projects have now begun to appear in the main portfolio of the World Bank, and ESMAP has played an effective and honourable part in this process. However the stimulation of such projects takes a long time and ESMAP inputs to the World Bank's main successes in renewable energy (in India, China, Indonesia, and Argentina, and wood fuel in Africa) took place

prior to the 1992 cut off for this study, and it may be some time before the final results of the projects under review become clear. ESMAP has also had a major effect in keeping issues of wood fuel and “energy poverty” on the agenda of the World Bank - through difficult times and against many opposing forces.

### **The New Paradigm**

6. A new paradigm of energy and development is clearly emerging. This paradigm recognises the older truth that poor people will continue to rely on markets and private sector suppliers to meet their needs for energy. But it is also recognised that governments and aid agencies have a pressing duty to make sure that these markets work more effectively for poor people. Such a model creates both opportunities and threat to sustainable development, and to the use of new forms of renewable energy.

7. ESMAP has been at the forefront in showing that the market is already providing energy services to many marginalised people and that they are already spending significant amounts of cash for very poor quality services (ESMAP provided particularly startling evidence of this through its work in Zimbabwe and Uganda).

### **Perverse Effects on Renewables of Sector Reform**

8. Despite many of the obvious benefits of sector reform, the fear is that it may well have had “perverse” effects in terms of increasing environmental damage. It has long been argued that higher discount rates would under value a sustainable environment, and financial imperatives would necessitate a shift from hydro to thermal power plant. Similarly, the poverty impact of certain types of energy sector reform is also not yet known. ESMAP would appear to be in an ideal position to help clarify and remove those elements of sector reform that have particularly damaging effects on the environment, on energy poverty, and on the use of new renewables.

### **“Renewables” - An Unhelpful Concept**

9. A striking lessons from the review is that in practice the concept of “renewable energy” is confusing. The largest energy resource for poor people is (and will continue to be) wood and other biomass. Some of this is harvested on a renewable basis, but and some is ‘mined’. In ESMAP’s strategy, renewable energy is seen as contributing to two priority area: when it is associated with promoting access to energy for rural and peri-urban populations it is bundled together with rural electrification (from renewable and non renewable sources). All other renewables, such as wind, solar, small hydro (which are also associated with rural electrification) and “large biomass”, are grouped in the priority area of main-streaming renewable energy technologies. However geothermal and large hydro sources appear to be excluded from both categories.

10. Operationally the use of the term “renewable energy” also hampers the optimal allocation of resources and sends out mixed messages to both staff and clients about where the priorities lie. The ‘main-streaming’ of ‘renewable energy’ is not an end

in itself, but is a means to satisfying two objectives: namely the objective to reduce poverty and the objective to reduce global environmental damage that results from energy use. Under current incentive structures there will frequently be a trade off between these two objectives.

### **The Primacy of “Energy Poverty”**

11. ESMAP’s task would be made easier and more effective if the main priority was to address the energy options, from whatever source, that best meet the needs of poor people. This would put all renewables on an equal footing with the other options, and facilitate a more “technology neutral stance” that is more in keeping with ESMAP’s desire for “objectivity and independence”. It would avoid the complication of distinguishing between “old” renewables, such as wood fuel and large hydro, and “new” renewables. It would also focus attention on the development of “decentralised” approaches to the supply of improved energy services that can attract private sector finance.

### **Deal with Energy Pollution Directly**

12. Similarly, the objective of reducing the impact of current energy systems on the environment is probably better achieved by directly promoting improved energy efficiency, repairing gas leaks, fuel switching from coal to gas, cleaner coal, structural reform that internalises environmental costs in market prices through enforced regulation, the reduction in gas flaring and so on.

### **Meeting Client Needs**

13. ESMAP staff report that client governments and marginalised people do not want to limit their choices just to renewable energy options. Although ESMAP work shows that “renewables” can be the best choice in some circumstances, restricting support to renewable energy sources alone places severe additional burdens on poor people, and denies them the opportunity for productivity growth that fossil fuelled technologies facilitate.

### **Authenticating New Models**

14. There is a widely recognised need for experimentation to develop new institutional arrangements for supplying improved energy services (including renewables) to marginalised people by private sector suppliers at a profit. The need is to demonstrate business models that work, rather than demonstrations of particular types of equipment. But there is an equally important need to authenticate the results of these new business models in terms of best practice, and provide real evidence of the circumstances under which the decentralised energy service delivery systems can work. ESMAP appears to have the comparative advantage in providing such authentication. Many initiatives involving renewables appear promising but in many cases it is too early to tell whether they will be financially sustainable.

15. ESMAP has assisted in the development of a number of new models ranging from the Solar Development Corporation (which resulted in a major fund, following a relatively small ESMAP investment), through the rural electricity supply model developed in Laos, to the approach to funding PV that has been developed in Kenya and elsewhere.

#### **Subsidies to Make Rather than Destroy Markets**

16. In the context of making markets for new renewable (and other decentralised) energy options, it is clear from ESMAP's work that subsidies are frequently necessary at least in the short run. ESMAP (and others) are beginning to learn how the available subsidies can be used to make rather than destroy markets. In this context, it is to be hoped that bilateral donors and private companies will adopt "codes of conduct" which discourage the use of grants to sell equipment below cost and thereby hamper the development of competitive markets. Such a code of conduct (similar to the OECD restrictions on subsidising exports with aid through "credit mixte") would probably help speed the creation of sustainable markets for new renewable sources of energy.

#### **The Importance of the Institutional Framework**

17. The financial viability of projects powered by renewable sources of energy (including co-generation) depend greatly on getting the institutions framework right and providing the necessary levels of support. ESMAP's work suggests that institutional change is everything (even the technologists are saying this). But this is the area that takes time, patience, and the creation of new human and institutional capacities. For their part, the Bank's clients will need to insist upon a genuine partnership and transfer of skills when operating with ESMAP, and that the building of local capacities should be targeted as an objective of the work, even if it takes more time.

18. Evidence from recent Bank reports confirms that restructuring (often including "re-regulation") is taking place very slowly, and it is predicted that it may take another ten years. One of the implication of this slow progress is that many "renewable energy" options are unlikely to face a level playing field for some time. In the light of this reality, some of the ESMAP reports may be overly optimistic about the financial viability and spread of new renewables.

#### **ESMAP's Impact on Marginalised People Including Women**

19. ESMAP does not routinely monitor the impact of its work, therefore it is not possible to establish how effective the work has been, say, in increasing the number of people having increased access to "modern renewable energy". Furthermore, there was very little explicit mention of the role women play in the energy economy in the reports reviewed. However, it would appear likely that the views of women were address in the wood fuel work and the rural energy surveys.

### **ESMAP's Impact Through Influencing Others**

20. ESMAP's main impact is most likely to its influence on others. If this is so, then ESMAP requires a more explicit strategy about how such influence can be achieved with a number of different audiences. It also probably requires the development of a separate budget line to finance these communication tasks.

### **ESMAP's Comparative Advantage in the Field of Renewables**

21. ESMAP's niche is described as working "upstream" of other units within the Bank. This concept is not widely understood. This in turn probably leads to duplication of effort, and false expectations about what ESMAP can achieve in relation to renewable energy. Although the new criteria for project selection explicitly highlight the importance of working within ESMAP's comparative advantage, it is not made explicit to prospective clients and to donors what is and what is not within ESMAP's comparative advantage, and how this differs from the services offered by other parts of the Bank (or indeed UNDP). need for projects to

22. When reviewing the ESMAP portfolio, the TAG has frequently asked whether ESMAP can add value to an activity over and above the activities of normal commercial consultants. At first sight a number of projects in the ESMAP portfolio of renewable projects might have been carried out just as well by any number of local or foreign consultants with local funds or bilateral aid. But in many cases, World Bank involvement does appear to add to the "credibility" of the results in the minds of both government and other funding agencies. In addition, World Bank involvement appears to make it easier to attract additional funds from other sources.

23. In the past TAG members have questioned ESMAP's comparative advantage in relation to the Brazil Hydro and Thermal Power Sector Study (\$149,800). However it has to be accepted that there may have been unspecified, but sensitive, reasons which required an honest broker such as ESMAP to undertake the study. Some activities that might appear to have been standard analyses turned out on closer inspection to have involved the transfer of ideas and experience from one area to another (see for instance the Nicaragua wood fuel study, or the Laos decentralised energy options).

### **The Balance Between Meeting Demand and Setting the Agenda**

24. There is an inherent tension between the need for ESMAP to be pro-active in helping to set the agenda for the reduction of energy poverty (through the use of renewable and other energy technologies) and being responsive to the routine demand to subsidise the costs of developing projects for immediate Bank lending. It is widely believed that ESMAP has the opportunity to take greater risks than other parts of the Bank. But the overall impression is that the ESMAP is not allocating sufficient amounts of high risk "venture capital" to the task of intellectual leadership.

25. The literature reviewed during this study suggested that there are a number of methodological or conceptual “tangles” that need to be sorted out and intellectual leadership provided (such as the processes of internalising externalities, poverty and environmental impacts of sector reform). This is a area in which ESMAP is thought to have a comparative advantage. However there appears to be little of this type of work in the current portfolio.

### **Bank Structures and the Development of Renewables**

26. Many respondents argued that the structures of the Bank were un-conducive to investment in renewable energy supply options. First, the legitimate policy decision to concentrate on sector reform has reduced the Bank’s investment in conventional power generation, including large and medium scale hydro. Second, when it comes to supporting small scale renewables that assist poor people, operation staff commented that the constraints result more from investing in large numbers of decentralised energy supply systems, than the fact the energy source was renewable.

27. And third, the structures of the Bank are said to make it difficult to invest in any form of energy supply (including renewable energy) that are “outside the conventional energy sector” (such as renewable biomass fuel, and where the use of new renewables is associated with health, education, water supply, urban planning, livelihood security and so on). If this is true, it would be a particularly worrying constraint within a paradigm in which marginalised energy users have to pay the full cost of obtaining improved energy services,

28. Within this paradigm the bulk of improved energy supplies will have to be paid for from increases in incomes that result from the higher productivity that results from more efficient, cheaper or more plentiful use of energy. This means that new energy services will frequently have to be linked to end-use investments, and the small enterprises that operate them. This has been labelled the “motorisation of development”.

29. This shift will probably necessitate changes within the Bank and the forging of new alliances. It will certainly involve getting to know a new set of clients (with a switch from government utilities to private, often small scale, suppliers). It will certainly involve taking more account of women as both users and producers of energy services.

30. However, recent reforms within the Bank way well mean that the short term problems that Country Programme Managers face (such as intractable poverty, restructuring and recession) make them particularly wary of investing in things that are new to them (and anyway appear less predictable) such as “renewables”.

### **ESMAP as a Broker of Funding for Renewables**

31. There is an impression that renewable energy projects (and particularly those associated with decentralised supply) cost more to prepare than conventional energy projects. But there is also a widely expressed belief that 'there is a lot on money out there for renewables'. This suggest that there may well be a new role for ESMAP in identifying such additional resources and brokering them to other parts of the Bank (and the UNDP).

### **Institutional Memory About Renewables**

32. Much of what is known in ESMAP about both new and old renewables (and indeed, decentralised supply) is contained in the experience of the Bank's staff. But the current team (both inside and outside ESMAP) is small and appears beleaguered. This raises a range of questions about the critical mass of effort that is required, both in ESMAP and in Operations, to sustain such activities. And how this experience can be retained, codified and communicated to others. Hopefully these issues will be addressed by the Bank's newly developing Knowledge Management Systems and Thematic Groups.

### **The Role of UNDP as a Co-Sponsor of ESMAP**

33. During the review, it became clear that a number of Bank staff regard ESMAP as another department of the World Bank, rather than a separate entity that is run jointly with the UNDP and that is "housed" in the Bank. In relation to this, TAG members have raised the concern that the project selection criteria re-enforce this view by referring exclusively to Bank objectives and Country Assistance Strategies. Although plans are underway to correct this, ESMAP probably does not yet draw sufficiently on the resources and experience of UNDP.

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## Introduction

1.1. Purpose. The Technical Advisory Group (TAG) of the Energy Sector Management Assistance Programme (ESMAP) was set up to “provide continuous advice to the Consultative Group [of Donors] and to the Management of ESMAP on the Programme’s rolling work plan”, to provide “an annual review of ESMAP’s ongoing activities and prospective orientations” and , “in addition to providing strategic and policy advice, TAG members will serve as reviewers of certain ESMAP activities”<sup>2</sup>.

1.2. This study is one such review of ESMAP activities and concentrates on their work with renewable energy since 1992 (see the full terms of reference in Annex 1). In general the purpose of the review is to reflect on what has been done, with a view to providing advice to both donors and ESMAP staff about how these particular sub-set of activities can be improved in future. It is necessarily an “outsider’s” view, and while this offers a different perspective, it is recognised that such a brief review is liable to miss or misunderstand many issues in so complex a field in so complex an organisation. The hope is that the report will stimulate reflection and the process of review will result in many of the most glaring errors being removed. Clearly the views expressed in the report are those of the author alone.

1.3. **Method.** Twenty days were allocated to the task, plus the services of an assistant for fifteen days . Five days were spent by the main author in Washington identifying the relevant projects, and the associated document and in carrying out initial interviews (see Annex 4 for a list of people interviewed). The Review Assistant assisted in administering a brief questionnaire to all the Task Managers of the identified projects. And face to face interviews were carried out with a sample of Task Managers within the

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<sup>2</sup>. See the Terms of Reference of the Technical Advisory Group. At the current time the members of the TAG are Youba Sokona, Jan Moen, and Andrew Barnett.

operational areas of the Bank<sup>3</sup>. Comments were sought from staff and TAG members and were incorporated in subsequent drafts.

1.4. At an early stage of the review it became clear that it would not be possible to carry out that part of the Terms of Reference that involved consulting the various external “clients” of the ESMAP work within the ten day time frame. This is a serious omission and should be taken into account in considering the conclusions of this report.

1.5. All the reports were briefly reviewed, as were the relevant files. An analysis was performed of the responses from the 31 questionnaires returned.

1.6. **Some History.** The World Bank has had some success in recent years in getting “new” renewable energy into the project pipeline. However the absolute number of megawatts of power generated from renewable sources may well have fallen as the number of large hydro projects has been reduced in the portfolio. A number of reports have confirmed that ESMAP has played a significant role in the process of getting new renewables into the portfolio<sup>4</sup>. It is said that there are now more “new renewable” projects in the pipe line than have been completed in the history of the Bank<sup>5</sup>. However if renewable energy has now become part of the common discourse within the World Bank, it was not always so, and many of those involved have had a long and lonely time of it. A review of the various reports and interviews shows that the staff involved in renewables in all parts of the Bank are likely to continue to face a difficult task in future.

1.7. It would appear that some of the structures of the Bank and pressures on staff are un-conducive to investment in sustainable energy strategies. Many of these investments involve greater uncertainties and greater need to build local capacities and institutions, than investment in more conventional power plant for which the Bank was designed. In addition, the relative fall in oil prices (back to pre 1992 prices levels at something like 20% of the peaks reached in 1983) and the more recent financial crises have provided a strong counter weight in operational departments and their clients’

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<sup>3</sup>. The Review team was greatly helped by a number of ESMAP staff, and appreciates the time given by Task Manager and other staff in agreeing to fill in questionnaires, supply documents and answer questions. Without this help, the report would not have been possible. However any errors and omissions that remain are the responsibility of the main author.

<sup>4</sup>. See for instance the report of the Operations Evaluation Department 1997, and the contributions to Fuel for Thought, and Rural Energy and Development.

<sup>5</sup>. The OED report number 17359 of February 1998.paragraph 31 shows the situation for Non-traditional renewables as follows:

1980-1993 \$429 million for 6 projects

1994-1997 \$172 million for four projects (1.4% of total energy sector lending) plus three GEF projects totalling \$55m,

1999-2000 Pipeline has 14 projects with renewable components \$620m plus \$150m GEF.

countries to the exhortations to invest in “renewables” from senior managers and international climate change negotiators.

1.8. Recent reforms within the Bank way well mean that Country Programme Managers now have more power to allocate resources, but the short term problems they face (with intractable poverty, restructuring and recession) may well make them particularly wary of investing in things that are new to them (and anyway appear less predictable) such as “renewables”.

1.9. Certainly the reports reviewed provide indications that renewables frequently lose out to more conventional energy sector investments. A number of staff pointed to the difficulty in breaking the link in people’s minds that “energy” is synonymous with electricity, and that as the Bank has moved away from direct investment in power there should be no more energy related investments of any sort!

1.10. There have been a number of efforts in recent years to counter these restrictions and pressures. These are well known and need not be described again in detail here<sup>6</sup>. The point to note, though, is that ESMAP’s has contributed to many of these efforts and its current work has to be seen in relation to these other initiatives.

1.11. Similarly this TAG review follows a review of all the Bank’s work on renewables carried out by the Bank’s Operations Evaluation Department as an input to the new draft environmental strategy for the energy sector, *Fuel for Thought* (September 1998) which is currently out for external review. The OED report provides a number of important conclusions (some of which will be discussed below). But it is relevant to what follows to note at this stage that the OED report found that some aspects of energy sector restructuring have had negative environmental impacts, particularly with the reduction in investment in large hydro power<sup>7</sup>. However the OED make little mention of the effects of increased use of renewables on the Bank’s main Mission, namely “to fight

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<sup>6</sup>. The “Solar Energy Initiative” grouped many of the Bank’s disparate efforts in renewables under one label in the spring of 1994.

There have also been a number of “policy statements”, such as the *Rural Energy and Development* (1996), and *Fuel for Thought: an Environmental Strategy for the Energy Sector* (September 1998) that seek (in part) to raise the profile of renewables within Bank operations and the aid business more generally. There has also been a growth in funds earmarked for renewables. These have included the new generation of “subsidy” schemes provided by the Global Environmental Facility, the Solar Development Corporation, and the setting up of donor Trust Funds that are ear marked to finance renewable energy project preparation (such as the Asia Alternative Energy Group, formerly ASTAE, and the Africa-based Regional Programme on the Traditional Energy Sector (RPTES). New lending instruments have also been created recently, such as Learning and Innovation Loans (LILs) and Adaptable Programme Loans (APLs), which are expected to be better suited to certain types of renewable projects, than previous instruments.

<sup>7</sup>. Leading to the “perverse” shift away from “economically justifiable hydro dams towards. less environmentally friendly, thermal plants” (page 58, see also page 57).

poverty and improve the quality of life through sustainable growth and investment in people”.

1.12. Not surprisingly many of the views expressed by staff during this review in relation to renewables are reflected in the text of *Fuel for Thought* (page 37-46). These include the need to work “further upstream” to influence the Country Assistance Strategies (CAS), the need to mainstream these activities into the Bank Operations (through new approaches and new lending instruments), improved analysis, monitoring and communication (with more objective assessments of achievements), a bigger push for technical change, the catalysing of new resources through novel forms of partnership, and changing the skill base within the Bank. A number of these points will be discussed further below.

1.13. The final piece of history that sets the background for this TAG review is that ESMAP itself has recently renewed its own strategy<sup>8</sup> (September 1997) and procedures<sup>9</sup>. Most of the renewable energy activities under review took place before these changes, but it seemed sensible to keep them very much in mind while carrying out the review.

1.14. Definitions of renewables. The focus of this review is on “renewable energy projects”. The problem of what constitutes “renewable energy” is old and as long as a piece of string. But definitions do matter in this case because the task facing Bank staff becomes confusing when it is unclear whether their main objective is to use renewables to address poverty and the concerns of “energy access”, or to tackle issues of (global) environment through renewable energy.

1.15. The OED report offers some way into the problem of definition with its breakdown into two types of renewables (paragraph 30), namely, “large scale generation hydro and geothermal plants”, and “more non-traditional forms including solar, wind, biomass, and mini hydro”. However, the introduction of the concept of “traditionality” probably adds more confusion than insight (is wood fuel more or less traditional than hydro?).

1.16. The largest energy resource for poor people is wood and other biomass, though some of this is harvested on a renewable basis, and some is “mined”. Large hydro probably has been the largest contributor of renewable energy in the “modern sector”, but does not figure significantly in the work of ESMAP<sup>10</sup>. Similarly the OED reports that over the past four years geothermal electricity projects have been at their highest ever levels (\$485 million plus \$37m from GEF because of two large projects in the Philippines) but are projected to fall in 1998-2000.

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<sup>8</sup>. ESMAP Purpose and Approach, September 23 1998

<sup>9</sup>. ESMAP Application Process, Guidelines and related documents (Northern Summer 1998).

<sup>10</sup>. According to the OED there is a clear role for ESMAP to find new ways “to spread the risk of hydro development to attract more private financing, an area where the bank could play a key role” (page 32).

1.17. In its own strategy ESMAP bundles energy from traditional wood and biomass in with rural electrification (from any energy source) in the priority area of promoting access for rural and peri-urban populations. Other renewables "(such as those associated mainly with rural electrification - wind, solar, small hydro) and "large biomass, are grouped in the priority area of main-streaming renewable energy technologies, though geothermal and large hydro sources appear to be excluded.

1.18. This splitting of "renewables" across a number of priority areas provides an initial indication that the category "renewables" probably has little relevance to the Bank's Mission or Operational units. This is an issue that will be further developed throughout this report, as the category of "renewables" sends out mixed messages to both staff and clients.

1.19. **ESMAP's Niche.** In reviewing renewables, the outsider is struck by the large number of different groups associated with this type of work within the Bank and an apparent lack of clarity in the division of labour and responsibilities between them. It is clear that some units (like the Asia Alternative Energy Group and Africa-based Regional Programme on the Traditional Energy Sector) are "in the Regions and in Operations" whereas ESMAP is "in the Centre". But there is criticism that ESMAP is not "more operational", and it would appear that at least some of this criticism is the result of a misunderstanding of (or lack of clarity in) the roles of the different groups<sup>11</sup>.

1.20. The new ESMAP strategy says that [it] "is focussed on upstream, that is pre-investment, issues", but the real significance of this description is probably not clear to most readers, not least because it goes on to say that these this focus is on "issues that have a clear potential for key policy formulation and energy investment" (presumably like any other project preparation activity of the Bank). However, the *Fuel for Thought* paper does make the meaning clearer by making the distinction between the "Upstream sector work funded by ESMAP, and project identification by the Asia Alternative Energy Programme, or the non-conventional and traditional energy funds for Africa" (page 48).

1.21. In practice the staff with renewable expertise move between upstream and down stream work and between Operations and the Centre. But the new environmental strategy for the energy sector concludes that there is a need for more "upstream sector work" and that this is needed as it "will act as an incentive to generate demand" in what it calls the "demand driven operational environment" (page 7 and 48).

1.22. **Multiple clients.** ESMAP faces a large range of clients: ranging from the marginalised people of the world, the governments that represent them to varying

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<sup>11</sup>. The Review of the ESMAP a Commission (1990) suggested that ESMAP should work closer with the "World Bank's operations complex" and it is reported that this did happen -see Brief September 1997, page 4. In comments to an earlier draft of this paper it has been pointed out that a number of these operational programmes (such as ASTAE and FINISS) grew out of ESMAP initiatives.

degrees, the donors who provide the money to ESMAP, through to various clients within the Bank and the wider professional community of consultants, contractors, NGO's and academics.

1.23. This in itself is probably inevitable in such a programme, but equally it leads to a proliferation of goals and targets (some of which are in conflict with others). But as a consequence the management task becomes particularly complex and objectives and the measurement of effectiveness can become unclear.

1.24. The work of ESMAP certainly appears to reflect a tension between those people (inside and outside the Bank) that want ESMAP to take a pro active stance to take risks and to change the agenda of the Bank, and those people that would like a programme that was "demand led" in the sense of following what the Operational programmes want and what is conventionally included in the Country Assistance Strategy (CAS). It also reflects tensions between the donors that are primarily concerned with energy, those concerned with poverty eradication and those that are primarily concerned with environmental damage, primarily at the global level.

1.25. During the review, it became clear that a number of Bank staff regard ESMAP as another department of the World Bank, rather than a separate entity that is run jointly with the UNDP and that is "housed" in the Bank. TAG members have raised the concern that the project selection criteria re-enforce the view by referring exclusively to Bank objectives and Country Assistance Strategies. ESMAP probably does not yet draw sufficiently on the resources and experience of UNDP.

# 2

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## Description of ESMAP Work on Renewables

2.1 A list of the renewable projects supported by ESMAP since 1992 is provided in Annex 2.

2.2 The identification of the relevant projects was based on a number of subjective judgements, as it was often not clear whether “sector studies” or studies on “decentralised energy” had renewable components. Similarly the work on sector restructuring may not explicitly mention renewable energy, although it may well have a bigger impact (both positive and negative) on the use of renewables than projects with the word “renewable” in the project title. Studies such as that on the value of electricity, would probably have implications for renewables, but were excluded from the review.

2.3 It is also the case that there are strong links between ESMAP and other programmes, but the links are often difficult to determine in a review of this sort. The result is that the extent of ESMAP involvement is not always clear. For instance, while many interviews praised ESMAP involvement in the preparation of the renewable energy loans to China ESMAP funding does not appear to be acknowledged in the resulting report (it may be that “ESMAP staff” are involved but not paid for from ESMAP funds).

2.4 Approximately \$8m has been allocated to renewables in the six years since 1992. This is approximately 10% of the total ESMAP expenditure. In terms of the total number of projects, Africa leads with 14 of the 32, or 44%. LAC’s eight projects are next with 25% of the total, followed by Asia’s five projects representing 16% of the total. The five “global” projects also represent about 16% of the total ESMAP-funded renewables projects in the sample. See Table 2.1.

2.5 Comparing the total expenditures across the regions, LAC region leads the others with \$3.8 million in projects, representing 48% of the total amount of \$7.9 million. Second highest dollar total is the Africa region, with \$2.7 million in projects, or 34%. Following Africa is Asia with \$1.1 million in ESMAP renewables projects amounting to about 14% of the total. Finally, those projects categorized as “global” amount to \$352k in funding, or 4% of the total.

**Table 2.1: Summary of ESMAP Renewable Energy activities by Region (including large Bolivia project) 1993-1998**

Region	Number of Projects	Combined Budget	% Of \$ Total
LAC	8	3,819,235	48%
Africa	14	2,668,271	34%
Asia	5	1,103,629	14%
Global	5	351,800	4%
<b>totals</b>	<b>32</b>	<b>7,942,935</b>	<b>100%</b>

2.6 However these data are considerably affected by a single large project in Bolivia (National Biomass Program, budgeted in the amount of \$2.6 million which itself represents one third of total value of the sample of nearly \$8m.). If this is excluded the total falls to just over \$5m over six years, as shown in Table 2.2.

**Table 2.2: Summary of ESMAP Renewable Energy activities by Region (excluding large Bolivia project) 1993-1998**

region	number of projects	combined budget	% of \$ total
Africa	14	2,668,271	50%
LAC	7	1,228,977	23%
Asia	5	1,103,629	21%
Global	5	351,800	7%
<b>totals</b>	<b>31</b>	<b>5,352,677</b>	<b>100%</b>

2.7 The average contribution by ESMAP is approximately \$170,000, although six projects were less than \$50,000.

# 3

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## Findings

3.1 In what follows an attempt is made to rise above the details of individual projects and the views of individuals to draw out some of the major themes of ESMAP support to Renewable Energy.

3.2 **Strategic Relevance.** For some years the TAG has expressed its concern about the apparent lack of strategy in the selection of projects in the ESMAP portfolio<sup>12</sup>. The production of the new strategy in September 1998 was therefore particularly welcome, as were the efforts to select, report and monitor project activity in relation to these strategic objectives through the modified Logical Framework<sup>13</sup>.

3.3 The new strategy describes the Mission of ESMAP as:

- “To address the role of energy in the development process with the objective of contributing to poverty alleviation, improved living conditions and preserving the environment in developing countries and transition economies”

3.4 A comparison of the portfolio of renewable energy project against the new strategy provides two main insights. First that the term “renewable energy” creates problems both operationally and conceptually and second, there is uncertainty about ESMAP’s precise role and how it can exert its influence most effectively. These two themes are explored before moving on to more detailed findings.

3.5 **Energy, Poverty and the Environment.** The ‘main streaming of renewables’ is one of six thematic areas in ESMAP’s work programme. This theme is driven by two objectives: to promote “access” to energy for rural and peri-urban

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<sup>12</sup>. Eg “The Mission was struck by the fact that there did not appear to be any strategic pattern in ESMAP’s activities” - page 4. *China and Vietnam Project Evaluation*, Leach and Foley 24 March 1996. This issue was pursued at a number of TAG meetings in 1996 and 1997, see TAG report to the Consultative Group April 23 1997 (page 2).

<sup>13</sup>. The Chair of the Consultative Group, Richard Stern, urges the CG and the TAG to regard the strategy as “continually evolving” in his letter to CG members September 24 1998.

populations, and to improving the environmental problems linked to energy conversion and use<sup>14</sup>. But the promotion of renewables is a means to achieve these objectives rather than an end in itself.

3.6 The review of ESMAP reports on renewables suggests that under current prices and other incentives there can be a very strong trade off between these two “drivers”. There is a trade off between maximising the access of marginalised people to “efficient and affordable energy”, and doing so in those places where **renewable** energy is least cost. Activities should be selected and judged in relation to their impact on poverty or environment.

3.7 The trade-off is apparent in the very precise way that the reports on renewable options state that they “are the least cost options **in the areas investigated**” (ie remote sites or where there is a low load density). But many respondents stressed the need for energy supplies to be least cost to the user (though this sometimes may only result with GEF subsidy<sup>15</sup>), and that “pushing renewables” (or indeed any one technology) was often counter productive.

3.8 The trade off is perhaps most dramatically seen in terms of coal and the idea expressed in *Fuel for Thought* that “many developing countries would find it difficult to lift themselves out of poverty without the use of coal, which is a cheap and abundant fuel” (p 22).

3.9 By implication more of the nearly two billion people currently without access to efficient and affordable energy could be provided with access if the limited resources available were allocated to non-renewable energy sources (than restricting the options just to renewables). Similarly, if the objective were to generate the largest effect on reducing the impact of current energy systems on the environment, then probably a greater return (than investing in renewables) would be achieved by investing in energy efficiency<sup>16</sup>, repairing gas leaks, fuel switching from coal to gas, structural reform (including efforts to internalise environmental externalities in market prices through enforced regulation), efficiency improvement, reduction in gas flaring and so on.

3.10 A key dimension of the trade off is that the benefits and burdens fall on different social groups, and that they occur in different parts of the world - the currently

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<sup>14</sup>. The Six Thematic Groups are: energy sector policy and restructuring, encouraging more energy efficient practices, facilitating international energy trade, “main streaming” renewable energy, linking energy use and the environment, promoting access to energy for rural, and peri-urban people.

<sup>15</sup>. In the case of the North East of Brazil respondents remarked that renewables were the least cost option, and the GEF subsidy was needed only to expand the market more quickly.

<sup>16</sup>. Despite its name, energy efficiency is included in the remit of the Asia Alternative Energy Group.

richer social groups are located in one place and are contributing (both currently and cumulatively) most to pollution, while the “energy poor” are located in another<sup>17</sup>.

3.11 Recent international discussions suggest that many of the Bank’s “clients” find it unacceptable (and from their perspective unjust) to burden people who currently do not have access to modern forms of energy, with restricting their options to renewable options, while not doing enough to reduce the pollution burden of energy consumption in northern industrialised countries.

3.12 Support for these views is provided by a number of the reports which mention that clients did not want the analysis of options to be restricted to only to renewable energy (or in extreme cases only PV options), and as the ESMAP solar initiative in West Africa concluded as the “markets are demand driven...[they] ...need the most appropriate technology to meet consumer needs” [whether or not it is from a renewable source] and that consumers need access to “a complete menu of decentralised energy options”<sup>18</sup>.

3.13 It might be argued that a poverty focussed institution such as the World Bank, should focus its energy work on “energy poverty”. However such a view is open to misinterpretation. It is not to argue against “renewable energy”. Clearly renewable energy will be the “best solution” to some people, at some locations at some times. Indeed it is clearly the case that wood fuel is already the least cost energy solution for very large numbers of people : “Biofuels in the form of wood, crop residues, brush and animal dung is today still the chief form of energy for the majority of humanity, just as it has since the discovery of fire”<sup>19</sup>. But even “new renewables” do have a role to play, and would have a larger role (if they were treated on more equal terms with fossil fuels in terms in terms of prices, taxes, subsidies, R and D etc).

3.14 But it does suggests that more might be achieved by focussing on increasing energy access or on improving the environmental costs of energy conversion and use by the most cost effective means possible to achieve each of these two objectives separately, rather than trying to achieve both objectives simultaneously (and then with only one rather limited weapon, namely “new renewables”).

3.15 At the level of the ESMAP programme this would put all renewables on an equal footing with the other options, and facilitate a more “technology neutral stance” that is in keeping with ESMAP’s desire for “objectivity and independence”. It would

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<sup>17</sup>. *Fuel for Thought* notes that “industrialised countries currently account for about 80% of the present stock of green house gases in the atmosphere....equivalence in stock contributions from developing countries to that from the industrialised world will not occur until approximately 2090” (page 10 footnote 11).

<sup>18</sup>. West Africa Solar - Completion Report October 1998 (pii). Similar views were noted in the other decentralised electrification reports (eg Cameroon, Laos, India).

<sup>19</sup>. Dr Kirk Smith, personal communication, quoting Professor David Hall.

avoid the complication of distinguishing between “old” renewables such as wood fuel and large hydro, and “new” renewables. It would allow a focus on the development of “decentralised” approaches to the development of energy services, that have a potential for attracting private sector finance. Operational staff commented that it is often the “decentralised” nature of energy access that was the barrier to Bank investment, not that the energy source was renewable.

3.16 Making the trade-off more explicit draws attention to issues about why the trade-off exists and what can be done to reduce it. The UNDP’s Initiative for Sustainable Energy (1996) appears to take a stronger leadership position than ESMAP in relation to energy and poverty. It argues that “poverty eradication and improved living standards cannot be achieved sustainably without major changes in the current energy system”<sup>20</sup>. This produces a strong argument for energy sector reform, from the point of view of environmental and social efficiency. *Fuel for Thought* similarly identifies the need for more analytical work to develop pragmatic ways of “internalising the externalities” associated with the environmental impact of energy conversion and use.

3.17 Such a focus then makes a case for stronger link between “access”, “environment” and “sector reform”. There are clear signs in the OED report that such links have not yet been made very effectively in relation to renewables. The fear expressed in the OED report is that, despite many of the obvious benefits of sector reform, it may well have had “perverse” effects in terms of increasing environmental damage (it has long been feared that higher discount rates would under value a sustainable environment, and the OED report provides initial evidence that this is so in practices as financial imperatives necessitate a shift from hydro to thermal power plant). Similarly, the poverty impact of certain types of energy sector reform is also not yet known. ESMAP would appear to be in an ideal position to help clarify which elements of sector reform have particularly damaging effects on the environment and on poverty.

3.18 An effective response to current institutional inadequacies has been to tie funds to specific activities that would not otherwise take place under the current incentive systems (eg where energy prices do not fully reflect environmental costs). In the renewables sector these responses involve subsidies such the Global Environment Facility and bilateral project development funds. These have been effective, but they also have perverse effects. Soft funds are needed for the preparation and development of all

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<sup>20</sup>. UNDP Initiative for Sustainable Energy, June 1996. It goes on to say that “the transition to this new paradigm will inevitably take many decades” page 18. “Improvements in end-use efficiency and greater use of renewables have long been discussed as major hopes for the future. They have not yet, however, made the substantial contribution to increased energy services for which they have potential” - however, the UNDP is unequivocal in its belief that it is “technically possible to meet all of the environmental changes associated with energy while increasing the supply of available energy and the living standards of billions of people (page 34). However it notes a great deal of uncertainty about performance and cost characteristics in more environmentally benign options - but this will only be known if the world puts in place “strong and sustained investment in R and D” (page 40).

decentralised rural projects, but such funds are currently tied only to renewable options (and not for poverty eradication).

3.19 So, in the light of the review of renewable projects it seems that consideration may usefully be given to the re-definition and relative importance of the various themes in the work programmes.

3.20 As it currently stands ESMAP may well be in danger of spreading its resources too thinly across too many objectives and programmes. A more defined objective would also be in keeping with the view that “The Bank is committed to devoting significantly more attention and resources to the alleviation of the ‘energy poverty’ of large portions of the developing world’s rural populations.”<sup>21</sup>

3.21 *ESMAP’s Role and Influence.* Reading ESMAP files and reports on renewables, it was difficult to form a clear picture of who was the intended audience and what role ESMAP was trying to perform in terms of exploiting its strength in “intellectual leadership”. One interpretation of this observation is that ESMAP is effectively addressing a wide range of audiences with a necessarily wide range of instruments. But the relevant point here is that the range is so wide and the outputs so diverse that there are strategic questions as to whether a more focussed and explicit allocation of resources could produce even better results in terms of influence. A number of these issues will be discussed further in a later section on ESMAP’s impact on renewables.

3.22 Many interviews made it clear just how complex these issues of influence can be. If ESMAP’s role is to work “upstream”, just how far away upstream from specific project preparation should it be, and how far in advance of funding should the effort start? The answers to these questions probably begin with a more explicit statement of who the ESMAP’s different audiences are and to prioritise them (colleagues, donors, recipient governments, local NGO, the large and small business community). ESMAP’s ‘implicit models of influence’ need to be linked to questions of the programme’s purpose, its niche and its comparative advantage relative to other departments and organisations.

3.23 In the strategic allocation of resources it will be important to maintain a delicate balance between “upstream” sector analyses that are pro-active and agenda setting (and therefore on occasion “out on a limb” and high risk), and the more responsive activities that require the capacity to operate flexibly and quickly when more demand led

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<sup>21</sup> See page 10 of *Rural Energy and Development*, World Bank 1996. The UNDP would appear to have a stronger commitment than the World Bank to addressing poverty as it cuts across other sectors and themes (in particular gender).

opportunities arise <sup>22</sup>. This balance should be kept under constant review (and probably should be the subject of reporting requirements).

3.24 **Past Projects and the New Criteria.** ESMAP's new project selection guidelines offer a sensible range of criteria. These are:

- The activity is innovative in developing, testing, and main streaming new ideas and new ways of doing things
- the activity contributes to building institutional and human capacity in the recipient country
- the activity addresses poverty, social and gender issues
- the activity is one for which ESMAP has a comparative advantage
- the results of the activity have an excellent chance of being used in other countries
- the activity can contribute to attracting subsequent large scale investment by the World Bank or Others
- the activity can result in important new knowledge, for which there is a clear demand.”

3.25 In practice the review found that many of these criteria were inter-related (and this is reflected in the discussion that follows). Many projects contributed to most of the criteria. This fact alone might that the criteria are open to a wide range of interpretation, and may not provide an adequate way of discriminating between project proposals.

3.26 ESMAP project task managers were asked to provide their own assessment of which of these criteria best described each of their projects. By far the most frequently cited criterion was that their projects ‘developed tested and main streamed new ideas or ways of doing things’. The next two most cited descriptions were that the projects were ‘carried out in order to attract World Bank investment’, or that they were to ‘develop an approach that could be replicated elsewhere’.

3.27 ***The Poverty, Social and Gender Criterion.*** Generally speaking ESMAP projects do not routinely monitor impact. The “upstream” nature of ESMAP work means that it is rarely intended that the projects themselves would have direct benefits to poor people - in the sense of number of people having increased access to “modern energy”.. But as suggested earlier, if the primary concern was with either increasing “energy

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<sup>22</sup>. During the interviews it became clear that there were strong differences of opinion among staff about how to make exploratory sector work more “operationally relevant”: some felt it was a matter of helping local people get up to speed so they could develop funding proposals at a later stage, while other felt the orientation should be to identify what barriers would have to be removed to get a World Bank project loan going and clear operational tasks would be needed to remove the constraints.

access” or “environment” the portfolio of projects would probably have been significantly different. That said, improving energy access was an objective of a large number of the reviewed projects. Probably the exceptions were the impact of the hydro (Brazil) and solar thermal power stations (Egypt) where the direct poverty impact was likely to be slight.

3.28 On the question of Gender, ESMAP recognised the under emphasis of gender relations in its energy work in a report in the late 1980's (*Women and Energy: The international Network: Policies and Experience a Resource Guide*). This report noted that “a full time Women and Energy Co-ordinator has been appointed to oversee the implementation, monitoring and evaluation of the programme”. It is not clear when this report was written, but no evidence was found that such a person had been active for some years. There was very little explicit mention of the role women play in the energy economy in the reports reviewed. However, in talking to staff it would appear likely that the views of women were address in the wood fuel work and the rural energy surveys<sup>23</sup>.

3.29 ***The Environmental sustainability Criterion.*** This criterion is presumably added to address projects in other parts of the energy sector that have not traditionally been concerned with environmental sustainability (such as oil, gas, coal, sector reform, transport and so on). Where ESMAP projects led to the installation of renewable energy supplies, there is likely to be an positive environmental impact. However, as before, given the upstream focus of the work on renewables, it is probably not relevant whether these actual projects have measurable environmental impacts, as the effects are likely to be indirect.

3.30 ***The Criterion of ESMAP's Comparative Advantage.*** In the past, when reviewing the ESMAP portfolio, the TAG has frequently asked whether ESMAP can add value to an activity over and above the activities of normal commercial consultants. Where the analyses are very standard, or when very detailed knowledge of a market is required, it is probably that ESMAP has little to add.

3.31 At first sight a number of projects in the ESMAP portfolio of renewable projects might have been carried out just as well by any number of local or foreign consultants with local funds or bilateral aid. But in many cases, World Bank involvement does appear to add to the “credibility” of the results in the minds of both government and funding agencies. In addition, World Bank involvement made it easier to attract additional funds from other sources.

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<sup>23</sup> A presentation by Elizabeth Cecelski to the recent “Village Power 98” that was co-sponsored by ESMAP attracted considerable support when it outlined how energy programmes can be improved by more careful consideration of women as suppliers and users of energy services (see the conference proceedings on the NREL web site).

3.32 TAG members have in the past have questioned ESMAP's comparative advantage in relation to the Brazil Hydro and Thermal Power Sector Study (\$149,800). This task appeared to be well within the competence of Electrobras or a number of Brazilian consulting firms. However it has to be accepted that there may have been political or other sensitive reasons which required an honest broker such as ESMAP to undertake the study<sup>24</sup>.

3.33 Some activities that might appear to have been standard analyses turned out on closer inspection to be new to a particular country, and to have involved the transfer of ideas and experience from one area to another (see for instance the Nicaragua wood fuel study, or the Laos decentralised energy options). To some extent this was also true for the Egyptian solar thermal power plant.

3.34 In the light of this discussions, it may be useful for ESMAP management to make more explicit to prospective project clients what is and what is not within ESMAP's comparative advantage.

3.35 *The Institution and capacity building Criterion.* Many reports suggest that there is a strong component of building local capabilities in some of the projects. This was particularly so in the work in Uganda, the early work in China, work on wood fuel and decentralised electricity supply generally. Similarly a number of projects did appear to use local consultants and expertise extensively. However, the results of the questionnaires suggested that there were often pressures to use foreign consultants to speed up the work and to meet Bank determined deadlines<sup>25</sup>. The suggestion was that a slower form of project implementation might produce better results in terms of the transfer of skills and the establishment of local "ownership". This is an important point that can be generally accepted, but it must be equally accepted that a small minority of ESMAP renewables projects do appear to have taken an excessively long time to complete by any standard.

3.36 It is also clear that in a number of cases the funds available from ESMAP to carry out a task are insufficient. Staff suggest that the simplest way to obtain additional resources is to ask for contributions in kind from other donors to supply consultant services directly to the developing country client (rather than route money through ESMAP). No doubt such support is both useful and gratefully received, but it probably limits the extent of capacity building in the local economy. Furthermore, as the cost of World Bank staff can cost as much as \$6,500 per person week (gross costs including overheads), not only do some of the projects appear under funded, but it is probably the case that work of a similar quality could be obtained outside the organisation at lower cost (though not necessarily with the same "authority").

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<sup>24</sup>. In the limited time available it was not possible to pursue these questions during interviews.

<sup>25</sup>. It was not possible to gain an impression whether or not there is an "excessive" use of Consultants from any one donor country.

3.37 TAG has made the point on a number of occasions, that with a longer term and more strategic approach to investment ESMAP funds could have been spent more effectively to build local capabilities, particularly given the large amounts of funds that have been spent on short term foreign consultants.

3.38 *The New Knowledge Criterion.* Interestingly Task Managers only rarely suggested that the generation of new knowledge was among the main purposes of their projects. Apart from modesty of the Task Managers, this view probably reflects the fact that the field has now shifted away from “technical invention” to issues of institutional innovation. Much current information is new in the sense that of being “location specific”, and that ideas developed elsewhere are being tested in new circumstances.

3.39 The literature reviewed during this study suggested that there are a number of methodological or conceptual “tangles” that need to be sorted out (such as the processes of internalising externalities, poverty and environmental impacts of sector reform). This is a area in which ESMAP is thought to have a comparative advantage. However there appears to be little of this type of work in the current portfolio.

3.40 Best practice, or reviews of state of the art are also considered critical at this time by many respondents. Such work has formed part of the portfolio (for example, reviews of solar pumping, status and cost of renewables, PV applications in rural areas). But again it would appear that ESMAP has a comparative advantage in this type of work which involves providing the time necessary for careful analysis, and the “authentication” of results of “best practice”.

3.41 The view is emerging strongly both inside the Bank and elsewhere (eg during the Village Power 98 conference) of the need learn the lessons from the body of new knowledge about how to involve private sector in the supply of decentralised energy services. It would appear that there is extensive evidence of the relative success of these “new models” in the projects in the Comoros, Brazil, Laos, and Peru. These include greater participation with all stake holders, and new forms of public/private partnership.

3.42 In this context the study on Rural Electricity Success Factors would seem timely (the white copy is planned for Feb 1999 as a result of work started in June 1996).

3.43 Similarly the new models for wood fuel market development, regulation and institutional reform (such as in Nicaragua) provide important new knowledge in the sense of lessons learned. Even the Solar Thermal project in Egypt can be seen as creating new knowledge by “pushing the envelope” of conventional electricity supply.

3.44 *The Restructuring Criterion.* On the basis of the documentation of the projects reviewed it was difficult to determine just how much consideration is given to “renewable energy” in the discussions and negotiations about energy sector restructuring. As suggested earlier the OED report suggested that insufficient attention had been given to the “perverse” effects of restructuring in terms of environmental sustainability. But there clearly was considerable attention given in both reports and interviews to the

opportunity that restructuring gave to private sector participation in the provision of energy services, particularly through the decentralised options.

3.45 The OED report remarks on how slowly restructuring (often including “re-regulation”) was taking place. From the start of major involvement by the World Bank in 1993, it suggests that the process will take about 15 years (para. 14). One of the constraints identified by the OED was the perception by some governments that restructuring was an “externally imposed measures to benefit foreign investors”(para. 13). The implication of this slow progress is that many “renewable energy” options are unlikely to face a level playing field for some time.

3.46 In the light of this reality, some of the ESMAP reports are overly optimistic about the spread of new renewables. Certainly the OED report argues that the slow process of sector reform should be taken more into account when making projections about the environmental benefits that will result from on going projects.

3.47 *The Energy market development Criterion.* As suggested before, this is clearly the issue of the moment. If re-structuring offers an opportunity for new forms of participation in energy markets by the private sector (often in new forms of partnership with the public sector), the key question is what has to be done to make it to happen. Many of the ESMAP reports address this issue, and although no single model appears to be better than all the others there is certainly a need to authenticate the experience and learn the lessons that can be transferred from one location to another<sup>26</sup>.

3.48 The reports showed that subsidies would continue to be an important contribution (such as GEF). But the key question was how to use the subsidy to create markets rather than to destroy them (and at the same time, meeting the needs of marginalised people for energy services). The need is for “demonstrations of business success” not “demonstrations of particular technologies”. The Bolivia report showed that the subsidy provided by some donors “polluted the well” for people who were trying to build a more financially sustainable activity. A code of conduct to prevent “dumping” of PV (along the lines of the OECD restrictions on subsidising exports with aid - “credit mixte”) would probably help speed the creation of sustainable markets.

3.49 In this context a number of respondents remarked on the fact that the Bank had little difficulty in principle in deal with environmental externalities when financing governments and utilities, through “real resource” economic analyses (“if you can quantify the effect, we can add it in”). But the gap between economic and financial rates of return are far more difficult to deal with in relation to the private sector. Here the process of internalisation has to be through regulation (usually re-regulation) and fiscal policy (taxes and subsidies). These are both areas that “under developed” economies are, by definition, likely to find difficult.

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<sup>26</sup>. Though the financial crises in Asia and elsewhere may well add difficulties to the interpretation of the empirical evidence.

3.50 In models that rely on poor people paying for improved energy services, experience is showing that such payments come from two main sources: from saving from inferior supplies (such as dry cells, or locally monopolised kerosene supplies); or from increases in income that result from using improved energy supplies. Linking payment for improved energy services to increases in “end use” productivity, requires new models of intervention. Staff report that this will be difficult to cope with under current bank systems. This is because these energy developments take place outside the conventional energy sector. This will be discussed further in the next section.

3.51 **Balance.** The review looked at the ESMAP renewable portfolio from the point of view of various balances (technologies, countries, types of work, risk/innovation and so on). No written statement could be found that provided strategic guidance or operational guidelines to ensure that such balances were maintained. This is not to suggest that all options should be treated equally. But even at the level of technologies multi megawatt hydro seems to have been particularly neglected (as suggested by the OED evaluation), while the portfolio probably over emphasises the importance of PV relative to other alternatives (wind, hydro and new biomass).

3.52 It is obviously not the case that ESMAP has to deal with everything. For example, while there did not appear to be anything on geothermal power in the ESMAP portfolio, the Bank’s overall lending to Geothermal power is higher than at any time in its history.

3.53 There is one area which would appear to need more emphasis in the ESMAP portfolio. This concerns energy investments that are outside the conventional boundaries of the energy sector. Many respondents remarked on the difficulty the World Bank faces in trying to tackle energy issues in non-energy sectors, such as health, education, water supply, urban planning, livelihood security and so on. As one senior manager remarked “there is no obvious mechanism within the current Bank structure” to carry out such investment<sup>27</sup>. Country Managers are said to find it difficult to get teams together that cut across these traditional sectoral boundaries. There is also a constant fear that such a ‘holistic’ approach will run into the managerial quagmire that frequently resulted from past attempts at “integrated rural development”.

3.54 The need for such cross sectoral energy investment is likely to become more pressing, as the Bank and others move towards an approach in which energy users have to pay the full cost of supplying services. Under such a policy the bulk of improved energy supplies can only be paid for from increases in incomes that result from the higher productivity that more efficient, cheaper or more plentiful energy facilitates. This means that new energy services will frequently have to be linked to end-use investments, and the

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<sup>27</sup>. This point was disputed by another staff member in comments on an earlier draft.

small enterprises that operate them. This puts “energy” at the centre of attempts to tackle poverty, and has been labelled the “motorisation of development”<sup>28</sup>.

3.55 The categories used to describe the processes of development exercise a powerful influence on conceptions of what is and is not important. A number of people suggested that there was a major difficulty for the Bank in addressing problems of wood fuel as it neither addressed the priorities of the energy sector (with its traditional emphasis on electrical power) nor the forestry sector (or indeed their skill resources). The fact is that biomass often constitutes over 50% of primary energy used in many countries, and will continue to be the main source of energy for poor people in every scenario of the future. On this view, it would appear that fuel wood is severely under-represented in the balance of ESMAP renewable energy activity or wider Bank portfolio aimed at fighting poverty, and enhancing the role of women.

3.56 Probably the most difficult aspect of balance is the balance of risk within the portfolio. A significant majority of respondents both inside ESMAP and outside argued that if ESMAP is not to take risks, it is unclear who else in the Bank will. All agreed that there is a need to take risks if the world is to move from the current energy paradigm to the new one. It is equally understandable why the operational departments have to have more risk averse strategies.

3.57 At the moment the portfolio does contain high risk activities (particularly in relation to the risk of projects not leading immediately to Bank loans), but the overall impression is that the ESMAP is not allocating sufficient “venture capital” to the task of intellectual leadership<sup>29</sup>. In other words to the task of pushing forward with new ideas, and new understanding of what needs to be changed. This is clearly a very subjective judgement, but the portfolio does not now have the buzz that it once did in the early days of ESMAP when the energy sectors of the world were in crisis, nor when the Bank was showing that the public sector (including aid agencies) did not have the funds to meet the energy needs of developing countries, and that sector reform was necessary to attract the necessary private capital.

3.58 Probably it is the primary of task of the TAG to review these various “balances” both in the current portfolio, but more particularly in the pipeline. Though in order to do this effectively ESMAP’s niche and comparative advantage (relative to other parts of the Bank) probably needs to be more explicitly specified and agreed by the Consultative Group and other clients.

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<sup>28</sup> Dr Youba Sokona, personal communication.

<sup>29</sup> The series of projects on “solar initiative Regional Strategies” appear to have provided a flexible fund for rapid response to client requests or funds to assist in bringing renewables on to the agenda. They appear to have been successful, it will therefore be important to ensure that a more bureaucratic funding style can tolerate such open-ended initiatives.

3.59 **Impact.** The question of the impact of ESMAP cannot be separated from the programme's purpose. While the Bank as a whole may be expected to be judged in terms of its direct impact on poverty, this is probably not the main purpose of ESMAP. ESMAP can be said to seek its impact in terms of influence. Such influence ranges from main streaming of new ideas (such as "new renewables"), and changing views of clients and colleagues about what is possible and most effective in terms of subsequent lending.

3.60 If this perspective has any validity, then it is perhaps surprising that there is no very explicit model about who the audience is and what instruments are most effective. ESMAP has been influential, but would a more focussed approach, based on a more explicit strategy may well have achieved even better results?

3.61 In considering impact there are well known problems of determining causation and what constitutes evidence. There is a natural tendency for many people to claim "leverage" over the same piece of work, but in the case of ESMAP it may also be important to staff to play down their role (as "facilitators") in order to get better "ownership" of the subsequent activities by the implementers. The further upstream the work takes place the harder it is to prove causation.

3.62 Despite these caveats there is much evidence that ESMAP has helped the Bank and its clients to identify and prepare bankable renewable energy projects. Indeed many respondents suggested that ESMAP has been involved at some (usually early) stage in the development of all of the Bank's major lending to new renewables, namely in China, India, Indonesia, Argentina, wood fuel in Africa<sup>30</sup>. However the long lead time in the preparation of such projects, means that the ESMAP's work often took place before 1992 - the period chosen for this review. It is important to keep this in mind when considering this review.

3.63 Much of the success of these activities to develop Bank projects is widely ascribed to the personal chemistry (and mutual trust) between renewable specialists in ESMAP and in operational departments who were in practice able to overcome or utilise the internal structures of the Bank.

3.64 However as the review progressed it became clear just how complex the issues of influence were within the Bank. A number of interviewees (in ESMAP and in operations) described how difficult it is to compete with the other "sales teams" from the other sectoral programmes trying to get "their subject" into particular Country Assistance Programmes. It was apparently difficult even to main stream "energy" in the CAS, let alone new renewables, that cut across into a number of other sectors.

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<sup>30</sup> The site visits relating to the development of the wind energy project in India took place in May 89, and April 1990. The report on Renewable Energy for Electric Power in China printed in 1996 has no reference to ESMAP involvement. The report on Indonesia biomass options was printed in 1994 but exchange rate shown is 1991. This report itself built on earlier issue and options studies in 81 and 87, and a gasifier pre-investment study in 1989.

3.65 A number of respondents stressed the need for ESMAP to give more thought to how it feels to be a Country Programme Manager, and to make ESMAP outputs more useful to them. Operations staff complained that their own project teams are often weak as they have very limited project preparation resources they could benefit from ESMAP expertise particularly if it were paid for by ESMAP. Everyone stressed the need to show Country Managers examples of concrete risk free examples of what could be done! But in tackling this task, it appears that the recent financial crisis in Asia means that the evidence is still not yet there as the “Flagship” projects (such as the PV model in Indonesia) are currently “becalmed” or sinking.

3.66 The barriers are probably less about problems with “renewables” as such, but rather with the delivery energy services by any decentralised means (from any energy source). Such new service supply models probably do not fit easily into existing Bank structures and which are probably better suited to dealing with governments and large utilities than with large numbers of private sector suppliers. Though, as the decentralised electricity project in Laos showed, it is possible to tag such work onto more conventional programmes.

3.67 Lobbying for renewable energy is clearly part of the process of putting them into the mainstream of Bank operations, but the stronger the advocacy of a particular supply option, the greater the risk of undermining ESMAP’s role as honest broker. Indeed a number of staff stressed the need to down play the renewable element of the energy resource and to stress the low costs to users<sup>31</sup>?

3.68 New renewables are certainly now on the World Bank’s map, but the test will be whether they can be persuaded to put their money in to it. The successes in India, China and India suggest that they will. But it may take a long time.

3.69 The sample of projects did provide examples of projects not going forward even though the client country wanted them. This appears to be the case in north east Brazil, Uganda, Zimbabwe, and Guinea. Although in some of these cases it was suggested that the recent financial crises were the main reason for taking them out of the immediate pipeline. Given that even the successful renewable projects take a long time to come to fruition, it is to be hoped that these projects being placed on the ‘back burner’ rather than being cancelled.

3.70 Such set backs do underline the importance of tenacity, but it is clear that those staff associated with energy, poverty and renewables do feel beleaguered. This feeling is probably not helped by the fact that there appear to be relatively very few renewable specialists in the Bank (or more precisely people with the skill and motivation to work on decentralised, market orientated, poverty focussed energy projects). The

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<sup>31</sup>. For this reason it would appear tactically important to main stream the role that energy plays in rural development (following the production of the best practice book on Rural Energy and Development 1996. As part of the forthcoming “road shows” to main stream issues of environmental sustainability in the Bank.

range of opinion about them is illustrated by two (paraphrased) views: 'If we want to help the poor ESMAP cannot give up', and 'they should stop doing all these strategic sector reviews and get out into the field to prepare projects'.

3.71 The evidence from the sample of projects suggests that an important part of the influencing process is "upstream" of project preparation activities, and that reviews such as that of opportunities in North Africa, Central Europe and FSU are necessary first steps. Similarly the studies that determine current energy expenditures by marginalised people are likely to be necessary pre-cursors to get "ownership" of the ideas and a more complete diagnosis of the problems (eg the idea that the private sector can develop solar thermal power plant in Egypt, that Zimbabweans, Indians and Ugandans do currently spend considerable amounts of cash on batteries (and other 'inferior' energy services).

3.72 However there were strong disagreements about what such sector reviews should cover. The lesson from this is that it is probably important for all of these strategic sector review to add sections that explicitly address the question of what would have to be done to get from where people are now to a bankable project.

3.73 **Dissemination.** Staff on ESMAP projects often feel that reports are the least important part of the project. But certainly from the perspective of the outsider, the data, new methods and new perspectives are invaluable. ESMAP is probably one of the largest source of this information (particularly as so much other information remains the private property of consulting firms, or the confidential reports of over secretive governments). Publication also performs an important role advertising for what the programme can offer, and has added quality control function. If there is no policy to put everything into the public domain it is all too easy for activities that are not up to standard to be hidden under the stamp of secrecy!

3.74 **Client driven projects and the Effectiveness of ESMAP as Interlocutors.** The results of questionnaires to Task Managers indicated that ESMAP work on renewables was largely client driven (contrary to popular opinion). Clearly this is a one sided view, (as it has not yet been possible to obtain opinions from external clients). But it does not appear that staff on ESMAP projects imposed their views (though there clearly are "Bank views" about the benefits of restructuring and so on) and they did appear to form a bridge between local clients, government and the Bank's operations staff.

3.75 In most cases the initial contact was with staff in the Operations departments usually responding to requests from client governments. But there were a number of cases (such as wood fuel in Nicaragua where the initial contact was with an NGO (who was aware of ESMAP work elsewhere and wanted to transfer the knowledge).

3.76 In the case of electricity in Nicaragua a regional review suggested electrification was lower than might have been expected, and this led to discussions with operational sector staff. They had been approached by the Government seeking WB advice and it was possible to respond through ESMAP. The project in Zimbabwe was said to have been the result of an urgent request from country programme manager.

3.77 In one case ESMAP decided to withdraw from a project when it was concluded that the client no longer was particularly interested in renewable energy (Jordan).

3.78 The issue of “buy in” is at the forefront of discussions with ESMAP projects. In the sense that ESMAP is “up stream” and is main streaming renewables there clearly will be (or rather should be) cases where complete “buy in” with the client government is not complete initially. This would appear to be particularly so with efforts at sector reform. But ESMAP runs a particular danger in that as its resources are free to the user, there must always be a concern that the client says yes because it is free.

3.79 TAG has frequently raised with ESMAP management the question of whether certain clients should contribute financially to some of the activities of ESMAP<sup>32</sup>. This would might provide an indication of commitment from the client at the outset (and a commitment to ensure the quality of the product), and provide ESMAP with funds to work with clients that do not have the necessary funds.

3.80 **Timeliness.** There is no doubt that with hind sight the most effective projects were those that took place at the right time. The problem is that the right time is difficult to judge and circumstances change (such as the financial crisis currently unsettling many countries). There were cases where operational staff felt there was good work, but that it was at the wrong time (for instance in Uganda), and there were others where circumstances had changed and projects could not now go into the pipeline as had been expected at the outset. But the main impression from the review is that getting renewables into the pipeline takes a long time, even when everything goes well. When working “up stream” from projects, the situation for renewables will probably always look very untimely at the outset.

3.81 **The Process of Project Design.** An attempt was made to examine the way projects were designed. However it was difficult to form an opinion on the basis of the information available. A large number of files were examined, and their contents ranged from very little, to full sets of memos and reports.

3.82 Two items stand out. First, that the projects were generally very good at leveraging other resources. Generally speaking the allocation from ESMAP was probably insufficient to the scale of the task , and additional resources had to be used (however it may well be that the allocation of ESMAP resources was made in the knowledge that other funds would be forthcoming).

3.83 Second, there was a trade-off in project design and execution in the extent to which external consultants are used (and the job done quickly and to time) and using local staff, and thereby gaining in capacity building, but often taking considerably longer. There is also a trade-off in cost.

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<sup>32</sup>. This suggestion was initially in relation to work with Gas, Coal, sector restructuring and international energy trade where at least some of the players had an ability to pay.

3.84 There was a common view that new renewable energy projects take more money and time to prepare. Indeed this was probably the justification for setting up the Asia Alternative Energy Programme. While this may be the case, it appears that all projects in the Bank are now costing significantly more to prepare, as more care is taken with involving stake holders, and environmental and other assessments. But in many ways the cost increase does not appear directly associated with “new renewables” but rather with the nature of large numbers of small projects associated with decentralised options and the fight against poverty. Furthermore many of the costs of preparing conventional energy projects are covered by existing local institutions and therefore are not seen as costs to a Bank project (an example was cited of a 1000MW conventional power project being developed in China in the space of less than a year, because the design work had been going on in China for many years before).



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## Conclusions and Lessons Learned

4.1 Certainly ESMAP has played a significant role in raising the profile of renewable energy within the Bank and in the wider world. ESMAP has been involved with many of the World Bank's major investments in new renewable energy. But the process of project promotion takes a long time, and the main impact of the current portfolio may well take many years for fruition. ESMAP has also had a major effect in keeping issues of wood fuel and "energy poverty" on the agenda of the World Bank - through difficult times and against many opposing forces.

4.2 It is not the purpose of this section to list the lessons that have been learned in the renewable energy field. But it is clear that a new paradigm of energy and development is emerging. This paradigm recognises the older truth that poor people will continue to rely on markets and private sector suppliers to meet their needs for energy, but that governments and aid agencies have a pressing duty to make sure that these markets work more effectively. Such a model creates both opportunities and threat to sustainable development, and to renewable energy.

4.3 ESMAP (and others) are beginning to learn how the available subsidies can be used to make rather than destroy markets. Similarly, it is to be hoped that bilateral donors and private companies will adopt "codes of conduct" which discourage the use of grants or the dumping of equipment below cost that hamper the development of competitive markets.

4.4 There is a considerable uncertainty within the Bank (and the wider world) about the impact of energy sector reform on the use of renewables, poverty, and the environment. There is a widespread belief that reform has resulted in a reduction in investment in one of the major renewables, namely conventional hydro electricity.

4.5 ESMAP has contributed significantly to generating and publicising the lessons to be learned about renewable energy development. But it has done so, and will need to continue to do so in partnership with other allies both inside and outside the Bank.

4.6 From all that has been said, and certainly in response to a number of users of ESMAP output, there is a clear need to draw together the lessons learned for its work

on renewables, and by extension environmental and poverty impact. There is a particular need for the lessons to be drawn out in an authoritative way, and to balance the views of each of the various “protagonists” and enthusiasts. There is a desperate need for more experimentation (of business models that work, rather than demonstrations of particular types of equipment), and for more real evidence of the circumstances under which the decentralised energy service delivery systems can work<sup>33</sup>.

4.7 ESMAP probably has probably not been drawing out these lessons sufficiently in the recent past, but then some of the new experiments are not yet mature (hampered by the current financial crises) and certainly no single model has yet emerged in terms of best practice.

4.8 The very concept of “renewable energy” has been found to have its limits both operationally and conceptually and there certainly is a trade-off under current conditions between tackling “energy poverty” and “sustainable energy development”. One of the comparative advantages that the Bank has over other institutions is its honesty as a broker. For this reason it is important for the Bank to remain neutral in terms of technical options (though strongly ‘biased’ in favour of poor people). Restricting poor people to renewable energy sources will place severe additional burdens on them, and deny them the opportunity for productivity growth that fossil fuelled technologies facilitate.

4.9 The impression that decentralised energy projects (and particularly ones using renewables) cost more to prepare, combined with the impression that ‘there is a lot on money out there for renewables’, suggest that there is a role for ESMAP in identifying such sources and brokering them to other parts of the Bank (and the UNDP).

4.10 Much of the development of renewable energy options for marginalised people probably needs to be linked more closely to end-uses that will generate the cash flow to pay the full cost of the energy. This probably will necessitate changes within the Bank and new alliances forged. It will certainly involve getting to know a new set of clients (with a switch from government utilities to small private sector suppliers). It will certainly involve taking into account women as both users and producers of energy services.

4.11 None of this will be easy, given the other pressures under which Operational staff do their business, and will take a long time and will require continued tenacity.

4.12 Much of the opportunity for larger projects powered by renewable sources of energy (such as co-generation depend greatly on getting the institutions right and providing the necessary levels of support. Institutional change is everything (even the

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<sup>33</sup> ESMAP has assisted in the development of a number of new models ranging from the Solar Development Corporation (which resulted in a major fund, following a relatively small ESMAP investment), through the rural electricity supply model developed in Laos, to the approach to funding PV that has been developed in Kenya.

technologists are saying this<sup>34</sup>), but this is the area that takes time, patience, and the creation of new human and institutional capacities. For their part, the Bank's clients will need to insist upon a genuine partnership and transfer of skills when operating with ESMAP, and that the building of local capacities is an objective of the work, even if it takes more time.

4.13 Some of the greatest success in the area of renewables has been when ESMAP has co-operated (formed "partnerships" even) with other parts of the Bank and other external partners. But it probably takes an outsider to observer that a number of the new systems within the Bank appear to be generating a form of destructive competition between individuals and departments. This will need to be countered if such partnerships are to thrive in future. This will be helped by a clearer definition of ESMAP's role relative to other programmes, a more general agreement about the relationship between "upstream" work and the preparation of specific loan projects, and the effective introduction of the cross-cutting Thematic Groups.

4.14 Much of what is known in the Bank about both new and old renewables is contained in the experience of the staff. The current team (both inside and outside ESMAP) appears beleaguered. This raises questions about what is the critical mass of effort required both in ESMAP and in Operations to sustain such activities. However, the thrust of this review implies that the required focus may well be less on "renewables" as such but on decentralised energy deliver through new approaches to energy market development, and people searching for new ways on using energy in the fight against poverty.

4.15 *Lessons learned for Africa.* Most of ESMAP's renewable activities are based in Africa, and it is here that the greatest difficulties are likely to arise (but not of course where most of the world's poor people live). This review shows that a great deal has been learned that is of relevance to Africa. However any bullet point list of "lessons learned" from such a rich material tends to sound trivial, but there are a number of people both inside ESMAP and in the operational areas who know what the lessons are and can implement effective programmes given the time and the necessary resources.

4.16 Improved access to better energy services are a necessary condition for the elimination of poverty, and it is difficult to believe that the Bank will be effective in its mission if does not address the energy issues that relate to productivity improvement of poor people. It is unlikely that the Bank will be able to address the issues of "productive energy" for poor people in isolation from other sectors, as the need to pay for increases in energy services will have to be met from increased productivity (and income).

4.17 Renewable energy, in the form of harvested biomass, is and will remain the major energy source for most of the world's poor people for many years to come.

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<sup>34</sup> . As the UNDP report says there is a need for R and D and technological innovation, but it is probably not in ESMAP's comparative advantage to do it, or even to fund it.

However, clients do not want their options to be limited only to renewable energy sources. Electricity (however produced) probably will never meet the needs of rural people for cooking; but marginalised people do place a high value on services that can best (or only) be provided by electricity (lighting, radios, and, where possible telecommunication).

4.18 The market is already providing energy services to many marginalised people and they are already spending significant amounts of cash for very poor quality services (ESMAP provided startling evidence of this through its work in Zimbabwe and Uganda). Under particular circumstances, and with certain types of support these markets can be expanded, often in partnership between the public and private sector. Much is still not known, particularly about the role and views of women in the supply and use of energy services. There is also much to do to re-regulate and organise wood fuel markets so that they are renewable and sustainable.

4.19 Africa is showing the rest of the world that there are now cost-effective (expensive, but less expensive than previous options) ways of providing lighting and refrigeration to homes schools, and health centres.

4.20 It appears that the most cost effective ways of dealing with global environmental damage from energy supply and use in Africa is likely to be work on energy efficiency in the modern productive and transport sectors, rather than focussing on new renewables, as such.

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## Recommendations

- 5.1 Clarify, and possibly separate out, the relative importance of programme objectives that on the one hand relate to increasing energy access and on the other that relate to reducing environmental damage from energy production and use. Consider focussing ESMAP more explicitly on energy poverty and decentralised energy services than on “renewables” per se.
- 5.2 Clarify the role of ESMAP in the renewables field relative to the work of other departments within the Bank. Actively use the thematic group to counter those elements of the current internal market that are undermining the development of partnerships and alliance across the World Bank Group.
- 5.3 Clarify and publicise both to both Bank staff and clients what is thought to be ESMAP comparative advantage in the area of renewable energy (or energy poverty).
- 5.4 Maintain a balance between upstream agenda setting work and more routine down stream demand driven work. Consider earmarking a proportion of ESMAP funds for higher risk “venture capital” investments in the portfolio.
- 5.5 Monitor, and report regularly both to the Consultative Group and TAG on the balance of ESMAP activities and its pipeline of prospective projects.
- 5.6 Evolve the project selection criteria to be more operational, to be more discriminating and to reflect better ESMAP’s priorities and strategic vision.
- 5.7 Review ESMAP’s communication and influencing role, by identifying the key client groups and determining what types of activity are likely to be most effective with each.
- 5.8 Invest in the independent authentication of best practice for the provision of decentralised energy services (including renewables), and develop a plan for how this experience can be popularised.
- 5.9 Consider the effect of energy sector restructuring on the use of renewable resources (and on both reducing environmental impacts and eliminating energy poverty), and what options there are to mitigate the undesirable consequences.

5.10 Review ESMAP's use of consultants and the trade-off between operational requirements and the building of local capacities.

5.11 Consider increasing the share of funding to reflect the importance of renewable energy from biomass in the energy balance of marginalised people.

5.12 Consider systematically monitoring the availability of complementary resources and skills that are external to the Bank and brokering these to meet the needs of the World Bank Group to propagate pro-poor renewable energy investments.

5.13 Consider requiring those clients with an ability to pay to make a financial contribution for ESMAP services.

# Annex 1

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## Terms of Reference

1. This memorandum sets out the terms of reference for a proposed evaluation by members of the Technical Advisory Group (TAG) of Energy Sector Management Assistance Programme (ESMAP) of ESMAP's stock of renewable energy projects undertaken since 1992.
2. Andrew Barnett, a TAG member, will lead the evaluation with the help of a research assistant, and report his findings. He will:
  - (a) Review ESMAP renewable energy projects and reports and project files;
  - (b) Interview existing and previous government officials in countries for which the projects were carried out; ESMAP task managers and other staff contributing to the renewable energy agenda in the World Bank; and the current and previous ESMAP Managers.
  - (c) Analyse, and prepare an assessment of, the development impact of the work under the ESMAP renewable energy projects, identify lessons learned and best practice (if applicable); prepare recommendations for improving the effectiveness of the on-going or future ESMAP work on renewable energy.
3. The evaluation of the impact of the renewable energy projects should assess;
  - (a) The degree to which the assistance programme has been client driven and met the clients' priority needs;
  - (b) The timeliness of delivery of technical advice;
  - (c) The contribution to sustainable policy reform in the energy sector, in particular in:
  - (d) The energy market development
  - (e) Increasing access to under served population, and
  - (f) Environmentally sustainable development.

- (g) The contribution to institutional capacity development;
  - (h) The generation of knowledge applicable / replicable to other countries and the contributing to finding 'solutions' and implementing them; and
  - (i) The dissemination of findings and results.
4. The TAG member could also examine the impact and complementarity of ESMAP activities with the UNDP and World Bank's operational work and the work of other donors in terms of:
- (a) Whether ESMAP's assistance was perceived as a key element in fostering renewable energy projects;
  - (b) Whether the ESMAP projects were followed by other projects financed by the Bank, UNDP, or other donors and investors, and
  - (c) The magnitude of ESMAP assistance relative to the Bank's and UNDP's and others', for renewable energy projects.
5. The TAG member will also report back to the manner in which projects were designed and implemented:
- (a) Quality of project design;
  - (b) Degree of reliance on consultants, ESMAP and Bank staff for the design, resources, mobilisation and implementation of the activity; and
  - (c) Extent of balance in the use of ESMAP / Bank Staff as major interlocutors especially during implementation, versus being largely supervisors of consultants delivering a 'turnkey product'.
6. Mr. Barnett will travel to Washington DC for a period of approximately one week starting November 16, 1998 to meet with ESMAP task managers and other World Bank staff, and members of ESMAP management. The ESMAP administrative team will make available the list of project and all the documentations.
7. Mr. Barnett will provide his draft report to other TAG members, and to ESMAP Management and UNDP by December 15<sup>th</sup>, 1998 and to the donor community by February 15<sup>th</sup>, 1999. The evaluation will be discussed at the 1999 Consultative Group meeting of ESMAP.

# **Annex 2**

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## **List of ESMAP Renewable Energy Projects 1993-1998**



Product ID	Region	Country	Project Name	Project Cost	Operational Manager(s)	Task Manager
1W-UE-48364	GLB	Global	Techniques for Financing Photovoltaics	30,000		Spencer
BO-UE-36724	LAC	Bolivia	Energy Strategy for Rural Sector	330,000		Floor
TN-UE-41797	AFR	Tunisia	Renewable Energy Strategy Study	327,262		Savary
F4-UE-39834	AFR	W. Africa	W. AFRICA SOLAR PROJECT	360,000		Floor/Masse
BO-UE-45287	LAC	Bolivia	Renewables for Rural Electrification	20,000	Gorrio	Terrado
1W-UE-39359	GLB	Global	Global Solar Initiative Regional Strategy I	75,000	various	Terr/Adaman
ZA-UE-41577	AFR	Southern Afr	Southern Africa RE for Rural Electrification	30,000	O'Leary	Terrado/White
LA-UE-48066	EA	Laos	Laos Decentralized Rural Electrification	198,000	Crousillant & Bishop	Floor/Barnes
UG-UE-44561	AFR	Uganda	Rural Electrification Study	170,000	Koljonen & Rasmussen	Van der Plas
1W-UE-44460	GLB	Global	Regional Project ID Strategy II	111,700	various	Terrado
BR-UE-45123	LAC	Brazil	Brazil Northeast Renewable Project ID	96,500	Luis Vaca Soto	Meyr/Terrado
KM-UE-45205	AFR	Comoros	Solar Market Development	168,120	Boucheny	Van der Plas
EG-UE-43925	EA	Egypt	Egypt -RE Strategy & Institutional Strengthening	113,029		Spencer
EG-UE-50683	EA	Egypt	Solar Thermal Power Options	50,000		Spencer
NI-UE-53228	LAC	Nicaragua	Nicaragua Modern. of Fuelwood Sector	150,000	Agostini	Masse
PE-UE-43318	LAC	Peru	Peru Rural Energy Electrification	176,677	Jorg Uwe Richter	Meyer

Product ID	Region	Country	Project Name (cont.)	Project Cost	Operational Manager(s)	Task Manager
ZM-UE-53421	AFR	Zimbabwe	Decentralized Rural Electrification	154,860	Sharma & Rasmussen	Van der Plas
CM-UE-44275	AFR	Cameroon	Decentralized Rural Electrification-spinoff, "73"	250,000	Layec	Masse
GN-UE-44276	AFR	Guinea	Guinea Decentralized Electrification	250,000	Durand	Masse
MW-UE-44764	AFR	Malawi	Malawi Rural Energy Development	320,000	Sharma & Koljonen	Hoskote
IN-UE-35324	SA	India	Rural Energy Study - Phase II (survey)	375,696	Manzo	Barnes
PH-UE-53242	EA	Philippines	Strengthening of Rural & Non-conv. Energy Development Programme	210,000	Farhandi (former)	Terrado
1W-UE-44763	GLB	Global	Global Lighting Services for the Rural Poor (PV)	120,100	various	Van der Plas
KE-UE-44166	AFR	Kenya	Kenya PV Financing Mechanisms for Elec Equip	255,000	Koljonen & Sassia	Van der Plas
SZ-UE-56574	AFR	Swaziland	Solar Development Market	175,000	Sackey	Van der Plas
BO-UE-56928	LAC	Bolivia	Bolivia National Biomass Programme - includes PV & Hydro	2,590,258		Floor
6C-UE-53523	LAC	LAC	Central America & Panama Rural Electrification	306,000	Klockner & Halpern	Barnes/Rivera
JO-UE-54017	MENA	Jordan	Jordan Renewables Assessment	45,000		Spencer
1W-UE-61189	GLB	Global	Financing of Decentralized Rural Electrification	15,000		Floor
		Brazil	Hydro and Thermal Power Sector Study	149,800		Law
7C-UE-44466	CntrlAsia	Kazak& Kyrgy	Opportunities for Renewable Energy Development	143,187		Adamantiades
		China	Assessment of Opps. for Investment in Renewables	119,000	Taylor & Cabraal	Terrado
			<b>Total</b>	<b>7,885,189</b>		

# **Annex 3**

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## **Bibliography of ESMAP Documents on Renewables**



<b>List of Source Documents – Renewables</b>						
<b>Code</b>	<b>Country</b>		<b>Date</b>	<b>ID</b>	<b>Corresponding to</b>	<b>Have Copy?</b>
		<b>ESMAP Supported</b>				
1.	Nicaragua	Evaluation of the Actual Conditions of the Commercial & Domestic Woodfuel Sector for 2 Major Cities of Nicaragua	12/98		“85”	Yes
2.	Ecuador	Private Minihidropower Development Study (English)	11/92		Not in sample	
3.	India	Windfarm Preinvestment Study (English)	12/92	150/92	Not in sample	Yes
4.	SADC	Activity Completion Report – Prospects for RE Development in Selected Countries	07/98		“76”??	Yes
5.	Uganda	Rural Electricity Study	Late 97?		“79”	Yes
6.	Egypt	Solar Thermal Power Options.- Activity Completion Report	05/98	EG-UE-50683	“84”	Yes
7.	Bolivia	Developing a Rural Electrification Project Utilizing RE – Activity Completion Report	10/98		“74”??	Yes
8.	Philippines	Commercial Potential for Power Production from Agricultural Residues (English) “study commenced 11/91”	12/93	157/93	Not in sample	Yes
9.	Kenya	PV Power to the People – the Kenya Case	01/94		Not in sample	
10.	Kenya	Development and Testing of Financing Mechanisms for Solar Electric Equipment in Rural Villages	02/96		“95”	Yes
11.	Brazil	Draft Initiating Memorandum	02/95		“105”	
13	Indonesia	Prospects for Biomass Generation with Emphasis on Palm Oil, Sugar, Rubberwood and Plywood Residues (English)	11/94	167/94	Not in sample	Yes

<b>List of Source Documents – Renewables</b>						
<b>Code</b>	<b>Country</b>		<b>Date</b>	<b>ID</b>	<b>Corresponding to</b>	<b>Have Copy?</b>
		<b>ESMAP Supported</b>				
15	Madagascar	Environmental Impact of Woodfuels (French)	10/95	176/95	Not in sample	Yes*
16	Vietnam	Household Energy Technical Assistance: Improved Coal Briquetting and Commercialized Dissemination of High Efficiency Biomass and Coal Stoves (English)	01/96	178/96	Not in sample	Yes
19.	Tunisia	Renewable Energy Strategy Study, Volume I (French)	11/96	190A/96	"72"	Yes*
20.	Tunisia	Renewable Energy Strategy Study, Volume II (French)	11/96	190B/96	"72"	Yes*
23	Brazil	Hydro and Thermal Power Sector Study	09/97	197/97	"105"	Yes
25	Kazakhstan & Kyrgyzstan	Opportunities for Renewable Energy Development	11/97	16855-KAZ	"106"	Yes
26		PV Applications in Rural Areas of the Developing World	1995		"94"?	Yes
27	Laos	Institutional Development of Off-grid Electrification	09/98		"78"	Yes
28	West Africa	Implementation Completion Report – West Africa Solar	10/98		"73"	Yes
29	Various	RE Development Potential for Selected Countries: A Regional Approach, Phase I – North Africa, Central Europe, and FSU	06/98		"75"	Yes
30	China & Vietnam	China & Vietnam Projection Evaluation by the ESMAP TAG	03/96		N/A	Yes
34	China	China Renewable Energy for Electric Power	09/96	ASTAE	"107"	Yes
		<b>OTHER SOURCES</b>				
31		RE Technologies – A Review of the Status and Costs of Selected Technologies	1994	Ahmed		Yes

<b>List of Source Documents – Renewables</b>						
<b>Code</b>	<b>Country</b>		<b>Date</b>	<b>ID</b>	<b>Corresponding to</b>	<b>Have Copy?</b>
		<b>ESMAP Supported</b>				
32		The Case for Solar Energy Investments	1995	Anderson, Ahmed		Yes
33		Best Practices for PV Household Electrification Programs – Lessons from Experiences in Selected Countries	1996	Davies, Schaeffer		Yes
35		Solar Pumping – An Introduction and update on the Technology, Performance, Costs & Economics	1993	Barlow, McNelis, Derrick		Yes
36		Financial Incentives for RE Development – Proceedings of Int'l Workshop 2/97, Amsterdam	1998	Piscitello, Bogach		Yes
37	China	A Strategy for International Assistance to Accelerate RE Development	1998	Taylor, Bogach		Yes
38		Energy Issues – Financing Decentralized RE: New Approaches	10/98	Barnes, Jechoutek, Young		Yes
39		ASTAE Status Report # 5, FY97	09/97			Yes
*Indicates that a copy was sent to Y. Sokona, 11/30/98						



# Annex 4

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## People Consulted

Interviews (either telephone or in-person)

Anil Cabraal

Willem Floor

Suresh Hurry (UNDP)

Karl Jechoutek

Paivi Koljonen

Dominique Lallement

Eric Martinot

Arun Sanghvi

Judy Siegel

Richard Spencer

Ernie Terrado

Luis Vaca Soto



Joint UNDP/World Bank  
ENERGY SECTOR MANAGEMENT ASSISTANCE PROGRAMME (ESMAP)

LIST OF REPORTS ON COMPLETED ACTIVITIES

<i>Region/Country</i>	<i>Activity/Report Title</i>	<i>Date</i>	<i>Number</i>
<b>SUB-SAHARAN AFRICA (AFR)</b>			
Africa Regional	Anglophone Africa Household Energy Workshop (English)	07/88	085/88
	Regional Power Seminar on Reducing Electric Power System Losses in Africa (English)	08/88	087/88
	Institutional Evaluation of EGL (English)	02/89	098/89
	Biomass Mapping Regional Workshops (English)	05/89	--
	Francophone Household Energy Workshop (French)	08/89	--
	Interafrican Electrical Engineering College: Proposals for Short- and Long-Term Development (English)	03/90	112/90
	Biomass Assessment and Mapping (English)	03/90	--
	Symposium on Power Sector Reform and Efficiency Improvement in Sub-Saharan Africa (English)	06/96	182/96
	Commercialization of Marginal Gas Fields (English)	12/97	201/97
Angola	Energy Assessment (English and Portuguese)	05/89	4708-ANG
	Power Rehabilitation and Technical Assistance (English)	10/91	142/91
Benin	Energy Assessment (English and French)	06/85	5222-BEN
Botswana	Energy Assessment (English)	09/84	4998-BT
	Pump Electrification Prefeasibility Study (English)	01/86	047/86
	Review of Electricity Service Connection Policy (English)	07/87	071/87
	Tuli Block Farms Electrification Study (English)	07/87	072/87
	Household Energy Issues Study (English)	02/88	--
	Urban Household Energy Strategy Study (English)	05/91	132/91
Burkina Faso	Energy Assessment (English and French)	01/86	5730-BUR
	Technical Assistance Program (English)	03/86	052/86
	Urban Household Energy Strategy Study (English and French)	06/91	134/91
Burundi	Energy Assessment (English)	06/82	3778-BU
	Petroleum Supply Management (English)	01/84	012/84
	Status Report (English and French)	02/84	011/84
	Presentation of Energy Projects for the Fourth Five-Year Plan (1983-1987) (English and French)	05/85	036/85
	Improved Charcoal Cookstove Strategy (English and French)	09/85	042/85
	Peat Utilization Project (English)	11/85	046/85
	Energy Assessment (English and French)	01/92	9215-BU
Cape Verde	Energy Assessment (English and Portuguese)	08/84	5073-CV
	Household Energy Strategy Study (English)	02/90	110/90
Central African Republic	Energy Assessment (French)	08/92	9898-CAR
Chad	Elements of Strategy for Urban Household Energy The Case of N'djamena (French)	12/93	160/94
Comoros	Energy Assessment (English and French)	01/88	7104-COM
Congo	Energy Assessment (English)	01/88	6420-COB
	Power Development Plan (English and French)	03/90	106/90
Côte d'Ivoire	Energy Assessment (English and French)	04/85	5250-IVC
	Improved Biomass Utilization (English and French)	04/87	069/87
	Power System Efficiency Study (English)	12/87	--
	Power Sector Efficiency Study (French)	02/92	140/91
	Project of Energy Efficiency in Buildings (English)	09/95	175/95
Ethiopia	Energy Assessment (English)	07/84	4741-ET

<i>Region/Country</i>	<i>Activity/Report Title</i>	<i>Date</i>	<i>Number</i>
Ethiopia	Power System Efficiency Study (English)	10/85	045/85
	Agricultural Residue Briquetting Pilot Project (English)	12/86	062/86
	Bagasse Study (English)	12/86	063/86
	Cooking Efficiency Project (English)	12/87	--
Gabon	Energy Assessment (English)	02/96	179/96
	Energy Assessment (English)	07/88	6915-GA
The Gambia	Energy Assessment (English)	11/83	4743-GM
	Solar Water Heating Retrofit Project (English)	02/85	030/85
	Solar Photovoltaic Applications (English)	03/85	032/85
Ghana	Petroleum Supply Management Assistance (English)	04/85	035/85
	Energy Assessment (English)	11/86	6234-GH
	Energy Rationalization in the Industrial Sector (English)	06/88	084/88
	Sawmill Residues Utilization Study (English)	11/88	074/87
Guinea	Industrial Energy Efficiency (English)	11/92	148/92
	Energy Assessment (English)	11/86	6137-GUI
Guinea-Bissau	Household Energy Strategy (English and French)	01/94	163/94
	Energy Assessment (English and Portuguese)	08/84	5083-GUB
Kenya	Recommended Technical Assistance Projects (English & Portuguese)	04/85	033/85
	Management Options for the Electric Power and Water Supply Subsectors (English)	02/90	100/90
	Power and Water Institutional Restructuring (French)	04/91	118/91
	Energy Assessment (English)	05/82	3800-KE
	Power System Efficiency Study (English)	03/84	014/84
Lesotho	Status Report (English)	05/84	016/84
	Coal Conversion Action Plan (English)	02/87	--
	Solar Water Heating Study (English)	02/87	066/87
	Peri-Urban Woodfuel Development (English)	10/87	076/87
	Power Master Plan (English)	11/87	--
	Power Loss Reduction Study (English)	09/96	186/96
	Energy Assessment (English)	01/84	4676-LSO
Liberia	Energy Assessment (English)	12/84	5279-LBR
	Recommended Technical Assistance Projects (English)	06/85	038/85
	Power System Efficiency Study (English)	12/87	081/87
Madagascar	Energy Assessment (English)	01/87	5700-MAG
	Power System Efficiency Study (English and French)	12/87	075/87
	Environmental Impact of Woodfuels (French)	10/95	176/95
Malawi	Energy Assessment (English)	08/82	3903-MAL
	Technical Assistance to Improve the Efficiency of Fuelwood Use in the Tobacco Industry (English)	11/83	009/83
	Status Report (English)	01/84	013/84
Mali	Energy Assessment (English and French)	11/91	8423-MLI
	Household Energy Strategy (English and French)	03/92	147/92
Islamic Republic of Mauritania	Energy Assessment (English and French)	04/85	5224-MAU
	Household Energy Strategy Study (English and French)	07/90	123/90
Mauritius	Energy Assessment (English)	12/81	3510-MAS
	Status Report (English)	10/83	008/83
	Power System Efficiency Audit (English)	05/87	070/87
Mauritius	Bagasse Power Potential (English)	10/87	077/87
	Energy Sector Review (English)	12/94	3643-MAS
Mozambique	Energy Assessment (English)	01/87	6128-MOZ

<i>Region/Country</i>	<i>Activity/Report Title</i>	<i>Date</i>	<i>Number</i>
Mozambique	Household Electricity Utilization Study (English)	03/90	113/90
	Electricity Tariffs Study (English)	06/96	181/96
	Sample Survey of Low Voltage Electricity Customers	06/97	195/97
Namibia	Energy Assessment (English)	03/93	11320-NAM
Niger	Energy Assessment (French)	05/84	4642-NIR
	Status Report (English and French)	02/86	051/86
	Improved Stoves Project (English and French)	12/87	080/87
Nigeria	Household Energy Conservation and Substitution (English and French)	01/88	082/88
	Energy Assessment (English)	08/83	4440-UNI
	Energy Assessment (English)	07/93	11672-UNI
Rwanda	Energy Assessment (English)	06/82	3779-RW
	Status Report (English and French)	05/84	017/84
	Improved Charcoal Cookstove Strategy (English and French)	08/86	059/86
	Improved Charcoal Production Techniques (English and French)	02/87	065/87
	Energy Assessment (English and French)	07/91	8017-RW
	Commercialization of Improved Charcoal Stoves and Carbonization Techniques Mid-Term Progress Report (English and French)	12/91	141/91
SADC	SADC Regional Power Interconnection Study, Vols. I-IV (English)	12/93	--
SADCC	SADCC Regional Sector: Regional Capacity-Building Program for Energy Surveys and Policy Analysis (English)	11/91	--
Sao Tome and Principe	Energy Assessment (English)	10/85	5803-STP
Senegal	Energy Assessment (English)	07/83	4182-SE
	Status Report (English and French)	10/84	025/84
	Industrial Energy Conservation Study (English)	05/85	037/85
	Preparatory Assistance for Donor Meeting (English and French)	04/86	056/86
	Urban Household Energy Strategy (English)	02/89	096/89
	Industrial Energy Conservation Program (English)	05/94	165/94
	Seychelles	Energy Assessment (English)	01/84
	Electric Power System Efficiency Study (English)	08/84	021/84
Sierra Leone	Energy Assessment (English)	10/87	6597-SL
Somalia	Energy Assessment (English)	12/85	5796-SO
South Africa Republic of	Options for the Structure and Regulation of Natural Gas Industry (English)	05/95	172/95
	Management Assistance to the Ministry of Energy and Mining	05/83	003/83
	Energy Assessment (English)	07/83	4511-SU
Sudan	Power System Efficiency Study (English)	06/84	018/84
	Status Report (English)	11/84	026/84
	Wood Energy/Forestry Feasibility (English)	07/87	073/87
	Energy Assessment (English)	02/87	6262-SW
Swaziland	Household Energy Strategy Study	10/97	198/97
Tanzania	Energy Assessment (English)	11/84	4969-TA
	Peri-Urban Woodfuels Feasibility Study (English)	08/88	086/88
	Tobacco Curing Efficiency Study (English)	05/89	102/89
	Remote Sensing and Mapping of Woodlands (English)	06/90	--
	Industrial Energy Efficiency Technical Assistance (English)	08/90	122/90
Tanzania	Power Loss Reduction Volume 1: Transmission and Distribution System Technical Loss Reduction and Network Development (English)	06/98	204A/98
	Power Loss Reduction Volume 2: Reduction of Non-Technical Losses (English)	06/98	204B/98

<i>Region/Country</i>	<i>Activity/Report Title</i>	<i>Date</i>	<i>Number</i>
Togo	Energy Assessment (English)	06/85	5221-TO
	Wood Recovery in the Nangbeto Lake (English and French)	04/86	055/86
	Power Efficiency Improvement (English and French)	12/87	078/87
Uganda	Energy Assessment (English)	07/83	4453-UG
	Status Report (English)	08/84	020/84
	Institutional Review of the Energy Sector (English)	01/85	029/85
	Energy Efficiency in Tobacco Curing Industry (English)	02/86	049/86
	Fuelwood/Forestry Feasibility Study (English)	03/86	053/86
	Power System Efficiency Study (English)	12/88	092/88
	Energy Efficiency Improvement in the Brick and Tile Industry (English)	02/89	097/89
	Tobacco Curing Pilot Project (English)	03/89	UNDP Terminal Report
	Energy Assessment (English)	12/96	193/96
	Rural Electrification Strategy Study	09/99	221/99
Zaire	Energy Assessment (English)	05/86	5837-ZR
Zambia	Energy Assessment (English)	01/83	4110-ZA
	Status Report (English)	08/85	039/85
	Energy Sector Institutional Review (English)	11/86	060/86
	Power Subsector Efficiency Study (English)	02/89	093/88
	Energy Strategy Study (English)	02/89	094/88
	Urban Household Energy Strategy Study (English)	08/90	121/90
Zimbabwe	Energy Assessment (English)	06/82	3765-ZIM
	Power System Efficiency Study (English)	06/83	005/83
	Status Report (English)	08/84	019/84
	Power Sector Management Assistance Project (English)	04/85	034/85
	Power Sector Management Institution Building (English)	09/89	--
	Petroleum Management Assistance (English)	12/89	109/89
	Charcoal Utilization Prefeasibility Study (English)	06/90	119/90
	Integrated Energy Strategy Evaluation (English)	01/92	8768-ZIM
	Energy Efficiency Technical Assistance Project: Strategic Framework for a National Energy Efficiency Improvement Program (English)	04/94	--
	Capacity Building for the National Energy Efficiency Improvement Programme (NEEIP) (English)	12/94	--
<b>EAST ASIA AND PACIFIC (EAP)</b>			
Asia Regional	Pacific Household and Rural Energy Seminar (English)	11/90	--
China	County-Level Rural Energy Assessments (English)	05/89	101/89
	Fuelwood Forestry Preinvestment Study (English)	12/89	105/89
	Strategic Options for Power Sector Reform in China (English)	07/93	156/93
	Energy Efficiency and Pollution Control in Township and Village Enterprises (TVE) Industry (English)	11/94	168/94
	Energy for Rural Development in China: An Assessment Based on a Joint Chinese/ESMAP Study in Six Counties (English)	06/96	183/96
	Improving the Technical Efficiency of Decentralized Power Companies	09/99	222/999
Fiji	Energy Assessment (English)	06/83	4462-FIJ
Indonesia	Energy Assessment (English)	11/81	3543-IND
	Status Report (English)	09/84	022/84

<i>Region/Country</i>	<i>Activity/Report Title</i>	<i>Date</i>	<i>Number</i>
Indonesia	Power Generation Efficiency Study (English)	02/86	050/86
	Energy Efficiency in the Brick, Tile and Lime Industries (English)	04/87	067/87
	Diesel Generating Plant Efficiency Study (English)	12/88	095/88
	Urban Household Energy Strategy Study (English)	02/90	107/90
	Biomass Gasifier Preinvestment Study Vols. I & II (English)	12/90	124/90
	Prospects for Biomass Power Generation with Emphasis on Palm Oil, Sugar, Rubberwood and Plywood Residues (English)	11/94	167/94
Lao PDR	Urban Electricity Demand Assessment Study (English)	03/93	154/93
	Institutional Development for Off-Grid Electrification	06/99	215/99
Malaysia	Sabah Power System Efficiency Study (English)	03/87	068/87
	Gas Utilization Study (English)	09/91	9645-MA
Myanmar	Energy Assessment (English)	06/85	5416-BA
Papua New Guinea	Energy Assessment (English)	06/82	3882-PNG
	Status Report (English)	07/83	006/83
	Energy Strategy Paper (English)	--	--
	Institutional Review in the Energy Sector (English)	10/84	023/84
	Power Tariff Study (English)	10/84	024/84
Philippines	Commercial Potential for Power Production from Agricultural Residues (English)	12/93	157/93
	Energy Conservation Study (English)	08/94	--
Solomon Islands	Energy Assessment (English)	06/83	4404-SOL
	Energy Assessment (English)	01/92	979-SOL
South Pacific	Petroleum Transport in the South Pacific (English)	05/86	--
Thailand	Energy Assessment (English)	09/85	5793-TH
	Rural Energy Issues and Options (English)	09/85	044/85
	Accelerated Dissemination of Improved Stoves and Charcoal Kilns (English)	09/87	079/87
	Northeast Region Village Forestry and Woodfuels Preinvestment Study (English)	02/88	083/88
	Impact of Lower Oil Prices (English)	08/88	--
	Coal Development and Utilization Study (English)	10/89	--
	Energy Assessment (English)	06/85	5498-TON
Tonga	Energy Assessment (English)	06/85	5577-VA
Vanuatu	Energy Assessment (English)	06/85	5577-VA
Vietnam	Rural and Household Energy-Issues and Options (English)	01/94	161/94
	Power Sector Reform and Restructuring in Vietnam: Final Report to the Steering Committee (English and Vietnamese)	09/95	174/95
	Household Energy Technical Assistance: Improved Coal Briquetting and Commercialized Dissemination of Higher Efficiency Biomass and Coal Stoves (English)	01/96	178/96
	Energy Assessment (English)	06/85	5497-WSO
Western Samoa	Energy Assessment (English)	06/85	5497-WSO
<b>SOUTH ASIA (SAS)</b>			
Bangladesh	Energy Assessment (English)	10/82	3873-BD
	Priority Investment Program (English)	05/83	002/83
	Status Report (English)	04/84	015/84
	Power System Efficiency Study (English)	02/85	031/85
	Small Scale Uses of Gas Prefeasibility Study (English)	12/88	--

<i>Region/Country</i>	<i>Activity/Report Title</i>	<i>Date</i>	<i>Number</i>
India	Opportunities for Commercialization of Nonconventional Energy Systems (English)	11/88	091/88
	Maharashtra Bagasse Energy Efficiency Project (English)	07/90	120/90
	Mini-Hydro Development on Irrigation Dams and Canal Drops Vols. I, II and III (English)	07/91	139/91
	WindFarm Pre-Investment Study (English)	12/92	150/92
	Power Sector Reform Seminar (English)	04/94	166/94
	Environmental Issues in the Power Sector (English)	06/98	205/98
	Environmental Issues in the Power Sector: Manual for Environmental Decision Making (English)	06/99	213/99
	Household Energy Strategies for Urban India: The Case of Hyderabad	06/99	214/99
	Nepal	Energy Assessment (English)	08/83
Status Report (English)		01/85	028/84
Energy Efficiency & Fuel Substitution in Industries (English)		06/93	158/93
Pakistan	Household Energy Assessment (English)	05/88	--
	Assessment of Photovoltaic Programs, Applications, and Markets (English)	10/89	103/89
	National Household Energy Survey and Strategy Formulation Study: Project Terminal Report (English)	03/94	--
	Managing the Energy Transition (English)	10/94	--
	Lighting Efficiency Improvement Program Phase 1: Commercial Buildings Five Year Plan (English)	10/94	--
Sri Lanka	Energy Assessment (English)	05/82	3792-CE
	Power System Loss Reduction Study (English)	07/83	007/83
	Status Report (English)	01/84	010/84
	Industrial Energy Conservation Study (English)	03/86	054/86
<b>EUROPE AND CENTRAL ASIA (ECA)</b>			
Bulgaria	Natural Gas Policies and Issues (English)	10/96	188/96
Central and Eastern Europe	Power Sector Reform in Selected Countries	07/97	196/97
Eastern Europe	The Future of Natural Gas in Eastern Europe (English)	08/92	149/92
Kazakhstan	Natural Gas Investment Study, Volumes 1, 2 & 3	12/97	199/97
Kazakhstan & Kyrgyzstan	Opportunities for Renewable Energy Development	11/97	16855-KAZ
Poland	Energy Sector Restructuring Program Vols. I-V (English)	01/93	153/93
	Natural Gas Upstream Policy (English and Polish)	08/98	206/98
	Energy Sector Restructuring Program: Establishing the Energy Regulation Authority	10/98	208/98
Portugal	Energy Assessment (English)	04/84	4824-PO
Romania	Natural Gas Development Strategy (English)	12/96	192/96
Slovenia	Workshop on Private Participation in the Power Sector (English)	02/99	211/99
Turkey	Energy Assessment (English)	03/83	3877-TU
<b>MIDDLE EAST AND NORTH AFRICA (MNA)</b>			
Arab Republic of Egypt	Energy Assessment (English)	10/96	189/96

<i>Region/Country</i>	<i>Activity/Report Title</i>	<i>Date</i>	<i>Number</i>
Arab Republic of Egypt	Energy Assessment (English and French)	03/84	4157-MOR
	Status Report (English and French)	01/86	048/86
Morocco	Energy Sector Institutional Development Study (English and French)	07/95	173/95
	Natural Gas Pricing Study (French)	10/98	209/98
	Gas Development Plan Phase II (French)	02/99	210/99
Syria	Energy Assessment (English)	05/86	5822-SYR
	Electric Power Efficiency Study (English)	09/88	089/88
	Energy Efficiency Improvement in the Cement Sector (English)	04/89	099/89
Syria	Energy Efficiency Improvement in the Fertilizer Sector (English)	06/90	115/90
Tunisia	Fuel Substitution (English and French)	03/90	--
	Power Efficiency Study (English and French)	02/92	136/91
	Energy Management Strategy in the Residential and Tertiary Sectors (English)	04/92	146/92
	Renewable Energy Strategy Study, Volume I (French)	11/96	190A/96
	Renewable Energy Strategy Study, Volume II (French)	11/96	190B/96
Yemen	Energy Assessment (English)	12/84	4892-YAR
	Energy Investment Priorities (English)	02/87	6376-YAR
	Household Energy Strategy Study Phase I (English)	03/91	126/91
<b>LATIN AMERICA AND THE CARIBBEAN (LAC)</b>			
LAC Regional	Regional Seminar on Electric Power System Loss Reduction in the Caribbean (English)	07/89	--
	Elimination of Lead in Gasoline in Latin America and the Caribbean (English and Spanish)	04/97	194/97
	Elimination of Lead in Gasoline in Latin America and the Caribbean - Status Report (English and Spanish)	12/97	200/97
	Harmonization of Fuels Specifications in Latin America and the Caribbean (English and Spanish)	06/98	203/98
Bolivia	Energy Assessment (English)	04/83	4213-BO
	National Energy Plan (English)	12/87	--
	La Paz Private Power Technical Assistance (English)	11/90	111/90
	Prefeasibility Evaluation Rural Electrification and Demand Assessment (English and Spanish)	04/91	129/91
	National Energy Plan (Spanish)	08/91	131/91
	Private Power Generation and Transmission (English)	01/92	137/91
	Natural Gas Distribution: Economics and Regulation (English)	03/92	125/92
	Natural Gas Sector Policies and Issues (English and Spanish)	12/93	164/93
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	Preparation of Capitalization of the Hydrocarbon Sector	12/96	191/96
Brazil	Energy Efficiency & Conservation: Strategic Partnership for Energy Efficiency in Brazil (English)	01/95	170/95
	Hydro and Thermal Power Sector Study	09/97	197/97
Chile	Energy Sector Review (English)	08/88	7129-CH
Colombia	Energy Strategy Paper (English)	12/86	--
	Power Sector Restructuring (English)	11/94	169/94
	Energy Efficiency Report for the Commercial and Public Sector (English)	06/96	184/96
Costa Rica	Energy Assessment (English and Spanish)	01/84	4655-CR
	Recommended Technical Assistance Projects (English)	11/84	027/84

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Dominican Republic	Energy Assessment (English)	05/91	8234-DO
Ecuador	Energy Assessment (Spanish)	12/85	5865-EC
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	Energy Strategy (English)	04/91	--
	Private Minihydropower Development Study (English)	11/92	--
	Energy Pricing Subsidies and Interfuel Substitution (English)	08/94	11798-EC
	Energy Pricing, Poverty and Social Mitigation (English)	08/94	12831-EC
Guatemala	Issues and Options in the Energy Sector (English)	09/93	12160-GU
Haiti	Energy Assessment (English and French)	06/82	3672-HA
	Status Report (English and French)	08/85	041/85
	Household Energy Strategy (English and French)	12/91	143/91
Honduras	Energy Assessment (English)	08/87	6476-HO
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	Petroleum Procurement, Refining, and Distribution Study (English)	11/86	061/86
	Energy Efficiency Building Code Phase I (English)	03/88	--
	Energy Efficiency Standards and Labels Phase I (English)	03/88	--
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	Charcoal Production Project (English)	09/88	090/88
	FIDCO Sawmill Residues Utilization Study (English)	09/88	088/88
	Energy Sector Strategy and Investment Planning Study (English)	07/92	135/92
Mexico	Improved Charcoal Production Within Forest Management for the State of Veracruz (English and Spanish)	08/91	138/91
	Energy Efficiency Management Technical Assistance to the Comision Nacional para el Ahorro de Energia (CONAE) (English)	04/96	180/96
Panama	Power System Efficiency Study (English)	06/83	004/83
Paraguay	Energy Assessment (English)	10/84	5145-PA
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	Status Report (English and Spanish)	09/85	043/85
Peru	Energy Assessment (English)	01/84	4677-PE
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	Proposal for a Stove Dissemination Program in the Sierra (English and Spanish)	02/87	064/87
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	Reform and Privatization in the Hydrocarbon Sector (English and Spanish)	07/99	216/99
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St. Vincent and the Grenadines	Energy Assessment (English)	09/84	5103-STV
Sub Andean	Environmental and Social Regulation of Oil and Gas Operations in Sensitive Areas of the Sub-Andean Basin (English and Spanish)	07/99	217/99
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	The International Network: Policies and Experience (English)	04/90	--
	Guidelines for Utility Customer Management and Metering (English and Spanish)	07/91	--
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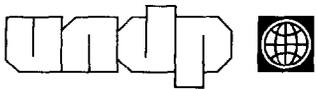
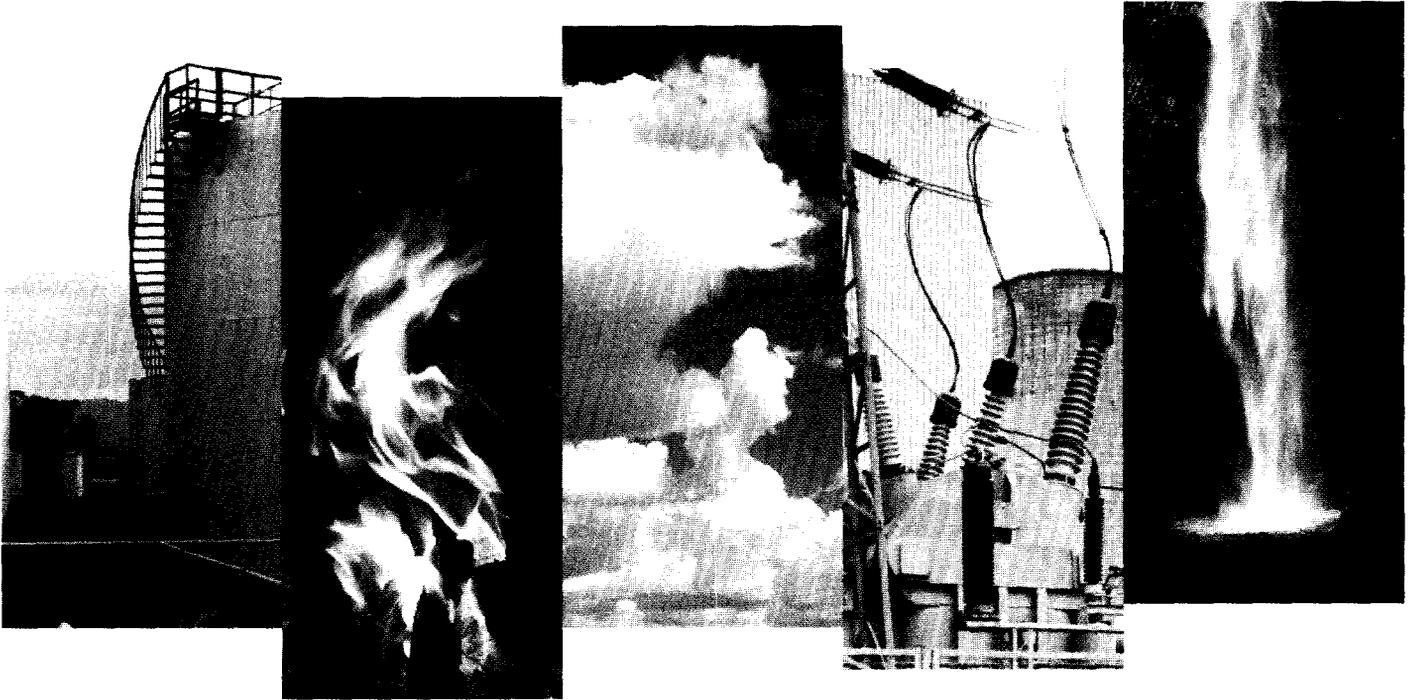
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