

Communication on energy

Renewable energy and environment policies in Africa

Energy policies in Africa, as in most other developing regions, have been in a state of flux ever since petroleum-based fuel prices began to rise significantly from late 1973. For African countries, the timing of this increase in energy prices could not have been at a worse juncture. In the early 1970s, many African countries – especially those in the Sudano-Sahelian region, had been ravaged by years of drought, which had seriously adverse impacts on food production. When energy crisis was superimposed on an already persistent food crisis on a group of developing countries whose economies were not robust and resilient enough to successfully withstand even one of such major crises, the results were predictable and catastrophic.

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Before the countries concerned could overcome these shocks, they were hit by another drought in the early 1980s that was even more widespread than the one before. The drought-affected belt expanded from a few countries in the Sudano-Sahelian region in the early 1970s to encompass 34 countries in coastal and other areas in eastern, central, western and southern Africa in the 1980s.¹ As a result Africa continued to suffer.

The prevailing social conditions in Africa are still far from acceptable. They have actually shown a tendency towards serious deterioration since the early 1970s. In fact, if the following facts about Africa are considered,² it would be evident that almost all the indicators of the socioeconomic situation have been pointing to extremely disturbing long-term trends in recent years.

- *Per capita* income, which was growing at negligible rates during the 1970s, has consistently declined since 1980 at an average annual rate of 4.1%. Average *per capita* income is now between 15 and 25% less than 15 years ago.
- The performance of the predominant agricultural sector reflects a long-term deteriorating trend in

both agricultural production and *per capita* food production.

- About 70% of the total African population is currently either destitute or below the poverty line.
- The number of severely hungry and malnourished people has been estimated to have increased from close to 80 million in the early 1970s to over 100 million in 1984.
- Nearly 60% of the population live in slums and/or squatter settlements, and only some 25% have access to clean water.

The causes of Africa's economic and social crisis and Africa's underdevelopment in general are many. This is not the place to analyse them but among the litany of woes identified in 1985 by the African Ministers responsible for Economic Development and Planning are 'structural internal and external disequilibrium of the African economies, the inadequate and poor conditions of Africa's transport and communication infrastructure, energy imbalances and problems, the steady and increasing desertification of the continent, colonial neglect of human resources development, inappropriate post-independence economic strategies and

policies, inefficient management of African economies, political instability and socio-economic destabilization'.³

To confront many of these serious problems, and with the final goal of achieving self sufficiency in food and energy, Dr M. K. Tolba, Executive Director of the United Nations Environment Programme (UNEP), convened a meeting of the African Ministers of the Environment in Cairo, Egypt, on 16–18 December 1985, in cooperation with the United Nations Economic Commission for Africa (ECA) and the Organization of African Unity (OAU). The facts that 41 African countries were represented at this Conference at such high levels and that the ministers generally stayed for the entire duration of the meeting confirmed both the wisdom of convening such a meeting as well as its timing in this critical juncture.⁴ Here only the energy-related facts and views that emerged from this unique meeting of very high level policy makers will be reviewed.

Energy in Africa

Energy, food production and the environment are inexorably interlinked, especially in an African context. The continent is not exactly energy poor: in fact the potential is enormous. As Dr Tolba pointed out: 'oil reserves amount to 55 billion barrels; there are some 5 900 billion cubic metres of natural gas, mostly in North Africa; 88.5 billion tons of coal, mainly in southern Africa; peat and lignite deposits; 1.7 million tons of uranium reserves; 200 000 MW of hydroelectric potential; great potential in solar and wind energy; considerable geothermal potential, chiefly in the Great Rift Valley; biomass energy and animal energy'.⁵

In spite of such vast energy potential, energy consumption and use in Africa is still low for a variety of reasons, among which the following are worth noting: 80% of oil and gas is exported; only some 3% of hydroelectric potential is being utilized; harnessing draft animal power has not been very efficient because of the common problems of how to feed the working

animals adequately and slow progress in harness design; firewood, which is the main source of energy in Africa, is used with a very low level of efficiency; various renewable sources of energy are not being exploited for a host of different reasons.

On the basis of discussions at the Cairo meeting and different reports available, we shall examine the various energy-environment related policy implications for Africa under two sections: climate and hydropower, and firewood.

Climate and hydropower

Much has been written during the past decade on the impacts of climate, especially rainfall, on agricultural production. Unfortunately very little analysis has been made in any African country or international organization on the type of energy policies that need to be adopted in view of the precipitation regime that has been witnessed in the recent past, especially in terms of hydroelectric power generation.

General texts in hydrology still indicate that averages computed over a 30 year period will provide a good estimate of hydrometeorological parameters which can be used for design of hydraulic structures. Up until recently, the 30 year reference period was considered to be 1931 to 1960, which, unfortunately, for most of Africa appears to be a relatively wet period. Thus, past analyses which used hydrometeorological parameters of this reference period for planning of water development projects are not adequate for the rainfall regime we are witnessing at present. Similarly the FAO's Agro-Economical Zone study is based on this wetter period.⁶

The recent studies by several scientists of rainfall patterns in Africa during the present century indicate that the present drought started with a general decline in rainfall which began in the mid-1950s. Analyses of monthly Sahelian rainfall indicate that the departure from the 1931-60 mean is most evident for the month of August. Since climate changes from year to year, decade to decade and century to century, we cannot make any definite

statements on the present climate. This contention is especially valid when one further considers the errors that are inherent in nearly all the past data sources available at present. These errors are not only difficult to identify but also are even more difficult to rectify.

From a hydroelectric generation viewpoint, streamflows are all important. And yet in places like Maradi in Niger, no annual total during the period 1965 to 1983 even reached the 1931-60 long-term mean. The water level in the Volta Lake dropped by more than 10 feet below the minimum required for the Akosombo generating plant to function normally. This in turn drastically reduced the electrical power generated so that supply of electricity in Benin, Ghana and Togo was seriously curtailed which meant that basic industries and services had to be operated at their lowest levels. The hydropower plant was almost closed down for a period starting from May 1984.

Similarly, water levels in Lake Chad have continually declined since 1963. By 1973, the surface area was reduced by nearly two-thirds and volume by three-quarters. Since then the lake has split into two parts, with the northern part drying up every year.

The average annual water yield for all the rivers reaching the Sahel has declined by some 25% in 1968-83. This deficit alone is equivalent to three times the assumed storage of the Manatali Dam in Upper Senegal Basin.

Since only about 3% of the hydropower potential in Africa is being utilized at present, many governments are contemplating large water development projects for both irrigation and hydropower generation. Thus, a

serious problem confronting them is how to design and operate such major projects in the face of climatic uncertainty so that the returns from these expensive investments can be justified. Equally, another policy issue confronting the decision makers is how best to use the existing projects to generate adequate energy, when it appears they may have been designed on the basis of much higher streamflow regimes.

Firewood

During the past two decades, Africa continued to be the main region that depended primarily on firewood as the predominant form of energy consumption. As shown in Table 1, nearly two-thirds of the energy consumed in Africa came from firewood in 1970: the corresponding figure in 1982 was slightly more than a half.

The status of firewood resources in Africa is shown in Figure 1. The present situation in different African countries in terms of acute scarcity and deficit and prospective deficit situations are shown in Table 3.⁷ Satisfactory situations are not mentioned.

Energy accounted for 2.5% of private consumption expenditure (PCE) of developing countries in 1970.⁸ This share increased to 18% by the late 1970s, of which firewood accounted for between 4 to 5% of PCE. In Africa, where more firewood is used, firewood accounted for some 10% of PCE. If the least developed countries of Africa are considered, this share was even higher at 20%.⁹ One advantage of higher firewood use was that the imported cost of fuel was lower than it might otherwise have been.

Firewood is an essential component

Table 1. Role of firewood in energy consumption of developing regions.

Region	Energy consumption index			Firewood/total energy (percentage)		
	1970	1975	1982	1970	1975	1982
Africa	100	126	177	67.0	61.5	53.0
Asia	100	141	191	24.0	19.0	16.0
Latin America	100	133	180	21.0	18.0	16.0
Total, developing countries	100	135	185	28.0	24.0	20.0

Source: FAO, *State of Food and Agriculture 1984*, FAO, Rome, 1985, p 185.

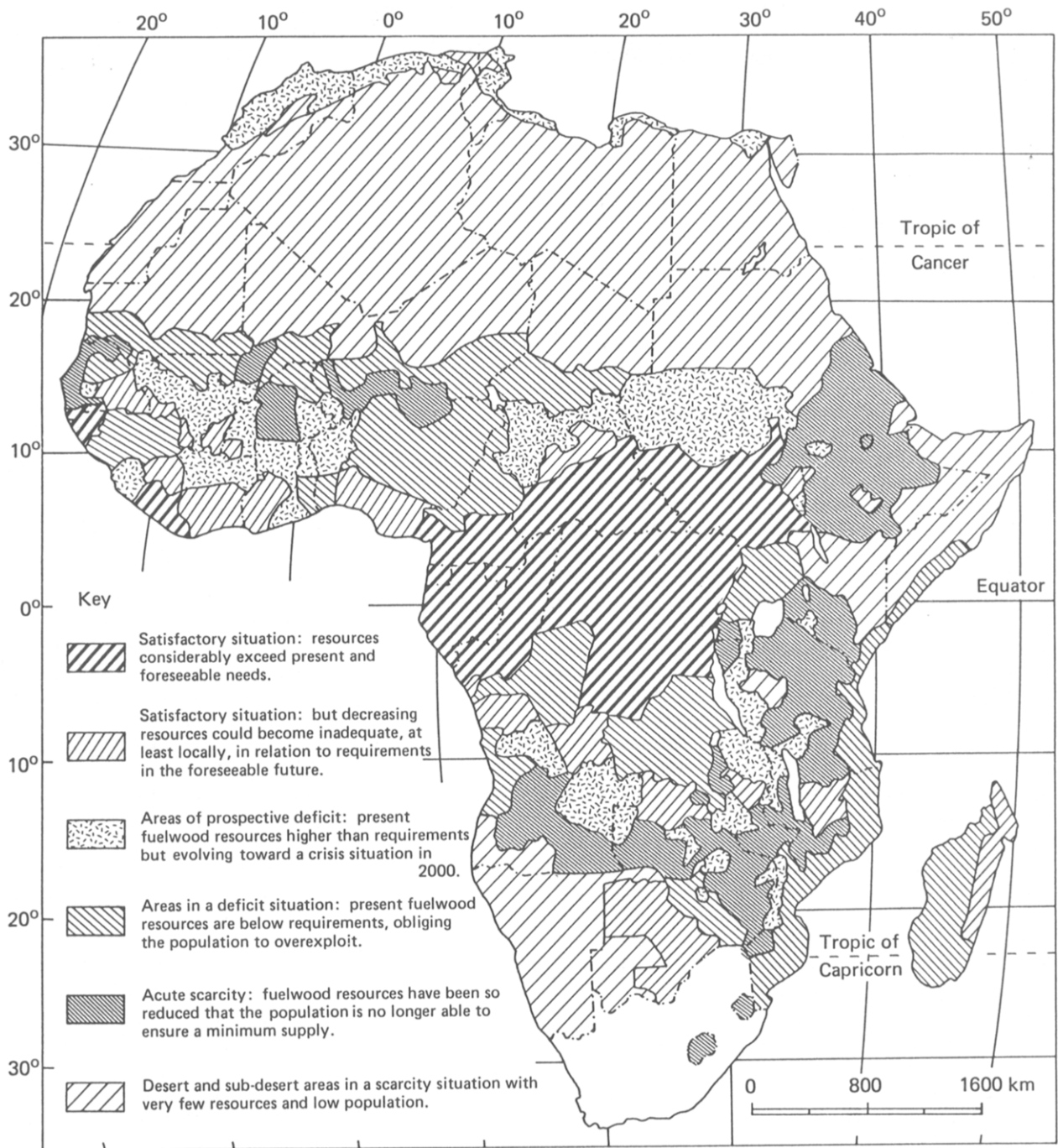


Figure 1. Firewood availability in Africa, present and future.

of energy use in rural areas and for poorer socioeconomic groups in towns. Firewood plays a very important role in countries south of the Sahara, where it provides 90 to 98% of the energy needs of the rural people. Unfortunately with the combined pressure of high rates of deforestation and population growth, the disparity

between firewood supplies available and the general demand is continuing to grow. As R.M. Banda, Minister of Forestry and Natural Resources of Malawi, pointed out at the Cairo Conference, deforestation is the 'most serious problem in the country'. Such rapid deforestation has meant that only 6 out of 24 districts in Malawi did

not have a firewood deficit in 1985, and by the year 2000 only two districts will have sufficient firewood.

The magnitude of the problem of meeting the demand for firewood in Africa in the future should not be underestimated. Projected demand for firewood and charcoal indicates that firewood demand in Africa is

likely to more than double by the year 2010. Furthermore, the only part of the continent that is likely to have a positive balance of firewood by 2010 is humid Central Africa (Table 2).

The environmental aspects of deforestation and firewood use have been discussed elsewhere.¹⁰

Concluding remarks

After three days of intensive discussions, the Cairo Conference agreed on a comprehensive Programme of African Cooperation. The ministers decided to institutionalize the conference by meeting every two years and by approving a \$32.5 million fund. They agreed to establish or strengthen eight regional networks, one of which will be in the area of renewable sources of energy. The specific terms of reference for the proposed network on energy will be to:

- i) review proposed national, sub-regional, and regional projects for development and implementation;
- ii) recommend priorities for the development of renewable sources of energy, taking into account the potential profitability of the projects and their urgency;
- iii) collect and disseminate information on current activities and projects in this area;
- iv) proposed specific projects for im-

- v) follow up on project implementation to ensure successful operation.

As Dr Tolba forcefully emphasized during the conference, African solutions have to emerge for the African problem.

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¹Economic Commission for Africa, *Special Memorandum by the ECA Conference of Ministers on Africa's Economic and Social Crisis*. ECA, Addis Ababa, 1984, p 59.

²Economic Commission for Africa, *Second Special Memorandum by the ECA Conference of Ministers: International Action for Relaunching the Initiative for Long-Term*

Development and Economic Growth in Africa, E/CA/CM.11/77/Rev 1, ECA, Addis Ababa, 1985, p 25.

³*Ibid.* For a report of the meeting, see Margaret R. Biswas and Asit K. Biswas, Report on the First African Ministerial Conference on the Environment, *Resources Policy*, Vol 14, No 2, June 1986; for the implications for food and agricultural, see Margaret R. Biswas and Asit K. Biswas, 'Food and environment policies in Africa', *Food Policy*, Vol 11, No 3, August 1986.

⁵M.K. Tolba, *Report of the Executive Director of the United Nations Environment Programme to the First African Ministerial Conference on the Environment*, UNEP, Nairobi, 1985, p 32.

⁶FAO, *Report on the Agro-Ecological Zones Project, Vol 1, Methodology and Results for Africa*, FAO, Rome, 1978.

⁷Margaret R. Biswas and Asit K. Biswas, 'The global environment: past, present and future', *Resources Policy*, Vol 13, No 1, March 1985, pp 25-42.

⁸FAO, *State of Food and Agriculture 1984*, FAO, Rome, 1985, p 185.

⁹*Ibid.*

Table 2. Sustainable supply and demand of firewood, 2010.

Region	Extent (million ha)	Sustainable firewood (million m ³)		
		Supply	Demand	Balance
Mediterranean and arid				
North Africa	600.2	1	14	- 13
Sudano-Sahelian Africa	828.2	135	140	- 5
Humid and sub-humid				
West Africa	206.6	240	275	- 35
Humid Central Africa	398.8	660	92	+ 568
Sub-humid and mountain				
East Africa	251.0	55	234	- 179
Sub-humid and semi-arid				
Southern Africa	559.8	165	198	- 33
Total	2 844.0	1 255	953	+ 302

Source: FAO, *Forestry Department Report*, FAO, Rome, 1985.

Table 3. Present scarcity and deficit situations in Africa.

Acute scarcity situations	Deficit situations	Prospective deficit situations
Botswana (western)	Algeria	Benin (northern)
Burundi	Angola (northwest, southwest)	Burkina Fasso (western, eastern)
Chad (northern)	Burkina Fasso (central)	Chad (central, southern)
Comoros	Egypt	Ghana (northern, southern)
Djibouti	Gambia	Guina (southern)
Ethiopia (Abyssinia, Ogaden)	Guinea (northern)	Ivory Coast (northern, southern)
Kenya (northern)	Kenya (coastal, central)	Madagascar (Diego Suarez, Tamatave)
Lesotho	Madagascar (except Diego Suarez, Tamatave)	Mali (southern)
Mali (northern)	Malawi	Mozambique (central, northern)
Mauritania	Morocco	Niger (south-eastern)
Mauritius	Mozambique (southern)	Nigeria (southern)
Namibia	Niger (southwest)	Sudan (central)
Niger (northern)	Nigeria (southern)	Tanzania (southern)
Rwanda	Sengal (central west, river plain)	Togo (northern)
Somalia (northern, southern)	Tanzania (northern)	
Sudan (northern)	Togo (southern)	
Swaziland	Tunisia	
	Uganda	
	Zaire (southern part of western)	
	Zambia (eastern)	