

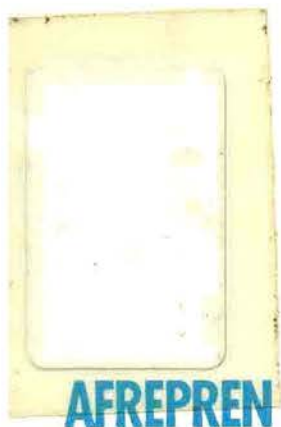


Environmentally-Sound Energy Options for Africa

Final Statement of the
African Energy Experts Meeting
Nairobi, Kenya (18 - 20 May, 1992)

Edited by
Ogunlade Davidson
Stephen Karekezi

June, 1992



African Energy Policy
Research Network

FWD

Foundation for
Woodstove Dissemination



Energy Unit, United Nations
Environment Programme

UCC

UNEP Collaborating Centre on Energy and Environment
Located at Risø National Laboratory, Denmark

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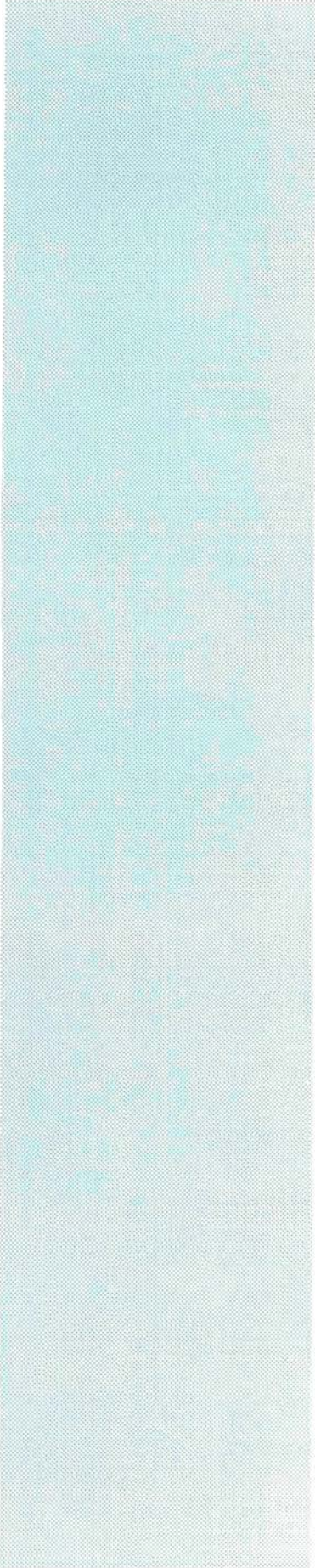
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PREFACE

The Experts Meeting held in May, 1992 in Nairobi, Kenya was an initiative of the Energy Unit of the United Nations Environment Programme (UNEP) Kenya; the UNEP Collaborating Centre on Energy and Environment located at the Risø National Laboratory, Denmark; the African Energy Policy Research Network (AFREPREN), Kenya; and, the Foundation for Woodstove Dissemination (FWD), Kenya. The objective of the Experts Meeting was to develop environmentally-sound energy options for Africa that are in line with the broad tenets of ecologically-sustainable development as outlined in the United Nations Agenda 21 environment initiative and the recommendations of an earlier AFREPREN strategy document entitled: "A New Environmentally-Sound Energy Strategy for the Development of Sub-Saharan Africa", by Ogunlade Davidson and Stephen Karekezi. For more information on the Experts Meeting, contact:

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1.0 INTRODUCTION

Biomass dominates the energy sector in Sub-Saharan Africa. For many African countries, it accounts for 50% to 90% of their total national energy supply. Although biomass can be an environmentally-sound source of energy for the region, current practices of biomass production, transformation and end-use are unsustainable and have adverse effects on Africa's environment.

As a consequence of over-dependence on biomass in its traditional form, Sub-Saharan Africa's per capita annual consumption of modern forms of energy is less than half the average of developing countries which makes it the lowest in the world. Large disparities exist among countries with only five accounting for 70 percent of total modern energy consumption for the region. Of greater concern is the disparity that exists within the countries between the underprivileged rural and urban poor and the higher income groups.

Per capita modern energy consumption has been declining over the last 10 years and is set to decline even further as population continues to increase and electricity generation continues to show a downward trend. The decline in the energy sector reflects the poor performance of virtually all economic sectors of the region. A turn-around is not possible without substantial expansion of energy services.

2.0 ENERGY AND ENVIRONMENT

Africa's economic problems have exacerbated the stresses on its natural resource base. Energy production and use has been linked to some of these environmental problems. Unsustainable land-use has led to soil erosion, land degradation, de-vegetation, deforestation and, ultimately, desertification. Large-scale hydro power plants can lead to loss of agricultural land and human settlements if not properly planned.

The mainstream view among the scientific community indicates that increased emission of greenhouse gases (such as carbon dioxide, methane, nitrous-oxide and CFCs) would lead to a rise in global temperature beyond normal limits. The consequences of higher temperatures can lead to a gradual rise in the sea level; flooding of many coastal areas; and, may disrupt Africa's agricultural system.

Recent findings indicate that Africa is not yet a net contributor to the build-up of CO₂ in the atmosphere. However, the increased concentration of CO₂ and other greenhouse gases in the atmosphere is a trans-boundary problem with worldwide negative consequences. Similarly, the danger of dumping toxic and radioactive waste generated by industries and power stations in the developed world and the transfer of energy intensive and environmentally-hazardous industries to the region, are examples of trans-boundary environmental problems created outside Africa but whose adverse consequences affect Africans.

The wide-scale use of fuelwood in Africa is contributing to deforestation and soil erosion. As population growth continues to surpass increases in modern energy supplies, the demand for biomass supplies will continue to increase, placing further pressure on the natural resource base. The continued use of biomass in inefficient stoves in poorly ventilated surroundings exposes the users (usually women and children) to high levels of indoor air pollution. At the level of transformation of biomass energy, significant waste is generated due to current inefficient techniques of logging and charcoal production.

Although Sub-Saharan Africa's current consumption of fossil fuels is still relatively low it is likely to increase significantly in the future due to increased economic growth and industrialization. Higher fossil fuel consumption combined with accelerated de-vegetation and deforestation could transform Sub-Saharan Africa into a net contributor to the build-up of greenhouse gases.

The concern over the afore-mentioned environmental problems, which are, in the main, long-term issues, has to compete with severe short-term problems such as debilitating economic decline and concomitant political instability and famine that threaten the region's survival.

However, the ongoing global debate over energy and environment highlights the existing opportunities for formulating sustainable energy growth strategies. The continent has used only four percent of its hydro resources. If exploited in an environmentally-sound manner, the remaining vast reserves of hydro energy could meet significant portions of the region's energy needs. A significant amount of Africa's renewable energy resources such as solar and wind are not yet exploited. Reserves of less-polluting fossil fuels such as natural gas remain unutilized. About one fifth of the world's tropical moist forests and a third of its tropical grasslands are in Africa which can provide sustainable source of modern energy while acting as an important carbon sink. Many technologies and approaches exist which can be used to exploit these energy resources in a manner that minimizes the damage to the environment.

To date, the conventional approach to providing increased energy services has, to a large extent, been supply-oriented. While it is recognized that Africa will need to substantially increase its energy supply in the future in order to promote the sustained social and economic development of its people, it needs to re-examine its past heavy emphasis on supply. Greater emphasis should be given to enhanced efficiency of energy use in all sectors. Continued reliance on a purely supply-side strategy would require high levels of investment capital.

First, Sub-Saharan Africa's already onerous debt burden and fragile economies make such scale of investments difficult. Second, competition for the limited capital available is more intense due to increased demand from the emerging market economies of the Eastern Europe and Asia. Third, if conventional energy supply systems are used, the adverse environmental consequences would worsen the already difficult ecological situation.

3.0 STRATEGY

Therefore, a new energy strategy for development which frugally uses the region's limited financial resources and minimizes the negative environmental impacts of energy generation and use is urgently needed. This strategy would include the following:

1. Innovative policy instruments and institutions; and, incorporation of environmental costing .
2. Mobilization of financial resources.
3. Management, training and technology acquisition.
4. Energy efficiency.
5. Increased supply of environmentally-benign modern fuels and energy technologies .

3.1 POLICIES AND INSTITUTIONS

Energy should not be viewed as an isolated sub-sector but as an essential element of an integrated development process. Virtually all essential sub-sectors require energy for growth. Therefore, innovative policy and institutional options are required to ensure that energy needs of all economic sectors are met. Important policy and institutional options for the region include:

- Careful review of the existing institutional framework to identify opportunities for rationalization and improved efficiency. One promising option, successfully implemented in Ghana, is the establishment of an energy institution which is outside the conventional civil service structure with favourable terms of service that attracts and encourages the retention of qualified and motivated personnel.
- Increased use of independent institutions involved in energy policy research analysis and project implementation through greater recourse to Universities, NGOs, the private sector and regional research networks such as AFREPREN (African Energy Policy Research Network). This would enable Governments to focus on their central functions of regulation, evaluation and monitoring.
- Formulation of simple and transparent regulatory and fiscal measures and decisions that are commensurate with the enforcement and monitoring capacity of local institutions. These measures should be based on realistic and technically proven analysis. Participation of concerned stakeholders (energy producers, distributors and users) should be maximized.
- Encouragement of participation of local small and medium scale entrepreneurs by removing regulatory constraints such as the monopoly of power utilities on electricity generation and distribution.
- Establishment of appropriate pricing schemes which will allow the full recovery of the cost of energy generation and distribution and create a favourable climate for investment in the energy sector.

- Incorporation of environmental impact assessments in all major energy projects.
- Development of least-cost investment strategies which would ensure that environment costs are reflected in energy prices; minimize foreign exchange requirements and energy imports; and, develop a more diversified and secure energy resource base that optimally utilizes local sources of energy. An encouraging example is the successful transition of Ethiopia's power sector from diesel-based generation to one based on hydro.
- Strengthen institutional memory; awareness creation; and, proactive advocacy by providing support for regular and periodic reviews of past energy policies, projects and initiatives to ensure that the lessons learned are incorporated in current and future energy activities. This should be reinforced by effective national and regional coordination.

3.2 MOBILIZATION OF FINANCIAL RESOURCES

Mobilization of local financial resources is a pre-requisite for sustainable energy development in the region. The current high level of dependence on external sources to finance virtually every single aspect of energy development is so prevalent that little thought is given as to how we can use the substantial resources that are locally available. In addition, external finance is often obtained at disadvantageous terms which contributes to increasing the region's debt. Effective resource mobilization can be realized through:

- Establishing reliable and indigenous sources of local funds. These funding mechanisms should be free of bureaucratic impediments and allow rapid disbursement of money to finance energy programmes on a long-term basis.
- Encouraging greater involvement of local banks and financial agencies in energy investments. This would stimulate the activities of small and medium-scale energy entrepreneurs in the formal and informal sectors.
- Improving the financial performance of energy supply companies to attract local and external investment in the energy sector.
- Strengthening the local capacity for negotiating favourable terms for external financing of energy projects and investments in the region. This would entail the involvement of local and regional research and policy analysis institutions which would provide a wider range of options for energy development and mechanisms (e.g. bundling and packaging numerous small energy projects into long-term programmes that are easy to finance).

3.3 MANAGEMENT, TRAINING AND TECHNOLOGY ACQUISITION

In the short term, improved management and regular and planned maintenance of existing energy assets can yield substantial gains in the performance of the energy sector and reduce the high costs associated with frequent breakdowns and power outages. Optimum

use of existing skills and regular training are vital requirements for enhanced management. This calls for the urgent implementation of the following measures:

- Comprehensive maintenance programmes tied to transparent technical and financial performance criteria for all energy development programmes.
- Incorporation of maintenance of energy equipment into the curricula of all relevant training institutions in the region.
- Provision of formal and on-the-job training for all levels of personnel in energy agencies to ensure professional operation and management of national energy systems. Training courses should be based on identified local needs and geared towards the creation and continuous replenishment of a large pool of energy professionals thus overcoming the problems of attrition and high staff turnover. The regular energy training programme of ENDA provides a model for replication in other parts of the region.
- Maximise use of the substantial local skills that exist in the region to develop and implement appropriate energy policy measures.
- Ensure technology acquisition by developing and strengthening capabilities for effective operation, maintenance, design, manufacture and modification of energy equipment and components.
- Regional and international technical exchange programmes to overcome lack of skills at national level. Special attention should be given to networking and training within Sub-Saharan Africa.

3.4 ENERGY EFFICIENCY

Energy efficiency provides the opportunity of using energy savings to supply more consumers with no added adverse environmental effects. To promote energy efficiency, attention should be given to the following measures:

- Implement proven transport policy measures that yield significant energy savings at low cost. Examples include better road traffic management; greater use of mass transit systems; use of an optimal mix of transport modes (e.g. transportation of freight by sea and rail); and, improved communication infrastructure. The innovative traffic management policies tried in Ivory Coast and the extensive communication infrastructure in Mauritius offers good case examples of viable options.
- Encourage the development and establishment of energy service companies in the public and private sectors. Activities of these companies should include promotion, testing, manufacture and marketing of energy efficient technologies.
- Support R&D efforts in energy efficiency and establish mechanisms for accessing information on available energy efficient technologies such as, improved cookstoves; efficient electrical household appliances and lighting systems; efficient electrical

motors; and, energy-conscious architecture. Special attention should be placed on the development of new methodological tools and innovative approaches for technology adaptation and modification.

- Develop national energy efficiency packages which provide performance data and relevant technical specifications of known technologies. These packages should be designed to assist policy makers, entrepreneurs, researchers and end-users in selecting appropriate energy efficient technologies and formulate feasible energy standards. In addition, the packages should include information on known practices such as basic retrofitting, housekeeping measures and more complex management and public education techniques for reducing energy consumption.

3.5 ENHANCED SUPPLY OF MODERN FUELS

With the world's lowest per capita consumption of modern energy and massive reserves of both renewable and fossil energy resources, increased energy supply to Sub-Saharan Africa should remain on its development agenda. To increase energy supply to the African region, the following measures should be given priority attention:

- Develop the capacity to monitor and undertake the requisite exploratory activities to identify and determine the nature and characteristics of energy resources available in the region. Develop and strengthen a cadre of local energy experts capable of undertaking the requisite planning and implementation functions.
- Promote regional cooperation in energy resource assessment, development and distribution. This would attract local and foreign investment and thus facilitate cost-effective exploitation of the continent's vast energy resources.
- Encourage the efficient use of biomass in households and small and medium scale industries in the rural and urban areas. The Kenyan experience in the development and wide-scale dissemination of energy-efficient cookstoves for households and institutions provides a good example.
- Explore the possibility of using biomass as a high energy carrier in large centralized systems. In the near term, the most promising options are use of ethanol to blend with gasoline for motor vehicles; and, processing of agricultural by-products as an industrial fuel and for power generation.
- Promote environmentally benign and renewable sources of energy such as wind, biogas, hydro and solar. In addition, less polluting fossil fuels such as natural gas should receive priority attention. Preference should be given to those options with the highest potential for income generation and employment creation.
- Establish institutions in the Government, Non-governmental and private sectors dedicated to the development and promotion of new and renewable sources of energy; and, controlling pollutants emitted during the production and use of energy.

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