EVALUATION OF THE ENERGY SUBPROGRAMME

OF THE UNITED NATIONS ENVIRONMENT PROGRAMME

(UNEP)

UNITED NATIONS ENVIRONMENT PROGRAMME

Project Design and Evaluation Unit (PDEU)
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ACRONYMS AND ABBREVIATIONS

AfDB	African Development Bank
AfDF	African Development Fund
AEP	African Energy Programme
AMCEN	African Ministerial Conference on the Environment
ARCT	African Regional Centre for Technology
DANIDA	Danish International Development Agency
EDB	Environmental Database
ELI/PAC	Environmental Law and Institutions Programme Activity Centre
GHG	Greenhouse Gas
IE/PAC	Industry and Environment Programme Activity Centre
IEA	International Energy Agency
LEAP	Long-Range Energy Alternatives Planning
OCA/PAC	Ocean and Coastal Areas Programme Activity Centre
OECD	Organization for Economic Cooperation and Development
RET	Renewable Energy Technology
RISO	RISO National Laboratory (Denmark)
UCCEE	RISO/UNEP Collaborating Centre on Energy and Environment
UNDP	United Nations Development Programme
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Programme

Executive Summary

An in-depth review of the legislative authority for the energy subprogramme and of the rationale upon which the subprogramme was created has been undertaken using literature made available and information from relevant staff, so as to lay a foundation for determining the effectiveness of the subprogramme in relation to the mandate and objectives of UNEP.

The legislative authority together with excerpts from Agenda 21 which deal with energy-related issues are judged to be quite relevant to and give proper guidance for effective fulfillment of UNEP's mandate and objectives, which basically stress:

- Integrating the management of the environmental impacts of the production, transportation, conversion and use of energy into the policy-making and planning of Governments;

- Strengthening national policies, institutions and capabilities for environmentally sound development in the energy sector, particularly in developing countries and countries with economies in transition.

A survey of past activities and outputs has been made in order to assess the effectiveness of the subprogramme in promoting the sustainable development practice and strategies of targeted countries. The activities seem to have been many and executed in an ad hoc manner over a long period from the inception of the subprogramme.

These activities centered on, inter alia:

- The preparation of documentation and setting up of non-polluting energy demonstration centres in developing countries;

- An attempt at increasing global green acreage;

- The adaptation and dissemination of certain renewable energy technologies (RETs) in developing countries.

The early activities were not very encouraging as most if not all of them became moribund. They contributed little towards promoting the sustainable development practices and strategies of the countries in which they were undertaken.

A survey of other UNEP subprogrammes has revealed that quite a number of them overlap the programme of work of the Energy Unit. These subprogrammes include:

- Desertification Control Programme Activity Centre (DC/PAC);

- Environment and Economics Unit;

- Biodiversity Unit;

- Infoterra Programme Activity Centre;

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- Atmosphere Unit;
- Industry and Environment Programme Activity Centre;
- Environmental Law and Institutions Programme Activity Centre;
- Oceans and Coastal Areas Programme Activity Centre;
- Forestry and other Ecosystems Sub-unit.

All these subprogrammes deal with some element of energy and its effects on the environment, and there appears to be no in-house coordination/integration of these energy-environment activities with those of the energy subprogramme. It is suggested that these activities and those of the Energy Unit need to be integrated for optimal use of available resources.

From the above review/survey of past, ongoing and other UNEP energy-related subprogrammes, an assessment of the effectiveness and impact of the activities of the energy subprogramme has been made in relation to its mandate and objectives since inception. The initial projects have been found to be rather chequered, especially during the greater part of the first two decades of the subprogramme's existence. For example, arising from various UNEP Governing Council resolutions:

- The results of "A system study of energy and climate, phase I" and "Comparison of energy options - a methodology study" projects turned out not to tally with the expected realities at the material time;
- There is no evidence of a single success story worth mentioning in the realm of technology transfer, especially to developing countries, since projects for adaptation of such technologies never quite took off.

While activities of the subprogramme since its inception have rightly focused on issues of environmental impacts of various energy sources, and particularly on promotion and use of renewable energy sources in developing countries, it would appear that the subprogramme projects, especially during the better part of the first two decades, produced little impact, if any, because of the perhaps inadvertent omission of certain socio-economic tools such as pricing, taxation/levies and sociological mechanisms for ensuring their acceptance and effectiveness. Nonetheless, during the latter part of the subprogramme (five years or so), its activities received a face-lift with the creation of the UNEP Collaborating Centre on Energy and Environment (UCCEE) at the National Laboratory (Denmark) which has, since its inception in 1990, more or less acted as the de facto energy programme office for UNEP. With the advent of UCCEE, two very good projects were initiated in China and India, the results of which should go a long way towards playing a significant role in enhancing the capacity of various Governments, especially in developing countries and countries with economies in transition, to cope with energy-environment issues.

In the last five years or so, there has been a positive and encouraging trend in the conceptualization and execution of UNEP's energy projects. The

creation of the RISO/UNEP Centre in Denmark as well as the projects in China and India are cases in point. Since its inception in 1990, UCCEE, in collaboration with UNEP, has produced technical reports, databases, methods and models on energy, and helped in the training of energy planners, especially for the developing countries. UNEP-funded projects carried out at UCCEE have thus been appropriate, especially to developing countries, because of the lack of local institutions with adequate tools to enable such countries to formulate and include environmental concerns in their energy policy and planning. The Centre has thus played a positive role in contributing towards building the capacity of Governments, especially those of developing countries, to cope effectively with the environmental impacts of energy.

The two projects in China and India are also likely to assist Governments of the Third World countries, countries with economies in transition and even some of the industrialized countries in capacity/capability-building, as well as in promoting sustainable development practices and strategies for coping with environmental impacts of energy, which are essentially the overall prime objectives of the subprogramme.

Some strategies and modalities which have been employed by the subprogramme with significant effectiveness and productivity in its activities and which are judged suitable for replication are given. These include:

- The development of technologies and socio-economic tools which can enable various countries to formulate and include environmentally sound energy policies in their development plans;

- The proper identification of partners/consultants and institutions for implementation of projects as in the case of those carried out in China and India;

- The creation of centres of excellence such as UCCEE or its satellites for, inter alia, capacity/capability-building;

- The publication and dissemination of environmental impacts of various sources of energy (revival of the 1978-1980 "UNEP Energy Research Series").

Recognizing that:

There is no particular United Nations institution charged specifically with energy policy and bearing in mind that there is no formal mechanism for coordination of energy issues pursued by the various United Nations agencies;

There are many in-house energy-related activities;

There are many other energy activities carried out by government agencies, NGOs and other international agencies;

There is growing concern regarding the impact of energy on the environment and a need to develop environmentally sound energy systems

for sustainable development, especially in developing countries, it has been suggested that UNEP is the United Nations agency which could and should, best undertake a leading role in the overall coordination of environmentally sound exploitation and use of energy sources. But with the present organizational structure of its energy subprogramme, which is currently manned by only one Professional and a secretary, coupled with the use of UCCEE as its de facto programme office, the challenge alluded to above is wishful thinking.

Therefore, it is suggested that the UNEP Energy Unit's staffing should be revamped and the Unit be upgraded to a full Branch or Division, headed by a competent senior officer having impeccable administrative skills and academic qualifications in science/technology, with proven knowledge in all aspect of energy/environment issues. The key words here are **competence and proven knowledge in environmental issues** which must be observed at all times in the recruitment exercise of all staff of the Unit/Branch/Division; otherwise, UNEP and any other similar agencies will continue to waste valuable financial resources on projects which will never have significant impact on the exploitation and use of environmentally sound energy.

The evaluation exercise has pointed out a number of problems/successes and issues which have affected or will continue to affect the delivery of the subprogramme's activities and suggestions are given for possible improvement of the functioning and productivity of the subprogramme. The problems include:

- Apparent lack of a basis for policy actions to reduce/eliminate adverse impacts of energy systems on the environment, especially in the developing countries, perhaps due to the ad hoc nature of earlier activities of the subprogramme;

- Inability to incorporate socio-economic factors and tools into the design and implementation of earlier projects, thereby contributing to either their non-acceptance or their becoming moribund, or both;

- Apparent lack of follow-up evaluation carried out by a competent team of experts to ascertain success/failure after completion of the projects;

- Inability to make an impact on countering transboundary problems which arise from the production, transportation, conversion, storage and use of conventional energy sources, such as fossil fuels and nuclear energy.

The above notwithstanding, the subprogramme has put a lot of effort into the documentation and publication of a good deal of material on environmentally benign energy, such as the UNEP Energy Research Series published between 1978-80. Some attempts have also been made by the subprogramme to sensitize various Governments to the need to include:

- Energy-environment issues in their policy and planning;

- An attempt at increasing global green acreage, especially in developing countries.

Suggestions to improve the functioning and productivity of the subprogramme for achieving a higher degree of success have been made. These include:

- Identifying and putting in place various socio-economic and technological tools necessary for the success of the Unit's projects;

- Integration of the subprogramme's activities with other relevant UNEP subprogrammes while forging strategic alliances with other agencies with similar objectives for the optimal use of available resources;

- Instituting follow-up evaluation of projects by a team of experts to ascertain the projects' success/failure.

A good number of recommendations (see text below) for the future improvement of the subprogramme have been made, stressing the need to include human settlements and lifestyle patterns in the subprogramme's future activities.

A number of lessons have been learned through evaluation of the subprogramme activities and outputs. These include:

- Failure of the subprogramme to achieve its desired goals, especially during the better part of the first two decades, owing to the ad hoc nature of their formulation and execution;

- The dividends the subprogramme has reaped and is likely to reap through the creation of UCCEE and any other similar centres in developing countries and through projects such as the ones being executed in China and India;

- Too much reliance on UCCEE at RISO, which is undoubtedly expensive and is likely to deprive the UNEP Energy Unit at Nairobi headquarters of the chance of developing its capacity to play its rightful role as the de facto energy programme office of UNEP, thereby leaving UCCEE and any other similar future centres mainly for the purposes of implementation.

1. INTRODUCTION

The 1972 United Nations Conference on the Human Environment in Stockholm addressed various environmental issues and made recommendations for concrete action. Among the issues were those pertaining to energy in its various forms, because of serious environmental problems caused by its production, transportation, conversion and use. Certain recommendations on energy arising from the Stockholm Conference spelt out:

- The need to establish a sound energy database on the environmental effects of energy production and use, within appropriate monitoring systems;

- The need to pay special attention to the provision of a mechanism for the exchange of information on energy;

- The need to take steps to ensure that a comprehensive study would be promptly undertaken, in collaboration with appropriate international agencies, on available energy sources, new technology and consumption trends, in order to assist in the provision of a basis for the most effective development of the world's energy resources, paying particular attention to the consequent environmental implications.

In addressing the foregoing issues, the design and operation of the energy database were to stress the monitoring of levels of atmospheric pollutants and their sources, and the determination of the effect of these pollutants on, inter alia, weather, human health, and plant and animal life. Special attention was to be paid to the rationalization of energy production and the integration of resource management for its use. The information accruing from the database was subsequently to be disseminated as widely as possible for remedial measures to be taken and continually updated.

The concern of UNEP vis-a-vis energy was, indeed, the effect on the environment of its production, transportation, conversion and use, and how these effects could be limited to manageable levels. This concern inevitably called for UNEP to put in place legislative authority and was the rationale for the creation of an Energy Unit to cater for concerns regarding energy and environment.

2. ENERGY UNIT - ITS EVOLUTION AND INTENDED FUNCTIONS[1]

The initial strategy of UNEP's energy subprogramme was essentially built on the premise of establishing a good database on energy production, transportation, conversion and use, and on how these relate to the environment. Thus, arising from the 1972 Stockholm Conference, specifically from its Recommendations 57, 58 and 59, UNEP created the Energy Unit, whose operations evolved from various UNEP Governing Council resolutions as follows:

- Decision 1(I), Section III, subsection 12, paragraph (g), of 22 June 1973, gave legislative authority for the commencement of the unit to carry out research on non-conventional and non-polluting sources of energy for developing countries;

- Decision 8A(II), Section I, subsection 6, of 22 March 1974, recommended the need for UNEP's programme to concentrate on the environmental consequences of alternative patterns of energy generation and use in collaboration with other relevant United Nations agencies;

- Decision 34 III, paragraph 1, of 2 May 1975, called for special focus on renewable energy resources, their harness and demonstration to rural communities in the developing countries;

- Decision 60(IV), paragraph 2, of 13 April 1976, and decision 7/9, paragraph 1 of 3 May 1979, emphasized the need for project and actions on the use of renewable sources of energy.

- The fifth session of the Governing Council, in 1977, highlighted the principle of concentration and balance, while emphasizing the need for the efforts and resources of UNEP to be concentrated on a relatively small number of selected areas, including energy;

- Decision 7/9, of 3 May 1979, stressed the need to promote more activities in the area of environmental consequences associated with the use of various conventional energy sources.

- Decision 9/7, of 25 May 1981, and Decision GC 11/7, of 24 May 1983, recommended the need to support control of deforestation and desertification.

Further to the above resolutions, the United Nations System-Wide Medium-term Environment Programme (1990-1995)[2], paragraph 285, highlighted the need to develop sustainable energy systems while mitigating existing adverse effects, in a manner consistent with other economic and social objectives. During the course of this programme, Agenda 21 of the 1992 United Nations Conference on Environment and Development (UNCED) addressed the entire scope of energy-related issues[3] which are very pertinent to the Energy Unit's activities.

3. PAST ACTIVITIES AND OUTPUTS

The legislation cited above gave rise to various activities and outputs of the energy subprogramme, some of which are as follows:

- The first session of the Governing Council gave rise to the preparation of a document on solar, biogas, wind and geothermal sources of energy, the contents of which were transformed into a project on non-polluting energy demonstration systems in certain developing countries. The legislation also resulted in the Unit's contribution in 1976 to a project document on different sources of nuclear energy;

- Two projects: "A system study of energy and climate, phase I" and "The comparison of energy options - a methodological study" emerged from the second session of the Governing Council, between 1976 and

1979;

- The Unit established energy centres in rural areas of certain developing countries, based on legislation of the third, ninth and eleventh sessions of the Governing Council. Specifically, fast-growing trees for fuelwood, increasing the efficiency of fuelwood burning as well as developing and disseminating replacement methods and technologies for fuelwood by other renewable energy sources were launched by the Unit in Bolivia, Brazil and Kenya. Furthermore, a study tour to China was organized for a number of international experts and UNEP staff to get acquainted with small-scale hydropower schemes and biogas plants;

- Legislation from the fourth and seventh sessions of the Governing Council gave rise to the establishment of an energy demonstration centre in Sri Lanka, technical assistance to Mexico for the same and feasibility studies for harnessing renewable energy in the Philippines and the Arab region;

- From legislation in the seventh and ninth sessions of the Governing Council, the Unit initiated projects in 1979 on the environmental implications of energy from coal and other commercial sources. Reports on these projects were compiled and circulated and workshops on the subject organized for experts from developing countries.

- Following the eleventh session of the Governing Council, a project was initiated on co-generation of electricity and heat. This project was intended to provide guidelines/information on the construction and use of co-generation plants in developing countries. The outputs from the project included technical reports and a book, which have been circulated.

In addition to the above activities and outputs and in furtherance of the measures being taken by the Unit to promote the adoption of sustainable resource utilization in developing countries, a case study on energy and rural fuelwood development and promotion was carried out in Kenya, through the cultivation and distribution of tree seedlings and the reduction of fuelwood demand through the distribution of improved cooking stoves. The Unit also examined the impact of energy on pollution and health, the results of which have been published and circulated. Furthermore, between 1978 and 1980, the subprogramme used to produce, on a regular basis, a publication entitled "UNEP Energy Research Series". This useful publication apparently ceased on the departure of the specialist (Mr. El-Hinawi) who had initiated it.

In 1987, the Unit launched a project on environmentally sound management of low-grade fuels. The project focused on enhancing the capacity of certain developing countries to incorporate the consideration and management of environmental impacts of the production and use of low-grade fuel energy resources into their planning and development programmes. This project resulted in a publication for capacity-building in this area for developing countries.

Although most if not all of the above projects seem to have been executed on an ad hoc basis, some of them could and should have been conceived as pilot projects and replicated in some developing countries and would have paid handsome dividends if due cognizance of the pertinent human settlement patterns and socio-economic considerations had been taken into account. These projects include:

- An increase of global green acreage;
- The co-generation of electricity;
- The adaptation and dissemination in developing countries of certain renewable energy technologies (RETs) such as the Chinese type of biogas plant, where the UNEP/Energy Unit could have avoided the pitfalls encountered by the African Regional Centre for Technology/United Nations Economic Commission for Africa (ARCT/ECA) in the African region[3] over a long period of time.

4. ONGOING/RECENT PROJECTS

In furtherance of its mandate, the unit has launched some projects in the recent past, as set out below:

4.1 Energy Database (EDB)

This project, launched in 1988, was for the development of a computerized energy-environment planning system. The aim of the project was to build an organized international database on various energy systems emissions and their impacts on the environment, so that stakeholders could integrate these considerations into their planning strategies. There is no indication as to when this phase ended, nor was any document made available for an assessment of its impact to date. The consultant, however, has assumed that the first phase of this project ended in 1992, since the second phase of the project with the title "Computerized tool for environmental assessment of energy systems: life-cycle analysis and biomass energy" began in July 1993. The specific objectives of the project are:

- To encourage the incorporation of environmental aspects in energy planning and policy worldwide, particularly in developing countries, through the use of a computerized planning tool;

The short-term objectives of the project are:

- To establish capabilities within the Long-range Energy Alternatives Planning/Environmental Data Base (LEAP/EDB) programme package for carrying out life-cycle (fuel-chain) analysis of alternative energy options;
- The enhancement of the capabilities within LEAP/EDB for analysing the environmental effects of utilizing biomass energy, including land-use requirements and impacts, air pollution and human health effects;
- The establishment of comprehensive and representative data within LEAP

and EDB on utilizing biomass energy including land-use requirements and impacts, air pollution and human health effects;

- The establishment of expertise and experience in the extended use of the LEAP/EDB tool in selected developing countries through case studies, demonstration and training,

The results of the entire project (phases I and II) should, if successfully executed, be a useful tool for the dissemination of RETs.

4.2 Environmentally sound energy development - India pilot project[4]

This project commenced on 1 January 1992 and was due for completion on 31 December 1994 under the legislative authority of UNEP Governing Council decisions 15/1, 15/3 and document UNEP/GC.15/9/Add.1. Its long-term objective was:

- To contribute to the integration of environment criteria into energy policy and planning especially in developing countries, and to promote more environmentally benign energy production and use in order to achieve environmentally sound energy development.

The specific objectives were:

- To enhance the technical and political awareness in India of the environmental impacts of energy production and use in general, and particularly the role of the energy sector in global greenhouse gas emissions;

- To strengthen the existing institutional capacity and base of scientific and technical data for the development and implementation of environmentally sound and effective energy policies and technologies in India;

- to identify economic, institutional and technological factors that hamper the development of energy systems that are more environmentally benign.

At the outset, it was envisaged that this project would ultimately set an example to other developing countries so that they would be able to take steps towards the formulation of national energy policies, with special emphasis on environmental issues. Such policies would enable such countries to be partners in the current international negotiations in order for them to reach agreements that address environmental problems without constraining their economic development, and to identify ways and means of securing the funding and transfer of environmentally benign energy technology.

At the outset only one copy of the original project document[4] was made available to the consultant and, at the time of compiling the present report, the project had not been completed, despite its being almost one year off schedule. No explanation was offered as to the cause for this delay. Nonetheless, the objectives are sound and make it suitable for replication in other developing countries, should it be successfully completed.

4.3 Incorporation of environmental considerations into energy planning in the People's Republic of China[5]

This project commenced in June 1993 and is due for completion in November 1995 under the legislative authority of UNEP Governing Council decisions 15/1 and 15/3. Its long-term objective is to contribute to the integration of environmental criteria into energy policy and planning in China and to promote energy production and use with minimum environmental impacts.

The short-term objectives are:

- To promote energy-related national and regional policy regarding emissions of atmospheric pollution, especially sulphur and nitrogen oxides, particulate matter and carbon dioxide;

- To assist in strengthening the national institutional capacity for the development and implementation of sound energy strategies in selected regions;

- To enhance policies for energy conservation/efficiency and increase the use of renewable energy sources.

The choice of China for such a project was quite appropriate because of its very large consumption of fossil fuel energy and worrying level of carbon dioxide emission (the third largest in the world), its smoke dust, which is above the national standard in many of its cities, and the increasing acid rain problems, especially in the southern part of the country. The project is still in progress at the time of compiling the present report; however, potentially its results should have a far-reaching impact on both industrialized and developing countries, so as to warrant its replication in other countries.

It must be emphasized that, apart from a copy of the original project document, no other documents (draft or progress reports) were made available to the consultant, thereby rendering an assessment of its impact to date impossible.

4.4 RISO/UNEP Collaborating Centre on Energy and Environment (UCCEE)

This Centre was established in 1990 under a joint agreement between UNEP, the Danish International Development Agency (DANIDA) and the National Laboratory of Denmark. The major aim of the Centre is to promote the incorporation of environmental concerns into energy planning and policy worldwide, especially in developing countries. The long-term objective of UCCEE is:

- To contribute to the integration of environmental criteria into energy policy planning, especially in developing countries, and to promote environmentally benign energy production and use in order to achieve reductions in the adverse impacts from energy systems, especially greenhouse gas emissions.

The short-term objective is, generally, to enhance the working knowledge and consciousness of many professionals working in energy policy and planning, as well as those in research institutions in developing countries, about the environmental impacts of different national energy systems. More specifically, this objective was intended:

- To enhance technical and political awareness of the environmental impacts of energy production and use in general, and especially of the role of the energy sector in global greenhouse gas emissions;

- To increase the sensitivity of the United Nations system and other international organizations to the environmental aspects of energy activities;

- To enhance UNEP's participation in the energy-related aspects of international negotiations on climate change;

Outputs expected from the Centre included, among others: the production of technical reports, databases, methods and models on energy, trained energy planners, communication packages as well as the publication of newsletters and conference papers.

UNEP-funded projects carried out at the Centre since its inception appear to be appropriate, especially to developing countries, because of their lack of local institutions with adequate tools to enable them to include environmental concerns in their energy policy and planning. Some of these activities are: capacity-building, provision of linkages with regional research institutions in both industrialized and developing countries and execution of other energy-related environmental projects which UNEP may propose from time to time. These activities, as well as the results of UNEP's projects in India and China, are likely to help Governments in many countries in seeking to cope with the environmental impact of energy.

While the performance of UCCEE in meeting its mandate so far is fairly laudable[6], some of its activities, nonetheless, would probably serve a useful purpose if, with the help of UNEP, they were decentralized to local research institutions of various countries having a nucleus for energy-environment studies. This mode of replication would bring the objectives of the energy subprogramme closer to the energy/environment planners of those countries, thereby giving those objectives a bigger and faster impact.

4.5 African Ministerial Conference on the Environment (AMCEN)

An activity dealing with the assessment of energy and environmental issues in Africa was recently initiated by the Unit with a view to contributing towards energy management and policy analysis at the country level on the African continent. The AMCEN activity seeks to reach most African countries through their relevant Ministers, with a view to enhancing their energy-environment activities.

4.6 Collaboration with the African Development Bank (AfDB) and African Development Fund (AfDF)

A collaborative effort between UNEP and AfDB was initiated very recently

by the only Professional currently manning the Energy Unit within the framework of the African Energy Programme (AEP). The collaboration aims at launching an energy and environmental project in the continent of Africa, with activities in the area of energy development and the protection and enhancement of the environment. Although the project has yet to take off, it is a commendable effort which should be extended to other regions.

5. OTHER UNEP PROGRAMMES WITH A BIAS TOWARDS ENERGY

A number of programmes within UNEP overlap with the programme of work of the Energy Unit. These programmes are under:

- The Dryland Ecosystems and Desertification Control Programme Activity Centre (DEDC/PAC), whose activities include promotion and establishment of green belts;

- The Environment and Economics Unit, whose activities to internationalize environment costs by means of economic tools must, of necessity, look into the energy sector;

- The Biodiversity Unit, whose activities also cover use of alcohol as an alternative source of energy;

- The Infoterra Programme Activity Centre, whose international database embraces information on energy and environment;

- The Atmosphere Unit, where UNEP supports, inter alia, the development and testing of international standard methodology for estimating national inventories of sources and sinks of greenhouse gases (GHG);

- The Industry and Environment Programme Activity Centre, whose portfolio includes energy and its effects on the environment.

There are also other units such as the Environmental Law and Institutions Programme Activity Centre (ELI/PAC), whose activities in the field of regulations on environmental impact assessment must encompass mandatory legislation on energy and the Oceans and Coastal Areas Programme Activity Centre (OCA/PAC) which so far does not include energy considerations in its work programme, but which covers an area where there are a lot of energy issues including their impact on the environment. The same observation applies to the Forestry and Other Ecosystems Sub-Unit, which can contribute immensely to the energy scenario, especially in the field of increasing global green acreage. There is thus a need for the integration of these activities into those of the Energy Unit.

6. EFFECTIVENESS AND IMPACT OF THE ENERGY SUBPROGRAMME

The effectiveness and impact of the energy subprogramme activities in relation to its mandate and objectives since its inception are chequered, particularly the earlier ones, as attested to by the following brief observations:

- The mandate which empowered the Unit to carry out research on

non-conventional and non-polluting sources of energy for developing countries gave rise to a document on solar, biogas, wind and geothermal sources of energy. However, the impact of the resulting projects in certain developing countries is rather difficult to quantify, nor is there a specific case where the results of this research have effectively and significantly changed or reduced the environmental hazards brought about by conventional and polluting sources of energy;

- The two projects (System study of energy and climate, phase I and Comparison of energy options: a methodological study) emanating from the second session of the Governing Council must have helped in stimulating the debate on energy demands and available options; but

  the consultant has been given to understand that the results of those studies did not tally with the expected realities;

- There seems to be no concrete evidence that the creation of centre(s) in Kenya for the development of fast-growing trees, efficient fuelwood burning and the replacement of fuelwood development and distribution by other renewable sources, as mandated by the third session of the Governing Council in 1975, has taken firm root and changed the life-style of people in that country. The same observation could very well apply to Brazil and Bolivia, where such centres were also created.

- Transfer of technology on renewable energy sources, such as small-scale hydropower and biogas plants from the Chinese experience, has not had any tangible impact in developing countries, even in Africa, where attempts to adapt these technologies have been made. (It is worth noting that the Chinese biogas technology, in particular, failed to take firm root when the plants were adapted for Africa by the African Regional Centre for Technology (ARCT) under the aegis of the United Nations Economic Commission for Africa (ECA), owing to various sociological and economic factors which hampered their acceptance)[7].

It would appear that, guided by the Governing Council decisions, activities of the Energy Unit since its inception have focused mainly on issues of environmental impacts of various energy sources and, in particular, on the promotion and use of renewable sources of energy with little regard for human settlements and socio-economic factors, whose pattern has a very important bearing on energy production, transportation, conversion and use. This omission/oversight could have contributed to the relatively slow pace in building the capacity of Governments, especially in developing countries, to cope effectively with environmental impacts on energy.

However, the more recent formulation of the Unit's projects, such as those in China and India, as well as those carried out by RISO/UNEP, is largely on the right course. The results of the Indian and Chinese projects, and possibly some similar ones in the future coupled with some activities at UCCEE, should go a long way towards playing a significant role in building the capacity of Governments, wherever they are replicated, to cope effectively with energy-related environmental issues.

7. STRATEGIES AND MODALITIES FOR THE EFFECTIVENESS AND PRODUCTIVITY OF THE ENERGY SUBPROGRAMME

The Energy Unit of UNEP must at all costs avoid the formulation and execution of its projects in an ad hoc manner, lest these projects continue to be moribund. There are, nonetheless, a number of strategies and modalities employed by the Unit in the execution of some of its past activities which are worthy of replication and which are bound to pay handsome dividends if properly executed. For the effective execution of the future activities suggested in section 10 below, the following are some of the strategies and modalities to which the Unit will need to pay special attention:

- Proper identification of partners, consultants and institutions for implementation of projects, as in the case of the projects in China and India;

- Creation of centres of excellence, such as UCCEE or its satellites, especially in developing countries for capacity/capability-building and implementation of projects, including those assigned to them by the Unit;

- Development of technologies and socio-economic tools which can enable various countries to formulate environmentally sound energy policies for inclusion in their development plans;

- Development of linkages and collaboration with other international and national agencies/institutions for joint ventures in the implementation of country projects and capability-building, again as was done in the case of the projects in China and India;

- Publication and dissemination of the environmental impacts of various sources of energy similar to those provided by a specialist between 1978 and 1980 under the heading "UNEP Energy Research Series", which should be updated.

8. STAFFING

While many United Nations agencies have a variety of activities in the field of energy, there is no particular United Nations institution charged specifically with energy policy. Furthermore, to the best of the consultant's knowledge, it would appear there is no formal mechanism for the coordination of the energy issues pursued by the various United Nations agencies.

With the growing concern for the impact of energy on the environment and the need to develop environmentally sound energy systems for sustainable development, especially in developing countries, UNEP stands out as the agency which could and should best undertake a leading role in coordinating all the United Nations agencies' activities in environmentally sound exploitation and use of energy resources. To be able to play this pivotal role in energy matters, UNEP must revamp its Energy Unit, both

professionally and financially.

Until 1994 the Energy Unit was part of the Technology and Environment Branch (TAEB) under which were other programmes, namely, human settlements, solid wastes, peace and security, and science and technology. TAEB was headed by an officer at the D-1 level and there were two Programme Officers in its Energy Unit until 1989, when the number was reduced to one. This single Programme Officer had left the service of UNEP by the end of 1990. Thereafter, there was a gap between 1990 and 1992 as far as the direct management of energy activities was concerned. However, the Chief of TAEB continued to run the Unit until 1992, with the assistance of consultants, when another Professional was transferred from the Climate Unit to cover energy issues. This Professional remained as the only staff member dealing with energy matters until 1993, when a Junior Programme Officer funded by the Government of Denmark joined the Energy Unit. This additional staff member of the Unit worked for only one year and left in July 1994, leaving behind only one Programme Officer at the level of P-3 who, together with one secretary, currently runs the Energy Unit, a staffing situation which can only be described as skeleton in the extreme.

Without adequate staff, especially at the Professional level, the Unit is obviously not only unable to take its rightful place as UNEP's programme office for energy but also cannot be in a position even to coordinate the various UNEP in-house energy-related activities described in section 5 above. More importantly, it cannot take the lead in coordinating the energy activities of various United Nations agencies as alluded to above. Because of this pathetic staffing situation at UNEP Headquarters, it is little wonder that RISO/UNEP appears to play the role of de facto programme office rather than that of project implementer.

It is imperative that the Energy Unit of UNEP regain its role as the de facto programme office and play a key role in the coordination of all the United Nations agencies' activities in the environmentally sound exploitation and use of energy resources. In order to do this, UNEP will need to upgrade the Unit to a full Branch or Unit and employ, to head the division, a highly competent and qualified science/energy specialist at D-1 level at least, with impeccable administrative skills. There will also be a need to recruit two Senior Programme Officers, one social scientist to take charge of the socio-economic aspects of energy/environment and another (a science/energy specialist) to head the science/technology section of the Division, while the Chief oversees the overall activities of the Division. It is essential that the recruitment exercise must at all times stress **competence** in staff selection, otherwise UNEP will continue to waste its valuable financial resources on projects that will never have any significant impact on the ever-growing crucial field of energy and environment.

Like all other United Nations agencies, UNEP should have seen the importance of energy for the improvement of the quality of life, particularly in the developing countries, when there was an energy crisis in the 1970's. As the threat to the dwindling fossil fuels eased off, enthusiasm to pursue the development of alternative/renewable energy sources, particularly for developing countries, also dwindled. This could have been a major reason for the loss of stature of UNEP's Energy Unit over the years. However, there is now a strong case for strengthening the Unit, especially in the light of Agenda 21 and the dire need to address human settlement and ecosystems

issues.

The lack of success of projects started by the Energy Unit in the early days may also have partly contributed to the loss of stature of the Unit, but this might also have been due to the lack of qualified and dedicated Professional staff with a deep understanding of energy issues, convinced of the need to work towards the success of alternative/renewable energy sources, **particularly for the advancement of the developing countries.**

9. PROBLEMS/SUCCESS OF THE SUBPROGRAMME

The legislative authority that set up the Energy Unit gave proper and adequate guidance to its activities. The Unit is fully aware of the environmental issues and of the impact of energy systems to be addressed, as well as of the technical and economic tools needed to reduce or eliminate these impacts. However, the subprogramme's projects must be able to convince stakeholders/users to provide a basis for policy actions to reduce/eliminate adverse impacts of energy systems on the environment; this is crucial to the success of the subprogramme's activities in any country. It would appear that the subprogramme's activities during the greater part of the two decades of its existence did not provide such a basis, although it mounted a number of projects in various countries. This problem could explain why most if not all of the projects became moribund. Other problems arose, perhaps unforeseen, from the omission of socio-economic factors from the design and implementation of projects, which also contributed to their lack of success and non-acceptance.

This situation may well have arisen because the Unit did not fully appreciate that impacts are not easily controlled, as the costs involved tend to favour systems that pollute and degrade the environment. Furthermore, human beings (stakeholders) tend to fall prey to such systems at the expense of ones that are more desirable environmentally, as a matter of convenience rather than choice. Solutions to the above problems may demand:

- Properly designed mechanisms and public awareness-raising, which should encompass the short-term and long-term benefits to be derived from the projects;

- The services of a well structured and high-level calibre of Professional staff, with a deep understanding of the issues at stake;

- The participation of social scientists in the execution of projects needing social acceptance for success.

The Unit has put a lot of effort into the documentation and production of material on environmentally benign energy. However, success in disseminating information from such documents and publications so that it reaches stakeholders/end-users is rather elusive. In the absence of any tangible results, one is tempted to conclude that most of the material ended up on shelves and in archives in various countries without achieving the intended goals. Indeed, the Unit successfully published very useful data under the title "UNEP Energy Research Series" between the years 1978 and 1980, and thereafter this useful publication ceased, for reasons which the consultant could not decipher but which presumably involved `limited resources'.

Despite attempts to increase global green acreage, the subprogramme's activities have not made any sizeable impact on the sustainable use of fuelwood, especially in rural areas of developing countries where biomass (fuel, agricultural and animal wastes) has been and will continue to be a major energy source.

The unsustainable use of fuelwood as charcoal or in other ways is still rampant and stocks are being devastated with impunity for perceived short-term economic gains in most of the developing countries.

Furthermore, the health of many people, especially in developing countries, is still adversely affected by the inefficient use of biomass despite the efforts the Unit has made over nearly a quarter of a century to encourage its efficient use for cooking and heating.

All these problems call for a concerted public-awareness campaign, and it is suggested that this effort be undertaken by the Unit.

There is no evidence that the Unit has exerted itself since its inception in dealing with environmental issues related to fossil fuels and nuclear energy, except for its contribution to a project document on various sources of nuclear energy in 1976. A very large part of the energy consumption in industrialized countries is still based on fossil fuels, the major energy-related problems of which are various types of atmospheric pollution. Besides, many aspects of the use of nuclear energy -- problems of nuclear plant safety (remember the Chernobyl disaster!), radiation protection and radioactive waste management -- still contribute to environmental pollution, and their abatement or complete eradication is not yet in sight. These are transboundary problems which need to be addressed through international negotiations. The Unit should play a catalytic role in these negotiations.

The above problems notwithstanding, some attempts have been made by the Unit to sensitize various Governments and the officials of Ministries dealing with energy-environment issues to the need to include energy-environment issues in their policy and planning. However, it is difficult to assess the impact of this exercise in enabling the inclusion of energy-environment issues in national programmes, especially in developing countries. But the subprogramme can at least pride itself on having stimulated debate on crucial energy-environment issues right from its inception. The Unit should, however, be required to put in place a mechanism for the professional evaluation of all its projects after completion to make its success more tangible.

10. RECOMMENDATIONS FOR THE FUTURE

Building on its past experience, and paying special attention to UNEP's new policy on energy[8] the Energy Unit should revisit and recast the methodology it has hitherto used to address the production, transportation,

conversion, storage and use of energy, taking due account of consumption and human settlement patterns, lifestyles and capabilities in various countries.

This approach should especially bear in mind that energy needs and consumption patterns vary significantly from country to country. Needs and consumption are directly related to the varying patterns of human settlement and socio-economic factors in all countries. Thus, the Unit should henceforth strive to modify its strategy in addressing these needs and their environmental impact.

Specifically, the Unit should:

(a) Obtain up-to-date data on human settlement and life-style patterns in all countries, and on the environmental and socio-economic impacts which these patterns are likely to have on energy production, transportation, conversion and use; it should then identify the existing technological options which are likely to enhance the solutions to the energy-environmental problems of each country or group of countries;

(b) Put in place a mechanism to identify, formulate and execute projects such as those suggested for China and India in the early 1990's, in order to avoid undertaking ad hoc activities again;

(c) Put in place effective mechanisms for institution- and capacity-building both within and outside Governments, particularly those of developing countries, for the effective and sustainable handling of energy-environmental issues;

(d) Act in collaboration with other relevant UNEP subprogrammes and international agencies/organizations as a forum for bringing together key operators (national, subnational and local government officials, academic and research professionals, as well as environmental groups and other non-governmental organizations) involved in energy-environmental issues to exchange ideas through seminars, workshops, conferences etc., with a view to finding solutions to environmental problems brought about by various energy and lifestyle choices;

(e) Integrate its energy-environment activities with other relevant in-house UNEP subprogrammes, while forging strategic alliances with other agencies with similar objectives, especially those linked with rural and urban development policies for the management of ecosystems and human settlements;

(f) Make the Energy Unit the de facto energy programme office of UNEP by strengthening its Professional-level personnel and making use of UCCEE mainly for the implementation of projects formulated by the Professional staff of the Unit, as the present arrangement is certainly expensive for UNEP.

Generally, the Unit should:

(a) Develop and use suitable technological and socio-economic tools (economic incentives, pricing, labeling, etc.) for the integration of energy and environment into the national programmes of all countries, even if this exercise requires the help of local or

international experts on a contractual basis;

(b) Expand energy-environment country projects, cooperating and coordinating at the country level with other agencies such as UNDP, the World Bank and NGOs, especially in view of the limited resources available within UNEP;

(c) Enhance public awareness and education regarding energy trends and their environmental and socio-economic consequences, through relevant publications, including the revival of the "UNEP Energy Research Series" and ensure that such publications are effectively used;

(d) Identify, develop (as appropriate) and disseminate, in collaboration with other agencies, existing and readily adaptable technologies and relevant information on the environmental and socio-economic impacts of energy production and use;

(e) Finally, perform general coordination on energy-environment policies, programmes and activities in liaison with, inter alia, the United Nations regional economic commissions, the Organisation for Economic Cooperation and Development (OECD), the International Energy Agency (IEA), the World Bank and other regional development banks.

11. LESSONS LEARNED

The present evaluation of the Energy Unit's activities and outputs has been carried out mainly through reviewing literature made available to the consultant and through interviews with relevant UNEP staff. Some lessons learned from the exercise are:

- It would appear that for a number of years after its inception, the Unit formulated some if not most of its earlier projects on any ad hoc basis worldwide and this resulted in most of these projects being closed without achieving tangible results. Besides, the Unit's earlier projects seem to have been conceived and executed in-house with limited resources, especially Professional personnel resources; this may also have contributed to the problems referred to.

- The rigour and thought which the Unit has lately put into the formulation of pilot projects and the strategy of identification and use of experts, as well as in creating collaborative efforts with local and international institutions for projects such as those about to be completed or in progress in China and India are, undoubtedly, along the right lines;

- The linkage with the RISO National Laboratory through the UNEP Centre for Collaboration on Energy and Environment (UCCEE) in recent years has provided UNEP with quite a useful mechanism for tackling some of the Unit's mandates. This Centre has, since its inception in 1990, provided an opportunity, especially for developing countries, to benefit from the experience of developed countries, which have

adequate tools and methodologies suitable for the inclusion of environmental concerns into energy policy and planning. This is a lesson which calls for a replication of the Unit's activities in other national laboratories/research institutions of other countries, particularly developing countries, possibly as satellites, for faster capacity/capability-building;

- UNEP lately appears to be relying heavily on the work of the RISO National Laboratory through the UCCEE linkage, thereby making it its defacto programme office and playing down the Energy Unit's functions. This could very well have come about owing to the understaffing situation in the Energy Unit. This lesson calls for an increase in Professional-level staff at UNEP Headquarters so that RISO/UNEP may be used mainly as an implementing centre/institution;

- While the programme activities of UCCEE are generally undertaken in direct collaboration with the staff of the Energy Unit at UNEP Headquarters, professional interaction between staff of the Centre and the Energy Unit seems to exist only on an ad hoc basis, thereby denying such staff a chance to enhance their capability to be the de facto energy programme officers of UNEP. This situation should not be allowed to continue in view of the pivotal role UNEP should play in energy-environment activities among other United Nations agencies, NGOs and other international organizations.

12. CONCLUSION

Like all other United Nations agencies and international organizations, UNEP undoubtedly realized the need, and rightly so, to address energy issues and their impact on the environment at an opportune time in the 1970's, at the peak of the so-called "energy crisis" period. The work of UNEP in this venture is even more necessary now than ever before, in view of Agenda 21 and the increasing concern for the impact of energy on the environment, as well as the need to develop environmentally benign energy systems for sustainable development globally.

For greater achievement and success in its energy programme, UNEP must at all times strive to have its activities evaluated in the field, to get first-hand information on the progress and impact of these activities, rather than rely on progress reports given by the executors.

More importantly, it is worth stressing that energy is the cradle of industrial development everywhere in the world, and its environmental effects are crucial to the cause for which UNEP was created. Consequently, it would be a grievous mistake, if not a tragedy, for UNEP to reduce rather than expand its energy-related activities.

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APPENDIX

TERMS OF REFERENCE FOR ENERGY SUBPROGRAMME EVALUATION

Scope of Evaluation

The evaluation was to involve extensive information-gathering through interviews and reviewing documentation at UNEP Headquarters in Nairobi between 15 August and 14 September 1995. In particular, the consultant was to study certain documents in order to achieve a better appraisal of the subprogramme on energy.

Terms of Reference

(i) Determine the effectiveness of the energy subprogramme in relation to the mandate and objectives of UNEP through reviewing the subprogramme's legislative authority and the rationale upon which the subprogramme was created.

(ii) Assess the effectiveness of the subprogramme in promoting sustainable development practices and strategies.

(iii) Assess the role the subprogramme has played in building the capacity of Governments to effectively cope with environmental impacts of energy.

(iv) Review how projects undertaken contribute to the attainment of the subprogramme's overall objectives.

(v) Identify the strategies and modalities employed by the subprogramme which have significant impact in the effectiveness and productivity of the subprogramme and that are suitable for replication.

(vi) Review the effectiveness of the organizational structure of the subprogramme through investigating the staffing and administrative arrangements and operational mechanisms with emphasis on its coordination process within UNEP, other United Nations bodies, Government agencies, NGOs and other international organizations.

(vii) Study the problems/success and issues affecting the delivery of the subprogramme and propose suggestions needed to improve the functioning and productivity of the subprogramme.

(viii) Produce concrete recommendations for the future improvement of the subprogramme.

(ix) Identify lessons learned through evaluation of the subprogramme's activities and outputs.
