

Appendix 2 Overview of Botswana, Energy and Power Sector

Appendix 2 Overview of Botswana, Energy and Power Sector

2.1 Overview of the Country of Botswana

2.1.1 Political and Administrative Situation

(1) Constitutional Framework

After 80 years as a British Protectorate, Bechuanaland attained self government in 1965 and became the independent Republic of Botswana on 30 September, 1966. The Botswana Constitution established a non-racial democracy which maintains freedom of speech, freedom of the press and freedom of association, and affords all citizens equal rights.

The Constitution provides for a unicameral legislature, the National Assembly. Members are directly elected from 40 constituencies and themselves elect four specially elected members and a Speaker of the National Assembly. The Presidential candidate, whose declared supporters form the majority of directly elected members of Parliament, takes office as President and selects his Ministers from among the National Assembly.

The President is head of the Executive Branch of Government and presides over the Cabinet. He/she must dissolve Parliament and hold a general election after five years, and may do so sooner. National Elections have been held in 1965, 1969, 1974, 1979, 1984, 1989, 1994 and 1999. The Botswana Democratic Party (BDP) has been returned to power on each occasion. The last general election was contested by nine political parties. In the 1999 election, the BDP won 35 seats in Parliament and the Botswana Front won 5. In addition to the National Assembly, there is a House of Chiefs with 15 members, which advises on matters affecting custom and tradition.

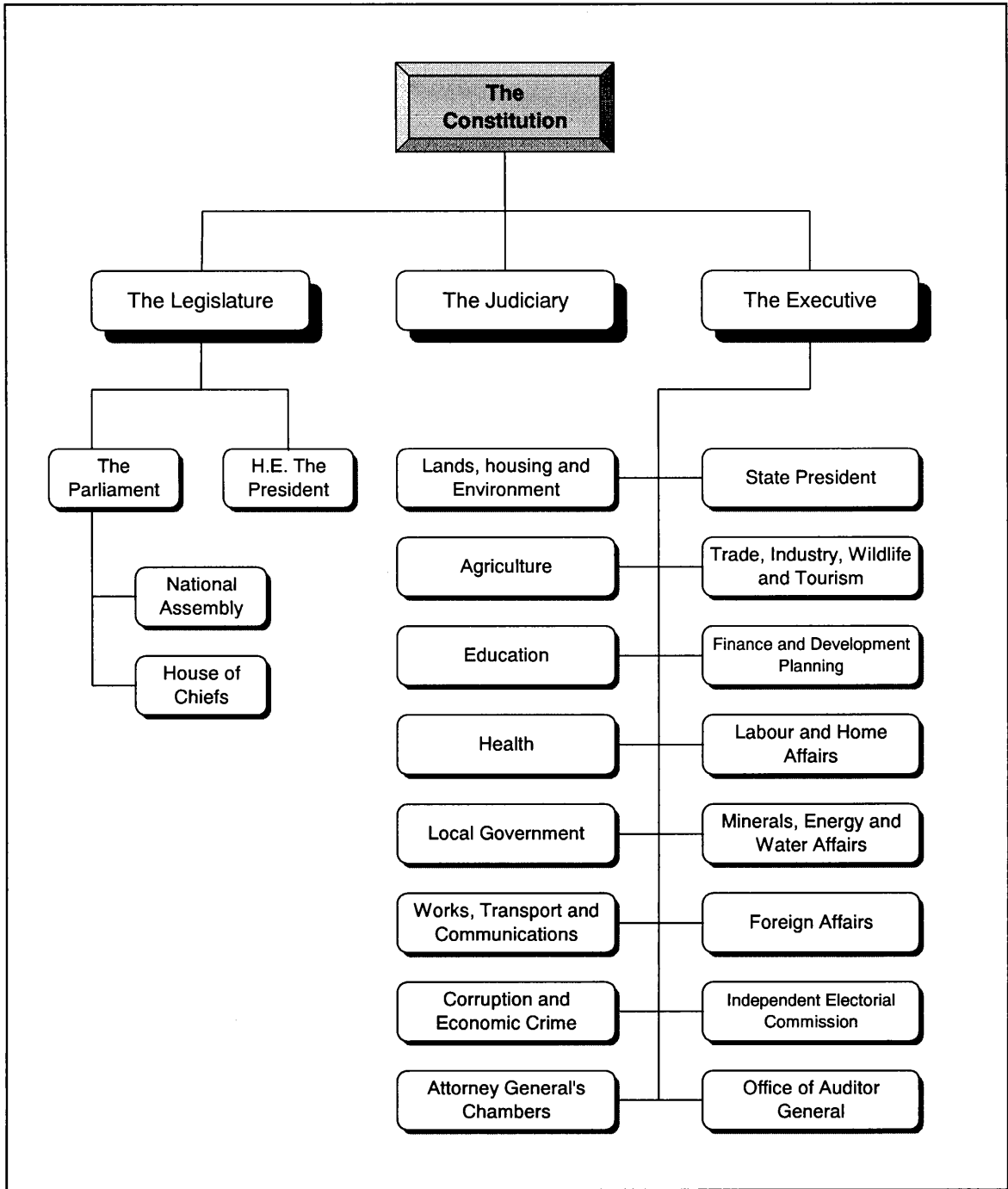
There is an independent judiciary with a High Court presided over by the Chief Justice. Some cases are heard by local chiefs and headman, or their representatives, and decided in accordance with customary law, while others are dealt with according to statute law by Magistrates' Courts and the High Court. The High Court is the appeals court for both branches of the judiciary.

(2) Administrative Structure

The capital of Botswana is the City of Gaborone. The Central Government is represented in each of the Districts by the District Administration, headed by

a District Commissioner. There are ten districts, and nine district councils; Ngamiland and Chobe Districts are jointly covered by the North West District Council. There is a City of Council for Gaborone, Town Councils for Francistown, Lobatse, Selebi-Phikwe, Jwaneng and a township authority for Sowa Town.

District, City and Town Councils have elected councilors, but the Minister of Local Government, Lands and Housing may nominate additional councilors. The Chief Executive of a Town Council is the Town Clerk and that of a District Council is the Council Secretary. These Chief Executives and their supporting staff are members of the Unified Local Government Services. The main components of Central Government are depicted in Figure 2.1-1. The Civil Service is headed by the Permanent Secretary to the President, and each Ministry is headed at an official level by a Permanent Secretary.



(Source: <http://www.gov.bw/>)

Appendix Figure 2.1-1 The Structure of Central Government, Republic of Botswana

(3) Community Development Structures

The institutional set up of planning in Botswana can be divided into three levels: Central Government Level, District Level and Community Level.

1) Central Government Level

The Ministry of Local Government (MLG)

MLG is the "parent" ministry of all local governments in Botswana. As Botswana is a unitary state, local government has no constitutional status and is a purely statutory creation. Within these statutes, MLG plays key roles in virtually every aspect of local government. (Refer to Appendix 6.1)

2) District Level

The next institutional level is that of the District. At this level the most important institutions are the District Administration (established by 1965 Act of Parliament), Tribal Administration (established by 1965 Act of Parliament), Land Boards (established by 1968/1970 Act of Parliament) and District and Town Councils (established by 1965 Act of Parliament).

a) District Administration

The District Commissioner (DC) who is responsible to the Ministry of Local Government and is a senior representative of Central Government in the District heads the District Administration. He/she is the chairperson of the District Development Committee, which is in charge of preparing the District Development Plans, thus the coordination function of the DC is very critical.

b) District Council

The Town and District Councils are locally elected bodies. These institutions have formal authorities to take decisions within their localities. They have the power and the discretion to allocate resources within their area of jurisdiction. They exist however side by side with locally based officials of various government departments. The councils carry out statutory duties through a system of standing committees. These include such committees as Education, Health, Works, Trade and Licensing, Physical Planning, etc.

c) Land Board

The Land Boards are responsible for leases and allocation of tribal land including open wells and boreholes. In other words they confer land use rights on individuals or groups. The Land Boards fall under the Ministry of Local Government.

d) Tribal Administration

Tribal Administration has both traditional and developmental duties. Chieftainship is one of the oldest institutions in Botswana. Chiefs have many responsibilities including maintenance of law and order, administration of justice, serving as spokespersons of their tribes, etc. The Chief, who is also the Head of the Tribal Administration, is by virtue of his position, an ex-officio member of the District Council. The chiefs have considerable personal and political influence, popularity and legitimacy.

e) District Development Committee

A presidential Directive established the District Development Committee (DDC) in 1970, under the chairmanship of the DC. It is the most significant institution at the district level for coordination of development activities. The DDC's terms of reference listed in the Botswana Government, District Planning Handbook (1996:51) are:

- To coordinate the activities of all local and central government agencies in the district with a view to promoting development.
- To serve as a planning body for the district.
- To advise the district agencies on all matters relating to development.
- To coordinate the planning, management, and implementation of district development plans, annual plans, and any other plans in the district.
- To coordinate the development activities of NGOs in so far as they affect Government and/or communities, with a view to harmonizing them with Government policy and Programs.
- To monitor the process of decentralization with a view to advising Government on the possible course of action.

In order for the DDC to function well it has the support of many other sub-committees, which usually report their activities during its meetings; these are listed in the District Planning Handbook as follows:

Production Development Committee (PDC, District Extension Team (DET), District Land Use Planning Unit (DLUPU), District Health Committee (DHC), District Drought Relief Committee (DDRC), District Education Planning Committee (DEPC) Plan Management Committee (PMC. As part of consultation for the District Development Plans a District Development Conference is convened. At this level Chiefs, Councilors, VDC Chairpersons, Members of Parliament, VET Chairpersons, all District Development Committees and District Extension Team members meet. The DO (D) and CPO present an overview of the success and failures of the past plan for the entire District. After reviewing the past plan the District Development Conference comes up with a plan for the next period.

Thus all village plans are summarized into a DDP. It is emphasized that all stakeholders “should be given equal opportunities to contribute to the debate, since this is the most crucial process at district level” (District Planning Manual 2000:59). The DO (D) and CPO will then produce a detailed DDP after the draft plan has gone through the necessary steps and copies provided to VDCs.

3) Community Level

The institutions at the community level, which are involved in the development process can be divided into two main categories:

a) The Traditional Institutions

The Traditional Institutions – so called because of their pre-colonial origin – are the chieftaincy, the kgotla and the wards. The kgotla represents the “institution” where commonly consensus can be arrived at and where development initiatives and participation can be encouraged. It is a traditional authority, chiefs, sub-chiefs, village headmen and ward heads are critical links between communities and government authorities. All villages have a Kgotla and the village Kgotla is led by the Chief who is responsible for calling the Kgotla meetings, trying cases under customary law, and is involved in village development.

b) The modern institutions

The modern institutions – so called because most of them were created after independence e.g. the Village Development Committee (VDC),

Village Health Committee (VHC), Parents Teachers Association (PTA), Village Literacy Committees (VLC), Village Extension Team (VET) and other village organizations such as voluntary organizations like Young Women's' Christian Association (YWCA), Botswana Red Cross, Botswana Council of Women (BCW), churches, burial societies, farmers committees. All committees report to the Village Development Committee (VDC). The VDCs were established by a Presidential Directive of 1968 for the purpose of implementing development Programs in villages. It is responsible for all village development matters and coordinates all village institutions' activities. It is however responsible to the kgotla on matters related to development. The functions of the VDC as outlined in the Botswana Government, District Planning Handbook (1996:56) are to:

- Identify and discuss local needs;
- Help villagers to prioritize their local needs;
- Formulate proposals for the solution of identified local needs;
- Determine the extent to which the people can satisfy their identified needs on self help basis;
- Develop a plan of action for their village area;
- Solicit the assistance of donors and other development agencies;
- Mobilize the community and its institutions for development action;
- Provide a forum of contact between village leaders, politicians and District Authorities to enhance the flow of development information; and
- Represent villagers in development matters and act as a source and reference point in matters pertaining to village development.

A VDC consists of 10 members elected at the Kgotla meeting. They are charged with development matters in the village. They then report on these at the Kgotla meetings where they can generate discussion with members of the village. The District Officer (Development) who is working under the District Commissioner and the Council Planning Officer (CPO) working under the Council Executive Officer lease with the village committee to tap information. Most of the time they get this information through kgotla meetings where the VDC chairman briefs the participants on development matters. The VDC in doing this will have met and solicited ideas from all other village committees particularly the VET (which consists of all central and local government

officers working in a village). During the preparation of the Village Development Plan the VDC should also meet with, chiefs and Councilors. Prioritization of projects is emphasized and officers should be ready to provide their technical expertise to advise the communities on Government policies and standards.

(4) International Links

Botswana is a member of various international organizations, including the United Nations, the Non-Aligned Movement, the African Union (formerly Organizations of African Unity), the African, Caribbean and Pacific group of countries covered under the Lome Convention, Commonwealth, the World Bank, the International Monetary Bank, the African Bank, the Southern African Customs Union (SACU) and the Southern African Development Community (SADC). The headquarters of SADC is in Gaborone.

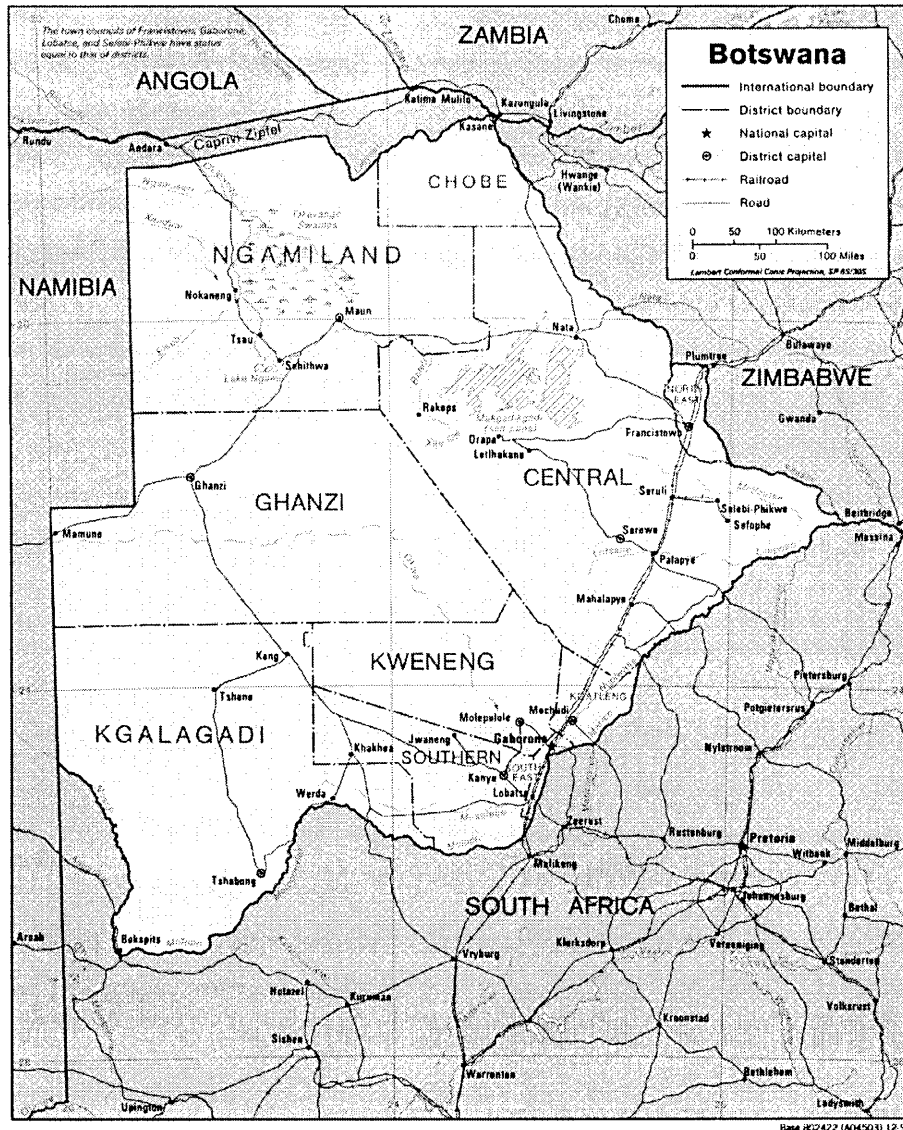
2.1.2 Geographical Situation

(1) Physical Features

Botswana is a landlocked and straddles the Tropic of Capricorn in the center of the Southern African Plateau. The mean altitude above sea level is approximately 1,000 meters and the country total land area is 582,000 sq. km, which is about the size of Kenya or France.

Botswana shares borders with Zimbabwe, South Africa, Namibia and Zambia. Much of the country is flat, with gentle undulation and occasional rocky outcrops. In the North-West, the Okavango River drains inland from Angola to form the Okavango Delta; in the central north-east is a large area of calcrete plains bordering the Makgadikgadi pans. In the east, adjacent to the Limpopo drainage system, the land rises above 1,200 meters, and the Limpopo Valley gradually descends from 900 meters in the south to 500 meters at its confluence with the Shashe River. This eastern region, which straddles the North-South railway line, has a somewhat less harsh climate and more fertile soils than elsewhere; and it is here that most Batswana live.

The rest of Botswana is covered with thick sand layers of the Kalahari Desert. This accounts for more than two-thirds of Botswana's land area. The sand cover is up to 120 meters deep. The Kalahari supports a vegetation of scrub and grasses, but there is an almost complete absence of surface water.



Appendix Figure 2.1-2 Map of Botswana

(2) Climate

Botswana is situated close to the subtropical high pressure belt of the southern hemisphere. As a result, the country is largely arid or semi-arid. Mean rainfall ranges from over 650 mm in the extreme north-east to less than 250 mm in the extreme south-west. A secondary maximum of over 550 mm occurs in the south-east around Lobatse, and a secondary minimum of less than 350 mm occurs in the low lying area between the Shashe and Limpopo rivers in the extreme east.

Almost all the rainfall occurs during the summer months, from October to April; the period from May to September is generally dry. Most of the rainfall

occurs in localized showers and thunderstorms, and its incidence is highly variable both in time and space. The volume of rainfall is also a poor indicator of its value since there is rapid run-off and drainage during the short, intense storms that account for the bulk of the rain that falls.

The average daily maximum temperature is about 33°C in January and 22°C in July, whilst extremes can reach 43°C and 32°C in July, respectively. The average daily maximum temperatures are around 19°C in January and 5°C in July, whilst extremes can fall to 7°C and less than negative 5°C, respectively; the lowest temperatures occur in the southern part and south-western parts of the country, which occasionally experience early morning frost during June to August.

(3) Natural Resources

Botswana's main natural resources are range and arable land, a large wildlife population, and a variety of known and promising occurrences of minerals. Arable land is scarce; it is estimated that less than 5% of Botswana's land area is cultivable. Capricious rainfall makes arable agriculture a precarious undertaking. Much of the best arable land is found in the freehold farming areas in the east. Much more of Botswana's land is suited to extensive beef production and this is reflected in the fact that cattle outnumber humans. As boreholes have been developed, there has been a tendency for cattle ranching to push further west in the Kalahari exploiting ever more fragile rangeland. This increases the likelihood of losses when drought recurs.

Some of the last great populations of wild animals left in Africa are found in Botswana; they constitute a tourist attraction that has yet to be fully exploited. Meanwhile, and more importantly, they make an important contribution to the subsistence economy of the country. Large areas of the country are designated as National Parks and Game Reserves, but a considerable number of game are found outside the reserves, though depleted in the more populous areas. Of particular importance for tourism are Chobe National Park, which contains massive concentrations of large game, the Okavango Delta, which, besides the outstanding natural beauty, teems with wildlife. Livestock agriculture and game often represent competing uses of marginal land; careful management is required to ensure that such land is used to its best advantage.

In spite of the accelerated pace of mineral exploration in recent years, much remains to be discovered about Botswana's mineral resources. The thick sand covering much of the country obscures the underlying geology, although the eastern part of the country is relatively well mapped geographically. Copper-nickel is mined at Selebi-Phikwe and other potentially exploitable copper resources are known to exist. Mining of coal at Morupule is relatively small-scale at present, but reserves of billions of tons have been proven. Diamond mines at Orapa, Letlhakane and Jwaneng are in production. Salt and soda ash deposits at Sua Pan are effectively unlimited, and are now being exploited. Numerous other minerals are known to occur in significant quantities. However, the exploitation of these minerals is constrained by remoteness and by the absence and high cost of supporting infrastructure.

(4) Communications

The single-track railway line between Ramatlabama in the south and Ramokgwebana in the north links Botswana with the South African and Zimbabwean systems. There are also three railway branch lines connecting the Selebi-Phikwe copper/nickel mine, the Morupule coal field and the Soda Ash Project at Sowa Town. The railway system carries a substantial portion of the total freight traffic within the country.

Regular air services connect Gaborone's Sir Seretse Khama Airport with major international airports at Johannesburg in South Africa, Windhoek in Namibia, Harare in Zimbabwe, and London in United Kingdom. Regular internal air services are maintained between Gaborone, Francistown, Maun, and Kasane.

The road network has been greatly improved since Independence. The main north-south highway between Ramatlabama and Ramokgwebana has been tarmacked, as has the route from Nata to the border at Kazungula where there is a ferry connection with Zambia. The Francistown to Maun road has also been tarmacked. The Trans-Kalahari highway links Botswana to Namibia. Feeder roads from the Ramatlabama/Ramokgwebana highway to major district centers have also been tarmacked. However, some of the secondary and rural roads are passable only with 4 wheel drive vehicles.

Botswana has international telecommunications links through an earth station at Gaborone as well as via South Africa. Microwave links have been

established between Gaborone and Johannesburg in South Africa and between Francistown and Bulawayo in Zimbabwe. These provide good quality external links to complement the earth station. Internal telecommunications are good in main centers; plans are in good hand to upgrade the telecommunications system in major villages and towns. In addition, Internet Services are gradually being developed.

2.1.3 People

(1) Ethnicity

Most of Botswana's citizens are members of Setswana-speaking ethnic groups, the official languages are Setswana and English, the latter being the main language in Government. There are other groups including Bakalanga in the north-east, Basarwa and other semi-nomadic groups in remoter areas, and Baherero in the west, as well as a small number of citizens of Asian and European origin. All citizens have equal rights under the Constitutions.

(2) Main Population Characteristics

Data on Botswana's population are crucial for planning, especially because many population characteristics are changing rapidly. A national census is taken every ten years, the most recent was in 1991 and its results have been used extensively in the preparation of this Plan. Internal and international migration is important influence on the economy and the pattern of settlement.

The main features of Botswana's population are that:

- * it is small relative to the size of the country
- * it is growing rapidly as a result of high fertility and declining mortality rates;
- * there is, consequently, a high proportion of children and young people:
- * infant mortality is declining and life expectancy is increasing; and
- * the pattern of settlement is changing rapidly.

The 2001 census yielded a de facto population of 1,680,863 compared with the 1981 figure of 941,027 and 1,326,796 for 1991. The mid-year population for 2003 is estimated at 1,780,000. The population density is projected to increase from 1.6 persons/km² by the year 2003. Although Botswana has one

of the world's lowest average population densities, most Batswana are concentrated in the east of the country.

Botswana's population has been growing at an annual average rate of 3.5% during the intercensal period. Population growth rate has thus accelerated since the 1971 census when it was below 3.1%. However, there is evidence that the total fertility rate has been declining since the mid-1980s; the point estimate of the total fertility rate in 1991 was 4.23.

(3) Pattern of Settlement

At Independence, Botswana's population was largely rural and the majority of the population resided along the main line of the railway system. The population was also very mobile; commuting between the villages, cattle posts and lands areas. With the rapid expansion of economic activities in the mid-1970s and the 1980s, the pattern of settlement changed rapidly. There is now a growing concentration of the population around five major regions in the country. In addition, there is rapid urbanization of the population. The five regions of concentration are settlements in the Gaborone, Serowe/Palapye, Francistown, Selebi-Phikwe and Maun catchment areas. In 1981, approximately 50% of the population was within 200kms of Gaborone. By 1991, 50% of the population was enumerated within 100kms of Gaborone. Such a large proportion of the population residing around the Capital causes concern. It implies a very high rate of rural-urban migration. In terms of urbanization, it was estimated that about 46% of the Botswana population was urban in 1991. A settlement is described urban, for statistical purposes, if 75% or more of its workforce is in non-agricultural activities and its population is at least 5,000. According to this definition, all the major villages in the country were classified as urban. It is anticipated that by the year 2003, about 52% of the population will be classified as urban.

2.1.4 Economic situation

At the time of Independence in 1966, Botswana was one of the poorest countries in Africa. An overwhelmingly rural population depended mainly on agriculture for a livelihood. Beef production was the mainstay of the economy in terms of output and export earnings. Both arable and livestock agriculture had been ravaged by a long and severe drought. Over 30% of Botswana men, between the ages of 20 and 40, were

working in South Africa. Apart from the railway line, communications and infrastructure were barely developed. Prospects for rapid development of the economy seemed bleak, and the Government was dependent on foreign aid not only for all its investment projects, but also to finance its recurrent expenditures.

The 30 years since 1966 have seen a remarkable economic transformation. Development efforts over the preceding Plans have increased access to water, roads, health and education. School enrolment has improved over the years with over 90% of primary school aged children enrolled in primary schools. The most notable achievement has been the expansion of secondary education.

During the last Plan period, there has been a significant expansion of Community Junior Secondary Schools, with the result that most primary school leavers are able to secure a place in Form 1.

Government has continued to implement the Primary Health Care strategy and about 85% of the rural population are within 15 km radius of a health facility. There are two major referral hospitals, one in Francistown and the other in Gaborone. In addition, there is a private hospital in Gaborone with modern equipment. The private hospital has somewhat reduced the number of complicated cases that have to be referred outside the country for specialist attention.

Although the mining sector has dominated the economy since the early 1970s, there are signs that the economy is beginning to diversify. From a share of GDP of about 50% in the mid-1980s, the mining sector's estimated contribution to GDP in 1994/95 was about 34%. Other sectors like Government, Finance and Business Services, and Trade are beginning to make a significant contribution to the economy.

Agriculture, which was the predominant sector at Independence, has continued to be subdued due to recurrent and prolonged droughts. The cattle industry has also run into additional problems due to the outbreak of cattle lung disease in the Ngamiland area; and over 300,000 head have been eliminated in an effort to contain the disease. The periods of drought have had an adverse effect on the environment and on specific sectors of the economy. Its effects on the national herd are also apparent. According to the results of the 1993 Agricultural Census, there were considerable losses of livestock during that year, particularly for the small stock owners.

Although the increase in the value of diamonds fluctuated a great deal over periods 1979-1995, they have nevertheless ranked first among the major export commodities over the same period. Their average annual contribution to total exports was 76% during the years 1990-1995. From 1994 to 1995, vehicles replaced copper-nickel matte as the second major export commodity. They accounted for 6% and 16% of total exports in 1994 and 1995, respectively. Hence, a fall in the relative contribution of diamonds to total exports from 1994 to 1995 was (in part) due to an increase in sales of vehicles.

A positive balance of trade was recorded during the years 1985-1989 and 1993-1995. The highest and lowest values of P 1.09 billion and negative P 300.4 million were recorded in 1987 and 1990, respectively. A positive trade balance over 1994-1995 was mainly attributable to an increase in the sales of diamonds and vehicles whose combined contribution to total exports amounted to more 80 percent.

Formal sector employment has grown considerably over the years. Formal sector employment increased from 69,500 in 1978 to 234,500 in 1995; an average annual increase of just over 7%. At the same time, with rapid urbanization, informal sector activities have increased substantially. However, despite these achievements, unemployment (as well as associated poverty) still remains a problem. During 1994, it was estimated that 21% of the labor force was unemployed. Unemployment was particularly prevalent among young people.

2.1.5 Current Government Vision and Policies on the Development Program

(1) Mid-Term Review of NDP 8

The National Development Plan 8 (NDP 8), covering the six-year period from April 1997 to March 2003, was presented to Parliament in June 1997. It has the theme of

Sustainable Economic Diversification, to be achieved primarily through accelerated growth of the non-mining sectors of the economy, especially manufacturing, tourism and financial services. The private sector of the economy is envisaged in the Plan as playing the leading role in the process of economic diversification and growth. Government's primary responsibility is to create and maintain a conducive environment for private sector growth through building the necessary physical and institutional infrastructure;

provision of basic services like law and order, security, education and health; and public policies in respect of all matters relevant to business such as wages, Government finance, money, credit and interest rates, trade and investment, exchange rates, delivery of serviced land, and the development of skills and technology.

At inception, the total estimated cost of the development program in NDP 8, in current prices, was P11.8 billion, together with an estimated recurrent expenditure of P30.9 billion over the same period. Manpower establishment in Government was planned to be increased from 72,352 at the beginning of Plan period to 75,544 at the end, i.e. by 4,853 points. With the deployment of these resources, the real GDP in the economy was projected to grow at an average annual rate of 5.3 percent over the six-year period, with total formal sector employment growing at an annual rate of 4.9 percent. Since the annual average growth rate of the labor force was estimated to be 3.4 percent, the 4.9 percent annual growth in employment was expected to bring down unemployment significantly by the end of NDP 8 period, from the level of 21 percent estimated at the beginning of the Plan. The latest figures indicate that the rate of unemployment has since come down to 19.6% in 1998.

The commencement of NDP 8 in 1997 followed the launching of the *Framework for a Long Term Vision* for Botswana in September 1996 by H.E. Sir Ketumile Masire, the then President of Botswana, on the occasion marking the country's thirty years of Independence. The framework was subsequently developed into a document: "*Long Term Vision for Botswana (Vision 2016): Towards Prosperity for All*", which was published in September 1997. The long-term Vision runs to the 2016, when Botswana will have been independent nation for 50 years. It sets some goals for the nation for the year 2016, identifies major challenges in achieving them, proposes a set of strategies to meet those challenges.

Vision 2016 is multi-dimensional, encompassing the economic, as well as social, political, cultural and spiritual aspects of the lives of Botswana. In its economic dimension, the Vision is for a trebling of per capita real income of Botswana over the 20-year period from 1996 to 2016; full employment for the labor force; and eradication of absolute poverty. It was estimated that such trebling of per capita year in real terms, which, in turn, would call for an investment-to-GDP ratio of 41 percent, one of the highest in the world.

The Vision document states, among others, that the goals of Vision will be the starting point for all future National Development Plans and all Mid-Term Reviews. It is in order, therefore, that this Mid-Term Review of NDP 8 should begin by calling the goals of Vision 2016. However, a more thorough integration of 2016 goals and objectives into the planning process will be started in NDP 9.

While Vision 2016 calls for an average annual real GDP growth rate of 8 percent, revised projections for NDP 8 by the Ministry of Finance and Development Planning indicate that, with the completion of the Orapa expansion project the growth rate of the economy is likely to fall to the 4 to 5 percent range. The original NDP 8 projections had also envisaged such a slowing down of GDP growth during the last two years of the Plan period, when there would be little growth of the mining sector, after the full effects of the Orapa expansion project have been realized. Since the mining sector GDP continues to account for about a third of the total GDP, achieving an 8 percent overall growth with GDP from the mining sector growing very little or not at all, would require the non-mining sectors to grow initially at a significantly higher rate than 8% per year.

The Vision's goal of 8 percent average growth per year is, indeed, a challenge for the entire nation. The nation must brace itself to meet this challenge by, among others, increasing domestic savings and channeling them towards productive investment. Measures must be put in place to encourage greater savings by households. At the same time, appropriate incentive packages must be provided to attract foreign capital, while making sure that the local entrepreneurs are not dis-empowered in the process. The 8 percent growth may not be realized in the short run; but with the right policies, a dynamic and insightful political leadership, and above all, the mobilization of productive endeavors of all stakeholders in the nation, the growth rate can certainly be pushed up from the 4 to 5 percent range to the Vision target.

The other major challenge is the rapid spread of HIV/AIDS in recent years. Despite considerable Government efforts to deal with the HIV/AIDS epidemic, there is no sign yet that the nation is winning the war against it. Some measures have been put in place to arrest the spread and impact of HIV/AIDS. Their effect is still to be felt, as HIV/AIDS continues to spread.

There is, therefore, need to review our strategies. To this end, Government decided to undertake six studies to assess the impact and spread of HIV/AIDS. Four of these studies were completed in the first quarter of the year 2000.

Another major public issue is public sector reform. This is a very broad area, covering diverse subjects such as cost containment in project implementation, reform of the public procurement system, speeding up Government decision-making, right-sizing Government, and others.

(2) The most critical issues

a. HIV/AIDS

The HIV/AIDS epidemic continues to pose a threat to the social and economic development of Botswana. The disease is not only a health problem but is also a social and economic problem, cutting across all groups in society and all sectors of the economy. On the economic front, it poses a threat to development by depleting the country's supply of labor, lowering productivity and increasing the dependency ratio. The prevalence of HIV/AIDS infection has increased from 13% among the general population in 1996 to 19% in 1999, and from 23% among sexually active age group (15 to 49 years) to 29% over the same period. The estimated number of infected individuals has also increased from 180,000 in 1996 to 300,000 in 1999. One of the forecast consequences of the increase is that Botswana will have 65,000 AIDS orphans at the end of the year 2000.

Various measures have been taken to curb the spread of the disease. However, it is clear that more concerted efforts are still needed to contain the spread of the epidemic. Four of six studies to assess the impact and spread of HIV/AIDS have been completed earlier in the year 2000 and Government is considering their reports, with a view to identifying what further measures should be taken. It should be noted, however, that the HIV/AIDS Programs will have to be prioritized, in view of financial constraints.

b. Unemployment

Another major problem facing the nation is unemployment. The 1998 Demographic Survey estimated unemployment at 19.6% of the labor force.

This represents a fall of 1.9 percentage points from the level of 21.5% estimated in 1996. Despite the fall, however, 19.6% rate of unemployment is still very high and unacceptable, and continues a major socio-economic problem for the country.

It appears anomalous that unemployment has remained a problem when the population has been growing at slightly over 3% p.a. for almost three decades until recently, while the economy has been growing at 10% on average. A principal reason for this, of course, is that mining, which accounts for most of the growth in the economy, creates very little direct employment due to its relatively capital-intensive nature. On the other hand, the agricultural sector, which is highly labor-intensive, has shrunk over the years relative to the rest of the economy. One of the major reasons for this is the low productivity of the agricultural sector due to the use of outmoded and inappropriate technologies, which is worsened by the recurrence of drought.

The other reason for the relatively slower growth in unemployment is that employment mix has become continuously more skill-intensive in both the private and Government sectors. Each year, more skilled workers are required relative to unskilled workers. Lack of required skills, therefore, often explains why a significant proportion of the labor force remains unemployed. In recognition of this, Government has consistently placed a great deal of emphasis on education and training. However, since prospective employers are looking for progressively higher levels of skill in their employees, the education system has had to aim at a moving target. While sectors such as agriculture and to some extent, construction, will continue to be developed to absorb the low skill workers such as Junior Certificate holders, the strategy is to improve the overall level of training in the country such that those get employed are productive and command high wages, thus avoiding the problem of the “working poor”.

The principal Government strategy to bring down unemployment is to achieve high and diversified economic growth in the country. Increased investment in general health, education, skills development and technology, together with other measures to raise productivity are further elements of Government policy to tackle the unemployment problem.

c. Poverty

The other major challenge facing the country is poverty. Poverty is calculated on the basis of the Household Income and Expenditure Survey (HIES) data, the latest being for 1993/94. According to the 1997 Study of Poverty and Poverty Alleviation in Botswana, 47% of Botswana individuals and 38% of household, were living in poverty in 1993/94. A higher proportion, 50% of female-headed households were living in poverty compared to 44% of male-headed households. Furthermore, it was estimated that 62% of poor or very poor Botswana were living in rural areas, 24% in urban villages and 14% in urban areas. It may be noted that the percentage of Botswana living in poverty in 1993/94, i.e., 47%, 12 percent decline from 59% estimated in 1985/86. While this is a welcome reduction, the country is still very far from the Vision 2016's goal of having eradicated absolute poverty by the year 2016. Concerns have also been raised that the Poverty Datum Line (PDL) basket used in Botswana to assess the prevalence of poverty may be too generous. In this regard, Government will undertake another HIES and also review the PDL basket before the end of Plan.

There are a number of causes for the existing poverty situation. As would be expected, lack of income has been identified as the most immediate cause of poverty. This, in turn, is related to lack of wage employment and insufficient opportunities for self employment. A narrow resource base is another important cause of poverty. Lack of human capabilities in education and health also contributes to poverty, since they affect peoples' ability to take up opportunities and improve their lives.

Another way of looking at the problem of poverty is to view it as the problem of low productivity. Underlying the low productivity in the agricultural sector is the poor rainfall and soil conditions in much of the country, as well as perennial droughts. To overcome these disadvantages, agriculture in Botswana will have to adopt appropriate technology. In wage employment, whether in agriculture or elsewhere, wages have to take into account productivity levels, if they are to be sustainable. Otherwise, they would raise the cost of production in the relevant industry or business relative to competitors and drive it out of business. In

countries like Botswana where the public sector plays a key role in determining the wage level, Government often has to walk a tight rope in balancing the need for competitiveness with that of social justice.

As in the case of unemployment, the principal Government strategy for fighting poverty is to go for high and diversified growth of the economy, to generate higher employment and income for all Botswana. Measures to improve the general health of the population and to raise the standards of education and skill will also help to boost employment and income, thereby pulling individuals and households above the poverty line. For effective poverty reduction, it may be necessary, in certain situations, to systematically target these and policies at individuals, groups and localities. Programs such as the destitute allowance will continue to be carefully targeted so as to ensure that only the needy are covered. Other Programs aimed at drought induced destitute will be reviewed on a regular basis to ensure that they achieve their stated objectives.

d. Economic Diversification

Economic growth in Botswana over the last three decades has been driven chiefly by the growth of the mining sector, the mining of diamonds. This has been followed by the general Government sector. The call for sustainable economic diversification in both NDP 8 and Vision 2016 came out of the realization that high and stable growth of the economy in the long run, along with approaches towards full employment and eradication of absolute poverty, can only come through sustained growth and development of the other, i.e., non-mining and non-Government, sectors of the economy. Indeed, the need for diversification has been recognized as being critical in the past successive National Development Plans, and in other policy papers over many years. But as the Vision 2016 puts it, the importance of economic diversification has now become paramount’.

It should also be noted that a significant level diversification of the economy has already taken place since the early eighties. Thus, the share of mining in total GDP in constant (1985/86) prices fell from 50.7% in 1983/84 to 30.8% in 1998/99. The share of the general Government sector, however, increased from 12.3% to 16.2% over the same period. A comparison of the average sectoral GDP growth rate also points to a

certain measure of success in diversification. For instance, while real GDP of the mining sector has grown at an annual average rate of 3.9% over the period 1983/84 to 1998/99, GDP in other sectors like electricity and water, trade, transport, finance and services has grown at double digit annual average rates of ranging from 11% to 14%. The continuing concern of Government policy for diversification underlines the fact that, given the low base of economic sectors other than mining and Government, the extent of diversification that has occurred already, though significant, is nowhere near adequate to ensure sustained long run growth and vibrancy of Botswana economy and thus prosperity for Botswana.

Government will continue to implement policies aimed at diversifying the economy. The whole gamut of macro-economic policies and policies relating to ownership, regulation and control are being made investor-friendly. The new Industrial Development Policy, which was approved by Parliament in December 1997, is a comprehensive policy agenda for promoting growth in competitive manufacturing and service industries. Other major recent policy initiatives are the establishment of the International Financial Services Center, the Privatization Policy for Botswana and the Reform of the Public Procurement System. Significant among other initiatives aimed at diversification as well as citizen economic empowerment are the Financial Assistance Policy (FAP) and the Small, Medium and Micro Enterprises (SMMEs) policy, which have been reformulated and consolidated under the Citizen Empowerment Development Agency (CEDA).

e. Public Sector Reform

Public sector reform is an encompassing term, which includes, among others: changes in the public procurement system, cost control and cost recovery, right-sizing of Government, productivity increases, privatization, improvement of implementation capacity in Government, etc. The need to right-size Government was recognized and agreed in NDP 8. In spite of the accepted to “hive off” some activities to the private sector, the provisional data for the first two years of NDP 8 show a marginal rise in Government’s share in total GDP. However, the most recent data on formal sector employment show that employment in the private sector in the economy increased by 7.6% from September 1998 to September 1999,

whereas employment in Government increased by only 3.2% over the same period. This is a welcome change in the trend observed so far, which needs to be sustained for the success of the accepted Government policy of progressively expanding and strengthening the role of the private sector in the economy.

Increasing the extent of participation of the private sector in the economy is also the core objective of the Privatization Policy, which was approved by Parliament recently. Many commercial and industrial activities being carried out at present in state-owned enterprises are expected to be fully or partly transferred to the private sector under the policy. This is expected to result in a leaner and more efficient Government. In addition, privatization is expected to enhance citizen economic empowerment. However, even after the completion of the privatization process, the role of Government in the provision of services such as education, health and physical and institutional infrastructure will continue to remain crucially important for the growth and development of the private sector.

f. Citizen Economic Empowerment

Citizen economic empowerment has recently become a topical issue. A national conference organized in July 1999 deliberated on the concept and arrived at the following operational definition:

“Citizen Economic Empowerment is a set of policies and Programs, designed to benefit a broad spectrum of society and enable Batswana to participate meaningfully in every aspect of the economy in the fulfillment of social justice and the creation of globally competitive businesses. In this respect, the individual “shall unleash his or her potential and take risks to benefit self and other Batswana”

Government is currently considering the recommendations of the conference to determine what steps be taken to strengthen the existing citizen empowerment schemes, and what additional steps may be introduced. However, it should be noted that citizen economic empowerment is a process and not an event. And this will take time to be achieved.

Several special schemes are in place to enhance citizen empowerment, such as the Local Procurement Program under which 30% of all central Government purchases are sourced from local firms. At a more general level, the main thrust of Government policy for citizen economic empowerment is to enhance human capabilities of Batswana through education and training to enable them to participate more effectively in economic development. There is particular emphasis on skills development, in recognition of the fact that many poor people are poor because they lack requisite skills to participate in either wage employment or self-employment. The problem of lack of finance is also being addressed through the introduction of special schemes like the Micro Credit and Credit Guarantee schemes, in addition to the Financial Assistance Policy.

2.2 Overview of Energy Sector

2.2.1 Overview of Botswana Energy Sector

Botswana Energy Balance in 1997/98 is shown in Appendix Table 2.2-1.

Appendix Table 2.2-1 National Energy Balance in Tera Joule (TJ)

Supply and consumption	Coal	LPG	Av Gas	Jet A	Petrol	Paraffin	Diesel	Fuel Oil	Lubes	Electricity	Wood	Solar	Oter Renewable	Total
Indigenous Production	18,696										21,456	21	1	40,174
Imports	480	733	102	259	9,164	812	7,457	233	261	2,912				22,413
Exports														0
Stock Changes														0
Primary Supply	19,176	733	102	259	9,164	812	7,457	233	261	2,912	21,456	21	1	62,587
Transformation Input	14,856						294	62	9					15,221
Coal Upgrading														0
Steam Power Plants (Grid)	11,760						5	62	0					11,827
Diesel Power Plants (BPC)							29		1					30
Diesel Power Plants (DEMS)							260		8					268
Self Generation	3,096													3,096
Transformation Output	0	0	0	0	0	0	0	0	0	3,407	0	0	0	3,407
Coal Upgrading														0
Steam Power Plants (Grid)										3,004				3,004
Diesel Power Plants (BPC)										15				15
Diesel Power Plants (DEMS)										78				78
Self Generation										310				310
Consumption of Transf. Plants										371				371
Transf. & Distribution Losses										590				590
Net Supply	4,320	733	102	259	9,164	812	7,163	171	252	5,358	21,456	21	1	49,812
Statistical Differences	0	166	0	0	0	307	-1	0	0	-9	2			465
Total Final Consumption	4,320	567	102	259	9,164	505	7,164	171	252	5,367	21,454	21	1	49,347
Non Energy Consumption														
Final Energy Consumption	4,320	567	102	259	9,163	506	7,164	171	251	5,367	21,454	21	1	49,346
Residential	48	518	0	0	0	502	0	0	0	684	21,454	19	0	23,225
Urban	48	498				335				439	4,616	19		5,955
Rural	0	20				167				245	16,838		1	17,271
Agriculture	0	0	0	0	18	0	475	0	27	0	0	0	1	521
Crop Farming					10		252		15					277
Livestock Production					8		223		12				1	244
Industry	4,152	36	1	15	118	1	2,001	168	91	3,002	0	0	0	9,585
Diamonds		25	0	15	61	1	1,631	24	31	1,051				2,839
BCL	3,720	0	0	0	9	0	223	144	59	1,453				5,608
Other Mining		0	1	0	16	0	77	0	1	400				495
Manufacturing	192	1	0	0	5	0	39	0	0	35				272
Construction			0	0	24	0	29	0	0	0				53
Meat and Meat Products	240	10	0	0	3	0	2	0	0	63				318
Trade and Hotels	0	3								1,278		1		1,282
Transport	0	0	101	244	8,571	0	4,360	0	133	0	0	0	0	13,409
Rail					8	0	455	0	1					464
Other			101	244	8,563	0	3,905	0	132					12,945
Social & Private Services														0
Government	120	10			456	3	328	3	0	403	0	1	0	1,324

(Source: Botswana Energy Statistics 1997/98)

- * **Fuel wood** is mainly consumed in the household sector, especially in rural households where incomes are generally low and fuel wood is perceived as “free”. Government institutions like schools and clinics as well as some commercial enterprises also rely on fuel wood especially for cooking.
- * **Coal** is one of the resources with which Botswana is well endowed. Approximately 79% and 20% of annual coal production is used for electricity

generation and for Copper Ore smelting respectively. The balance is mainly consumed by government institutions and the manufacturing sector. There are no exports and insignificant amounts of washed coal are imported by industry and manufacturing sectors from South Africa and Zimbabwe.

- * **Petroleum Products** are all imported in refined form from the Republic of South Africa (RSA). Petrol and diesel account for the bulk of petroleum products and are mainly consumed by road transport. However, diesel is also used for electricity generation. Liquefied Petroleum Gas (LPG) and paraffin are mostly used by the residential sector for cooking and lighting. Jet A1 and Aviation Gasoline are consumed by air transport.
- * **Electricity** consists of both local production (thermal) and imports. During 1997/98, BPC's total electricity supplied was 1643.5 GWH of which 850 GWH was imported. The mining sector remains the largest consumer of electricity and use by households remains low.

2.2.2 Energy Policy

Energy policy is an extension of national policy. Presently Botswana energy sector is governed under the following hierarchy of national policy.

(1) Long Term Vision in Context with Energy Policy and Rural Development

The Botswana Government set forth "Long Term Vision 2016" and shaped the vision and strategies.

The Long Term Vision presents, among others, "Building an Educated, Informed Nation", "Building a Prosperous, Productive and Innovative Nation" and "Building a compassionate, Just and Caring Nation". In order to accomplish such vision, the following strategies, among others, are raised:

- * Education is an investment that will lead to higher quality of human capacity and productivity in the future. Botswana must aim in the long term to introduce universal, and compulsory schooling up to the secondary level. Attention must be given to the improvement of all level of schooling. The proper equipping of primary schools, particularly in remote areas, must be seen as a priority. Primary schools must be

electrified with the same priority as secondary schools. Human resource development for gender is required.

* **Information:** To ensure the participation of Botswana in the developments of society driven by information throughout the world, there is an urgent need to develop the media within Botswana, especially in the area of radio and television.

* **Economic Growth:** Energy is a pre-requisite for successful industrialization. Botswana must therefore seek to develop cost effective sources of energy.

Botswana has a tremendous potential for solar energy that must be exploited, especially for rural communities not catered for by the national grid. Solar power is a potential source of electricity for schools in remote areas. Creating employment and the expansion of small and medium sized enterprises is a vital component of the strategy to achieve full employment within twenty years.

* **Income Distribution and Reduction of Poverty:** Effective measures must be put in place to provide income earning opportunities for those who are not sharing in the national prosperity, and thereby to reduce the degree of income inequality in Botswana.

The most important measure is to create sustainable jobs in the economy, particularly in rural areas where the extent of poverty is highest.

A second measure is to develop human resources so that the poor are enabled to utilize the job opportunities created through economic growth.

(2) National Development Plan in Context with Energy Policy and Rural Development

The main theme of the Eighth National Development Plan (NDP8) is sustainable economic diversification. In NDP8, energy sector policy and strategy are raised.

Energy Planning

Energy planning focused more on the supply side than on the demand side, had deficiencies in that the focus was on the needs of the energy supply

industry with no clear perception of suppressed demand and the resultant potential (and history) of over supply. These deficiencies will be overcome in NDP 8 through the application of Integrated Energy Planning (IEP). In IEP various scenarios of satisfying users energy service needs are evaluated in terms both of the capacity, or potential capacity, of the supply side and also in terms of other national policy goals.

Energy Policy

Energy policy in NDP8 is aimed at providing a least cost mix of supply, which reflects total life cycle costs and externalities. Energy policy should take into account the following factors:

- * the limited ability of consumers to react to energy price fluctuations in the short term
- * many of the poor are not able to pay market prices, and thus would not be able to meet their basic energy needs
- * rural energy consumption is still a substantial proportion of total energy consumed, but energy markets in rural areas are either non-existent or developing slowly
- * for some fuels, Botswana is still heavily dependent on imported supplies, hence the need to reduce vulnerability to disruptions in imports
- * energy utilities operate as monopolies and, therefore, require Government monitoring
- * environmental costs, e.g., deforestation and pollution, are not currently reflected in market prices

Economic Efficiency

- * although the energy supply industry should be financially sustainable, profit margins will continue to be controlled
- * within the context of efficiency, energy users (and potential users) should have access to appropriate energy services (to enable economic diversification)
- * energy should be used efficiently

Social Services

- * increasing access by households and community services to adequate and affordable energy services

Environment, Quality, Sustainability and Security

- * energy extraction, production, transport and use should not damage the environment or people's health and safety
- * in the long term, sustainable energy usage must be implemented
- * supplies must be reliable to ensure economic development and business confidence

2.2.3 Overview of the Power Industry in Botswana

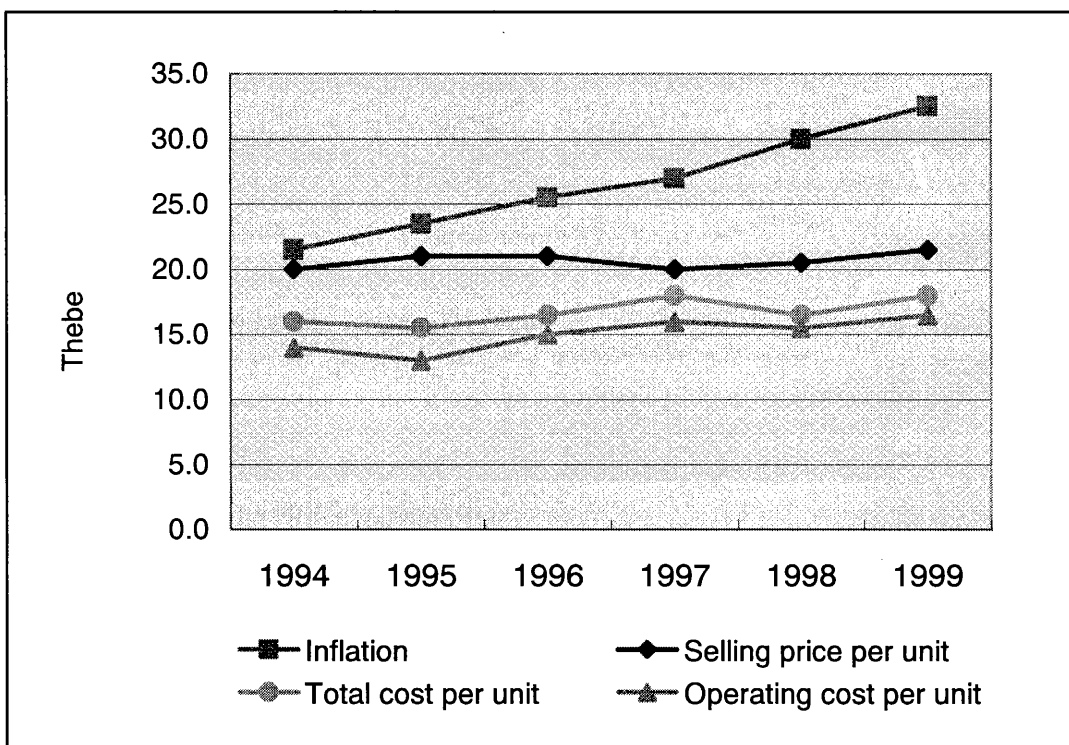
(1) Tariffs

BPC customers are categorized into six classes based on the use and size of supply taken. Each tariff grouping has particular rates assigned to it as given in the table below.

Appendix Table 2.2-2 Tariffs Effective From February 1999

	Fixed Charge	Energy Charge	Demand Charge	Note
Domestic [TOU 4]	P7.00	P0.2523	None	a. This category is reserved for supplies used for domestic purposes only. It does not include institutional customers such as boarding houses. b. Common sizes of supply offered are 60 Amps 230 volts and 60 Amps 400 volts, where the security deposit is a standard P200.00. c. Consumers in this category pay a fixed charge plus energy rates only.
Small Business [TOU 6]	P17.00	P0.2618	None	This category applies to commercial, industrial or institutional consumers supplied with electricity not exceeding 60 Amps 400 volts and in respect of loads not exceeding 35kW.
Medium Business [TOU 7]	P17.00	P0.1342	P32.13	This category applies to commercial, industrial and institutional customers supplied with electricity not exceeding 400 volts and in respect of loads that exceed 35kW.
Large Business [TOU 8]	P17.00	P0.1210	P30.24	This category applies to all business consumers supplied with electricity at or above 11000 volts.
Govt. I [TOU 2]	P17.00	P0.3392	None	This category applies to all Government, Municipal and Street Lighting installations, regardless of the size of supply taken or the use to which the supply is put.
W/Pumping [TOU 1]	P17.00	P0.2669	None	This is a special category reserved for water pumping applications, regardless of the size of supply taken.

(Source: BPC Customer Information Guide)



(Source: BPC Annual Report 1999/98)

Appendix Figure 2.2-1 Inflation, Tariffs & Costs

A tariff increase of 5% was effectuated in February 1999. This was the first increase since October 1993. Accumulated inflation for the period March 1994 to March 1999 was 53%, versus the accumulated increase in tariff over the same period of 2%.

2.2.4 Overview of PV Rural Electrification

(1) Manyana PV Pilot Project

Evaluation of the commercial phase is summarized in Appendix Table 2.2-3. Following the positive evaluation of Manyana Project, the National PV Rural Electrification Program (NPV-REP) was initiated.

Appendix Table 2.2-3 Evaluation of Manyana PV Project

ITEM	Evaluation
1 End User Average Income	Average: P846/m, Income range: (P100 to P3,000) - in 1998 Low (P300/m and below) : 31% Middle (P301~P500/m) : 19% High (P501 and above) : 50%
2 Selection criteria for allocating Systems to users	1) Permanent residence 2) Marriage 3) Trustworthiness of prospective users The criteria was problematic. It was decided by the village leadership alone without involvement of the community. Users felt disgruntled by the fact that they were not informed of implications such as the financial ones initially, such that the commercialisation phase came as a surprise.
3 Lighting Costs Before PV installation	Average P7/m (Paraffin)
4 Degree of Interest or willingness to pay	High : 63% Moderate : 21% Low : 0%
5 Affordability	affordable : 59% difficult to pay : 41%
6 Preference	to purchase the system : 88% to pay only utility costs : 12%
7 PV system usage	Running Radios : 69% Running TV sets : 3% Charging car batteries : 18%
8 Recovery of loans	Almost all households payed within two years and only a few extended the payment schedule.
9 Contribution of the resident caretaker	Positive to improve communication links between RIIC and the end-users

(Source: RIIC done in February, 1998)

(2) National PV Rural Electrification Program (NPV-REP)

Evaluation of NPV-REP conducted by EAD in October 1999 is summarized in Appendix Table 2.2-4.

(3) Centralized PV system by BoTeC

The centralized PV system with capacity of 5.5kW(DC) started commercial operation in August 1998 in Motshegaletau Village. In June 1999, an inauguration ceremony was held in the presence of the President of Botswana.

The system has two inverters and the AC output is 4.5 kW. It is the mini independent system which supplies electricity to 14 customers through the 240 V distribution line of about 2 km. Most electricity is supplied to a school, a clinic, Kgotla and households. Two TVs, which are donated by a firm, are installed in the school and the clinic. The rest of energy is supplied to streetlights. Electric tariff is 25 Th/kWh same as that of BPC and a pre-paid system is applied. There are P10, P50 and P100 cards provided. After collection of tariff, BPC pays 90 percent of tariff to BoTeC. No tariff is charged to public facilities such as the school and the clinic because District pays for them. There are nine conventional meters installed at nine different households and the pre-paid system is applied to the rest of the households. District Council operates and maintains the system. An electrical engineer and three electrical technicians operate and maintain the systems. In order to prevent theft, 250 W class panels, which are bigger than ordinary sizes and have serial numbers, are installed. It is easy to identify these panels when they are stolen and sold in other areas. In addition, a security guard and an attendant are on the watch.

There were only two forced outages occurred since the commissioning. The causes were lightning and a shortage of power because it continued to be cloudy weather for more than two weeks, whereas batteries were capable of discharging for five days.

The construction cost is P433,000 which includes the cost of distribution lines, lightning protection, control room and data logger etc. PV modules were imported from the U.S. BoTeC installed the whole system. The Supervisory Control and Data Acquisition (SCADA) system was completed in November 2000 in order to manage the system from the BoTeC head office.

Three-day training is provided four times a year. The training course consists of maintenance and fixing the system.

Appendix Table 2.2-4 Evaluation of NPV-REP (Source: EAD October, 1999)

Items	Key Findings	Countermeasures
<p>1. Validity of Planning 1) Target Setting</p> <p>2) Target Area</p> <p>3) Integration with Grid Electrification</p>	<p>During the planning stage there were no clear strategy on achieving the 237 SHS/y target.</p> <p>The installed systems are scattered all over the country and this make it difficult to attend client's problems adequately.</p> <p>No apparent complementarity between RCS and NPV-REP</p>	<p>to put in place clear strategies towards targets.</p>
<p>2. Operation and Management 1) Execution Body</p> <p>2) Accounting</p> <p>3) Sales Activity</p> <p>4) Maintenance</p>	<p>Long term execution body for PV electrification is not identifies.</p> <p>EAD is not directly involved in hiring of program staff.</p> <p>Insufficient management control by Management Committee.</p> <p>Poor auditing.</p> <p>Very high rate of defaulters and its negligence.</p> <p>Poor records of end users.</p> <p>In proper accounting package.</p> <p>Non-availability of pay points as hindrance to the up-take and a cause for arrears.</p> <p>Poor administration ability, inconsistency in pricing poor services.</p> <p>Poor promotion.</p> <p>Overall system costs increase by inception of the program.</p> <p>Too vast areas to cover.</p> <p>Poor inspection checklist.</p> <p>Insufficient man-power.</p> <p>Poor maintenance program.</p> <p>Poor after-service.</p>	<p>to identify an umbrella body to administer all rural electrification schemes and to facilitate better coordination of activities.</p> <p>to devise some means of verification on the output of program.</p> <p>to improve the overall implementation capacity.</p> <p>An annual audit should be introduced.</p> <p>to develop a loan appraisal tool to ascertain client's ability to pay.</p> <p>to put in place mechanism to follow up defaulters.</p> <p>to equip accounting package and to train staff.</p> <p>to establish pay point in proximity to clients.</p> <p>Introduction of proper PV system sizing software package and relevant staff training.</p> <p>to intensify awareness campaigns through kgotla medium.</p> <p>to introduce price control mechanism.</p> <p>Decentralization of maintenance to local artisans.</p> <p>to establish a technical inspection check list.</p> <p>to beef up technical staff and to recruit qualified personnel.</p> <p>to make available manuals in Setswana and English.</p> <p>to make periodic follow up of clients.</p>

Items	Key Findings	Countermeasures
<p>3. System Design</p> <p>1) Application</p> <p>2) Sizing</p>	<p>There are many applications. Lack of proper system sizing method for quotation. Present system size installed.</p> <p>101 – 150 Wp : 41% 51 – 100 Wp : 34% 151 – 200 Wp : 9%</p>	
<p>4. Analysis of End-users</p> <p>1) Employment</p> <p>2) Income level</p> <p>3) Payment Arrears</p> <p>Income level of Arrears beyond 6 month</p> <p>4) Estimated affordable loan amount</p> <p>Down payment:</p> <p>Income level:</p> <p>Total loan Amount</p> <p>5) Reasons for low dissemination</p> <p>5. Measures to make the scheme affordable</p>	<p>Formal employment : 64.7% Self employment : 31.4% Over P2,000 : 41.2% P501 ~ P1,000 : 19.6% 0 ~ P500 : 15.7%</p> <p>Income level Arrears % 0 ~ P500 : 87% P1,000 ~ P2,000 : 63.7% Over P2,000 : 64.7%</p> <p>P850 P1,450/m = 6 x Income 15% down payment is not affordable</p>	
	<p>1) Decrease of down payment 2) Prolongation of loan period 3) Decrease of tariff and other subsidies 4) No insurance 5) Decrease of interest rate</p>	

2.3 PV Projects in the Selected Developing Countries

2.3.1 Schemes and Features of PV Projects in the World

Scheme and features of PV projects in the various developing countries are enumerated in the Appendix Table 2.3-1 and the details of the selected projects are described in its Appendix Document 2.3-1~3.

Appendix Table 2.3-1 PV Projects in the Development Countries

Item No.	Host Country	Population in 1998	Surface area 1000 sq. km	Population density people/sq. km	GDP per capita 1998	Implementing/Executing Agency	Local Sponsor	Project Title	Project	Project Cost (total/ Agency funds)	Project Volume	Objectives	Electrifi. Mode	Project Start Year	Remarks (Previous experiences)
1	Global (especially in India, Kenya, and Morocco)				Current US\$	WB		Photovoltaic Market Transformation Initiative (PVMTI)	Project seeks to accelerate the commercialization, market penetration, and financial viability of PV technology in developing world and demonstrate large-scale use of PV as one of the strategies for reducing GHG emissions. PVMTI is based on the premise that private sector project design and management will stimulate more sustainable ventures than government- or donor-financed PV procurement alone.	Total: 90-110 (GEF:30, equity from investee companies, commercial financing, potential IFC cofinancing, and additional donor funds: 60-80)	MW	Support private sector investments to expand the market and use of PV, especially for rural electrification.		India, Kenya, and Morocco were selected for PVMTI based on their high level of existing commercial activity and government endorsement. Unelectrified population: India:75million, Kenya:3million, Morocco:2million	
a-1	India	979.7	3,300	296.9	439	WB/IFC, GEF	PV manufacturer, distributor, System component supplier, NGOs.	PV Market Transformative Initiative (PVMTI)	Develop SHS retailer, Off-grid dealership, Pumping sys.	105/15	22.9	Project financing to private sector	System sales, leasing with consumer credit	11/1/93 for 10 years	Current installed PV capacity: 27MW, Annual sales: 11MW
a-2	India	979.7	3,300	296.9	439	WB/IFC, GEF	Shri Alternative Energy		Building a network of energy stores for the sale of consumer products of PV etc.	-/2.2					
b	Kenya	29.3	580	50.5	396	WB/IFC, GEF	PV distributor, Battery supplier, Bank	PVMTI	Develop SHS sales and end-user finance, Off-grid dealership	10/5	1.3	Project financing to private sector	System sales, leasing with consumer credit	8/30/94 for 10 years	Current installed PV system: 50,000, Annual sales: 0.3MW
c-1	Morocco	27.8	447	62.2	1,277	WB/IFC, GEF	Battery supplier, Bank	PVMTI	Develop SHS sales and end-user finance, Off-grid dealership	107/5	4.9	Project financing to private sector	System sales, leasing with consumer credit	12/28/95 for 10 years	Current installed PV capacity: 3, Annual sales: 1MW
c-2	Morocco	27.8	447	62.2	1,277	WB/IFC, GEF	ONE (national electricity utility)	PVMTI+PERG (national rural electricity program)	ONE intends to have 200,000 SHS installed by private sector during next 7 years	-/3			ONE provides contribution for each households which will pay for part of an individual SHS		
2	Zimbabwe	11.7	391	29.9	538	UNDP	DOE	SHS	to enhance solar power manufacturing and delivery and expand its market, and to establish credit mechanisms allowing low-income groups to purchase PV. 45W-9800set	GEF: 7, Government: 0.4	0.4	Catalyze and sustain market acceptance of SHS	System sales, leasing with consumer credit (down payment: 15% of system price; US\$ 136, and 5 years repayment; US\$ 18/month)	4/91-8/97	8million people who are without access to grid supplied electricity. High downpayment and monthly payment in case of GEF. Project could be payable only by affluents.
3	Cameroon	14.3	475	30.1	622	WB/UNDP	SONEL(national power comp.), private sector	Energy Sector Management Assistance Program (ESMAP)	Pilot operations to test market and technical assistance on commercial arrangements, retail channels, credit facilities, and institutional arrangement. 250 SHS in 6 villages (1st phase:1998; 80 SHS in 2 villages)				Systems are to be managed by local operators on a commercial basis	1998	
4-1	South Africa	41.4	1,221	33.9	3,236	USDOE, US/South Africa Binational Commission	DME, NRECA	Pilot program for Renewables for Sustainable Village Power (RSVP)	2500 PV systems in rural SA				Integrated rural energy delivery by combining the financing, installation, and servicing of PV system with the distribution of LPG for cooking.		The electrification program for the year 2000 for non-grid PV systems is 23,000 connections.
4-2	South Africa	41.4	1,221	33.9	3,236	DME	6 Consortia	1st phase of non-grid rural electrification	23,000 non grid connections for the first year of operation and depending on the successful implementation of the first phase, more areas will be opened up.						
5-1	Botswana	1.6	582	2.8	3,063	EAD/RIIC		NPV-REP	Rural communities can utilize the NPV financing scheme to purchase PV systems repayable over 4 years with interest.					1997-2001	
5-2	Botswana	1.6	582	2.8	3,063	EAD/RIIC		Manyana Pilot project	Rural communities can utilize the NPV financing scheme to purchase PV systems repayable over 4 years with interest.					92-97	
5-3	Botswana	1.6	582	2.8	3,063	EAD/BotTec		Moshogaletau Mingrid PV	Rural communities can utilize the NPV financing scheme to purchase PV systems repayable over 4 years with interest.					98	
6	China	1,200	9,600	125.0	789	WB		Renewable Energy Development	PV for schools, households, small businesses in NW rural China	Loan:100 Grant: 35				6/8/99	

Appendix Table 2.3-1 PV Projects in the Development Countries

Item NR.	Host Country	Population in 1998 million	Surface area 1000 sq. km	Population density people/sq. km	GDP per capita 1998 Current US\$	Implementing/Executing Agency	Local Sponsor	Project Title	Project	Project Cost (total/ Agency funds) mUSD	Project Volume MW	Objectives	Electrifi. Mode	Project Start Year	Remarks (Previous experiences)
7-1	Indonesia	203.7	1,900	107.2	462	WB	GOI	SHS Project	to support installation of ca. 200,000 SHS in 4 regional markets, focusing on areas too remote to connect existing grids but reasonably close to urban centers. Activities: a credit component comprising an IBRD loan and a GEF grant and technical assistance	Total 118.1 (GEF: 24.3, WB: 20, GOI: 1.5, banks: 5, subborrowers and end users: 67.3)		Catalyze and sustain market acceptance of SHS	to enable purchase of SHS by rural households and commercial establishment	1/97-4/02	The Bampres Project (Pilot PV demonstration program): The government assisted PV prototype program provides SHS to users who pay an initial fee of about \$25 and a \$3 monthly fee for 10 years. 20,000 SHS have been installed. Projects have been hampered by a lack of in-country experience in organization and financing. Efforts have not focused on cost recovery or building a base for future product or market development.
7-2	Indonesia					WB/US DOE	BPPT/teknologi	Bampres Project	The Bampres Project (Pilot PV demonstration program): The government assisted PV prototype program provides SHS of 50Wp to users who pay an initial fee of about \$25 and a \$3 monthly fee for 10 years. 20,000 SHS have been installed. The project is to set up a financing arrangement with REC to enable it to acquire PV household in bulk. The funds are provided in a form of a loan and have the same terms as loans for conventional rural electrification activities from the national utility. To reduce the costs of the maintenance service, PV systems are installed only in areas where a cluster of consumers is willing to take them.				ESCO approach: The actual field implementation is carried out through the cooperative system. The local cooperatives, KUDs, are responsible for fee collection, record keeping, and technical support.	1993	Projects have been hampered by a lack of in-country experience in organization and financing. Efforts have not focused on cost recovery or building a base for future product or market development.
8	Philippines	75.2	300	250.7	866	GTZ	Rural Electric Cooperative (REC)	GTZ program					Consumer pay an initial charge of about \$200 and then a monthly service fee of about \$7.5. REC technicians inspect and maintain the systems.		
9	Nepal	22.9	147	155.6	210								50% subsidies of SHS hardware cost		
10	Argentina	36.1	2,800	12.9	8,258	WB	New World Power Co./Solartec	SHS, Water pumping, communicatio and food refrigeration	SHS, Water pumping, communicatio and food refrigeration	2.6			private electric utility, rural electric cooperative or other institution to be granted a concession for providing electricity services with subsidies	1995-3/96	
11	Mexico					Mexico government	National electric utility (CFE)	Promasal program (Least cost rural electrification)	SHS program was initiated and carried out by the public sector involvement with subsidies. 1991-94: 5MW, 10,000 SHS, by 98: more than 40,000 SHS installed				CFE issues tenders for PV suppliers to install and maintain SHS for which end-user pay a fixed monthly service fee.	late 1980s	
12	Brazil	165.9	8,500	19.5	4,691	Solar Electric Light Fund(SELF)	Sustainable Development and Renewable Energy (IDER): non-profit NGO	The National Program for Energy Development of States and Municipalities	to increase renewable energy project installations in rural communities from 2,000 in 1998 to more than 10,000 a year within a few years. Each project is expected to reach about 200 people living in rural communities.				Utilizing a revolving credit fund, enduser purchases 4803 SHS with 10% downpayment and monthly 12.6\$		20 million rural inhabitants and 3 million properties do not have access to grid power
13	Dominica Republic	8.3	49	170.3	1,916	Soluz (USA)	Private investors	1600 SHS installed, Soluz buys PV systems from USA at market price, which are distributed, installed and maintained by Soluz local center.					ESCO: Soluz sell electricity by 50Wp PV at almost same price as paid for kerosene (\$8 to \$8/m)	1999	Small PV systems on credit can help rural people even in some of the poorest rural sectors to develop business opportunities, if accompanied by a SMME-approach

2.3.2 Lessons Learned from PV Projects in Developing Countries and Consideration on Botswana PV Projects

Lessons learned from PV Projects in Botswana and other countries are useful and suggestive to formulate PV rural electrification master plan. The followings are the summary of various reports and considerations on application for Botswana.

(1) Pre-conditions for Getting PV Programs and Businesses off the Ground

In order to get PV programs and businesses off the ground in developing countries, it is said that the best markets are countries/regions that meet the following criteria:¹⁾

- 1) The countries/regions must have either an insufficient grid or a grid so unreliable as to create demand for supplemental power sources.
- 2) The rural population should be readily accessible within a region so that the systems can be serviced in a cost-effective manner.
- 3) It helps to have a majority of the population in the cash economy with an income level that supports the minimum payments required by a custom financing vehicle. If a country is so poor, or if major portions of population earn low income, then unsubsidized SHS sales -even with a consumer financing program- are infeasible.

If the above mentioned criteria 1) to 3) are applied to Botswana, then conditions in Botswana are as follows:

- ① In Botswana, grids are extending rapidly. Most of larger villages will be served by grids after completion of the project to expand grid connectivity to 72 villages. Low populated villages sparsely located will remain unserved. Electricity demand in such areas is small, because of poverty and underdeveloped rural industries.
- ② As mentioned the above, target areas are further dispersed than grid served areas in Botswana where the population density is 2.8-persons/square km, one of the most sparsely populated countries in the world. Considering the situation cost-effective supply of services are very difficult, such being the case of RIIC's NPV-REP.

¹⁾ Source: Attachment, Reference list No.6

- ③ In Botswana rural areas, most of household incomes rely on livestock sales. Income level of such households is so low that down payment and annual repayment for PV systems are not affordable. This is one of the reasons why NPV-REP is poorly accepted.

As enumerated in the above, the situations in Botswana are not favorable for launching the PV program and business on a commercial basis and sustainable development of them, without special government supports including appropriate subsidies.

(2) Approach to Bring PV to Customers

Although each SHS program has unique characteristics, there are two general approaches to bringing PV to customers in the developing world:²⁾

a. Open market approach

As the most common approach, described by the World Bank as the open market approach, there is a roughly unrestricted market in which PV dealers and developers can conduct direct sales and -with government, donor, and nongovernmental organization involvement- establish PV micro credit, leasing, or direct sale programs.

b. Dispersed area ESCO or concession approach

In the dispersed area ESCO or concession approach, applied chiefly in Argentina, the Philippines and South Africa, a public or a private electric utility, rural electric cooperative, or other institution is granted a concession for providing electricity services to unserved populations and does so in part through establishing a PV program.

Few PV programs in developing countries, regardless of approach, have achieved independent financial sustainability. Although they are aiming eventually to become financially sustainable, most of these programs -while perhaps successful by other standards- have been unable to wean themselves from grant support.

There are several reasons why so few PV programs have in developing countries achieved financial sustainability.³⁾

²⁾ Source: Attachment, Reference List No.6

- 1) The most common problem is extra costs arising from unanticipated maintenance, component replacement, outreach efforts, and training.
- 2) In cases where extra funds are available to cover these activities, there is no "human software" to provide maintenance or training in many cases.
- 3) In Kenya, a PV program did not address the middle-market consumers-i.e., consumers who cannot afford to pay the entire cost of a PV system up-front in cash but who are not so poor that they need the PV system price subsidized; the program in Kenya focused only on the cash market, thereby preventing the next level of penetration and precipitating a long-term decline in sales.
- 4) In Sri Lanka, the lack of working capital and low margins at the dealer level prevented the PV program from thriving, let alone expanding.
- 5) A program in the Philippines suffered from, among other things, poor financial management and a lack of understanding of the terms and conditions of its own loan program on the part of key officers in the implementing institution.
- 6) The practical problems of designing and installing significant numbers of PV systems in the rural areas of the developing world were seriously underestimated in many programs. The variations in patterns and the degree of insulation were not always taken into account, and systems were inappropriately sized or located. The quality of cables, clips, switches, and ancillary equipment was often not given the attention it deserved.
- 7) Centralized PV power stations:⁴⁾

The progress that has been made in PV technology means that the costs of the centralized stations built in the 1980s would now be lower. Nevertheless, the inherent disadvantages of high capital investment and the lack of flexibility in meeting load growth of these stations remain. Another major problem is that the equipment is extremely sophisticated, and repair and maintenance are costly, especially when technician have to be flown in from the country of origin of the equipment. There tend to be a high level of consumer dissatisfaction, because households connected to what appears to be a conventional grid expect the same level of service. A GTZ review stated, "Central-station village systems do not today constitute a viable alternative to

³⁾ Source: Attachment, Reference List No.6

⁴⁾ Source: Attachment, Reference List No.88

diesel-based isolated grids, and not even a dramatic decline in the price of solar cells would alter this.”

In order to cope with the above difficulties, possible solutions are briefly outlined below:⁵⁾

a. Realistic financial charges

Realistic financial charges are required in order to promote a self-sustaining dissemination of PV systems. Appropriate end-user's burden of financial charges creates ownership of the PV system. Such ownership is important to maintain the PV systems properly.

b. Practical design and installation problem

PV programs need to be carefully designed and targeted, system components checked and installation properly supervised.

c. Repair and maintenance arrangements

Simply providing training courses for technicians will not meet this need. Unless these technicians are employed and appropriately compensated for their knowledge, they will not consolidate their skills, and the training will be wasted. Major emphasis in program planning must therefore be given to establishing sustainable repair and maintenance services.

In the Pacific island countries, it is reported that user maintenance of PV systems is rarely successful, and frequent visits by trained maintenance personnel are very important. Although “handyman” working in churches, schools, and hospitals has been successful to some extent in maintaining their institutions' PV systems, rural householders generally lack the skills to diagnose PV problems and make effective repairs.

d. Need for adequate information for consumers

It is important to inform customers in advance about what PV system can and cannot do. Where customers' initial expectations have been too high, and they have thought they were buying into a full-scale electricity service, they have been disappointed and resentful. Customers must be properly informed on the proper way to use and maintain their systems.

⁵⁾ Source: Attachment, Reference List No.88

e. Need for adequate management skills in local organizations

Where local PV cooperatives are set up, or are used for running PV programs, a realistic assessment of their managerial skills must be carried out. Cooperatives also require adequate, ongoing monitoring and support. This is particularly important if they are responsible for collecting fees and paying for repair and maintenance services.

Independent auditing and control over the cooperative's operations are likely to be essential in many cases. Similarly, strict control must be maintained over the implementation of disconnection policies for failure to pay fees or to look after systems properly. If excessive leniency is shown to some, moral is lowered, payment default increases, and the financial viability of the program is undermined.

f. Need for realistic assessment of comparative costs

Where donor or government programs are intended to stimulate and develop a commercial market in PV systems, it is essential to carry out realistic economic and technical evaluations and to compare costs with conventional alternatives. This has frequently not been done, and the lack has led to installation of the systems that are uncompetitive with their conventional alternatives. As a result, even if these programs succeed at a technical level, once the funding is finished, the installed systems are unlikely to be replaced at the end of their working life or to be repaired if they break down.

PV demonstration or promotional programs, if they are to lead to sustainable and self-supporting self-dissemination of PV systems, must genuinely represent technically satisfactory, least-cost, and affordable solutions to their target groups of potential users.

Comparing the above mentioned analyses with the situation in Botswana, the following recommendation are derived:

a. Open Market Approach

NPV-REP, the first national PV rural electrification project, applied open-market approach. The government has arranged a financing mechanism on better conditions than the market conditions and RIIC was entrusted to implement the project. In this case there is no problem on financial source because of government support. However, there are

lack of manpower, technologies and software (similarly to item (2)-1), (2)-2) and (2)-5)) and the payment conditions are far beyond reach of low income households (similarly to item (2)-3)). Thus, progress of PV dissemination has been low and the target has not been accomplished.

Concerning private sector participation, cash sales of PV systems has been done on a small scale only in urban and rural urban areas.

It is not recommendable to take open-market approach in Botswana.

b. Concession Approach

This approach has not been tried in Botswana. It will be impossible to apply concession approach without government subsidy, considering small number of target villages in sparsely populated areas. The concession approach taken in South Africa might be applicable in Botswana. However, foreign investors will not be interested in PV project investment in Botswana because of small scale and private companies in Botswana are still under development and will not be able to manage the project on concession basis.

It is recommended that government continues to foster the private sector in the course of PV rural electrification projects under government leadership in order for the private sector to get the concession approach off the ground in future.

In conclusion of evaluation of the PV projects in the Pacific islands countries, it is reported as follows:⁶⁾

To overcome the constraints associated with the low density, low skill levels, and remoteness of the rural communities, the institutional approach most likely to succeed appears to be the provision of PV-based electricity on a fee-for-service basis by a utility rather than through the sale of hardware to individual consumers. The fee-based approach would require that the utility own and maintain the SHSs installed in its customers' premises. Trained staff would visit the customers regularly to service systems, carry out repairs, and collect a service fee. The aim of this fee would be the recovery of utility's operating costs, including a capital recovery charge. A headquarters office would manage the accounts, inventory, procurement, and training.

⁶⁾ Source: Attachment, Reference List No.102

Considering Botswana PV dissemination, the above conclusion would be applicable also in Botswana, because the situations in Botswana rural villages are quite similar to the Pacific island countries, although they are not separated by ocean but by desert.