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Seven Energy and Development Myths
- are they still alive?

by Lars Kristoferson, Professor of Energy Systems and International Environment Policy, Secretary General, Baltic 21, (Presently on leave from SEI)

The way that energy and development issues are understood and treated in international co-operation and aid programmes has shifted quite dramatically since they surfaced a decade or so ago. A significant fraction of the total efforts and funds have been spent on issues such as renewable energy, "rural energy", household energy, small-scale energy, stoves and bioenergy and it is here that the most dramatic shift in understanding, priorities and "trends" has taken place.

The Energy and Development team at the SEI, and before that the Beijer Institute, has been closely involved in these matters since the end of the 1970s, working with a number of highly qualified teams in the developing world, primarily in sub-Saharan Africa. We have come across a number of "energy and development myths", and have worked hard to see beyond them. The introduction of fuelwood in national energy statistics is one early case in point, the "de-linking" between fuelwood use and deforestation is another. The understanding of how major African cities can use fuelwood sustainably is a third. Of course, we also made our mistakes and learnt a great deal. Some of the earlier myths still seem to prevail among donors and the public and contribute to a "development mind-set" that leads to the repetition of past mistakes.

Little of what is said below should be news to informed readers. You may also notice that I border on the unfair, simplistic and categorical in this very personal and subjective selection, all in the interest of the debate!

1. Lack of energy is an important obstacle to development

The reality is rather the opposite, it is economic development that creates a demand for energy. Economic development creates possibilities for new energy investments. There is not a lack of energy, but a lack of money to afford energy services. Moreover, if people are too poor to afford the appliances that require modern energy services such as electricity, it is pointless to try and introduce them (see Renewables in the Developing World - the road from wishful thinking to practical realisation).

However, when development has started to take off, lack of energy can hold up development. For example, when industries can not rely on a stable supply of energy due to load shedding or unreliable diesel supplies they may put an unproportionally large share of their investments into securing a stable energy supply.

2. Rural deforestation, erosion and desertification are caused by too many people using fuelwood

Rural fuelwood gathering usually has got nothing to do with deforestation, whereas agricultural expansion and commercial forestry does. As regards the influence of population density, recent studies reveal that more people create reforestation rather than de-forestation. The higher the population density, the greater the number of trees, is often closer to the truth. Moreover, deforestation is not a universal evil. Opening up land for food production is important in the developing world, as it was in Europe and America some time ago. (see Wood-fuel and deforestation in southern Africa - a misconceived association)

3. Woodfuel is not a sustainable source of energy, particularly not in cities

With proper management, woodfuel is often a sustainable fuel, even in the cities of developing countries. Moreover, it is a fuel that is easily accessible and reliable. In many cases, a cheaper alternative to woodfuel in urban areas would be subsidised electricity or fossil fuels. But subsidised fuels are still only accessible to a rather small share of the population. From an economic and development perspective, woodfuel will continue to be the dominating fuel in many developing countries for some decades to come, the realisation that woodfuel can be used sustainably gives room for manoeuvre. (See Woodfuel and deforestation in southern Africa - a misconceived association.)

4. Fuelwood use in home stoves is a serious health threat in developing countries

In some places smoke is a hazard noticeable in health statistics, in other places this is not the case. It is impossible to generalise the situation. Sometimes smoke is even desired, to keep insects such as malaria transmitting mosquitoes out. However, the combined safety, comfort and environmental issues connected to cooking with fuelwood provide strong arguments for modernisation of kitchens and appliances - and this is exactly what happened to cooking in Europe a century or so ago.

5. Energy efficient stoves are important for preserving forests, etc.

Since it is the agricultural sector and not the energy sector that is mainly responsible for deforestation, improved stoves won't save many trees. On the other hand, in urban areas, where people pay for their wood fuel, energy efficient stoves have in some cases been successful. But the driving force behind this is purely economic. In rural areas, with a free supply of e.g. dead wood, improved stove programmes will frequently fail.

6. Rural electrification to save fuelwood (and thus forests, etc.) is a priority in developing countries

It is doubtful if any rural electrification scheme has ever substituted any fuel-wood. And how could it? Viable rural electrification is still unusual. Moreover, if rural people were to afford cooking with electricity, using 2-3 kW at a time, the electricity system would collapse.

7. Renewable energy technologies are particularly suited to rural areas in developing countries

This is an idea of the 1980s that has attracted a lot of development assistance efforts. Many of these efforts have failed due to a lot of wishful thinking and not enough hardheaded realism. There are many good reasons for renewable energy in general, but it must be kept in mind that its near-term possibilities are usually much, much smaller in developing than in industrialised countries. Off-the-shelf, proven and cheap standard energy tech-nology (mostly fossil) is more promising! The restricted examples of renewable energy technologies that luckily fall within this category need to be carefully nurtured! (SEI has been involved in a few such schemes.)

In the long-term, what needs to be done is to create the possibilities for renewables - primarily through legal, economic and administrative measures. This should be an urgent priority every-where, primarily for credible donors.

There are of course many more "myths" and debatable concepts with respect to rural and renewable energy and development policies, and many of the issues above may seem a bit outdated to the "insider". However, those myths are usually more persistent than "insiders" may think. In any case, given the importance and size of the energy sector, priorities must always be discussed. Where are the myths of other sectors of development? I look forward to more debate!

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Renewables in the Developing World - the road from wishful thinking to practical realisation

by Gerald Foley, Nordic Consulting Group

> **The reasons why everyone is in favour of renewable energy sources are familiar. Because they are seen as having a special relevance in the rural areas of the developing world they have been the focus of a large number of development assistance efforts. Yet in spite of twenty years of effort, their penetration scarcely registers in the overall energy consumption scale in most developing countries.**

There are good reasons for this general lack of progress. Despite their attractive qualities, renewables tend to be seasonal, unreliable, expensive and limited in their output. PV household systems, to take the most commercially successful, provide only a tiny fraction of the power available from a grid connection. As for biofuels, how many Swedes would swap their Volvo or Saab for one of the gasifier-powered vehicles that filled the gap when petroleum was unavailable in Sweden during the Second World War?

There has, in fact, been a large element of wishful thinking in the promotion of renewable energy technologies. People have tended to look at their advantages rather than being realistic about what is involved in getting them into large-scale use. If things are to change in the future, more hardheaded and realistic attitudes need to be adopted.

It must be recognised that the developing world is a harsh environment for most of those living there. People are poor. They are at risk from natural and man-made hazards to a degree that is almost inconceivable in the prosperous industrial countries. Because people have so little, they cannot afford to incur additional avoidable costs or take the same risks as rich people. When they make investment decisions, low cost and reliability are of crucial importance.

It also needs to be kept in mind that energy is a derived demand. No one wants electricity for itself. People are interested in it because improved lighting in their houses has become a priority and they want something better than kerosene lamps; because they are tired of paying for dry cell batteries for radios and cassette players; or because the cost and trouble of recharging a car battery to run their television set is too high. It is pointless to try to introduce renewable energy technologies in areas where people are too poor to afford the appliances that require the energy these technologies produce.

A great deal has now been learnt about renewable energy technologies and the conditions under which they can make a genuine contribution to raising people's standards of living. Research or demonstration projects that simply show that electricity or gas can be produced from a renewable energy device no longer serve any useful purpose. More is now required. Any serious analysis of the potential for a renewable energy technology in a particular location in the developing world must consider four basic criteria. Is it economically justifiable; financially viable; institutionally sustainable; and locally replicable?

Economically justifiable

A renewable energy project should produce more economic benefits than it consumes in the developing country in which it is implemented. Otherwise, as a benefit sink, it is making the country poorer rather than more prosperous.

Strictly speaking, the economic analysis should compare all the project costs, no matter who bears them, with the benefits. In many cases, however, the external capital costs of projects are borne by donor countries with the recipients expected to carry only the local costs. But even, to the disapproval of the purists, excluding the capital costs borne by the donor does not necessarily mean that the project will provide a net economic benefit to the recipient country.

The local costs of providing materials, together with the necessary skilled and unskilled manpower, are often high. This is particularly the case when skilled local technicians are attracted to the development project from other more productive activities. Operating costs during the lifetime of the installation, including spare parts, which may have to be imported, need to be taken into account. Other costs such as transport, including meeting the foreign advisers at the airport and driving them round, should also be counted but rarely are.

These costs must then be compared with the economic value of the energy produced. If the costs are greater than the benefits, then the project is a mini black hole in economic terms. While this may be of little consequence in a rich industrial country, it hardly qualifies as "development assistance."

Financially viable

Assuming it is economically justifiable, the next question is who pays the project's lifetime operating and maintenance costs. Donors are generally, and rightly, reluctant to fund the recurrent operating and maintenance costs of projects. Once the relatively short funding period is over, the project should therefore be able to continue operating satisfactorily for the rest of its working life.

The ideal position is when the people who benefit from the project pay its full running and maintenance costs. This is what happens outside the development assistance area when, for example, a family buys a television set, a motorcycle or a buffalo. They accept full responsibility for all its maintenance costs. It is, however, the exception rather than the rule in renewable energy projects and local people rarely pay the full operating and maintenance costs. This is particularly the case in remote areas where the true costs of getting a repair technician to come and replace a faulty component are generally well beyond what the local users can afford.

If the users cannot pay the running costs, the burden falls on the government once the project funding ends. Developing country governments face a multitude of demands on their scarce resources. In some of the poor Sahelian countries, governments have literally no spare resources and some are unable even to pay their own civil servants. There is nothing to spare for subsidising renewable energy projects that cannot cover their running costs.

The reality is that there is little long-term hope for renewable projects whose users are unable or unwilling to cover their full operating and maintenance costs. Lack of financial viability is one of the major reasons for failed renewable energy projects throughout the developing world.

Institutionally sustainable

Institutional questions are often put in second place to technical issues when renewable energy projects are being planned. This can be a fatal error as far as the long-term operational survival of the project is concerned.

Operation and maintenance do not happen by themselves. They have to be organised on a permanent and self-sustaining basis. Someone with the necessary skills has to be found, appointed and paid to take responsibility for following the necessary operating and maintenance procedures. The spare part inventory has to be managed and replenished. User fees have to be collected and properly handled. All this requires planning and administrative capacities at the institutional level.

Simply running a few training workshops and hoping the imparted knowledge will stick is unlikely to achieve anything. Trained people need to practice their skills and have them refreshed on a regular basis otherwise the knowledge fades. In practice, if they are not able to earn an adequate financial return from their skills they either forget them or move to where they can use them profitably.

One way of dealing with the repair and maintenance problem is to ensure that the number of installations is sufficient to provide the newly trained technicians with an adequate standard of living. This can only happen where the necessary institutional structure is already in existence or can be put in place by the project.

Locally replicable

Many renewable energy projects are simply monuments to their donors. They are too expensive or complicated for local people, or the recipient country government, to replicate on a sufficient scale to make a difference.

It is, for example, quite unrealistic to expect developing country villages to be able to raise $200,000, or more, to install a centralised photovoltaic power system - however well the demonstration project works. Even $20,000 for a PV pumping system is beyond the reach of the vast majority of poor rural communities. Because local people using their own resources cannot replicate them, the number of such installations is restricted to the relatively limited number for which the donor agency is willing to pay.

If a significant contribution to the overall energy needs of the rural areas in the developing world is to be made, projects need to be designed with local replication in mind. There are ample precedents outside the energy area in which products such as radios, household goods, television sets, and mopeds are adopted and widely disseminated without donor or government interventions. Such widespread dissemination should be the objective and is, in some countries, being achieved by PV home systems.

Conclusion

The above four criteria clearly overlap to a considerable degree. They nevertheless provide a means of looking objectively and realistically at renewable energy projects and programmes at the planning approval stage.

There is no question that the merits of renewable energy sources are real. This is reflected in the fact that there are niches in which some, such as PVs, are already the technology of choice on straight technical and commercial grounds.

The task in the coming years is to widen these existing niches and discover new ones. Applying the above criteria provides a method of identifying projects with realistic prospects of succeeding and having a significant impact in their target areas. It is time, in short, that renewables were treated with the seriousness they deserve.

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Woodfuel and Deforestation in Southern Africa - a misconceived association

by Professor Emmanuel N. Chidumayo, Head, Department of Biological Sciences, University of Zambia

The consumption of woodfuel, especially in developing countries where this energy source is predominant, is often associated with deforestation. However, detailed analyses of where and in what form woodfuel is harvested, as well as where it is used, reveal that other competing uses of forestland and forest biomass may be more important causes of deforestation than is assumed. This is clearly demonstrated by the situation in the southern African countries.

Energy accounts of most developing countries are dominated by wood biomass fuels. In 1992 nearly 70% of the final energy consumption in the Southern African Development Community (SADC) countries was derived from wood biomass. In the household sector, woodfuel accounts for 97% of all the energy consumed. Does this high woodfuel consumption necessarily mean deforestation? To most people the answer is an automatic yes. It is this assumed association, coupled with a generalized perception of a deforestation crisis which is the basis for the myth that woodfuel use causes deforestation in many developing countries whose energy accounts are dominated by woodfuel.

But a better understanding of where, in what form and how wood biomass for fuel is harvested and where it is used reveals a very different picture about woodfuel and deforestation, at least in the southern African countries.

A comparison of annual woodfuel use and wood production shows that for most southern African countries wood biomass production in indigenous forests exceeds consumption (see figure on page 3), at least at a national level. In reality, wood biomass yield is far in excess of the woodfuel consumption shown in the figure because woodfuel needs by rural households are usually met from collections of dead wood. Only when collecting to stock-pile is live biomass harvested (Shackleton, 1993; Werren et al., 1995). But even under such conditions, firewood collectors have a limited destructive impact because they utilise small-sized branches and show a broad species selection (Bringham et al., 1996). Thus rural fuelwood collection rarely contributes to deforestation and because rural household consumption constitutes more than 50% of total household woodfuel use in all southern African countries, existing biomass and deforestation estimates have little relevance to household woodfuel consumption in rural areas. Unfortunately very few studies have assessed the amount of dead and twig wood in southern African countries to indicate the impact of rural household use of woodfuel.

The real causes of deforestation

Existing wood biomass and deforestation estimates in southern African countries are more appropriate for planning and assessing the impact of meeting energy needs of sectors that use woodfuel harvested by cutting down large live trees. The wood from such trees is sometimes converted to charcoal which is the dominant cooking fuel in urban households in Angola, Malawi, Tanzania and Zambia. Cord wood as well as charcoal are also used in some urban industries. Estimates of deforestation caused by woodfuel consumption assume that all the wood and charcoal used in urban areas comes from areas cleared primarily to harvest wood. But in accessible areas the forest biomass cleared during land preparation for cultivation is sold or converted to charcoal for sale in urban areas. This further reduces the deforestation caused by woodfuel harvesting. Furthermore, most statistics do not take into account woodfuel supplied from outside the forest. Even in areas primarily cleared for woodfuel, no account is taken of the high potential of dry tropical forests to regenerate naturally from seed, seedlings, roots and stumps (Chidumayo, 1997). Woodfuel harvesters therefore do not desertify the lands from which they extract urban energy supplies and the fact that such deforested lands may later be abused by over-grazing and/or uncontrolled bush burning which retard forest regeneration has little to do with the provision of woodfuel to urban areas (UNDP & World Bank, 1988).

Other uses of cord wood fuel include the curing of bricks, especially in rural areas. In Zimbabwe wood used for brick-making is said to equal that used for cooking in rural areas (Bradley & Dewees, 1993).

The agriculture sector is also a major user of cord wood fuel. For example, live trees are cut for fuel to cure tobacco and tea. Tobacco estates in Malawi account for 21% of the national woodfuel consumption (Moyo et al., 1993) and contribute nearly 47% to deforestation caused by harvesting wood biomass for fuel. Another extensive use of wood biomass in agriculture is fencing of arable fields. In Botswana the fencing of fields to keep out livestock consumes 1.5 times more wood than is used for cooking by farming households (Tietema et al., 1991).

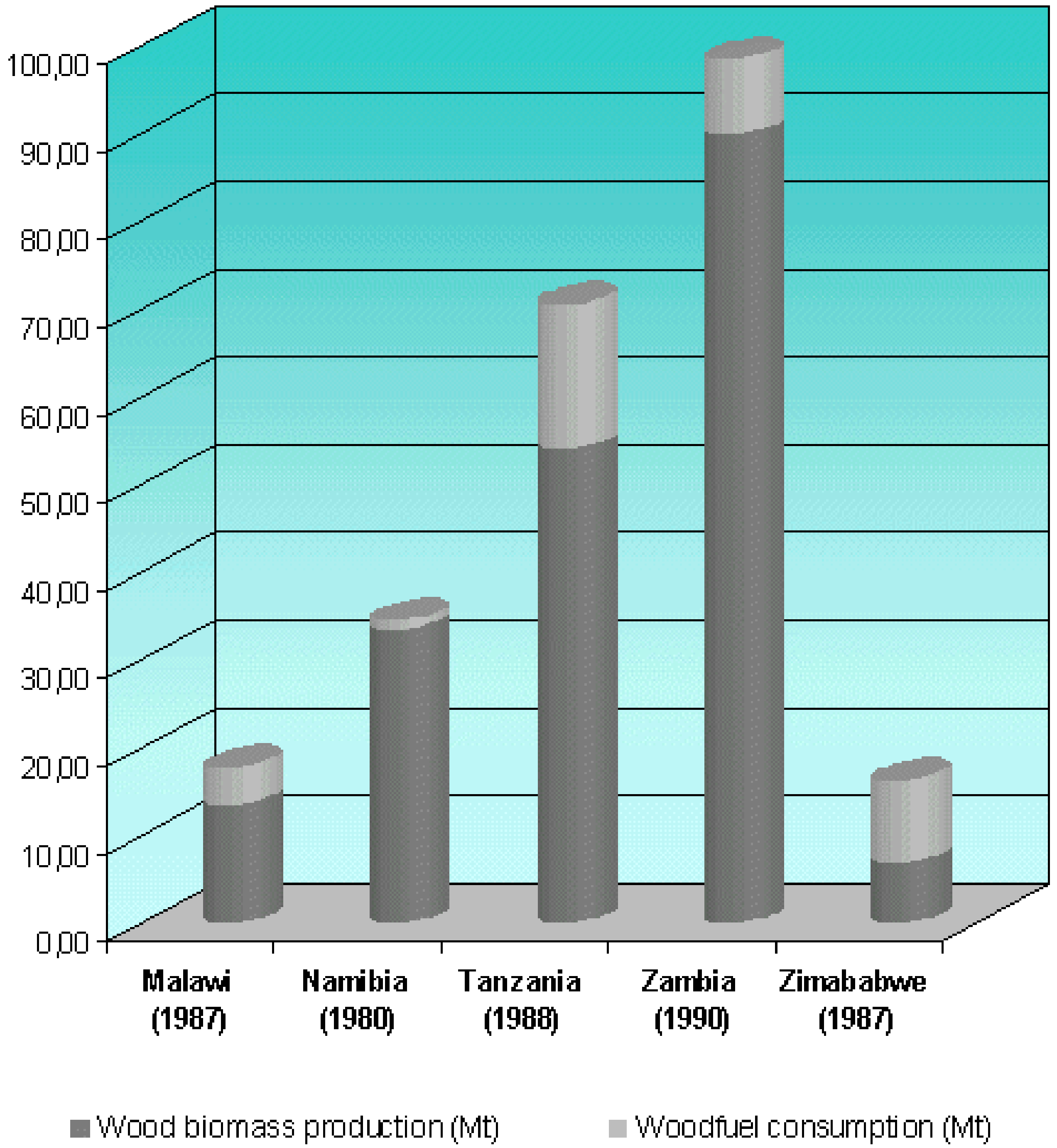
Competition for forestland

The major competitor for forestland in southern African countries is conversion to cropland and sometimes livestock grazing. In Malawi 24% of the total forested area has been converted to arable land (Lele & Stone, 1989). Of the estimated 0.9 million ha deforested in 1990 in Zambia, shifting and semi-permanent cultivation were responsible for 66% and 29%, respectively and the remaining 5% was attributed to harvesting woodfuel (Chidumayo, 1997) . The predominant role of agriculture in reducing forest cover is probably similar in the other southern African countries.

Developing a new perspective

Given that the bulk of the woodfuel consumed in southern African countries comes from dead and live brush wood, usually from natural woodlands, even the inclusion of non-household uses of woodfuel is unlikely to alter the balance between consumption and annual production (see figure below). It follows therefore that deforestation caused by woodfuel harvesting in all the southern African countries will continue to be locality-specific and in the majority of cases in areas of high population density where competing demands for land and forest biomass is high.

All these arguments suggest that the energy and environmental problems associated with the supply of woodfuel to urban areas in subhumid and semi-arid countries are seriously oversimplified and exaggerated. Undressing the myth that associates woodfuel use with deforestation should therefore begin with the realisation that competition for forestland and biomass in many developing countries is complex and often locality-specific and wood harvesting is just one and not necessarily the most important of such competing land uses.



Annual wood production and consumption in some SADC countries. Figures in parenthesis indicate source year.

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Understanding the Barriers to Renewable Energy Technologies in Africa

Source: AFREPREN/FWD Reference Sources, Electronic Version, 1996-97

Africa has substantial new and renewable energy resources, with more than 1.1 million GW of exploitable hydropower capacity, more than 9,000 MW of geothermal potential, abundant biomass potential, substantial solar potential, and in some countries, significant wind potential. In contrast to fossil fuel reserves which are potentially major sources of harmful local and global emissions that tend to be concentrated to a few countries, renewable sources of energy are not only environmentally-benign but are better distributed throughout the continent.

There is a growing consensus amongst policy makers today that past efforts to disseminate renewable energy technologies (RETs) in Africa have fallen short of their expectations. While policy makers today recognise that RETs cannot solve all of Africa's energy problems, RETs are still seen as having a significant unexploited potential to enable African countries to meet their growing energy requirements. Renewable energy is already the dominant source of energy for the household sub-sector. If properly harnessed, it could meet a significant proportion of energy demand from the industrial, agricultural, transport and commercial sub-sectors.

RETs in sub-Saharan Africa

Despite recognition that renewables are an important source of energy for sub-Saharan Africa, RETs have neither attracted the requisite level of investment nor tangible policy commitment. Although national and international resources allocated to developing, adapting and disseminating RETs in the last two decades may appear substantial, the total amount is still insignificant (6%) compared to that allocated to fossil fuels.

Since the beginning of 1994, the African Energy Policy Research Network /the Foundation for Woodstove Dissemination AFREPREN/FWD and the Stockholm Environment Institute jointly conducted a study on the non-technological factors influencing the dissemination of RETs in Eastern and Southern Africa. Six country case studies were undertaken in Botswana, Kenya, Lesotho, Seychelles, Uganda and Zambia. The case studies provide in-depth analysis of factors affecting solar, wind, biomass and micro-hydro technologies.

In its analysis of the RETs dissemination in the region, the study reveals that institutional deficiencies, pricing distortions and limited information on renewable energy are the key barriers to the dissemination of RETs.

Report conclusions

The report concludes that there are measures that would encourage the large-scale dissemination of renewable energy technologies in the region. These include the following:

(i) At the onset, renewable energy programmes should be aggressive, long-term, policy oriented, and aimed at senior decision-makers in both government and private sector. All the institutions and agencies involved should work more closely in the development and promotion of RETs.

(ii) Innovative and sustainable financing programmes for renewable energy technologies should be instituted. Of particular interest are financing programmes that mobilise local resources and facilitate the bundling of discrete small credit schemes into major financing opportunities for major multilateral and bilateral agencies.

(iii) All sources of energy should account for the social and environmental costs to ensure a level playing field for both renewable and conventional energy technologies.

(iv) Wider application should be made of the new renewable energy technology dissemination strategies that have demonstrated encouraging signs of success. Many of these strategies largely revolve around the idea of participation, income generation, and small-scale enterprise development. Existing systems of production, marketing and information dissemination should be utilised to the maximum to reduce cost and ensure sustainability (piggyback principle).

(v) Long-term renewable energy training programmes designed to develop a critical mass of locally trained personnel with the requisite technical, economic, and socio-cultural skills should be initiated. There should be maximum use of local researchers and consultants.

(vi) There is need for greater emphasis on quality control and regular and preventive maintenance. The requisite, technical and maintenance skills should be developed.

(vii) Countries should carry out studies to document as accurately as possible, the types, location and quantities of the various forms of renewable energy sources. This information should be made readily available and regularly updated.

The publication is available through Zed Books Ltd., 7 Cynthia Street, London N1 9JF, UK.

1997. Renewable Energy Technologies in Africa. 1997. ISBN 1-85649-089-0. 269 p. Zed Books Ltd, 7 Cynthia Street, London N1 9JF, UK in association with the African Energy Policy Research Network (AFREPREN) and the Stockholm Environment Institute (SEI).

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Publications

Transport Energy in Africa

By J. Baguant and M. Teferra

Sub-Saharan Africa has experienced substantial growth in motorised transport. Transportation is almost exclusively petroleum based and in many instances, import costs account for a significant proportion of export earnings. As its demand rises, certain problems need to be tackled urgently if this growth is not to place unbearable strains on African economies and urban environments. Chief among these are fuel-use inefficiencies of the present vehicle fleet, spiralling costs associated with mounting fuel wastage, the absence of systematic transport management and rising levels of urban air pollution.

This book is based on two research studies conducted in Mauritius and Ethiopia and presents the contrasting transport energy scenarios in the two countries (which exemplify the region's wide range of transportation challenges and policy interventions) and extracts from the research findings, policy measures that are appropriate and feasible in the wider African context.

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