

IMPROVING LINKAGES  
BETWEEN WOMEN  
AND ENERGY SECTOR  
POLICIES PROGRAMMES  
AND PROJECTS  
WITH SPECIAL  
REFERENCE TO NEW  
AND RENEWABLE  
SOURCES OF ENERGY

*Zambia Situational Analysis*

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IMPROVING LINKAGES BETWEEN WOMEN AND ENERGY SECTOR  
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TO NEW AND RENEWABLE SOURCES OF ENERGY

*ZAMBIA SITUATIONAL ANALYSIS*

A report prepared by the Department of Energy  
Ministry of Power Transport and Communications of the  
Government of Zambia submitted to the United Nations  
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## ACRONYMS AND ABBREVIATIONS

1. NCDP National Commission for Development Planning
2. NCSR National Council for Scientific Research
3. CSO Central Statistics Office
4. HUZA Human Settlements of Zambia
5. FAO Food and Agricultural Organisation
6. DANIDA Danish International Development Agency
7. ECA Economic Commission for Africa
8. EEC European Economic Community
9. NEC National Energy Council
10. DOE Department of Energy
11. CDC Commonwealth Development Corporation
12. NGO-CC Non-governmental Co-ordinating Committee
13. YWCA Young Women's Christian Association
14. WVI World Vision International
15. UNIP United National Independence Party
16. UNZA University of Zambia
17. TDAU Technology Development and Advisory Unit
18. NRSE New and Renewable Sources of Energy
19. ZAFFICO Zambia Forest and Forestry Industrial Corporation
20. FD Forest Department
21. DVS Danish Volunteer Service
22. ILO International Labour Organisation
23. WIDD Women in Development Department
24. ZESCO Zambia Electricity Supply Corporation
25. GDP Gross Domestic Products
26. NRD Natural Resources Department
27. MLNR Ministry of Lands and Natural Resources
28. LUDC Lusaka Urban District Council
29. CCDO Chief Community Development Officer
30. SCDO Senior Community Development Officer
31. CDO Community Development Officer
32. ACDO Assistant Community Development Officer

## 1.0 BACKGROUND

### 1.1 Population

Zambia, in comparison to other sub-Saharan African countries, is highly urbanized. According to the 1990 census, its population, at an estimated annual rate of increase of 3.6%, was 7.8 million. Out of the total population, 42% (3,285,766) live in urban areas comprising of 49.90% females (1,639,636) and 50.09% male (1,646,130); and the rural population is made up of 51.52% females (2,355,447) and 48.47% (2,197,234) males.

These figures show that, at the national level, the ratio of males to females is almost 1:1. There are more people in rural than in urban areas. Regarding the sex ratios, there are more males in urban than rural areas. The number of females in rural areas is more than in urban areas. This pattern of distribution may be explained by the higher numbers of males, than females, migrating to urban areas in search of jobs. The high level of urbanization has had a marked influence on the energy consumption, especially with regards to traditional energy sources, as shown by the report.

### 1.2 Economy

During 1984-1988, the country's Gross Domestic Product (GDP) grew at a moderate rate of 1.8% per annum, which was less than the population growth of about 3.6% per annum. In 1988, manufacturing accounted for 22% of GDP, Agriculture 18%, Services 16.3%, Mining 8.7%, Transport and Communications 5.2%, Construction 3.4%, and other sectors accounted for the remaining 26.4%.

It is notable that while the contribution to GDP of Manufacturing and Agriculture has been increasing that of the mining sector has been decreasing, although copper is still the country's major foreign exchange earner, accounting for 90% of earnings.

### 1.3 Development Priorities

Zambia's development priorities and aspirations can be summarized as follows:

- a. to diversify the economic structure in order to reduce the country's dependence on copper and launch an economic programme for promoting agriculture and industry.
- b. to prioritise rural development in order to create a strong rural economy.
- c. to reduce disparities in the level of income between rural and urban sectors.
- d. to promote a regional pattern of development compatible with the characteristics and dimensions of each region's socio-economic potential and needs.

There has been an emphasis on the need for a sustained programme of agricultural reconstruction and development by encouraging people to return to the land and increase agricultural production.

The overall strategy for rural development envisages co-ordinated programmes for improvement of agriculture, agro-industries, transportation, communication, social services, water supplies and other activities that have a bearing on the standard of living in rural areas. It aims:

- a. to increase the agricultural production;
- b. to increase the contribution of the rural sector to the GDP and diversify the rural economy;
- c. to create employment and income generating opportunities in the rural areas to both enrich personal consumption as well as reverse rural-urban immigration.

In the Fourth National Development Plan, agriculture continues to be accorded the highest priority in recognition of the fact that economic recovery can be achieved only if the vast land resource is utilized effectively. The overall strategy includes a combination of price and non-price incentives (e.g. foreign exchange retention, tax incentives, provision of adequate credit, etc.) with an emphasis on "growth from own resource", even though the battle against economic degeneration may be complex.

#### 1.4 Water Supply

The lack of water, an essential element to life, contributes to enormous health problems; 80% of all sicknesses and diseases can be attributed to inadequate water supply and sanitation (IDWSS National Action Committee, 1985). Recognizing the critical role that water plays in human life, the government has accorded a high priority to water development. A number of programmes have been drawn up and elaborated in each successive development plan. Furthermore, the government fully endorsed the United Nations resolution launching the International Decade for Water Supply and Sanitation, IDWSS (1981 - 90) which was aimed at achieving safe water and sanitation for all by the end of the decade. A National Action Committee was formed to spearhead this programme.

However, the level of achievement in terms of the proportion of the population that is adequately served with water has been rather low. By 1980, despite the high urbanization that the country had attained by that time (43%), only about 47% of the population had access to potable water.

##### 1.4.1 Urban Areas

The degree of provision of safe water in urban areas is dependent on the size of the town. Amongst the large urban centres (10 cities) which comprise 33% of the total population, 70% of the inhabitants are served with acceptable water

supply<sup>1</sup>. In small urban areas, housing is available to about 10% of the total population and about 45% of the residents are provided with acceptable water supply.

In both large and small urban areas, the district councils are responsible for water supply. In small towns, however, the Department of Water Affairs assists in constructing new supply systems which are later handed over to the councils to manage.

#### 1.4.2 Rural Areas

It is in the rural areas that the water supply situation is found most wanting. Only about 33% of the rural population have access to reasonable water supply which is obtained from protected wells, boreholes and small piped water supply schemes.

Rural water supplies are made up of a system of point supplies (that provide for less than 500 people) and small piped supplies (serving over 500 people). Point water supplies consist of hand dug wells equipped with windlass/bucket and/or handpumps and boreholes fitted windmills or handpumps. Supplies from rivers and dambos, although considered unsafe for direct consumption, are widely used as a traditional source of water.

By 1980, there were 3,900 protected shallow wells which was the dominant form of rural water supply system, 1,800 borewells (serving 14% of the rural population) and 230 small piped water supplies (serving 7% and protected wells covering 12% of the population, respectively).

During the Third National Development Plan (1979-84), some modest progress was made towards achieving the goals of the plan. Out of a target of 2,500 wells and 1000 borewells, only about 861 and 479, respectively, were sunk. In total, an additional 122 villages received adequate water supply during the plan period.

Under the current plan, the government aims to provide safe water to 50% of the rural population. This entails rehabilitating the existing 2,300 wells and 1,150 boreholes in addition to constructing 5,750 wells and 1,200 boreholes.

Renewable energy technologies have a strong potential for improving water supply in rural areas, as shown in the paragraphs below. For instance, well planned promotion could help alleviate the heavy burden that women face in water provision.

#### 1.5 Women in Development

The Government of Zambia accords a high priority to the role of Women in Development (WID). The Fourth National Development Plan (FNDP) extensively discusses ways of achieving the full integration of women in national development in all sectors of the economy, including energy. Recognizing that the full

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<sup>1</sup> Acceptable water supply is defined in terms of quality, quantity, reliability and distance from service point (less than 100m).



integration of WID requires adequate coordination, the government has formed a WID Department at the National Commission for Development Planning.

The FNDP provides a number of guidelines to ensure that women are participants and beneficiaries of development at various levels. Its long and short-term objectives are:

- a) to ensure the improvement of socio-economic conditions of women;
- b) to bring about a fuller integration of women in the development process;
- c) to improve the collection, processing, analysis and storage of statistics;
- d) to improve the living conditions and general welfare of rural women;
- e) to reduce maternal morbidity and mortality rates;
- f) to create more awareness on issues, needs, concerns and roles of women in development;
- g) to promote the training of women for media promotion;
- h) to increase and sustain the rate of women in wage employment;
- i) to increase women's participation in the private sector;
- j) to improve the conditions of the informal sector with particular emphasis on sanitation, day-care, training and credit facilities.

These objectives are envisaged to be achieved through a number of strategies among which are:

- a) to increase and improve women's access to production;
- b) to increase women's participation in decision-making planning, designing, implementation and evaluation of programmes;
- c) to strengthen the capability of the WID Department (WIDD) in order to effectively co-ordinate and monitor women's development projects;
- d) to promote the dissemination of information on women and development in order to create more awareness on issues, needs and role of women;
- e) to create gender awareness in provincial planning units and establishing links between them and WIDD.

In line with the national objectives outlined above, the present project seeks to address the role of women in the energy sector.

## 1.6 Energy Situation

### 1.6.1 Energy Supply

Zambia is well endowed with energy resources. Woodlands and forests cover an estimated 50 million ha or 66% of the total land area. The hydropower potential is estimated at 4000 Mw with an installed capacity of 1700 Mw, making the country a net exporter of power. Proven coal reserves exceed 30 million tons. These indigenous energy resources satisfy about 88% of total energy demand, the remainder being met by petroleum, all of which are imported.

Woodfuel is by far the largest contributor to meeting the country's energy requirements, accounting for 72% of total primary energy supply (Table 1). Electricity accounts for 13% while coal and petroleum contribute 6% and 9%, respectively.

Similarly, the energy consumption pattern shows the importance of woodfuel in meeting national energy needs, accounting for 58% of total final energy consumption. Electricity accounts for 13%, coal 8%, petroleum 13% and crop residues 8%.

Table 1 Energy Supply and Consumption by Energy Source in 1988  
( '000 toe)

Energy Source	Primary Supply		Final Consumption	
	Quantity	Percent	Quantity	Percent
Woodfuel	3303.0	64	2466.0	58
Electricity	595.5	12	537.6	13
Coal	341.9	7	341.9	8
Petroleum	567.3	11	567.3	13
Crop residues	321.0	6	321.0	8
Total	5128.7	100	4233.8	100

Source: UNDP/WB/DOE Household Energy Sector Strategy Study, 1990

#### 1.6.2 Energy Demand

Trends in energy-demand indicate a domination by households. According to an estimate of energy consumption in 1986, households accounted for 58% of the final energy consumption, primarily in the form of fuelwood and charcoal (Table 2).

Woodfuel met about 97.6% of household energy needs while electricity accounted for just under 2% and the remainder came from kerosene.

Table 2. Energy consumption by sector in 1988  
(PJ)

Sector	Consumption	Percent
Households	103.9	58
Agriculture Forestry	9.7	5
Mining	31.8	18
Industry & Commerce	21.7	12
Government/service	2.1	1
Transport	11.7	6
Total	18.9	100

Source: UNDP/WB/DOE Household Energy Sector Strategy Study, 1990

Although production in the mining industry has been declining since about 10 years ago, this industry continues to dominate consumption of the commercial energies, namely electricity, coal and petroleum that account for 72%, 54% and 73%, respectively, of the total consumption of these fuels. This has been the single most important factor in the development of these energy sub-sectors. The energy consumption of the mining sector is likely to remain stagnant or fall, due to the continued reduction in copper production, high production costs and the energy conservation measures currently being implemented.

A notable feature of the energy consumption pattern in Zambia is the low energy utilization in agriculture which accounts for only about 5% of final consumption. With the economic strategy's emphasis on diversification into agriculture, there is wide scope for more energy utilization in this sector to boost production. Electricity consumption is expected to take an upswing with the increased emphasis on irrigation.

The other sectors that are major users of energy are industry and commerce for coal and electricity, and transport for petroleum, notably diesel and gasoline.

### 1.7 Energy Sector Objectives

The FNDP emphasizes "growth from own resources" which accents priority investment planning and co-ordination of the entire energy sector. The programmes introduced during the FNDP are aimed at maintaining and strengthening the

reliability of the energy production and distribution systems, maximizing the utilization of domestic sources of energy and increasing the efficiency of energy use wherever possible.

The Energy objectives of the FNDP are:

- a. to ensure that supplies of energy meet demand;
- b. to promote efficient use of energy in the country;
- c. to conserve energy, particularly oil, wherever practical and economical;
- d. to substitute imported energy particularly petroleum products by hydro-electricity and coal, wherever practical and economical;
- e. to allocate resources within the energy sector to areas yielding the greatest social and economic benefits;
- f. to exploit opportunities for the inter-change of energy with neighboring countries for mutual benefit;
- g. to improve the supply of energy for household use throughout the country;
- h. to improve the supply and utilization of woodfuel both for industrial and domestic use;
- i. to minimise environmental damage of energy production and consumption, particularly woodfuel and
- j. to promote research and development.

The objectives of the FNDP cited above are all general and do not have a direct bearing on women although to some extent they touch on the welfare of the women; for example, in matching supply and demand, and in improving household energy wherein most of the end users are women, etc. No specific objective addresses women as a specific target group.

The Urban Household Energy Programme focusses on the following objectives that have a bearing on women's energy-welfare:

- a. to provide energy to low income urban households at affordable prices and at minimum economic cost to the economy; and
- b. to develop sustainable methods of exploiting wood resources and reduce pressure on the environment by charcoal production.

The FNDP also recognizes NRSE's role in supplying energy to rural areas, for example, solar energy for drying, water heating and electricity production, biogas for lighting, cooking, etc. Demonstration projects are encouraged for new technologies to be disseminated to energy needy areas, such as where women have



to walk long distances to collect firewood or where refrigeration is needed for preserving medicines and vaccines for mothers and children. These issues are discussed further in the study.

## 2.0 PROJECT OBJECTIVES

The project aims:

1. to identify the present level of involvement of women in the energy sector with special reference to new and renewable sources of energy;
2. to identify obstacles that hinder increased participation of women in new and renewable sources of energy activities and emphasize on identifying training needs for women;
3. to determine and design a methodological framework and plan of action for enhancing the level of participation of women in the energy sector.

## 3.0 METHODOLOGY

The study involved the collection of data on the present situation concerning the involvement of women in the energy sector with a particular emphasis on new and renewable sources of energy. Data collection was undertaken in three phases:

1. Firstly, a desk review was undertaken. The literature collected dealt mainly with the issues of women in development and was obtained from local organizations involved in energy and/or women's issues. The main purpose of this step was two-fold: to gain some insight into the prevailing situation and to form a basis for planning the interviews.
2. Visits were conducted to institutions identified as being involved in energy and/or dealing with women's issues. A checklist of the following major issues was compiled and responses collected from interviewees:
  - a. An organization's work programme in relation to women's issues to ascertain if the institution was making a deliberate effort to target women or be conscious of their needs with regard to energy, in general, and new and renewable sources of energy, in particular.
  - b. the role that women play at project formulation, implementation and evaluation levels.
  - c. the experience of an organization on women's issues (their problems, barriers or constraints and needs).

- d. the perceived needs of women in relation to their being involved in renewable energy; this included identifying the means by which these needs could be met, so as to redress the situation.
  - e. the role that the institution would play in helping to increase the involvement of women in renewable energy.
3. Thirdly, the projects identified during the second phase were to be visited, so discussions would be held with project managers and beneficiaries to gauge the involvement of women, their perceptions and the success of such projects. However, due to weather conditions and the inability of such projects to receive the study team during specified periods, this was not fully undertaken. However, this is to be done in the near future, since it is the only way to appreciate activities in the field.

This approach was deemed most suitable for the limited time within which this study had to be undertaken. The limitations of the approach should be appreciated: it was not possible to draw out a sample of women in urban, peri-urban and rural areas, and solicit their attitudes and experiences in energy. The study instead targeted institutions and individuals with experience in energy and women's issues. Hence, the results depict the issues as they are seen more from the point of view of project planners and implementers rather than from that of women as beneficiaries or users of energy.

#### 4.0 INSTITUTIONAL FRAMEWORK

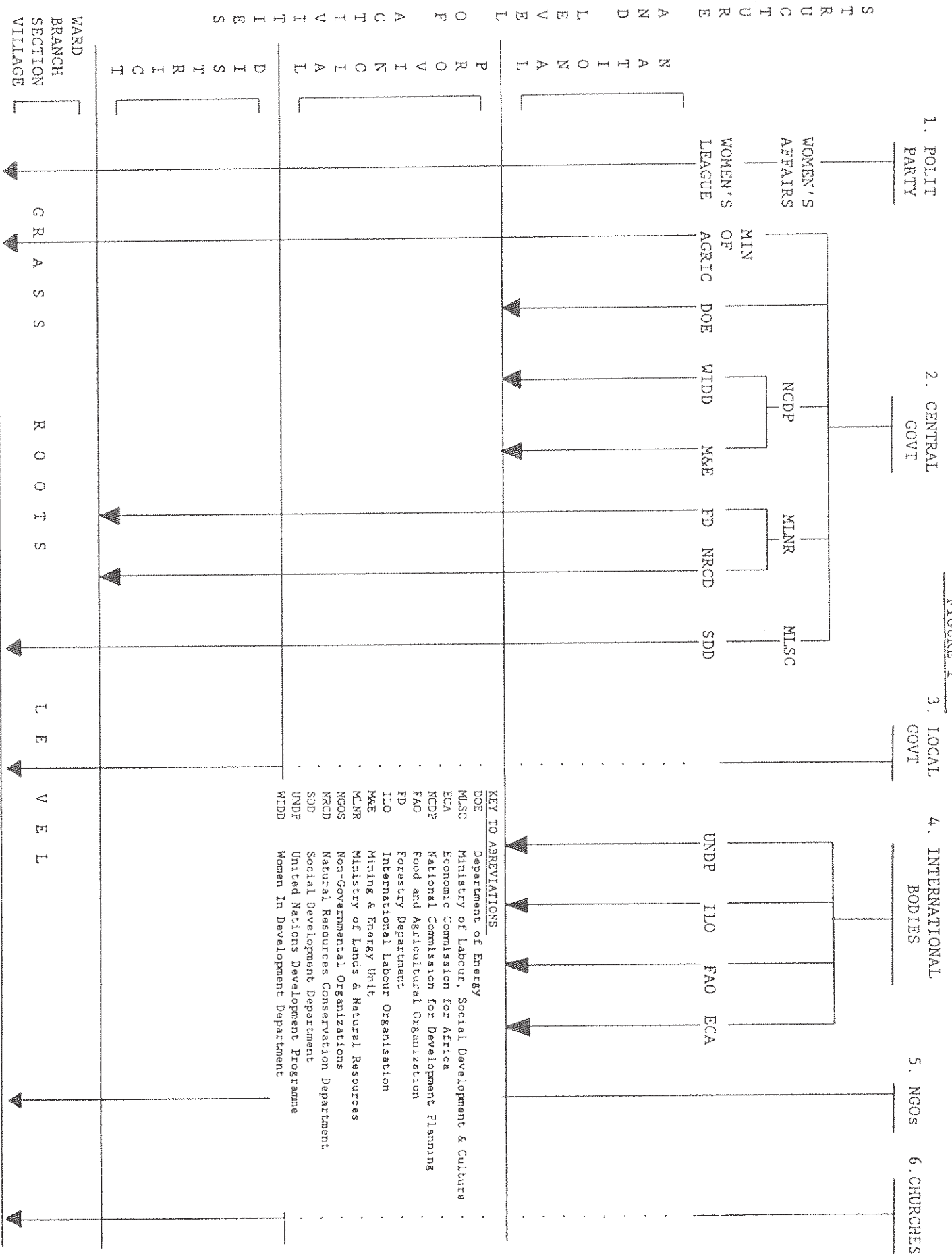
##### 4.1 Introduction

The institutional framework and infrastructure for the promotion and support of women in the political, economic and social spheres exists. Presently, there are many political parties, central and local government departments as well as local and international non-governmental organizations undertaking development projects and programmes that have a bearing on the special needs of women.

The organizations that make up the institutional framework for the promotion and integration of WID present an "already in place" infrastructural base for carrying out the women and energy programme. The experience and capability of institutions at all levels of the energy system can be strengthened further with an infusion of skills and training resources. The improved institutions can serve as effective channels for implementing various energy programmes and projects. This includes training women at all levels of the project cycle, application of NRSE technology use, and transfer of repair and maintenance skills.

Broadly, the Women and Energy institutional framework should reflect all institutions dealing with the management of energy supply as well as energy demand. In this section, some important institutions with a direct bearing on women and energy as well as those institutions with the potential to promote the role of women in the energy sector, are presented (see figure 1).

FIGURE 1



## 4.2 Political level

### 4.2.1 Women Affairs Sub-Committee

At the highest political level is the Women Affairs Sub-Committee of the Central Committee of the ruling Party UNIP. The Central Committee of UNIP is the highest policy making body of the country. The Women Affairs Sub-Committee was set up in 1983 to formulate policies that promote the interests of all the women in the country. The Sub-Committee is headed by a woman, assisted by a woman Permanent Secretary. Currently, there are no women in the Sub-Committee who are formally trained in energy or energy related issues.

The status enjoyed by the Women Affairs Sub-Committee to formulate national policies on women issues for the government will in the future be confined to party policies following the introduction of multi-party politics in Zambia.

### 4.2.2 Women's League

The Women Affairs Sub-Committee is supported in its work by the Women's League, a UNIP mass organization formed in the pre-independence days to disseminate UNIP policies. During the One Party State System of the past 17 years, the League has also disseminated Government policies as well at provincial, district, constituency, ward, branch, section and village level. Thus, the organizational structure of the Women's League represents a comprehensive system through which political as well as development policies have so far been channeled and disseminated from the highest policy making body in the land to the grassroots level in the villages.

Members of the League have not been formally trained in energy issues although some have participated in seminars and workshops on dissemination of NRSE technologies. Consequently, involvement in energy programme and project formulation, evaluation and implementation is quite marginal.

While the structure of the League has presented the necessary infrastructure through which development issues affecting women could be channeled, the new situation of political pluralism requires that a new apolitical institution be created so as to work on a non-partisan basis. Therefore, the formation of a Ministry of Women's Affairs has been suggested.

## 4.3 Central Government level

At the central government level several Ministries and Departments exist. Some of these deal directly with WID issues (like the WIDD at the National Commission for Development Planning) and others are less directly connected to specific women issues.



#### 4.3.1 National Commission for Development Planning (NCDP)

##### 4.3.1.1 Women in Development Department (WIDD)

At the central government level, the WIDD at the NCDP is responsible for coordinating the development policy objectives of the various sectors of the economy as well as the foreign resource mobilization.

This newly formed department, like its predecessor the WID Unit, is made up of only 4 women professionals and has serious staff constraints besides limited data and information on various women's activities in the country. There are moves to recruit more professional staff.

The objectives and functions of the department are based on ensuring the full implementation of the WID objectives, as set out in the Fourth National Development Plan. These include the following:

- i) to ensure the full integration of the women in the development process and confirm they equitably contribute to and benefit from the development process;
- ii) to develop and promote a WID Integrated Package which should form part of the guiding principles of all programmes, plans and projects in the country;
- iii) to ensure that all planners, policy-makers, government officials, party functionaries, donor agencies, etc. are fully aware of the needs and means to integrate WID, and that all planning takes into account the needs, concerns and issues of women;
- iv) to develop guidelines to line ministries and departments, non-governmental organizations, donor agencies, etc., on integrating women in all programmes and projects, and on coordinating their operations;
- v) to ensure the realization of the objectives of the WID chapter in the FNDP in all sectors and at all levels;
- vi) to translate macro-economic policies into development plans and programmes, and to ensure their realization;
- vii) to design a mechanism for ensuring that women participate in the identification, formulation, implementation and evaluation of all programmes and projects, whether specifically designed for them or not;
- viii) to promote research and data collection on women, and ensure that any empirical data on women, in their varied roles, are fully utilized by development policy analysts;

- ix) to improve coordination and collaboration among ministries, departments, NGOs, bilateral and multilateral agencies with regards to WID programmes and projects;
- x) to develop and maintain closer liaison with other national, sub-regional, regional and international WID structures and machineries.

Currently the department has one consultant as advisor, one principal economist, two senior economists and one economist. Several other positions, including Director, Assistant Director, one Principal Economist, two Senior Economists and seven Economists are to be recruited in the near future.

An interesting aspect of the organization's structure is that it reflects only the economists' positions. Given the multi-disciplinary nature of WID issues, this could handicap the effectiveness of the department in discharging the above functions. A recommendation for review of the composition of the department to include other disciplines has been made.

None of the department's staff are formally trained in energy or energy related subjects, consequently despite being in charge of national WID issues, the capability and effectiveness of the department to formulate and deal with energy related projects and programmes is minimal. To improve the situation in the short-run, WIDD must establish technical contact points in specialized institutions and open a channel of communications with agencies such as the DOE and NCDP's Mining and Energy Unit.

#### 4.3.1.2 Mining and Energy Unit

The Mining and Energy Unit in the Sectoral Planning Department of the NCDP is responsible for coordinating the government's Energy and Mining policy objectives. It is also responsible for the national energy plans. The Unit is supposed to have at least three professional staff. To date, the Unit has been manned by one professional at Senior Economist level. This critical staff situation has seriously handicapped the Unit from achieving its stated objectives. To date no special links have been forged with WIDD to provide technical advice or input. The constraints in the Unit's manpower needs to be seriously addressed, if the UNIT is to provide any technical input in projects and programmes designed in the WIDD. At least four more people trained in energy issues are required by the Unit.

#### 4.3.2 Department of Energy

The Department of Energy (DOE) in the Ministry of Power, Transport and Communications has the primary role in energy planning and policy formulation.

Working in conjunction with the National Commission for Development Planning and other line ministries, departments and a cross-section of organizations that together form the Energy Sector Development Committee, the DOE drew the Energy Fourth National Development Plan, 1989-1991.

The DOE has a New and Renewable Sources of Energy Section, manned by two male mechanical engineers. There are no women in the NRSE Section. The Section's objectives and functions include formulation, promotion and implementation of NRSE projects and programmes. The Section is also supposed to look at the improvement of rural energy supply and consumption. There is need to further strengthen the Section to advise on policy issues and implement programmes, such as women and NRSE.

The DOE also had the following sections, Energy Economics, Energy Planning Section and Energy Conservation and Management. There are three energy planners two of whom are energy economists. There are no women in the Energy Conservation Section.

In general, the Department of energy is capable of providing technical support to institutions on matters of energy. In this respect, it is recommended that a technical contact person, with the necessary experience and capability, should be appointed to liaise with WIDD at NCDP and to provide technical advice on women and energy issues.

#### 4.3.3 Natural Resources Department (NRD)

The Natural Resources Conservation Department falls under the Ministry of Lands and Natural Resources (MLNR). The objectives and functions of the NRD are:

- i) to look after the natural resources in areas outside the national parks and national forests;
- ii) to be responsible for conservation in open lands, Chiefs' areas, trust land; and
- iii) to ensure appropriate use of natural resources.

Day to day duties include monitoring the environment, rehabilitation work where the environment has been degraded, environmental education to make the general public aware of conservation concepts and caring for the environment.

The organizational structure of the NRD comprises of a Director, Deputy Director, Senior Natural Resources Officers, Natural Resources Officers and Assistant Natural Resources Officers. Apart from its headquarters in Lusaka, the NRCD has offices at provincial and district levels throughout the country. At the headquarters, the NRD has an Environmental Protection Unit, an Extension and Publicity Unit, a Resources Management Unit and co-ordinating provincial units.

The level of participation of women in the NRD is low. There are only five professional and technical women working for the NRD; one Senior Natural Resources Officer with the Environmental Protection Unit at headquarters; one Provincial Natural Resources Officer (Senior Natural Resources Officer) responsible for the Copperbelt Province; one District Natural Resources Officer in-charge of the Lusaka Province; and one Assistant Natural Resources Officer in-charge of Solwezi District; and one Assistant Natural Resources Officer in-charge of the Lusaka Urban District. Roughly, there are only five women out of a staff of 66 professional and technical staff.



The NRD programmes and projects include rehabilitating environmentally degraded areas, for instance, deforested areas resulting from land opened up for agriculture and energy purposes; encouraging afforestation programmes for conservation and provision of woodfuel for energy. One of the most successful of such programmes is the Chongwe woodfuel project, situated about 50 kilometers east of Lusaka. There are similar projects in Western, Southern and Copperbelt Provinces where natural forests can regenerate at a rate equivalent to wood consumption.

The Extension and Publicity Unit is responsible for producing materials for disseminating conservation measures. These include calendars and radio messages on environmental issues. Newsletters and brochures were published in the past to serve the same purpose but this has now been discontinued due to serious financial constraints. The NRD is also actively involved in organizing and running seminars and workshops at national, provincial, district and village level in order to disseminate environmental concepts to the general public.

The NRD has a number of Committees that set policy at national, provincial and district levels. At the very top is the National Resources Advisory Board comprising of technical officials from the departments of agriculture, forestry, veterinary, water affairs and the national parks in addition to five independent members from the general public, picked on the basis of their recognized knowledge and interest in conserving the environment. There are also Natural Resources Conservation Technical Committees at Provincial and District levels. It is interesting to note that while there are no women on the National Natural Resources Conservation Advisory Committee, women's participation on provincial and district committees is also extremely low.

The NRD is conscious of women's role in energy and regularly encourages and involves women in community projects, such as afforestation and in village seminars. The trainers and organizers of village seminars are mostly men.

The NRD has no one formally trained in energy issues. Assistant Natural Resources Officers are normally Grade 9 school leavers while Natural Resources Officers are normally Grade 10 school certificate holders. There is a particular problem at district level where very few officers have undergone training. To alleviate this situation the NRD regularly organizes in-house training, and provides international publications and magazines, so the staff are kept abreast of world developments. Senior Natural Resources Officers normally have a diploma certificate or BSc degree while others have certificates in agriculture.

To alleviate this critical shortage of trained manpower the Provincial Natural Resources Officers who possess diplomas should be trained at the undergraduate level, District Officers by a diploma course and Assistant Natural Resources Officers by a certificate level. In addition, in-house training should be continued. The low representation in the institution is largely due to the fact that few women have any background or training in either environmental sciences or energy issues. This has precluded their selection on committees that set policy.



#### 4.3.4 Forestry Department

The Forestry Department, like the NRD, falls under the Ministry of Lands and Natural Resources and has a direct and indirect bearing on the role of women in the energy sector both as suppliers as well as users of woodfuel. This is because the department is charged with the responsibility of establishing, managing, conserving and protecting national forests, which are the source of woodfuel. In addition, the department provides licenses, sales and forestry produce as well as deals with related matters.

Despite women's significant role in the woodfuel systems, both as gatherers and users of wood, the department has no programme to date that specifically targets women.

The department undertook a Wood Energy Consumption and Resource Survey in conjunction with the FAO, between 1984 and 1986. Women were not included as enumerators on grounds that the long distances and taxing camping conditions were too strenuous.

The staff of the department have not had any formal training in energy and energy related subjects. Furthermore, there is currently only one professional woman working for the department. The Forestry Department should re-orient some of its objectives and programmes to reflect the role of women as far as wood as a source of energy is concerned.

#### 4.3.5 Ministry of Labour, Social Development and Culture

At central government level, at the Ministry of Labour, Social Development and Culture, the Department of Social Development is directly responsible for Women's Programmes.

##### 4.3.5.1 Social Development Department

The Social Development Department has an infrastructure of women's clubs around the country, which are the focal point of development needs. There are about 1,900 clubs with a total membership of approximately 23,000.

The main focus of activities in the women's clubs are to provide elementary training and awareness programmes that centre on economic and social welfare, nutrition, home management, child welfare, sanitation and income generating activities.

These Women's Clubs are autonomous bodies. The Department of Social Development provides team leaders for such clubs. The Department also coordinates its activities with other institutions like the NCDP, Volunteer Services, NGOs (e.g. the Young Women's Christian Association that has promoted energy saving devices) and the Keembe Demonstration Centre (that holds demonstrations on water storage, solar dryers, stoves and cookers for women).

In terms of an already existing framework and plan of operations for involving women in the energy sector activities in the country (especially NRSE technologies), the link between the Department of Social Development and the

Women's clubs presents another opportune transmission mechanism in place, for training women and dissemination of NRSE technologies directly to them, as end users.

The department, because of its close links with women at the grassroots level, appears more sensitized about the role of women both as educators and as essential contributors to development.

The department has also noted the heavy burden of women as mothers, educators, food producers and so on, and has encouraged women's clubs to form cooperatives.

In terms of NRSE technology dissemination, the department lacks exposure and follow-up action on device utilization. Their professional officers, trainers and organizers of community programmes require exposure to energy issues, in particular NRSE, through sensitization programmes, demonstration and training.

#### 4.3.5.2 Provincial Departments of Social Development

The organization of the Social Development Department at the Central Government level of the Ministry of Labour, Social Development and Culture is generally replicated at Provincial level in the nine administrative provinces of Zambia.

Provincial Social Development Officers are responsible for social development activities of the parent Ministry in the provinces. These activities include functional adult literacy programmes, home economics, income generating projects, health and hygiene, nutrition and other similar activities. These activities are conducted at centres and at Women Clubs.

In Lusaka Province, for instance, there are 53 women's groups, where the main programmes include literacy, women's organization, social casework services, minor self-help works (in construction on a self-help basis, such as feeder roads, rural health centres, schools and so on), awareness programmes to enlighten people on current social issues and participating in fairs and shows at ward, district, provincial and national levels.

Provincial Social Development Departments are also responsible for training Community Development Officers of the Local Government Authorities at district level. At the grassroots level, the Provincial Social Development Departments co-operate and collaborate with other institutions, such as the Church, Provincial Women's League and other Party bodies, the District Councils and NGOs in carrying out some of the community programmes and projects.

Problems and constraints facing the work of the Provincial Social Development Departments include lack of transport and fuel to visit and manage programmes at the centre. Another crucial constraint concerns the lack of means to disseminate information and programmes, such as radios, stationery, inadequate trainers and other staff. In the past, radios played a useful role in disseminating information to listening groups formed all over the country. For instance, radio programmes like "Literacy Corner", aired at particular times of the day and week, would simultaneously reach hundreds of clubs and thousands of

people throughout the country. This powerful means of communicating development issues no longer functions due to lack of radios, lack of batteries or poor radio reception which have hampered the programme.

It is recommended that the means of dissemination should be revamped if dissemination of NRSE technologies and their applications are to have a chance of reaching the target groups in the rural areas.

#### 4.4 Local Government Level

##### 4.4.1 District Councils

All district councils in Zambia are supposed to have Social and Community Development Departments under whose auspices women's programmes and activities are organized.

Women's socio-economic clubs are formed to promote social welfare, home management skills, home economics, nutrition, health and sanitation, and training in energy activities.

##### 4.4.2 Lusaka Urban District Council (LUDC) - Community Development Department

The Lusaka Urban District Council has a Department of Community Development for urban dwellers. At the top of the organizational structure is the Chief Community Development Officer (CCDO), a woman, assisted by three Senior Community Development Officers (SCDOs) (all men), six Community Development Officers (CDOs) and 28 Assistant Community Development Officers (ACDOs). After the ACDOs are 38 Community Development Assistants (CDAs).

This structure reflects the size of the area covered. Lusaka Urban is covered by seven CDOs (five of whom are women) who are assisted by ACDOs. The CDAs help in organizing community groups, such as women's clubs, that conduct activities on home economics, cookery, hygiene, pre-school, sports and adult literacy programmes. No activities related to energy issues are conducted in these clubs. The success of these clubs varies with the quality and organizational ability of the organizers.

Constraints confronted by these organizers include quick loss of interest in programmes by women. This can be resolved by making programmes more interesting and practical. Women have been found to respond to organizers if they believe programmes enhance the well being of families. During the rainy season most programmes come to a halt due to the weather conditions as well as the agricultural activities. According to the Community Development Department, women get discouraged when they are not treated as adults by trainers, as might occur due to a poor approach in training or lack of communication skills by organizers. The time factor also plays an important part in the success of women programmes. For instance, mornings are normally not suitable to women as they are busy cleaning their homes, preparing meals or performing other household chores.

The attitudes of husbands is a crucial factor in determining the level of women's participation in community programmes or club activities. Traditionally



women must seek permission to participate, so their husbands need to be sensitized on this issue.

Other constraints are the lack of home visits by CDOs. Culturally, reciprocity is very important to cultivate interest. Most women in these clubs feel their visits to the clubs should be reciprocated by the organizers. The different household backgrounds is also crucial in holding women's clubs together. On the whole, organizers need to have special tact and skills in managing the club.

Socio-cultural factors in development are very complex, especially in an ethnically diverse country like Zambia. A short study on the socio-cultural attitudes and customs would be useful in providing a manual and guidelines on the best methods of disseminating information on NRSE to adults.

#### 4.5 Non-Governmental Organizations and International Organizations.

##### 4.5.1 Non-Governmental Organizations (NGOs)

A number of NGOs are actively involved in promoting women's interests. In terms of Women and Energy, there has been too much emphasis on charcoal and wood stoves. A comprehensive approach that looks at all forms of energy and accompanying technologies needs to be adopted. Management of energy resources and environment requires an understanding of the whole range of available energy options, their advantages and disadvantages, their link to everyday tasks and activities to provide alternatives.

##### 4.5.2 Danish Volunteer Service (DVS)

The DVS is a volunteer organization involved in various development projects in the nine provinces around the country. Presently, DVS has prioritised projects in North-Western, Luapula, and Eastern Provinces. When initiating projects, according to the policy, all the links of the development chain, i.e. nutrition, health and agriculture, are supported. About 60 volunteers are distributed among the following sectors: health and social welfare, education and culture, agriculture, manufacturing and management. Broadly defined, the volunteers' aim at improving living conditions for the poor and underprivileged groups in the society including:

- \* Small scale farmers and youth in rural areas
- \* Unemployed youth in the urban areas
- \* Women in general and single mothers in particular
- \* Physically and mentally handicapped
- \* Liberation movements and refugee communities

The DVS has some integrated projects on women with special interest on environment, participation and gender-issues, and works closely with governments and NGOs (i.e. community based groups).

DVS programmes are integrated and not specifically targeted at women. Energy related projects include Save Charcoal Stoves at Katundwe Multi-purpose project in Luangwa where mud stoves are used, tree planting for firewood in



Siavong and Ukwimi Refuge Centre. The participation of women in energy issues is low at the grassroots level.

#### 4.5.3 World Vision International (WVI)

World Vision International is a Christian relief and community development organization which targets the needy, including women and children, in areas of education, health, agriculture and income generating ventures. These activities are carried out in all the provinces of Zambia.

Only four professional women are employed in the organization with the majority being men. At the senior level, the Executive Assistant Communications is the only woman, while at middle management level two Area Managers out of six are women. The WVI also has a WID Unit which, until recently, was run by one woman and WVI intends to recruit a woman replacement.

Project areas normally cover a 15 kilometer region. A management committee, elected by the targeted group, runs the project. The key role of WVI in the project is to secure resources from sponsors and direct them into the project area.

Operational links include inviting local government authorities and politicians to create contacts with the project. WVI has also pointed out the need to create contacts with other NGOs in the project area and create channels of communication with the WIDD at NCDP.

Constraints and problems faced by WVI in carrying out its work include unsupportive attitudes in areas where there is a slow progress, poor mobility to and within project areas, and inadequate resources in the community projects. Granted resources, the WVI, like the DVS, has the infrastructure to advance women's activities at the grassroots level in the energy sector.

#### 4.5.4 Non-Governmental Organization Coordinating Committee (NGO-CC)

The NGO-CC oversees all the work of NGOs affiliated to it in Zambia. Some of its affiliates include the Zambian Alliance of Women and Volunteer Services.

The NGO-CC has trained women in conjunction with the Management Services Board (MSB) on various issues. Involvement in energy issues include clay stove making to conserve energy. In general, the NGO-CC presents a framework for co-ordinating the activities of women in the energy sector at the grassroots level.

#### 4.5.5 The Young Women's Christian Association (YWCA)

The YWCA was formed in 1957 to cater to the interests of women in order to achieve a better community. It is the oldest and most established women's organization in Zambia. Despite being a Christian organization, the YWCA caters to all women regardless of race, religion, politics, age or income level. The YWCA has programmes aimed at enhancing the quality of life by: increasing income levels, ensuring basic health needs are met, reducing the workload of rural women, developing leadership and self-confidence, promoting self-reliance,

showing a concern for the environment, etc., basically working towards a more just society.

Apart from carrying out programmes on skills training in agricultural practices, craft production, tailoring, leather-work and pottery, the YWCA has been conducting a number of other activities, such as fish farming, primary health care activities that include AIDS awareness workshops, control of diarrhoea diseases, family planning, training community health workers and immunization. The YWCA has also been playing an important role in the dissemination of appropriate technology and energy activities and information on mud stoves and drum ovens for baking, solar driers to preserve fruits and vegetables, pumps to ease the burden of drawing water, improved mbaulas to conserve energy, Ventilation Improved Pit (VIP) latrines for better sanitation, workshops on energy and utilization of some solar energy devices.

The YWCA is also involved in a conscientization campaign aimed at increasing awareness of social and economic issues that have a negative effect on communities. It has worked towards promoting a positive social change in Zambia, particularly from the women's perspective. The organization has 21 locations throughout the country.

#### 4.5.6 Human Settlements of Zambia (HUZA)

HUZA is a social and economic development programme with emphasis on human settlements and related issues of housing, water, food, ecology, nutrition, employment generation, adult education and so on.

HUZA's programmes are specifically targeted at generating income amongst women, such as design and tailoring, handcrafts, block making, construction and maintenance of infrastructure. The strategy of the programme is to identify multiplier effects of projects by starting with small groups first.

HUZA is also involved in energy activities which include the Charcoal Stove Project. It is also the contact point of the SADCC NGO. Women have also been involved in the dissemination and evaluation of the stove project.

#### 4.6 Training and Research Institutions

The National Council for Scientific Research (NCSR) and the University of Zambia Technical Development and Advisory Unit are the main organizations with the technical and scientific capability to undertake technical research on NRSE technology in the context of women and energy.

There are a number of training and research institutions that conduct research on issues affecting women and disseminate findings and information on WID. However, none were found to be carrying out specific research on women and energy. Lack of proper educational background has hindered most women from taking up research. At some of the institutions, the level of participation of women in research activities is significant. More women, however, need to be trained if more representative and higher participatory levels are to be achieved.

#### 4.6.1 The Institute for African Studies (IAS)

The IAS is a research institution involved in the following research programmes (a) economic and labour; (b) urban development; (c) health promotion; and (d) social and culture. Some activities cover research on women, although not much has been done on the subject of women and energy. Participation of women in the IAS is significant to several professional women involved in research. One energy study was undertaken on domestic energy in Mporokoso District by a male researcher.

In general, there are no institutions in Zambia that offer courses on either environmental sciences or energy related subjects, although the University of Zambia has been conducting a course on WID for sometime now. It is recommended that institutions of learning re-orient courses to include environment and energy issues.

#### 4.6.2 University of Zambia (TDAU)

The TDAU research programme is currently focussing on small-scale agricultural equipment with hardly any involvement in energy. Previously, TDAU had engaged in work on solar driers but, finding no market, the programme was discontinued. Part of the reason for this failure was that no market research had been done prior to the release of the solar driers. Another device, the solar cooker, had no success due to the significant cultural change required to adopt the technology. Problems of cooking indoors and at night, away from the sunshine, were important factors that impacted against the solar cooker.

### 4.7 Distribution of NRSE Technologies

Currently, two companies market and distribute solar energy technology: Phillips Electrical and British Petroleum.

#### 4.7.1 Phillips Electrical

The company has marketed some PVs, manufactured between 1982-1985, which were targeted at farmers; however, the response has not been good, largely because they were too expensive. Technicians were trained in PV installation and maintenance but women were not specifically involved. There is, however, one woman technician, trained in Germany, working for the company. Any future involvement of Phillips now depends on the economic prospects of the country.

#### 4.7.2 British Petroleum (BP)

BP is very active in the marketing and distribution of solar energy technology. Like Phillips, BP has not made any deliberate effort to target women. It generally holds seminars with institutions but has never involved any women's group as they have found it difficult to identify such groups.

BP provides backup services, guarantees as well as an instructional kit on installation and maintenance. Institutions alone are charged installation fees.



Import and domestic manufacture of solar products have been hindered by government import duties and tax policies in the past. Government must seriously consider less punitive tax policies if NRSE technologies are to gain wider adoption and application in the country. Higher taxes add to the cost of these technologies.

Figure 2 tabulates the main activities of various government institutions and NGOs that are presently involved in the energy sector. Many institutions deal only with a few aspects of the energy project cycle. The Energy Policy Formulation and Planning falls within the domain of the government. However, the government, unlike NGOs, does not deal directly with grassroots operations. The experience from community projects and programmes will provide indicators for a guideline to projects that can succeed at the grassroots level.

#### 4.8 The Level of Participation of Women in the Energy Sector

According to the data available, women constitute over 50% of the population. Despite this, their participation in various socio-economic fields of development is significantly behind that of men.

In the energy sector, the anomalies are quite significant, especially on the supply side involving energy policy formulation, planning, project design, evaluation and implementation. The participation and role of women is much more significant on the demand side involving acquisition and utilization of energy, especially woodfuel.

For the first time in the planning history of Zambia, the current five plan, the Fourth National Development Plan 1989-93, (FNDP), has devoted a whole chapter addressing WID harmonizing and increasing participation of women in socio-economic development. The Plan focuses on the full integration of WID as part of the effort to ensure the fullest possible participation of all sections and communities in the country. According to the FNDP, women constitute 7.3% of wage labour force, 65% of the illiterate population, 30% of secondary school enrollment and less than 20% of University and technical college graduates.

Women make up 60% of the working age population of rural areas and 30% of heads of rural households. It is against this background that the level of participation of women in the energy sector, both the management of supply and management of demand activities, are analysed. The various activities (including supply activities, such as policy formulation, management and planning, project planning and implementation, technology research, production and dissemination and the demand side use of energy) all suggest different levels of participation and different training needs and targets.

To a great extent, the role of women in the energy sector has not been comprehensively dealt with in the FNDP because of the relative newness of the subject and a low appreciation of the critical role of energy, hitherto only perceived in terms of petroleum products.



FIGURE 2

INSTITUTIONAL FRAMEWORK AND ACTIVITIES

INSTITUTIONS INVOLVED								
ACTIVITIES	POLITICAL PARTY	CENTRAL GOVT.	INT'L BODIES (e.g., UNDP, FAO etc.)	DONOR AGENCIES	NGOs	PARASTATAL AND PRIVATE COMPANIES	UNIVER-SITY	RESEARCH INSTITUT-IONS
1. Women in Development	*	*	*	*	*	X	*	*
2. Energy Policy Formulation	X	*	X	X	X	X	X	X
3. Energy Project Identification	X	*	*	*	*	X	X	*
4. Energy Planning	X	*	X	X	X	X	X	X
5. Energy Project Design, Evaluation & Implementation	X	*	*	X	*	X	X	X
6. Energy Technology R & D	X	X	X	X	X	X	*	*
7. NRSE Information and Technology Dissemination	X	X	X	X	*	*	X	X
8. Energy Technology Supply and Support Services	X	X	X	X	X	*	X	X

#### 4.8.1 Policy Formulation and Planning

The FNDP was formulated by committees from a cross-section of society. The WID Committee, responsible for drawing up the five year plan for women, ensured active participation of a cross-section of women from government ministries and departments, parastatals, the private sector, the University of Zambia and NGOs. The background of committee members on energy issues was inadequate and was acknowledged by some committee members as a serious handicap in drawing up the women and energy objectives. As a result the objectives have tended to tackle macro issues and ignored micro issues.

The policy objectives of the Energy Sector show a concern about the threat of woodfuel consumption on the environment and identify women's role as critical since they are heavily involved in the wood collection and its usage. The objectives do not show the micro issues that link the provision of energy to women's tasks and workloads, especially in rural areas. Nor does it show how the introduction of safer and more efficient sources of energy would improve the standard of living of the women especially in rural areas. The policy also advocates identification and development of alternative sources of energy and developing technologies that would promote a more efficient use of energy.

The WID Committee illustrates the highest representation of women at the highest level of policy formulation and planning, in as far as outlining the role of women in the energy sector is concerned. The lack of comprehensiveness of the policy guidelines perhaps is a reflection of the unfamiliarity of most of the members with energy issues.

The Committee Members need to be exposed to awareness programmes on energy for them to formulate effective policies that would increase the role of women in the energy sector. However, since this Committee is unlikely to meet again, future awareness programmes and workshops should be targeted at the other policy makers at Ministerial and Permanent Secretary level.

#### 4.8.2 Managers and Planners

Regarding energy sector management and planning, information gathered indicates the level of participation of women is low and scattered. In the entire government structure, there are no more than four women energy planners, who are trained in energy issues.

##### 4.8.2.1 The Government Sector

At the NCDP, the institution responsible for policy coordination and external resource mobilization, there are no professional women formally trained in energy issues and energy related studies. Worse still, the Energy Unit has neither men nor women trained in energy policy formulation, analysis or energy project evaluation. The sole officer in charge of the Energy Unit and many others at NCDP are, however, all university graduates whose training needs would be mainly re-orientation through short and long term courses as well as attending seminars and workshops on energy issues.

The National Energy Council has one professional woman with formal training in energy economics. However, the future of the Council is uncertain and, as such, it is difficult to suggest any training requirements.

The Department of Energy, with two energy economists, has the highest number of women formally trained in energy related studies. More women need to undertake courses that can allow them to offer high quality technical support services to other institutions dealing with women and energy issues.

At the Ministry of Labour, Social Development and Culture one professional woman in the Social Development Committee has had some training with solar energy, by attending a seminar in India. It is important for officers in this Department, who interact as trainers with women's clubs at the grassroots level, to be exposed to demonstrations of NRSE technologies so to raise their awareness.

#### 4.8.2.2 The Private Sector and NGOs

There are a number of women working for various NGOs dealing with women's programmes. On women and energy, the largest number of women are engaged in disseminating improved charcoal stoves. This over concentration on charcoal and mud stove dissemination is largely due to the limited use of other NRSE.

#### 4.8.2.3 Research and Development

There are no women involved in the research and development of NRSE of energy.

#### 4.8.2.4 Project and Programme Implementors

Most of the women in this field are involved in disseminating improved charcoal and mud stoves although none are involved in disseminating information on NRSE or implementing and supervising NRSE projects.

#### 4.8.3 Energy Producers and End-Users

In the traditional energy sector the gathering of firewood and utilization is predominantly done by women. Charcoal production, however, is predominantly done by men.

In general, national level data on the exact numbers of women at various levels of the energy sector is difficult to establish without a full census. In the absence of such figures, the table below indicates the level of women's participation in energy sector activities by institution.

FIGURE 3

THE LEVEL OF WOMEN PARTICIPATION IN ENERGY SECTOR ACTIVITIES

Institution/ Organization	Policy and Planning	Project Implement	Project Monitoring	Technology dissemination
Women's League	Non-existent	Non-existent	Low	Low
NCDP-WIDD	Non-existent	Non-existent	Non-existent	Non-existent
NCDP-M&E	Non-existent	Non-existent	Non-existent	Non-existent
Nat Res Dept	Very low	Fair	Low	Non-existent
Forestry	Very low	Low	Low	Non-existent
MinLSC	Low	Low	Low	Low
Prov. SDD	Very low	Low	Fair	Low
Dist. Counc.	Low	Fair	Fair	Low
UNZA-TDAU	Non-existent	Non-existent	Non-existent	Non-existent
Private Cos.	Low	Low	Non-existent	Non-existent
YWCA	Fair	Fair	Fair	High
Other NGOs	Low	High	High	Low

Key

NCDP - National Commission for Development Planning  
 WIDD - Women in Development Department  
 MLSC - Ministry of Labour Social Development and Culture  
 UNZA - University of Zambia  
 TDAU - Technology Development and Advisory Unit  
 YWCA - Young Women's Christian Association  
 NGOs - Non-Governmental Organization



## 5.0 NEW AND RENEWABLE SOURCES OF ENERGY

### 5.1 Definition

The term "energy" itself seems to be little understood; consequently, the term "new and renewable sources of energy" is even more obscure. Therefore, the following definition of the term is provided.

Firstly, the term New and Renewable Sources of Energy (NRSE) refers to a diverse set of energy sources and generally has two meanings: one refers to the nature of the energy source and the other to the method of application of the energy technology. In relation to the nature of the energy source, renewable energy refers to those sources that are or can be renewed as the energy is being drawn from them, notably solar energy, wind power, water flow and vegetative matter (biomass). Solar and wind energy are naturally inexhaustible; water flow is replenished annually while biomass, as for example, wood, can be renewed depending on how the exploitation of the resource is organized. Matched with conservation measures, such as efficient production of wood products like charcoal and more efficient stoves as well as good forestry management and afforestation, wood is certainly a renewable source of energy. This is in contrast to oil or coal which take millions of years to form and, hence, are exploited faster than they are formed.

In relation to the method of application, renewable sources of energy are usually exploited in a decentralised and localised manner. In this regard, a renewable energy technology is one that uses a local resource to meet a local energy need. Of course, there are exceptions to this, as for instance one finds large-scale centralised installations of solar photovoltaic panels and windmill farms supplying power to very large communities. However, in general, renewable sources of energy are localised in application, meeting relatively small energy requirements of a small community. Hence, although, water flow is a renewable energy, big hydro-electric power plants are not considered as being in the category of renewable energy; water flow is "renewable" when it is exploited as micro or mini-hydros (up to 1 MW of installed capacity). The distinguishing factor for this definition is both organisational and environmental. To qualify as a renewable source of energy, an energy application must do little or no harm to the environment. Dams for big hydro-schemes cover tens to hundreds of square kilometers, burying many trees and animals and forcing communities to leave their traditional lands in search of other settlements. Furthermore, such schemes are managed and controlled by large companies and the demand for energy may be many hundreds of kilometers away, necessitating huge investments in transportation of the generated power. Renewable energy technologies or projects on the other hand, are usually small in size, installed at or near the point of demand with the local community either in control or at least involved in the installation and operation of the technology.

Secondly, NRSE may be grouped into three categories namely, biological, non-biological and animate energy. The biological field includes wood, crops, agro-industrial wastes and animal wastes and is called biomass. The non-biological category includes solar, wind and mini-hydros while animate energy

refers to energy provided by humans and animals (draught animals). This study deals only with the first two categories.

## 5.2 Government Policy

Since 1979, mainly in response to the oil crises of the 1970's, the government policy has focussed on developing renewable forms of energy, especially those likely to compete with or complement conventional sources, particularly petroleum.

In the ensuing two five year development plans, specific programme proposals have been included concerning research and development in solar, biogas and wind energy. Demonstration and pilot projects on proven technologies have also been proposed. In the current plan (1989 - 1993), for instance, it is specifically mentioned that efforts must be made to "promote research and development in new and renewable sources of energy" as one of the energy objectives to be attained. Concerning woodfuel, it is the intention to achieve an improvement in the "supply and utilisation of woodfuel... for household use throughout the country".

Despite these laudable statements, the government has accorded insignificant funds towards the promotion of renewable sources of energy. This is exemplified by the fact that hitherto only less than 1% of the total energy budget has been allocated to renewable energy.

## 5.3 Resource Base and Potential Applications

### 5.3.1 Resource Base

The data available on the resource base of renewable energy is rather scanty. This is partly due to the diffuse nature of a number of these resources rendering it extremely difficult to take a comprehensive inventory of the resource availability. However, enough is known about the general picture of the situation to confirm that the country is well endowed with NRSE.

Zambia has approximately 66% of the land still under wood resources. The wood stock is estimated at 4.3 billion tons of wood giving an annual sustainable yield of about 130 million tons. However, there is an uneven distribution of wood resources in terms of population concentration leading to localised shortages particularly near urban areas (Table 1). For instance, the Copperbelt and Lusaka areas in which about 37% of the population reside has only 8% of the woodland. The high urbanisation of the country (about 42% of the population is urban, CSO, 1990) due to the development of the mining industry, has caused pressure on forest resources to meet charcoal production in urban markets.

Table 1 Forest resources and population distribution

Province	% of Total Population	% of Total Volume
Copperbelt	23	6
North Western	5	25
Western	8	22
Central	9	10
Lusaka	14	2
Southern	12	7
Luapula	7	2
Northern	11	8
Eastern	11	9

Source : Forest Department (Wood Consumption Study, 1986)

#### 5.3.1.1 Agricultural Waste

There is no data on the amount of crop residues available annually. Figures are available only on hectare and crop production since this is the chief concern of the agricultural establishments. Several crops are grown in various parts of the country, the most important being maize which is the staple food. The cultivated hectares for each crop is approximately as follows: maize 700,000; groundnut 80,000; cotton 77,000; sorghum 47,000; sunflower 44,000 and rice 10,000.

#### 5.3.1.2 Animal Waste

As with agricultural waste, no estimate on the quantity of animal waste available for energy purposes has been made until now. What is known is the population and distribution of livestock in the country of the order of 2,000,000 cattle, 600,000 pigs, 425,000 goats and 62,000 sheep.

#### 5.3.1.3 Other Waste

Under this category wood-processing and agro-industrial wastes are included, the latter being exclusively from sugarcane. Wood processing wastes are estimated to be a minimum of 400,000 M<sup>3</sup> annually.

#### 5.3.1.4 Solar Energy

Lying between 8 and 18 degrees South, Zambia enjoys high insolation levels in all parts of the country and almost throughout the year. Global solar radiation is estimated at 4 - 6Kwh/m<sup>2</sup> per day with sunshine hours ranging between 2500 and 3200 annually (ie 60 - 80% of day). Therefore, the potential for utilising solar energy is high.



### 5.3.1.5 Wind Energy

In contrast to solar energy, the potential for wind energy is rather low. In general, wind speeds range between 1.1 - 3.1m/s with an average speed of 2.5m/s. Therefore, the most appropriate application of wind energy is for water pumping.

### 5.3.1.6 Minihydros

A few studies on the minihydro potential have been undertaken. As the motivation for these has been the replacement of the diesel generators providing power to some rural towns, the studies have been limited in coverage (mainly to North-Western Province). However, as part of the formulation of an electricity master plan up to the year 2004 (Ekono, 1985), a study was done in 1984 in which the potential of minihydros was estimated at 45 Mw. Most of this is found in the northern part of the country where there is high rainfall. This is a minimum estimate, since the project only looked at potentials of at least 100 Kw.

## 5.3.2 Potential Applications

The possible application of renewable energies are as diverse as the energy sources themselves. Limiting the consideration to applications relevant to the subject, in the field of biomass, wood can be used directly as firewood or be converted into charcoal, and/or further into gas, using pyrolysis (use of gasifiers). It can be used for cooking, heating, lighting, mechanical power for electricity generation and water pumping. This is shown schematically in Figure 4. Wood wastes in saw-mills can be briquetted or pelletised and used as a domestic fuel (which would require appropriate stoves).

However, it is important to note that wood has other important uses apart from its contribution to meeting energy needs. The multi-purpose nature of wood is seen in its use for construction in the form of poles and beams, as fodder for animals and as a source of fruits, in shade provision and for hedges. This wide range of competing end-uses for wood poses pressure on the wood resources. This implies that in order to manage and satisfy each of these competing uses, proper planning and management in the utilization of this resource must be undertaken.

Agro-industrial wastes such as rice husks and maize cobs can be converted into gas and used for heating and mechanical power. Crops can be grown solely for energy, such as sugarcane and cassava, to make alcohol which may be blended with petrol or used directly to power motor vehicle engines for transportation. Animal wastes, such as pig and cow dung can be converted into biogas using anaerobic digester. The gas can be used directly for lighting, cooking and in mechanical power for water pumping, grinding and electricity generation.

In the non-biological category, solar power can be harnessed through thermal processes or converted into electricity directly by the photovoltaic effect. Through thermal processes, solar energy can be used for water heating, for domestic and process water, crop and fish drying, solar cooking and cooling. The direct conversion of solar energy into electricity by means of photovoltaics can be used for lighting, water pumping, refrigeration and telecommunications. Wind energy can be used for water pumping and electricity generation, although the



latter is impractical in Zambia due to low wind speeds. Micro and mini-hydros are for electricity generation but direct mechanical coupling may be used for grinding and water pumping. The various possible applications are shown in Figure 4.

Zambia exhibits favorable conditions for the application of renewable energy technologies which are particularly found in rural areas. Rural areas have low population density, low energy requirements and scattered centers of energy demand.

As indicated above, rural development is a very important aspiration of the Zambian government. The rural areas in Zambia have certainly lagged behind in development and are characterised by poor standards of living, very low incomes, poor services and amenities.

Although energy is not the problem in rural areas, its shortage does contribute to the poverty of rural life. From the overview of possible applications of renewable energy technologies, it can be seen that renewable energies do have a role to play in the process of rural development. This is shown in Figure 5 which depicts how a number of the renewable energies can be utilised for rural development.

Water for domestic, livestock and agricultural use can be pumped using solar, wind, biogas and other biomass. Electricity for lighting, water pumping, refrigeration and telecommunications can be generated from solar power, biogas and other biomass (by means of gasifiers). In some instances, household energy needs can be met through the use of biogas for both lighting and cooking. Small scale industries can be encouraged if energy is made available for small operations.

The benefits that women would derive from the use of renewable energy are easily identifiable, e.g. water provision. Water supply in rural areas is one of the most critical needs. Women are faced with the heavy burden of fetching water from considerable distances from their homes and the water pumping technologies identified above would help alleviate this chore. Besides obtaining access to clean water, availability of water would provide a potential for increased production, e.g. vegetables. Other uses, such as lighting, would add to improved life in general which would benefit women who are often more affected by poor conditions prevailing in rural areas.

**FIGURE 4**  
**POSSIBLE APPLICATIONS OF RENEWABLE ENERGY**

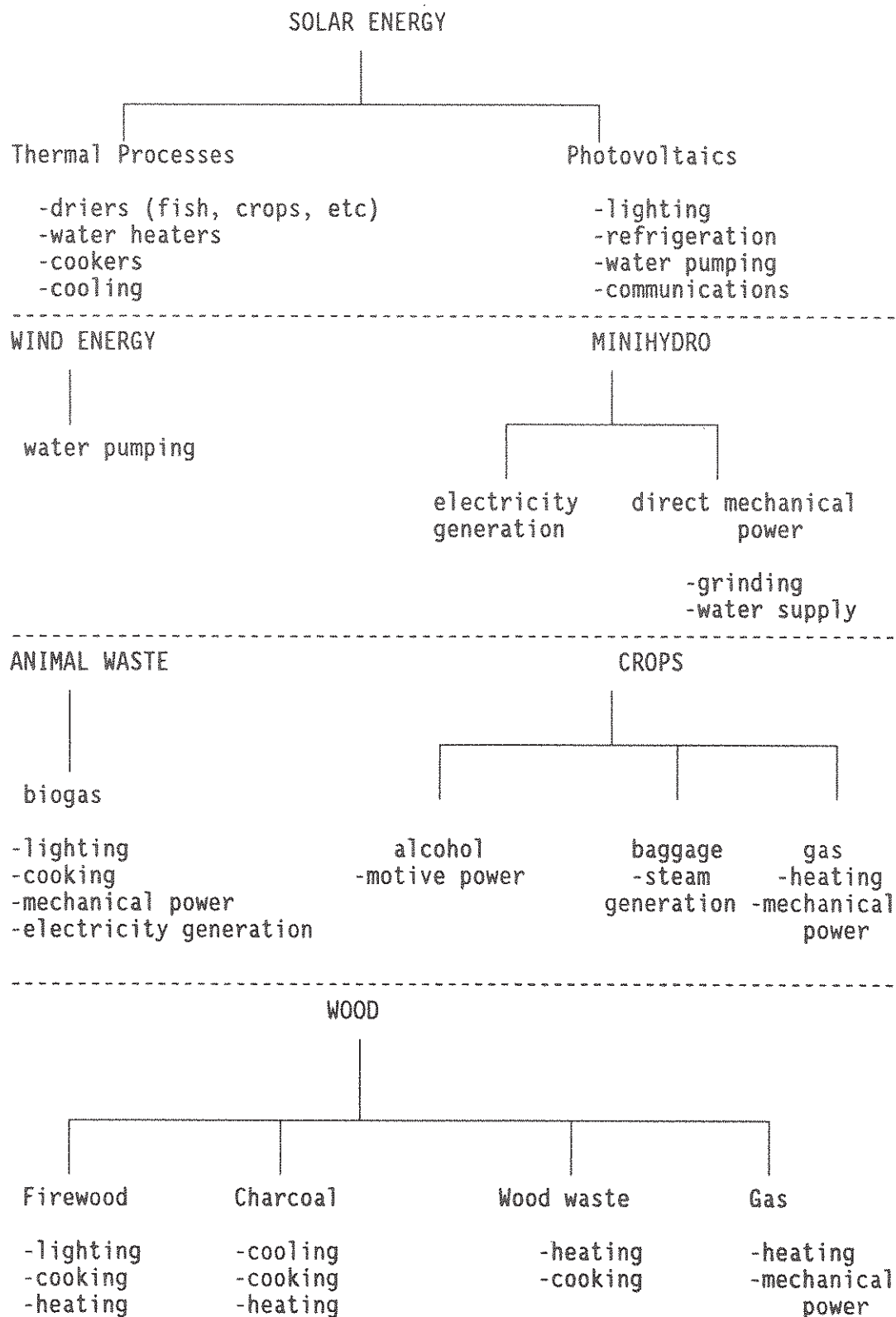
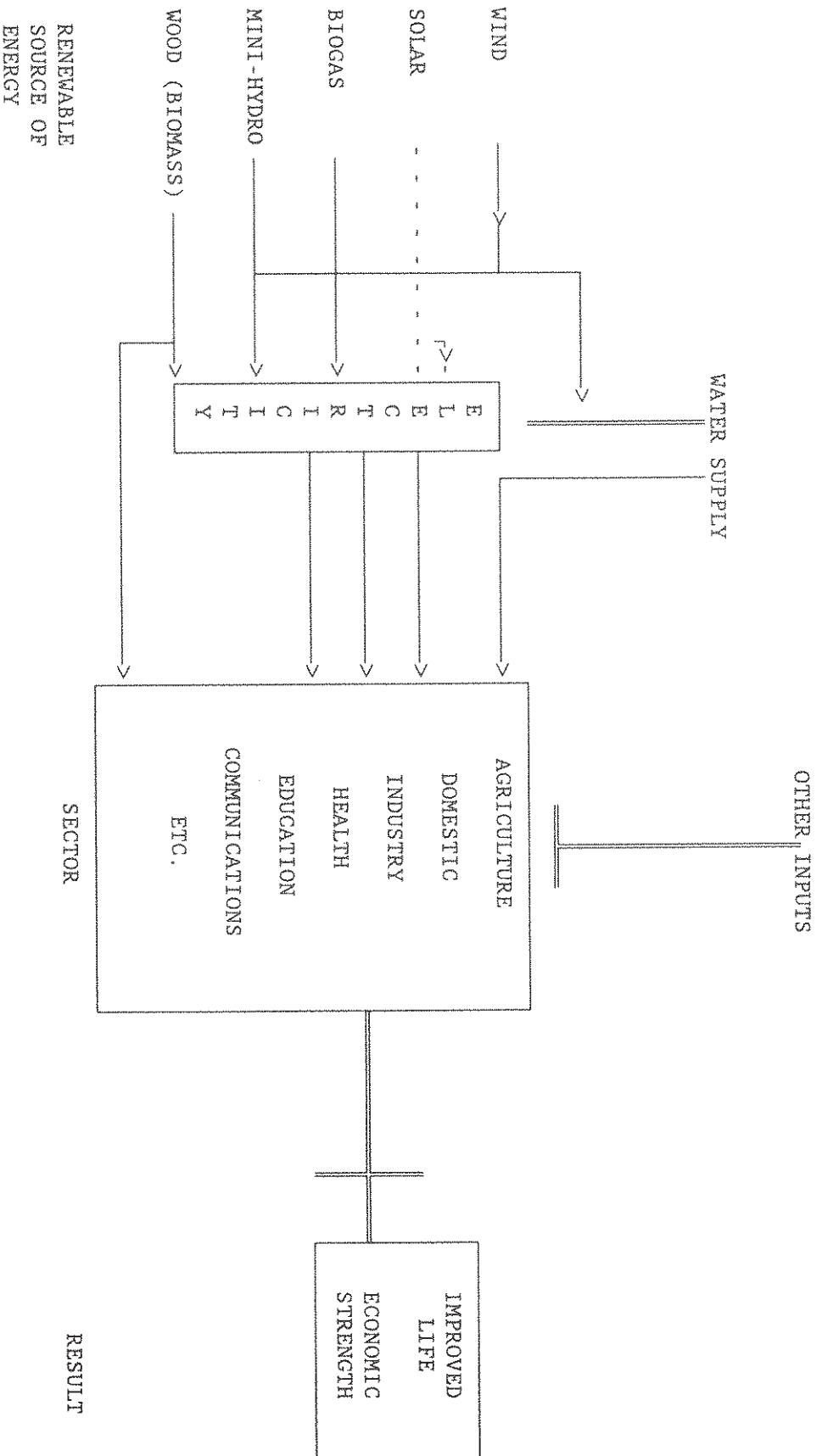


Figure 5

THE CONTRIBUTION OF RENEWABLE ENERGIES TO RURAL DEVELOPMENT



## 6.0 WOMEN AND RENEWABLE ENERGY ACTIVITIES

### 6.1 Urban and Peri-urban areas

Woodfuel. This is by far the most important energy source for the majority of Zambian households. Its significance in the country's energy balance has already been highlighted.

Women play an important role in the provision and utilization of woodfuel. In urban and peri-urban areas where charcoal is predominant (90% of the charcoal is consumed by households in these areas), women are involved in the retailing and use of charcoal with only an insignificant number in production and transportation.

In a study conducted jointly by the Department of Energy (DOE) and the UNDP/World Bank (ESMAP) in 1988 on the charcoal chain<sup>2</sup>, two women charcoal producers were found in a group of 50 producers. The statistical significance of this number cannot be determined since the sample was not random or necessarily representative. Women played the role of either assisting husbands in tasks such as harvesting and bagging which are considered less strenuous and, where she was a producer in her own right, she hired male labour to carry out felling, logging and kiln building. It can only be hypothesized that the low level of involvement of women in charcoal production may be attributed to the arduous nature of this activity which requires a lot of physical strength for the larger part of the process.

In charcoal transportation, it was observed that the involvement of women was in hiring of vehicles to fetch charcoal purchased in the production areas. Among the transporters interviewed during the above study, ownership of vehicles belonged to men despite the fact that for those charcoal transporters, who also were engaged in retailing, it was often the women and children who undertook the retailing on behalf of the men. This is a reflection of the commonly known feature that women frequently have no ownership rights over property, although they may actually contribute to its purchase and/or maintenance.

It is in the retailing and end-use of charcoal that one finds a predominant involvement of women. In the latter, women are solely responsible for food preparation in the home and in market places. As for retailing, women again play the lead role as this is part of general marketing, a sector in which women are active. It would be interesting to investigate the level of ownership of the charcoal being traded and the control of the proceeds from the sales. Charcoal is multimillion kwacha business in Zambia (approx. k2,000 million) and it would be informative to discern those in control of the business and the trade's impact on women in economic terms.

At household level, the use of charcoal is an economic burden to the poor who are dependent on it. During the rainy season when production areas are

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<sup>2</sup> The charcoal chain comprises of wood resources, production, transportation, retailing and utilization.



inaccessible, there are shortages of supply with the consequence that prices rise. Apart from this women are subjected to severe hardships as they have to travel long distances in search of charcoal.

Recently, efforts have been launched at finding alternatives to charcoal. The National Council for Scientific Research has been investigating the technical feasibility of briquetting the slurry from coal processing for use as a domestic fuel. A pilot plant is under construction which is designed to produce 1,000 tons per annum. An appropriate ceramic stove has also been developed. However, the economic viability and acceptability of this fuel as well as its competitiveness with charcoal have still to be determined. The stove also has not yet been field tested for performance and acceptability by households. Evidently, the end-users, that is women, have not been consulted in the design of the stove and the affinity to the fuel, which is a characteristic missing link in most appropriate technology development programmes.

Another potential substitute to charcoal is electricity. As indicated earlier, Zambia has an overcapacity of installed hydropower. This energy resource could be utilized by households, the majority of whom are not electrified (about 60% of urban households). Further, electricity would reduce exposing women to pollutants associated with woodfuel.

The major constraint to electrification is the high up-front costs for households with regards to undertaking the necessary wiring and connection. It is estimated that a household requires about K40,000 (US\$800) to have access to electricity. This is three-and-half times the average income and, since there are no credit facilities for such schemes, it is only the well-off that have access to electricity.

The DOE in conjunction with the Zambia Electricity Supply Corporation (ZESCO) is undertaking a study on the electrification of low income households. Preliminary indications are that for more households to have access to electricity, the up-front cost must be made up by part of the tariff. The potential for the success of this approach depends partially on educating the people to become appreciative of electricity being cheaper than charcoal.

Another major hindrance to the use of electricity is the high expenses of end-use equipments, such as stoves. The DOE is addressing this area by contracting the NCSR to develop a low cost electric hot plate using local materials. The stove is still at development stage. It must be mentioned here also that so far no end-users have been consulted on the design of the stove and no woman is involved in any of the electricity studies.

Two conservation measures have been launched recently to improve efficiency in the production and utilization of charcoal. The Forest Department developed some improved portable kilns which proved unaffordable by most charcoal producers. No women were involved either in the design, marketing or use of these kilns, probably for the same reasons as in charcoal production. The traditional earth clamp method is still the most popular and efficient way of producing charcoal, depending on the experience of the producer. Measures are underway to find means of improving this method through activities such as training of

producers in the management of kilns. However, the benefit of this project to women is not immediately evident.

To enhance end-use efficiency, an improved charcoal stove is being marketed by the Charcoal Stove project which is jointly sponsored by the government and a couple of donor agencies (NORAD and Netherlands). The project involves training tinsmiths in the production of the stove and in demonstrations for users on the most appropriate way of cooking with the stove. Working on metal or tinsmithing is predominantly men's job and, hence, no women are involved at this stage either as trainers or trainees. However, the usage of the stove is contrary to the above. At demonstrations of the stove, it is the women who are the target group. In fact the project has employed 5 full-time women demonstrators to carry out this task.

The project has a wide coverage in terms of area but serious questions have been raised about its success. An evaluation of the project, undertaken by the DOE in 1990, showed that most women do not use the stove regularly, the reason being the stove uses too much charcoal because of the large size of the combustion chamber; therefore, the traditional one was being preferred.

It is noteworthy that women were not involved in the design of the stove which was undertaken by the Engineering Faculty of the University of Zambia. Although the stove was field tested before widespread dissemination, it is not clear whether the stove was accepted at all during the trial period. Results of the field test indicated that about 30% of the households recorded negative savings (Siamwiza R, 1985). Nevertheless, these indications were ignored and widescale dissemination embarked upon. Incidentally, the Zambian improved stove is the traditional stove that is being discarded in Kenya and Tanzania. There is a need to learn from this experience and, perhaps, adopt the Kenyan JIKO which has proved extremely popular in those countries. In Tanzania for instance, the present production capacity of 5,000 stoves per month is inadequate in meeting the demand (Sawe E).

The use of firewood in urban areas is somewhat similar to that of charcoal. Women are involved in the retail and use of firewood for cooking and heating but hardly in production or transportation. It is not known how many are involved in retail as there has been no study undertaken to estimate this. On the other hand, since the level of use of firewood is much less than that of charcoal in these areas, it can safely be assumed that there are less women involved in firewood trading (firewood consumption in urban areas is estimated at 50% that of charcoal in energy terms). A notable difference between firewood and charcoal is that there has been no serious effort to promote the efficient use of firewood in urban areas. There are two related underlying factors: firstly, the use of firewood is inconvenient in an urban context where there is overcrowding, storage is problematic and consequently consumption low; secondly, the contribution of firewood to deforestation is considered insignificant to warrant a concerted effort to improve end-use efficiency. Therefore, any involvement of women would have to be in the area of substitution similar to that discussed for charcoal.



### 6.1.1 Wood Waste

Most of the waste from wood processing is discarded. Only about 5,000m<sup>3</sup> (approx. 1%) is used for energy purposes either as charcoal or directly fed into boilers for steam generation to dry timber. However, it was observed that women do gather the discarded wood at the saw mills on the Copperbelt and make charcoal for own use as well as for sale, although the amount of waste used thus is unknown.

### 6.1.2 Safety and Health Considerations

An area of concern on the use of woodfuel is that of its impact on health especially on women who are exposed to any pollutants arising from this fuel in their daily activity of cooking. The DOE conducted a study on the health impact of woodfuel use (Ellegard A, Egneus H; 1991). The study involved a sample of 787 women among whom 268 were involved in actual measurements. The respondents were randomly selected from three low-income residential areas of Lusaka. The subjects were assessed on the level of exposure to particulates, carbon dioxide and monoxide and their respiratory capacities. The results showed that woodfuel use has little negative health impacts, in itself. Where some cases of "unsatisfactory" health conditions were noted, it was observed that there were other compounding factors such as mould in the house, access to piped water and nutrition levels.

Although charcoal was found to produce considerable carbon monoxide (31% higher than WHO's recommendations), women seem to be quite aware of the dangers associated with charcoal in an improperly ventilated place. Therefore, charcoal stoves are always placed outside the house until it is safe to bring them inside for final cooking. However, some cases of children being burnt have been reported in one study (Siamwiza R, 1985). The reason seems to be that woodfuel stoves, being low, can easily be reached by children. Hence, there is need to take special care to ensure that children are not unattended, so as to minimize the risk of burns.

## 6.2 Rural Areas

### 6.2.1 Woodfuel

The structure of woodfuel consumption in rural areas is markedly different from that of urban or peri-urban areas. Firewood is predominantly used, i.e. 90%, while charcoal is negligible, i.e. 10%. At least 90% of the firewood is used in rural areas whereas less than 10% of the charcoal is consumed there. The role of women in rural areas spans a wider range; they are involved in production, transportation and end-use.

While no comprehensive study has been done on woodfuel issues in rural areas, indications show the situation varies from place to place. In most places, firewood is obtained from dead wood and does not involve cutting trees. Nevertheless, women have to walk long distances to look for firewood. A study of rural town (Christensen J, 1985) showed that women spent between 4 - 6 hours looking for firewood. The frequency of collection was twice a week and each load

averaged 25 kg. As a result, they were very careful in tending to the fire and putting it out, once the cooking was done.

Some scattered efforts aimed at firewood conservation in rural areas. Small projects are being carried out by some NGO's in the context of nutrition and environment preservation which teach women how to build more efficient stoves and thereby conserve the environment. It has not yet been possible to evaluate the success of these efforts since they are relatively recent.

In general it would appear that the promotion of more efficient woodstoves would meet with little success in rural areas. There is no documented case of firewood trading. Wood is collected free from forests and, in such a context, it is hard to imagine that the rural people would be interested in either expending finances to purchase a more efficient stove or spend time to construct the device. However, the promotion of stoves in the context of nutrition or income generating activities may have good potential for success. In an income generating activity, the need for profitability implies minimizing production costs which should lead towards more efficient use of energy.

#### 6.2.2 Biogas

Research and development of the biogas technology has been launched since the early 1980's, by the NCSR which has concentrated on evaluating the performance of the floating dome digester (Indian type). Of the two digesters that were installed at pilot scale round about 1983, one was abandoned by the users after a while due to lack of sufficient water for substrate formation. Eventually another pilot plant was installed at Kasisi mission for demonstration.

Recently a programme of popularizing the technology was embarked on. As a result, three other installations have been made in different rural contexts. These are reported to be working well although it was not possible to verify this information.

All installations use gas for lighting and cooking. Both the lanterns and stoves have been assembled by the NCSR. The programme has not specifically targeted at reducing the drudgery of women but to wood saving, it has been found to benefit users. A household using biogas needs less firewood and, since the areas where the digester have been installed are wood deficit areas, this is a great benefit to the women who would otherwise spend long hours in search of firewood.

The benefit of lighting is also significant since it eliminates the need for kerosene which is often difficult to obtain in rural areas.

The contribution of biogas to easing the burden of women in rural areas could be extended if the gas could also be used for water pumping or electricity generation. Unfortunately, the NCSR has not yet investigated these applications.

On the matter of acceptability by the rural people there has apparently been no difficulty in handling cow dung which is the feedstock. The systems are installed in areas where people are already familiar with this substance and hence have no inhibitions to using the manure in this fashion.



The involvement of women has been at the level of users and beneficiaries of the technology. They have not been involved in the design, fabrication and dissemination of the technology.

### 6.2.3 Agricultural Waste

Crop residues are available seasonally from May to September each year. Although it is known that crop residues are used in some areas, the quantity and extent to which they are used has not been investigated. Maize stalks and cobs seem to be the most commonly used crop residues to supplement firewood. In this regard, their use helps ease the supply of fuelwood thereby reducing the drudgery of firewood collection. There is, therefore, a direct benefit to women in that the supply of fuel is somewhat improved during this time.

There has so far been no major effort by the government to foster the use of crop residues either as a domestic fuel or as feedstock in gasifiers. Some research and development work was done by the University of Zambia on gasification using crop residues but the project did not go beyond the academic interest.

The DOE, however, has recently formulated a proposal to utilize cotton stalks as a domestic fuel. Cotton stalks have been selected because, according to law, the stalks must be burnt before September as a means of controlling pests. Based on the experience of a similar project in Sudan, the project intends to carbonize the stalks into charcoal and, thereafter, briquette it to achieve compactness. The fuel is meant for the urban market where it should supplement charcoal from the wood.

If this project goes ahead, the role of women in it could be that of supplying the cotton stalks, for which they would be paid, and as users of the fuel in the household. The former depends on the current involvement of women in cotton growing which is unclear, as yet. The acceptability of the fuel will depend on its cost and burning characteristics.

### 6.2.4 Solar Energy

The use of solar energy, though unquantified in terms of number of systems installed and types of applications, is quite widespread and seemingly increasing. Among the solar energy technologies, Photovoltaics (PV) has proven most popular with the others namely, solar driers, water heaters and solar cookers remaining as research interests or demonstration curiosities.

The most common applications of PV are lighting, telecommunications, water pumping and, to a lesser extent, refrigeration. Private marketing companies have played the leading role in promoting solar energy. Although in the 1980's there were about five companies, currently there is only one major supplier of PV systems, since the market did not respond as initially envisioned.

The major user of PVs have been the health and farming sectors. A number of PV systems have been installed at rural health centres run by both the government and missions. However, the mission hospitals, numbering about 89, are in the forefront of PV utilization. The Churches' Medical Association of Zambia (CMAZ),

the coordinating body for mission hospitals, plans to have nearly all rural clinics under its jurisdiction on PV. It was not possible to determine the quantity and types of systems to be installed but certainly this should be quite a sizeable amount.

The demand for PV systems in commercial farmers is extensive. According to BP solar which is the leading supplier, it has not been possible to meet demand due to foreign exchange restrictions and the heavy duties imposed by the government on the systems. A solar medical fridge for instance, attracts as much as 62.5% duty while other PV parts attract about 50% (Serenje W, 1989). Clearly this is a major impediment to the increased use of PV.

Commercial farmers, through their umbrella organization, the Commercial Farmers Bureau, have been lobbying government to reduce duty on the PV systems. As a result, in April 1990, the government issued a statutory instrument to the effect that reduction of duty on PV would be considered on a case per case basis. In this connection, a farmer must prove that the system will be used to enhance the agricultural activity. This is complicated since the farmer himself must import the technology rather than purchase it, from or through a local supplier, in order to obtain a rebate on duty.

The role played by women in PV is minimal. Out of more than 2500 systems supplied by PV on the market, only five purchasers have been women. No woman has been involved in the marketing of the systems (all technicians are men). To a large extent, women have merely been beneficiaries of the technology (in hospitals, farms, etc). A discussion with one of the five women PV owners revealed that she learnt about the technology at an agricultural show in Lusaka. Incidentally all the women purchasers live either in or around Lusaka. This may be an indication that information about the technology may be limited to the urban centres.

PV suppliers have never targeted women either as individuals or as organized groups. One PV technician admitted that he never thought of such an approach and besides he wouldn't know how to contact women only. It was found out however, that as part of its promotional campaigns, the company carries out demonstrations in various places. Demonstrations targeting women, through the women's organizations, could certainly be arranged to make them more aware of the technology.

One woman used the technology for commercial purposes, i.e. in an income generating venture, which illustrates the successful adoption of renewable energy technologies if the beneficiary has enough information upon which to base her decision.

Efforts aimed at introducing solar driers have been scanty. A number of research organizations (UNZA, NCSR) carried out some research and development of solar driers. UNZA conducted field tests of the developed driers with dismal results. The devices were not accepted by intended users and the programme was discontinued. Likewise at NCSR, the project was abandoned due to staff turnover.

Similarly, solar water heaters have had insignificant efforts at developing the technology. Research and development were undertaken but there was no local



manufacturing of the technology even though the industrial capacity exists. A few installations are available at mission hospitals in rural areas with the medical staff as the main beneficiaries of the technology. In a solar energy technology survey conducted by the DOE in the mid-1980s in the Eastern Province, a total of nine solar water heaters were found all of which were installed at the mission hospital with the help of foreign expertise (Hibajene S, Lagoutte M, 1984).

Solar cookers have been demonstrated to some women's groups with little interest in adopting the technology. Solar cookers involve major changes in the cooking habits, such as cooking in the sunshine, a rare practice. Because the technology involves major changes in the behavior of the user, its acceptance is unlikely.

#### 6.2.5 Wind Energy

Windmills have been in use in the country for a long time. No inventory has been taken of the number of systems installed but, from general observation, a sizeable number can be seen on some farms. The most common type is the windrows, an import model. Its major application has been water pumping which is the most viable use of the technology in the Zambian context. There is, however, one known installation at which electricity is generated for lighting at a mission hospital (Serenje W, 1989). In a government programme of windmill installation at villages around Lusaka, about 100 windmills were established. However, due to lack of maintenance and spare parts, most of these windmills are currently not working.

The DOE is sponsoring a windmill project involving the adaptation of a Dutch design. Under the project, one windmill has now been installed at Kasisi Mission, an appropriate technology centre near Lusaka, for monitoring and evaluation. It is intended to transfer the technology to a local manufacturer for commercial production once the technical performance is proven. According to a local supplier of windmills, there is a large demand for the technology among farmers. This demand is presently not being met due to import difficulties.

The DOE aims to popularize the windmill among villages for water provision. The development of an affordable windmill could play an important role in the provision of water particularly in rural areas. This undoubtedly could bring great benefit to rural women since they are responsible for water provision.

The present level of involvement of women in this technology is confined to their being beneficiaries. The local company marketing imported windmills has no women technicians. Similarly with the adapted Dutch design, the engineers and technicians involved in the adaptation, production, installation and monitoring of the windmill are all men. The windmill is installed at an agricultural training centre and the water pumped is used on small agricultural plots assigned to students. It was not possible to establish how many of the trainees at the centre are women.

#### 6.2.6 Minihydros

There is very limited information available on the status of this renewable energy technology. The TDAU had some R & D interest in the technology and developed a turbine which was installed at a remote mission hospital in the

northern part of the country. The system is a water pumping unit and does not generate electricity. Apart from this, there are two other installations of not more than 25 Kw at a mission hospital and a farm.

ZESCO has no interest in using this technology in remote places due to its seemingly high operational costs. The long-term objective of the utility is to connect all consumers to the central grid. Any exploitation of this resource must, therefore, be undertaken by another institution or individual.

The involvement of women is at the level of using the electric energy or water. Men have been involved in areas where technology development and dissemination has taken place.

## 7.0 CONSTRAINTS FACING WOMEN

Constraints that pose a major hindrance to the full integration and participation of women in the energy sector are interrelated and, hence, reinforce each other. (See Table 6)

The foremost constraint singled out was education. This should be examined at two levels. Firstly, the majority of women are illiterate and form 65% of the illiterate population in the country. This is because of a belief that it is unnecessary to educate girls since their role is understood to be that of home makers for which education is not considered relevant. Secondly, the education system is itself biased against women. They are discouraged from taking science subjects and mathematics, and this hinders them from undertaking technical training at a later stage. Although no figure was obtained, it is evident that the number of women who have been trained in technical subjects is extremely low. In engineering, for example, the number of women engineers trained by the University of Zambia since its inception 25 years ago are marginal. Besides, there are no technical schools for girls at secondary school level whereas there are at least three institutions for boys. This clearly indicates that girls are not expected to pursue careers in the technical field; consequently, they are not involved in technical research and development.

The need for technical training in energy cannot be overemphasized for energy is largely a technical subject. NRSE requires a good technical understanding in order to develop them. Unless more women acquire technical know-how pertaining to energy, their role in this field will remain marginal.

The cultural constraint does not appear prominently but the socio-cultural perception of women and girls are responsible for their limited and/or biased education. Women are not expected to understand technology and, therefore, this is left to men. A rather trivial example may illustrate the point. In a village, the most a woman is expected to know about a bicycle is how to ride it; she remains ignorant of how to repair and maintain it, since this is a man's job. If she were single, she would not be expected to own one even if she had the means to purchase it. In sum, society defines the roles that men and women should play; a change in social roles will take a long time but education is the surest way of making the roles more equitable.



Figure 6  
Constraints Preventing Women from Fully Participating  
in the Energy Sector

	Lack of Information	Women not Targeted	Vague Policies	Lack of Support & Incentives	Cultural Social	Biased Education Illiteracy	Economically Weak	Lack of Training	Women's Org Weak	Lack of Particip Consultation
Women's League	*	*		*	*	*	*	*		*
NCDP-Women's Department	*	*						*		
Department of Energy	*	*	*		*	*	*			*
Forestry Department		*			*	*	*	*		*
Ministry of Lab. Soc. & Cult.	*					*				*
UNZA TDAU	*				*	*		*		*
BP Solar		*				*	*		*	*
Philips		*				*	*			*
Young Women Christian Assoc	*					*		*		*
NGO-Co-ordinating Committee		*	*	*		*			*	
Human Settlements of Zambia	*				*	*		*		*
Danish V Service	*	*	*			*		*		*
European Community				*		*				
World Bank	*					*				
Commonwealth Devl Corporation		*			*	*				
Institute for Afric. Studies	*	*		*	*	*	*	*		*
International Labour Organization	*					*				*
Zambia Alliance of Women		*	*	*		*			*	
Community Development	*	*		*						
Central Stat. Office	*	*								
Charcoal Stove Project	*				*	*		*		*
World Vision International	*	*				*	*	*		*
SCORE	15	14	4	6	8	19	7	10	3	14

The study shows that in a household the decision to purchase an energy technology rests, to a large extent, on the man for the simple reason that he controls the finances. Women have minimal or altogether no economic power to improve their standard of life through the acquisition of improved energy technologies. Although energy resources, such as solar and wind, are free, their exploitation is not autonomous. They require large investments in up-front costs. Since women generally make up the majority poor due to lack of ownership rights in most cases, they cannot benefit. In sum, without land and credit facilities, it is extremely difficult for them to maneuver out of poverty.

Another major constraint identified is the lack of participation or consultation of women in energy projects. Even those energy projects that are targeted towards them involve them only at the very end during the technology dissemination phase as women are the end-users. They are left out at the levels of research and development, project formulation and design as a result of which a number of efforts fail.

A common feature amongst energy projects is that they do not target women. A conscious effort to assess the impact or benefits of energy programmes and projects on women is non-existent. This constraint is related to the preceding one, since women are often not consulted or involved in planning and, hence, their perceptions or interests are not taken into account.

Related to education is the lack of information and training which limits women's understanding of the options or possibilities available to improve their conditions. Furthermore, often when a technology is installed for the use of women, they are not trained in repair and maintenance. This limits their confidence and control of the technology.

A review of policy statements pertaining to the improvement of the role of women in energy shows that they are particularly vague. The suggested approaches or strategies are very general and lack implementable steps to address the issues. Consequently, there are no clearly outlined means of support and incentives for increasing the involvement of women in the energy sector. This may arise from a lack of understanding of the basic issues involved.

Some possible factors that underlie the constraints shown above have been identified and are summarized below:

1. Lack of information
  - No clear policy guidelines
  - Lack of coordination among institutions involved
  - Lack of research on women and energy
  - Lack of literature
2. Women not being targeted
  - Policies are too general
  - Lack of incorporation of gender issues in programmes
  - Women are weak as a pressure group

3. Policies are too general
  - Lack of understanding of issues involved
  - Under-representation of women in policy formulation
  - Misrepresentation of women in policy formulation
4. Lack of support and incentives
  - Lack of understanding of constraints women face
  - Under-representation in decision making
  - Misrepresentation in decision making
5. Cultural/Social
  - Traditions and customs
6. Educational bias and illiteracy
  - Culture
  - Social
  - Lack of interest on the part of women
  - Lack of motivation, incentives and challenge
7. Economic
  - Illiteracy
  - No ownership rights
  - Lack of control of finances
8. Lack of training
  - Lack of opportunities
  - Lack of institutions catering to their needs
  - Illiteracy
  - Biased education
9. Women's Organizations are Weak
  - Lack of management skills
  - Lack of support
  - Reliance on volunteer effort
10. Lack of participation/consultation
  - Women rarely thought of as a special group
  - Difficulty of targeting women

## 8.0 TRAINING NEEDS

Various levels of involvement for women have been identified. Each level requires a certain kind of training for effective participation in the energy sector. Following are the suggested training needs for each level:

1. Policy Makers
  - Awareness programmes: seminars, workshops, demonstrations

2. Planners (Macro level)
  - Formal training at degree, diploma and certificate levels
  - Workshops
  - On-the-job training
3. Planners (Micro level)
  - Project identification, management, implementation, monitoring and evaluation.
4. Trainers
  - Communication and Organizational skills
5. End-users
  - Awareness through publicity and demonstrations
  - Trades skills in making some devices
  - Repair and Maintenance renewable energy technologies

## 9.0 RECOMMENDATIONS

Since the more concrete actions that need to be put in place are the concern of the document entitled "Methodological Approach, Framework and Plan of Operations", the recommendations presented include some general issues which may be beyond the scope of the present project to implement but are nevertheless being submitted. Arising from the constraints identified above, the following recommendations are made:

1. The current biases against women and girls in the education system must be removed. Education is one of the key instruments that can help women improve their role in the various spheres of life, including energy. Apart from removing any bias in the present curricula, there is a need to challenge girls to undertake studies in scientific and technical subjects. This could be enhanced by opening up the present technical schools that admit boys only to enrol girls as well. In addition, various incentives should be instituted to encourage women to pursue science and technical subjects (e.g. scholarships, fellowships, awards, etc). Such incentives should be widely publicized for maximum coverage. It is also recommended that energy issues be included in school curricula at various levels to increase awareness of energy matters.
2. Government should include, as a matter of policy, the role and impact on women as a criteria for assessing the viability of any energy project. This will help policy makers, energy planners and implementors become conscious of gender issues and take into account women's interests in development projects. Subsequently, the problems of lack of targeting and involvement of women, in various the stages of projects, will be greatly diminished if not altogether removed.
3. There should be close liaison between the DOE and WID which will enhance the integration of women's issues into energy programmes. Therefore, it is proposed that the DOE appoint a woman professional as the contact point for WID issues.



4. Women at various levels should be trained in specific subjects related to energy to ensure that their participation is improved. Since this is the prime objective of this project, it is dealt with in greater detail in the document referred to above.

5. There is need to conduct basic research on women and energy in order to understand their perspectives and responses to various energy matters (such as scarcity, technology, etc). In this way, policies seeking to address the involvement of women in energy will be based on a sound footing and will have greater potential for fulfilling the intended objectives.

6. The present efforts by government to give women more opportunities for investment by providing credit facilities to them should continue. This will help women acquire the financial strength they need in order to escape poverty. Poverty prevents needs from being translated into effective demands for the energy technologies that could improve women's lives.

7. Women's organizations seem to be too dependent on volunteer work which often means they rely on the commitment of a few individuals who usually work on a part-time basis. Once these individuals leave the organizations, operations are severely hampered. It is, therefore, recommended that women's organizations consider employing qualified professionals to improve their performance. Since funds may be the major contributing factor to this situation, the organizations should make every effort to seek donor assistance, so that they can employ professionals on a full-time basis.

8. Efforts must be made to improve energy information dissemination to women, especially in rural areas as women are not aware of the opportunities available to reduce their daily chores.

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ANNEX 2  
QUESTIONNAIRE

1. Name of the organization and individual to be interviewed; job title.
2. What is your organization's programme?
3. Do you have any programme/project especially targeted to women?
4. How many professional women are employed in your organization?
5. Do you feel that women ought to play a greater role in the activities of your organization? How could that be done?
6. Have you been involved in any energy projects in the past and presently?
7. Have you had any formal training in energy or any other subjects related to energy?
8. Have you had any project related to energy? If yes,
  - a. What was it about?
  - b. What was the involvement of women (planning, implementation, evaluation).
  - c. If women were not involved, why not?
9. Have you done or come across any studies (surveys, research, etc) involving women and energy? Would you have any documents available on the subject?
10. What are the constraints to women's present involvement in the energy sector? How about in the renewable sector? Are they cultural, educational, economic, political?
11. In your opinion, what do you think are the training needs of women in the energy sector (professionals, end users, producers)? How could these needs be met?
12. How can the participation of women in the energy sector be improved/increased?
13. Have you had any dealings with other agencies on the same subject, for example government agencies, women's organizations, NGOs, research institutions etc? Elaborate on what has been done.
14. In your opinion what do you think should be the women's role in the dissemination of energy technologies that involve them?
15. Women should be fully involved in the planning and implementation of energy projects and programmes. What is the current situation?

16. Are energy activities designed in a way that takes sufficient account of women as decision makers, producers and beneficiaries?
17. Is your institution closely involved in the design and implementation aid financed energy projects and programmes for women?
18. Is there sufficient follow up work done after the projects have been started? How about the training aspect? Are women involved?
19. What is the level of political commitment to energy projects and programmes?
20. Does the present energy policy for Zambia have anything specifically for women?
21. Do you have some information on what the situation is on the role of women and energy in the other third world countries for example, SADCC, PTA, ECA countries?
22. What do you think should be the role of the following institutions on the role of women and energy (especially renewable energy): government, parastatals, private companies, NGOs and donor agencies?
23. Do you think the new and renewable sources of energy can significantly substitute traditional fuels like charcoal and firewood?
24. How about the costs involved, what do you think is cheaper, new technologies or traditional ones? How about fuels, which is better?



ANNEX 3  
INSTITUTIONS VISITED AND PEOPLE INTERVIEWED

	<u>INSTITUTIONS</u>	<u>NAME/POSITION</u>
1.	Institute for African Studies	O. S. Saasa, Director C. Mulenga, Researcher S. Mudenda, Researcher
2.	YWCA	F. Sakala, Appropriate Technical Coordinator
3.	Danish Volunteer Service	M. Machila Programme Officer
4.	TDAU	Frank Wolters Project Engineer
5.	BP	Freddy Bwebya Sales Engineer
6.	Phillips	N. Mumba Personnel Officer
7.	World Bank	J. Innes Acting Res. Rep.
8.	Charcoal Stove Project	S. Nachula Demonstrator (Women)
9.	Common Wealth Develop.	J. Taylor Corporation Representative
10.	HUZA	H.E. Jere Executive Secretary
11.	NGO-CC	C. Y. Ng'ambi Chairperson
12.	EEC	Blazques Engineering Adviser  Pilcher Information Officer
13.	ILO	J. A. Mokhetha Programme Officer
14.	-	R Nsama Business Woman

- |     |                                 |   |
|-----|---------------------------------|---|
| 15. | Department of Natural Resources | Mwanza, Provincial Natural Resources Officer  |
| 16. | WID-NCDP                        | M. M. Sikota<br>National Coordinator<br><br>D. Muntemba<br>National Coordinator                                     |
| 17. | World Vision Int'l              | V. Nanyangwe<br>Area Manager-Copperbelt   |
| 18. | LUDC-Community Develop.         | E.K. Chisanga<br>Senior Community Development Officer<br><br>D. M. Sampa<br>Assistant Community Development Officer |

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