



REPUBLIC OF BOTSWANA

BOTSWANA NATIONAL REPORT FOR THE
UNITED NATIONS CONFERENCE ON
ENVIRONMENT AND DEVELOPMENT



PREPARED BY THE DEPARTMENT OF TOWN AND REGIONAL PLANNING

MINISTRY OF LOCAL GOVERNMENT AND LANDS

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Preface

This report was compiled by Professor R. Silitshena and Dr. K. Osafo-Gyimah of the University of Botswana on behalf of Department of Town and Regional Planning. The Director of Town and Regional Planning and the consultants would like to thank the Steering Committee Members which was composed of relevant Ministries/Departments, and Non-Governmental Organizations for their comments, assistance and guidance which greatly shaped the present draft.

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The currency units are expressed in Pula, Botswana currency. The pula is equivalent to 0.4931 US\$ as of mid-May 1991.

EXECUTIVE SUMMARY

SUSTAINABLE DEVELOPMENT AND BOTSWANA

The concept of sustainable development has become important since the last decade in the wake of declining economies of African countries. It essentially implies the improvement of living standards of the mass of the population without necessarily eroding the economic base on which they depend.

Botswana has embraced the concept of sustainable development since its third development plan, launched in 1976. There are four development objectives in Botswana - rapid economic growth, economic independence, social justice and sustainable development. These objectives are not mutually exclusive, although they may sometime conflict.

Botswana's environment is hostile and its natural resources limited. The climate is semi-arid and is characterised, among other things, by low rainfall (250-659 mm), which is seasonal and variable, high daytime temperatures and high evaporation and transpiration in excess of rainfall, and endemic drought. Rainfall in particular has a major influence on the country's development. Most of the country's soils are derived from the Kalahari sands and poorly structured and unproductive. Even the relatively more fertile soils found in the eastern part of the country also have limited productive capacity and are equally vulnerable to erosion. Both the soils and climate, especially, rainfall, affect agriculture. Erratic rainfall, among other things makes arable agriculture extremely risky.

Water is the most critical resource affecting almost all facets of development. It is characterised by lack of surface water and heavy dependence upon ground water. Constraints on the development of surface water sources include unreliable rainfall, limited damnable sites and losses due to evaporation and seepage. Groundwater resources are threatened by poor recharge to the extent that water levels in some places are declining.

Water consumption is currently 116,9 million cubic metres and is growing. The leading consumers are livestock, followed by settlements and then mines and irrigation. However, with the rapid population growth, the demand of settlements is expected to catapult and overtake that of livestock so that by 2020 it will account for more than 50%.

The natural vegetation is predominantly scrub savanna with scattered trees and a field layer of grass. The vegetation has been affected by fire and overgrazing and in few places does a natural climate vegetation occur. Commercial tropical forests occur only in a small area in the north. Although total demand (700 000 tonnes per annum) appears to be less than annual increment, some area, (particularly the more densely settled eastern areas), are experiencing fuel wood shortage, and the supply-demand problem is expected to spread to other areas in the near future.

The natural vegetation provides the main forage for livestock. The rangelands of Botswana are in most places overgrazed. The trees are over-harvested, not only for firewood, but also for fencing, building materials, manufacture of crafts and for clearing of land for fields. As a result some areas have experienced severe deforestation. With rapid population growth, poor institutional build up, the development of a lucrative market for firewood, and increasing demand for arable land, the deforestation trend can be expected to continue. Other over-exploited resources are the forest (veld) products. These include thatching grass, medicinal plants, edible insects and various clays. Their depletion has a negative impact on the low income groups, especially, as they derive a relatively higher proportion of income from gathering these items.

One of the most significant renewable resources is wildlife. Nearly 18% of the country is devoted to national parks and game reserves. A large number and variety of wildlife are found in the country. Wildlife is a source of meat for the local population and together with wilderness, form the main basis for the tourism industry.

Minerals also constitute a major and important resource for Botswana. Diamonds are the main mineral mined. In 1989 more than 15 million carats valued at more than P2.5 thousand million were produced. Diamond production is expected to continue well into the 21st century at the current levels of exploitation. The other important minerals mined are copper and nickel, coal and soda ash. Botswana has been mining copper and nickel since 1974 from Selebi Phikwe; the viability of the project has been badly affected by the volatile markets. Botswana has extensive coal reserves and production for power generation, the copper nickel smelting and the new soda ash mine currently amounts to one million tonnes per annum. The brine deposits are estimated at 16 billion tonnes, and the plant which is expected to produce 650 000 tonnes of salt and 300 000 tonnes of soda ash annually, started operating in March 1991.

Natural resources constitute a cornerstone in the economy of Botswana. At independence, livestock, crops, hunting and gathering accounted for the largest share of about 42% of the country's gross domestic product. With the growth of the mining sector currently accounting for more than 45% of the GDP, former's share has now dwindled to a mere 3%. The country has therefore moved from dependence on renewable to non-renewable resources. It is expected however, that as the country industrializes, there will be an increasing dependence on natural resources.

With regard to consumption, there is high dependence on woodfuel and coal as sources of energy. Almost equally important is the dependence of certain sections of population on forest (veld) products, while wildlife has traditionally provided an important source of meat.

The contribution of natural resources to employment and income generation is limited because of the nature of the sectors. While the livestock sector has experienced phenomenal growth since 1966 (only to be checked by the drought of the 1980's) its contribution to employment generation has not been comparable because it is land rather than labour intensive. It, however, contributes 85% of the agricultural incomes; this contribution is less significant because of the skewed nature of cattle ownership.

In contrast, the performance of the arable sector has been disastrous on account of such factors as low and variable rainfall, poorly developed market infrastructure, inadequate management skills and inappropriate technologies, and poor access to credit and economic resources, particularly draught power and labour. The contribution of the agricultural sector to total formal sector employment in the period 1980-1988 therefore fluctuated between 8% and 5,6%. The contribution of the mining sector to employment is limited by its capital intensity. The mining sector is, however, a major provider of Government revenues, which are invested in other sectors particularly in rural development to create jobs and improve incomes.

The contribution of natural resources to international trade, typical of a third world country, is considerable. The three most important export items are diamonds, beef and copper nickel matte, accounting for nearly 93% of total exports by value.

It is obvious from the foregoing that to a considerable extent Botswana's economy has been dependent in varying degrees upon the natural and environmental resources. With increasing population, this has brought pressure on certain resources which is manifested by pressure on water resources, degradation of rangelands, over-exploitation of veld products, soil erosion, and pollution. The environmental problems threaten to undermine the ability of the environmental and natural resources to sustain development.

Major resource and environmental issues

The major environmental and resource issues that have been identified as needing priority are a) growing pressure on water resources, b) degradation of rangelands, c) depletion of wood resources, d) over-exploitation of forest (veld) products, and e) various forms of pollution.

The pressure on water resources results from the rapidly growing demand whose sources include a) fast population growth, b) rapid urbanisation, c) increase of human activities especially in the south eastern part of the country, d) rising incomes and standards of living and e) location of surface water resources away from main population concentrations. The country has recently carried out a comprehensive review of water resources and has produced a National Water Master Plan.

The degradation of the rangelands is a consequence of livestock numbers that are already beyond the range's carrying capacity. Many parts of the country are overstocked because of traditional attitudes to cattle by the majority of farmers which result in low off-take. Attempts to reduce stock numbers in communal areas by creating commercial farming areas have not solved the problem. This is going to continue to be an intractable problem as long as there are no other significant income-generating activities in the rural areas and cattle continue to provide draught-power. But the environmental, economic and social effects of overstocking are far-reaching. They include bush encroachment, soil erosion, desertification, declining productivity and living standards, especially of the poor.

Wood depletion is being threatened by the use of firewood as the main source of energy, both in rural and urban areas. Firewood provides at least 60% of domestically supplied energy. Consumption is, however, increasing as a result of rapid population growth and in some areas especially in eastern Botswana, where large settlements are found, an energy crisis is already being experienced. This will increase the price of firewood, to the detriment of the poor, who cannot easily afford the substitutes. Two other sources of wood depletion are a) inefficient commercial exploitation and b) the clearing of vegetation for agriculture.

A wide variety of wild products are gathered for food, building and medicines. Gathering constitutes an important source of income for the rural poor, while traditionally, gathering is for own subsistence, there is now commercial exploitation of some products, notably the grapple plant, silk cocoons and phane. Evidence suggests that there is an over-exploitation of some of these products, particularly, thatching grass, mokola palm (used in basket making) and the grapple plant. The major causes of these diminishing resources are overgrazing and destructive methods of harvesting, and ill-advised and unplanned commercialization.

Except for littering, most forms of pollution are not yet serious. But there are signs that they may get out of hand if the situation is not controlled. Air pollution is most serious at the Selibe Phikwe copper nickel mine as a result of sulphur dioxide emissions. However, it is closely monitored and even here the sulphur dioxide content in the air is within acceptable levels in most residential areas. Most of the country is however subject to pollution from wind-blown dust and smoke from cooking and heating fires. Other forms of pollution include water pollution from human excreta, some chemical pollution of vegetation and soils and solid waste pollution. The last is emerging as one of the serious problems in urban areas.

Government policies, programmes and practices

Among the current development goals of the Government are a) the development of new and better uses and optimization of existing uses of natural resources b) emphasis on environmental education and c) maintenance of the balance between population growth and natural resources availability.

These goals are reflected in various statutes and development programmes that have been promulgated over years. The laws cover various aspects of land use and other resource use and conservation.

As shown in the report, Botswana has adequate legislation covering environmental protection. What is lacking is enforcement and the major problem here is institutional. The institutions are not developed sufficiently and not adequately co-ordinated to enforce the existing legislation. This is in spite of fairly substantial budgets spent on environmental management and conservation.

Various programmes and projects have been introduced to conserve the environment. Among the major ones is the National Policy on Tribal Grazing Land,

whose main aim, among other things, was to deal with the problem of overgrazing. The programme has so far not yet achieved this objective and has recently been incorporated into a new programme that lays great emphasis on land use planning and management on sustainable basis. Other sectoral programmes include the Arable Land Development Programme, which aims to improve the arable sector, the National Settlement Policy, which is concerned with planning the settlement system in the country, and the Communal First Development Area (CFDA) rural development strategy whose major aim is integrated rural development.

The Government is also engaged through various institutions in environmental education. These range from primary schools to university. However there is need for more doses of environmental education in the various syllabi. The major source of environmental education for the majority of the population is the informal and non-formal education. In this activity the non-governmental organisations play an active role. One unique feature of Botswana is the close cooperation that exists between Government and non-governmental organisations. There is certainly need for more environmental education and research to bring out more information on available resources and various aspects of the environment.

Planning for sustainable development

There is a number of constraints to rational resource utilization. The first set of constraints are structural; these include rapid population growth, poverty and unfavourable social attitudes. The second set relate to research specifically the absence of data on resource stocks, how they are used and by whom. Thirdly there is lack of enforcement of legal provisions on the use of resources and this leads to unsustainable use of resources. Fourthly, the existing institutions appear not to have implementation capacity owing to technical, infrastructural as well as administrative bottlenecks. Finally, the prices may not properly reflect the value of a natural resource.

It was realized that since in the past, development policy has been primarily concerned with the problem of unemployment, poverty, inequality in the distribution of incomes, environmental concerns have not explicitly featured in policy matters although sustainable development has been one of the objectives of development planning. Consequently all the constraints mentioned above appear to be binding on all the environmental issues to varying degrees. The structural and research constraints, however, operate with stronger force on all the issues.

AN AGENDA FOR ACTION

The first part of Chapter 5 introduces and explains the major components of the National Conservation Strategy. The NCS, like the NDP's embodies programmes and project proposals and policies to achieve them. The essential difference with the NDP's however is that whereas the latter are geared to achieving specific economic and social objectives within the constraints of the country's resources, the NCS is primarily concerned with how these objectives can be achieved without jeopardising the natural resource base of the country.

Apart from the primary goals of effective natural resource use and management and integration of the work of sectoral ministries and other interested groups to improve the development of natural resources, the NCS has a series of other objectives appropriately grouped under development and conservation goals.

The document identifies five environmental issues of particular concern to the Government. These are growing pressure on water resources, degradation of rangeland, depletion of wood resources, over-exploitation of some veld products and pollution of the air, water soil and vegetation resources.

The NCS then designs solution packages to address these issues and describes the list of priority projects, resource requirements, etc.

With regard to implementation, the NCS identifies the key elements in publicising the BNCS Action Plan as the following:

- identification of intended audience: school age children and the general public.
- approach to the employed: kgotla meetings, radio programmes, newspaper articles etc.
- consideration to be given to those responsible for facilitating public relations efforts, namely civil servants, or politicians, the Botswana Natural Resources Conservation Society and Environmental Education Reference Group.

Effective implementation of the NCS requires periodic monitoring and review. Data requirements to form the basis of the review and monitoring are critical in such sectors as water and wood resources and veld products.

The monitoring and review will be on the basis of both short and long terms. In the short term the respective project implementation authority or agency will be required to submit progress report to the NCS Coordinating Agency on a quarterly or biannual basis. In the long term the NCS Coordinating Agency will produce annual or biannual 'State of the Environment Review.

CHAPTER 10 THE NCS

The NCS also allocates institutional responsibilities as follows:-

- NCS Coordinating Agency is to provide overall coordination of projects between the various levels of authority.
- At the National level - sectoral ministries and departments will be the primary implementation authorities. Parastatals, NGO's and other private sector interests will also feature here.
- At the district level, District Councils, Land Boards, District Development Committee etc. will feature.
- At the village level, VDC's, Women and Youth Groups will feature.
- The NCS finally touches on institutional requirements and explains the duties and responsibilities of the various institutions that will be involved in the implementation.

By 1980 a great number of African Countries has embraced various forms of World Bank and IMF structural adjustment programmes and were were efforts to address this African crisis. It was in the process of this search for a new strategy of development that the expression 'Sustainable development' found its way into the development jargon. The expression essentially connotes improvement in the social and economic wellbeing of the mass of population in various countries that can be sustained in the long term without jeopardising the resource base of these countries. However, various countries have articulated different strategies to achieve sustainable development, components of which differ according to both the stage of development of their countries as well as the resource base and constraints of the development effort. In what follows below we shall explain what the term means for development practitioners in Botswana both at the national and international levels and its implications for the various sectors of the Botswana economy.

Although the term 'sustainable development' gained currency on the international scene only a few years back, it has been one of the objectives of development planning in Botswana since the initiation of the third national development plan in 1976. Although the term has appeared as an objective in all subsequent development plans its meaning has been expanded to reflect the changing development realities over the years.

In pursuing its development objectives, Botswana is guided by four principles that are rooted in Botswana's traditional culture. These principles are

CHAPTER 1

1.0 THE CHALLENGE OF SUSTAINABLE DEVELOPMENT

1.1 Introduction

The United Nations declaration of the 1960's as the Development Decade coincided with the independence of a number of African Countries from Colonial rule. This early period of independence held great promise and expectations for the newly independent countries of Africa and these hopes and expectations were translated into an initial period of growth which found expression in the expansion of social and economic infrastructure as well as modest improvement in the welfare of the peoples of African Countries. This initial spurt in the growth in income and welfare was, however, short-lived. The decline in the economic circumstances of most African countries in the early seventies degenerated into a 'crisis of development' and by the closing years of the last decade the entire global development community was grappling with questions about what went wrong. The seriousness of the crisis is such that in 1989 it provoked a World Bank statement that *"Overall Africans are almost as poor today as they were thirty years ago"* (World Bank: Sub Saharan Africa: From Crisis to Sustainable Growth page 1).

By 1980 a great number of African Countries had embraced various forms of World Bank and IMF structural adjustment programmes and there were efforts to address this African crisis. It was in the process of this search for a new strategy of development that the expression 'Sustainable development' found its way into the development jargon. The expression essentially connotes an improvement in the social and economic wellbeing of the mass of population in various countries that can be sustained in the long term without jeopardising the resource base of these countries. However, various countries have articulated different strategies to achieve sustainable development, the components of which differ according to both the stage of development of these countries as well as the resource base and constraints on the development effort. In what follows below we shall explain what the term means for development practitioners in Botswana both at the national and international levels and its implications for the various sectors of the Botswana economy.

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In setting its development objectives, Botswana is guided by four principles that are to be found in Botswana's traditional culture. These principles are

Democracy, Development, Self- Reliance and Unity and the application of these principles are designed to achieve Social Harmony. Thus Social Harmony emerges as the ultimate vision of the society. In order to achieve Social Harmony Botswana identifies four basic objectives of development at various levels of concreteness and abstraction. They are Rapid Economic Growth, Economic Independence, Social Justice and Sustained Development. These objectives are gradually reduced in a hierarchial form into implementable targets to be realized under any given plan. These objectives are not necessarily mutually exclusive, in fact they can be conflicting as repeatedly pointed out in the NDP's. For example unnecessarily high growth rate of output may create environmental problems which can undermine the sustainability of development as can undue concentration of economic growth.

SOCIAL HARMONY

ECONOMIC INDEPENDENCE

Internal

- Training, Localisation and Diversification of the Economy.
- Maximization of Opportunities for Citizens.
- Specific Targets for Manpower Development.

External

- Diversification of Commercial Routes, Trade and Investment Partners.
- Sources of Aid
- Formation of and Participation in SADCC.

RAPID ECONOMIC GROWTH

(Long Term)

- Target Growth; Rate in Plan
- Sectoral Target Growth Rates
- Sectoral Investment Targets
- Sectoral Projects

SOCIAL JUSTICE

- Redistribution of income
- Elimination of Unemployment
- Formal Employment (Aggregate Figures)
- Sectoral Targets
- Guarantee of Minimum of Living Standard for all Batswana
- Health, Water, Education for all

- Rural Development

SUSTAINED DEVELOPMENT

- Protection of the Environment
- Diversification of the Economy from Dependence on Minerals
- Strategy to eliminate economic fluctuations and cope with other drought factors.
- Maintenance of adequate reserves to counter these.

These objectives are not necessarily ranked in any order of importance and the justification for them becomes obvious, if these objectives are viewed in the context of the lively debate among economists in the 60's and 70's on the meaning and measurement of development. In the light of this a recapitulation of the debate is in order. In the past, the use of per capita GNP as a measure of development has been defended on the grounds that it is an objective and value-free indicator and that it lends itself to easy quantification. Opponents of this view argue that on the contrary it is heavily value-loaded and that its quantifiability, particularly where LDC's are concerned, is highly suspect. Dudley Seers (1969) argues that every type of product or service which enters the computation of the GNP is assigned its own weight and that, for many, these weights are zero, that is, in the final analysis, they do not count. Where incomes are very unevenly distributed, the preferences of the rich who spend a greater proportion of their incomes on luxury items (i.e. luxury in terms of what a poor country can afford) by the sheer preponderance of their purchasing power, determine aggregate demand and hence the pattern of production. Such a state of affairs tends to attach greater weight to luxury manufactured goods as opposed to the basic consumption needs of the majority who are poor. This factor is further reinforced by official policy, for example, the promotion of import substitution policy, that is, import controls which unduly exaggerate the process of imports, leading to the production of luxuries rather than necessities. Thus a growth in per capita GNP (which is more a reflection of the preferences of the rich rather than the poor majority) is an inaccurate reflection of the well-being of the poor majority.

With regard to the defence of the GNP as a development indicator on the grounds that it is easily quantifiable, it is true that estimates of most LDC's national accounts completely exclude a whole range of goods and services which should pass for inclusion. The most often cited example is the output of domestic foodstuffs. This item is assumed to increase with increase in the rural population, the estimate of which in turn is based on some fixed arbitrary rate in the absence of data on births and deaths as well as on migration. Again most rural construction works - clearing land, digging of wells and ditches, constructing fences and hedges as well as most domestic services are completely ignored. (Seers 1969). Seers further argues that for LDC's in judging whether development has taken place, we need to look at what has been happening to poverty, unemployment and inequality. If there has been a reduction in all three, then it could be concluded that development has taken place for the country concerned. However, if they have been increasing over

time, it would be strange to call that development even if per capita income has been increasing.

Thus from Seer's point of view, at least for LDC's, when we are measuring the level of development, we should be looking at the trend in poverty, unemployment and income distribution over time.

Acceptance of Seer's view of development makes it difficult to rank any of the four objectives of Botswana's Development plan over the others. Of course, his argument does not deny the importance of growth in GDP. He implies that in addition to that, when we are considering development we should take the three factors which he mentions into consideration. To the extent that the problems of poverty, unemployment and income distribution - both in the present and the future - are addressed either directly or indirectly in the three objectives of Economic Independence (relevance of training, localization and diversification of the economy to the unemployment and income distribution objectives), Social Justice (income distribution and alleviation of poverty) and Sustained Development, and to the extent that the fourth objective, Rapid Economic Growth is seen as a necessary condition for development, it becomes difficult to accord priority to any one of them. Again seeing all these objectives as equally important does not necessarily mean that the rate of achievement will be the same for all. This is because some are easier to achieve than others, given the various constraints they face.

Given this general introduction, we are now in a position to explain the concept of sustainable development as Botswana sees it. In the third part of this chapter we shall treat in detail the natural resource base of Botswana including its climatic and environmental peculiarities.

1.1.1 Renewable Resources

Botswana's renewable resources comprise grazing and arable lands, forest and veld products, water resources as well as wildlife. These constitute the base for both productive and consumptive activities of the country and the Government recognizes that sustained improvement of the living standard of the population is not possible without the conservation of these renewable resources. In the light of this, planning and management of natural resources appears as one of the major policies of NDP 6 (NDP VI 1985). The overriding concern for natural resources conservation precipitated the preparation of a comprehensive report on the environment by the Government of Botswana and the UN Clearing House Mission (Nov.-Dec.1983). It is intended to incorporate this conservation strategy into the NDP VII due to be released in December 1991.

Rangeland and the grazing areas constitute one of the most important resources for Botswana's agriculture, rural development and economic growth.

It is estimated that over 50% of the country is available for grazing; over 95 % of the feed supply comes from natural range which implies that any range degradation poses serious problems to livestock farming. (Agricultural Sector Assessment MOA,

1989).

Arable land which is the other important resource from which the majority of the rural population derive its livelihood is very scarce (total cultivable land area is estimated as less than 6% of Botswana's land area). Given the unreliable nature of rainfall in Botswana and the country's proneness to recurrent drought, arable farming is a very risky occupation. The most pressing environmental problem in arable agriculture is soil erosion with its consequent problems of *"soil loss, reduction in soil fertility and changes in soil physical properties, making further arable production less productive"* (Arntzen et al 1986). Here sustainability requires that the basic problems of this sector - soil erosion, potential shortage of arable land as well as low agricultural yields be addressed.

Forest and veld products (Mophane worm, Mokola palm, Grapple plant and thatching grass) constitute the major source of supply for fuel and wood products as well as food and income for a significant proportion of people in the rural sector. There is a general feeling that these resources are being overexploited and mismanaged and this has generated a great deal of concern for the Government. Here again sustainable development calls for serious conservation measures particularly with increasing pressure of population increase.

Wildlife is an important natural resource in Botswana and there are significant numbers and diversity of species. Presently the Government has gazetted 17% of the land as national parks and game reserves and, with the establishment of wildlife management areas, this figure is likely to rise to 39% (Agricultural Sector Assessment, 1989 page 119). Exploitation of the wildlife resource and the Wilderness that support it, have great potential for development and contribution to Government's efforts to diversify the country's economic base, and lessen the current dependence on the non renewable mineral sector. Management plans are being formulated to guide and control the various uses of wilderness areas, their natural resources and also detail inputs needed to support management activities.

Water is considered as the most important natural resource in Botswana and is the greatest single constraint on development. Surface water is virtually non-existent in the two-thirds of the land area covered by the Kalahari although shallow pans may hold water for some time after the rain. Sustainable water resource development is presently considered high on the Government's development agenda in view of the competing demands for water from virtually all sectors of the economy. The preparation of a National Water Master Plan has been completed. The plan covers several aspects of water use and includes, among other things Agricultural and Environmental Aspects, Hydrology, Hydrogeology, Institutional and Training Aspects, Rural Water Supply, Sanitation, Water Development Strategies and Water legislation.

1.1.2 Non Renewable Resources

At the moment Botswana's major non-renewable resources that are being exploited are diamonds, copper/nickel, soda ash and coal. Since the mid 70's mining has been the backbone of the economy and is largely responsible for the growth in national output and the generation of foreign exchange reserves. The nature of non-renewable resources is that once the known deposits are exhausted income can no longer be generated from them; thus they are unreliable source of growth. Sustainable development in this regard requires that the proceeds from them be channelled into other forms of productive and renewable wealth that will ensure continued growth and development. Thus there is need to employ the resources from the mining sector for a full scale diversification of the economy to ensure that other sectors of the economy assume the role of engine of growth. The Government is keenly aware of this and the employment of the mining resources in this manner has been the main strategy behind Government development policy.

The Botswana economy is also prone to certain extraneous factors that from time to time threaten to interrupt the smooth functioning of the economy. Examples of such factors are drought, outbreak of livestock epidemics and unfavourable development on the international markets in which Botswana operates. If development is to be sustained, part of the mining revenue should be kept as an insurance against these contingencies.

As we have observed above, in the absence of non-renewable resources, Botswana's only hold for survival depends entirely on her renewable resources; thus there is need to channel part of the mineral reserves into adequate maintenance and care of the environment to ensure conservation of her renewable natural resources.

1.1.3 Government Strategies, Policies and Programs

Sustainable development requires the design and implementation of sound macro economic and sectoral policies and programs. This has been successfully achieved in the past and it needs to be continued if the development process is not to be interrupted. The following are a few examples to illustrate the point.

1.1.3.1 Debt Management

The global debt crisis and its deleterious effect on growth and development is by now a familiar story. Several studies have shown that unless the debts of a number of African countries are cancelled, their hope of initiating sustainable development is foredoomed. Though Botswana does not, at present, face any serious debt problem, future restructuring of the economy from mining to other industries will entail extensive use of foreign investment. This is a clear warning to device appropriate debt management policy in future to avoid falling into the debt trap and jeopardizing its development objectives.

1.1.3.2 Human Resource Development

Diversification of the economy will require the development of skilled manpower at all levels. At the moment availability of skilled manpower is one of the constraining factors on growth and development. The current competition for skilled manpower between the public and private sectors does not augur well for development in the future, particularly so, since the private sector is expected to play a predominant role in sustaining development. This calls for Government's continued effort to intensify training in various skills.

1.1.3.3 Wage Policy

Wage policy plays a crucial role in the process of development. If increases in wages are allowed to outstrip increases in productivity, it generates inflation in the domestic economy, reduces employment and renders producers uncompetitive on the international market. Government has shown a keen awareness of this in the past and it will be expected to do so in the future to avoid the disruptive effects of inflation on development.

1.2 PATTERNS OF ECONOMIC GROWTH

1.2.1 GDP GROWTH AND SECTORAL COMPOSITION

The story of the growth in the economy of Botswana in the recent past is a familiar one. As can be seen from Table 1.1 total GDP in constant 1979/80 prices increased from P391.1 million in 1974/75 to P1783 million in 1988/89 representing 11.4% real growth rate per annum.

Total GDP	394.1	100	761.3	49.9	1735	100
NON MINERAL GDP	340.9		501.2			

Source: CSO

Table 1.1

GROSS DOMESTIC PRODUCT AT CONSTANT 1979/80 PRICES (SELECTED YEARS)

SECTOR	1974/75		1980/81		1988/89		% Growth from 1974/75 to 1988/89
	Pm	%	Pm	%	Pm	%	
Agriculture	87.7	22.3	75.0	9.7	59.7	3.3	-2.7
Mining & Quarrying	53.2	13.5	260.6	33.8	806.7	45.2	21.4
Manufacturing	24.5	6.2	37.0	4.8	55.1	3.1	5.9
Water & Electricity	8.8	2.2	15.3	2.0	38.6	2.2	11.1
Construction	47.8	12.1	32.0	4.1	52.5	2.9	0.8
Wholesale & Retail Trade	66.2	16.8	163.8	21.2	319.2	17.9	11.9
Transport & Communications	9.0	2.3	14.8	1.9	43.8	2.5	12.0
Financial Institutions	21.4	5.4	33.0	4.3	80.2	4.5	13.7
General Government	60.5	15.4	114.2	14.8	261.4	14.7	11.0
Household, Social & Comm. Services	15.0	3.8	25.6	3.3	65.8	3.7	11.1
Total GDP	394.1	100	761.8	99.9	1783	100	11.4
NON MINERAL GDP	340.9		501.2				

Source: CSO

Table 1.2

PER CAPITA GDP 1974/75 to 1988/89 AT 1979/80 PRICES (PULA)

	1974/75	1975/76	1976/77	1977/78	1978/79
Estimated Population - Middle of the Period Shown (000)	696	728	762	798	835
Total GDP / Pm 1979/80 Prices	394.1	453.3	463.4	549.4	615.1
GDP per Capita 1979/80 Prices (Pula)	566	623	608	688	737

Table 1.2 Contd.

	1979/80	1980/81	1981/82	1982/83	1983/84
Estimated Population - Middle of the Period Shown (000)	874	915	954	989	1012
Total GDP / Pm 1979/80 Prices	709.5	771.8	753.5	934.0	1120.5
GDP per Capita 1979/80 Prices (Pula)	812	843	790	944	1107

Table 1.2 Cont.d

	1984/85	1985/86	1986/87	1987/88	1988/89
Estimated Population - Middle of the Period Shown (000)	1049	1088	1128	1169	1256
Total GDP / Pm 1979/80 Prices	1211.5	1308.2	1441.0	1570.4	1783.0
GDP per Capita 1979/80 Prices (Pula)	1155	1203	1278	1343	1421

Source: 1974/75 - 1982/83 - Quoted from Bank of Botswana: Selected Papers on the Botswana's Economy 1983/84/-88/89 - CSO

This growth in total GDP has resulted in growth in real per capita GDP of 6.8% over the period. The main factor behind this impressive performance was the exploitation of diamonds and copper nickel starting in 1971 and 1973 respectively. The other contributing factors to this growth, though in relatively modest terms, were the expansion of the national cattle herd and growth in the Government sector. This growth in GDP was accompanied by a change in the structure of the economy in terms of the contributions of the various sectors to GDP. In 1974-75 Agriculture had the highest share (22.3%) in total GDP followed by Wholesale & Retail Trade (16.8%), Government Sector (15.4%), Mining and Quarrying (13.5%) and Construction (12.1%). The shares of the other sectors in that year are shown in Table 1.1 column 1. This structure changed over the years and by 1989/90 Agriculture's share had dwindled to a mere 3.3%, exceeding only Manufacturing (3.1%), Construction (3.0%) Water and Electricity (2.2%) and Transport and Communication (2.5%). In that year Mining had become the leading sector, contributing a hefty 45.2% to GDP (Table 1.1 column 3). The shares of Wholesale and Retail Trade (17.9%) and Government (14.7%) remained relatively stable and maintained their relative positions in the terminal year as in the initial period. The shares of the Household, Social & Community Services Sector (3.7%), Transport and communications (2.5%), Water and Electricity (2.2%), and Financial Institutions sector (4.5%) also remained relatively stable. Sectors which suffered losses in their shares were, apart from Agriculture, manufacturing from 6.2% to 3.1%) and Construction (from 12.1% to 3.0%). The last column of the table shows the annual growth rates of the absolute GDP levels of the various sectors. With the exception of the growth in the Agricultural sector (which actually declined by 2.7% per annum), Construction (0.8%) and Manufacturing (5.9%) all the other sectors experienced annual growth rates of 11% plus, with Mining recording the highest growth of 21.4%.

This predominant shift in the contribution of the Mining Sector was, of course, expected, but of late, it has begun to pose some concern for policy makers. This dependence of growth on the mining sector means that unless the economy is diversified enough for other sectors to take over as the engine of growth from mining once the mineral revenues level off, the growth momentum cannot be sustained. Secondly, the products of the Mining Sector and their prices, like those of agricultural products, are subject to uncertain swings on the world market. Thus unless the resources for the sector are employed judiciously to shift the centre of gravity of the economy to sectors whose development impart self-sustaining growth to the economy, exclusive reliance on the mining sector may spell doom for the sustainability of growth and development. A third problem arises in connection with the employment generating capacity of the Mining Sector. In spite of the preponderance of the share of the Mining Sector in GDP the total number of its paid employees between 1980 and 1988 fluctuated between 7,000 and 7,500; in relative terms, the ratio of total paid employees in the Mining Sector to total paid employees in the Private and Parastatal Sectors fluctuated between 6.7% and 13.4% with the ratio around 10% for most part of the period (see table 1.3). Given the Government's priority for employment generation, it appears as if the Mining Sector does not hold much promise for the future. Manufacturing employment increased from 5,600 in 1980 to 16,400 in 1988. Because of these concerns about the Mining Sector, the Government intends to give

priority to the Industry and Services Sector during the next quarter decade, while maintaining the share of Government relatively constant.

Table 1.3

ESTIMATED TOTAL NUMBER OF PAID EMPLOYEES BY SECTOR - 1980-1988

Private & Parastatal	1980	%	1981	%	1982	%
Agriculture	4,300	8.0	4,800	7.4	4,200	6.4
Mining & Quarrying	7,200	13.4	7,300	11.3	7,100	10.8
Manufacturing	5,600	10.4	6,400	9.9	7,200	10.9
Electricity & Water	1,500	2.8	1,600	2.5	2,200	3.3
Construction	13,400	24.9	15,200	23.5	13,600	20.7
Commerce	10,400	19.3	15,300	23.6	16,600	25.2
Transport & Communication	3,400	6.3	3,900	6.0	3,700	5.6
Financial & Bus. Services	4,300	8.0	4,900	7.6	5,700	8.7
Community & Soc. Services	2,400	4.5	3,800	5.9	3,900	5.9
Education	1,300	2.4	1,600	2.5	1,600	2.4
TOTAL	53,800	100	64,800	100	65,800	99.9

Table 1.3 cont'd

Private & Parastatal	1983	%	1984	%	1985	%
Agriculture	4,500	7.1	5,400	7.7	4,000	6.2
Mining & Quarrying	7,299	11.5	7,500	10.6	7,300	11.3
Manufacturing	9,800	15.5	9,500	13.5	10,100	15.7
Electricity & Water	1,900	3.0	2,000	2.8	1,900	2.9
Construction	9,600	15.1	11,100	15.8	11,600	18.0
Commerce	15,300	24.1	18,100	25.7	11,300	17.5
Transport & Communication	3,900	6.2	5,500	7.8	5,700	8.8
Financial & Bus. Services	6,000	9.5	6,200	8.8	6,800	10.5
Community & Soc. Services	3,500	5.5	3,500	5.0	3,900	6.0
Education	1,600	2.5	1,600	2.3	1,900	2.9
TOTAL	63,399	100	70,400	100	64,500	100

Table 1.3 cont'd

Private & Parastatal	1986	%	1987	%	1988	%
Agriculture	4,900	6.1	5,600	5.8	6,500	5.8
Mining & Quarrying	7,500	9.4	7,000	7.2	7,500	6.7
Manufacturing	12,200	15.3	14,700	15.1	16,400	14.7
Electricity & Water	2,000	2.5	2,200	2.3	2,300	2.1
Construction	13,700	17.2	16,900	17.4	22,200	19.9
Commerce	20,900	26.2	25,700	26.4	28,800	25.8
Transport & Communication	5,100	6.4	6,700	6.9	7,900	7.1
Financial & Bus. Services	7,400	9.3	9,800	10.1	11,200	10.0
Community & Soc. Services	4,400	5.5	6,600	6.8	6,700	6.0
Education	1,700	2.1	2,100	2.2	2,300	2.1
TOTAL	79,800	100	97,300	100	111,800	100

Source: CSO

Table 1.4 shows how the sectoral composition of GDP will be expected to change during the next 25 years. The last two columns show the anticipated annual growth rates in the sectoral GDP shares and export growth in the sectors per annum. These projections are expected to result in 5.2% annual growth rate in total GDP (NDP VI).

Table 1.4

PROJECTED SECTORAL GDP AS PER CENT OF GDP (1990/91-2015/16)

SECTORS	1990/91	1996/97	2015/16	GDP GROWTH	EXPORT GROWTH
AGRICULTURE	3.3	2.6	1.2	1.0 % p.a.	0.5 % p.a
MINING	42.0	35.2	20.8	2.0 % p.a	2.0 % p.a
INDUSTRY	11.6	13.2	21.1	7.5 % p.a	10.0 % p.a
SERVICES	26.9	29.2	39.1	6.5 % p.a	10.0 % p.a
GOVERNMENT	16.2	19.8	17.8	4.5 % p.a	N/A
TOTAL GDP	100.0	100.0	100.0		

Source: NDP 7

1.2.2 Gross Fixed Capital Formation

The Gross domestic fixed Capital Formation is a rough reflection of the productive capacity of the economy. It gives an idea of the ability of a country to sustain a given growth in GDP. It has been a central theme of IMF/World Bank structural adjustment programs that if LDC's are to overcome their growth problems, it is essential to increase their gross domestic fixed capital formation. Botswana's target growth rate of GDP of 5.2% per annum during the next plan period, implies that, given a capital output ratio of 4.5, (not unrealistic for an LDC), it will need to invest 23.4% (4.5×5.2) of its GDP to attain the target growth rate. The ratio of fixed capital formation to GDP is a rough indication of this domestic investment requirement.

Table 1.5

GROSS FIXED CAPITAL FORMATION 1974/75-1985/86 (in 1979/80 prices)

	74/75	75/76	76/77	77/78	78/79	79/80
Fixed Capital Formation (Pm)	112.5	128.3	108.1	145.0	187.3	248.8
Total GDP in 1979/80 prices	394.1	453.3	463.4	549.4	615.1	701.5
Ratio (1):(2)	28.3	28.3	23.3	26.4	30.5	35.5

Table 1.5 Cont.

	80/81	81/82	82/83	83/84	84/85	85/86
Fixed Capital Formation (Pm)	264.7	247.4	211.7	210.1	299.6	224.2
Total GDP in 1979/80 prices	761.8	743.3	920.5	1120.5	1211.5	1308.3
Ratio (1):(2)	34.7	33.3	23.0	18.8	24.7	17.1

Source: CSO

Table 1.5 shows Botswana's fixed capital formation for the period between 1974/75 and 1985/86. During the period it increased from P112.5 million to P224.2 million in constant 1979/80 prices, implying an annual growth rate of 6.5%. The third row of the table shows the ratio of Fixed Capital Formation to total GDP also calculated in constant 1979/80 prices. From a base of 28.5% in 1974/75, the ratio exceeded 30% between 1978/79 and 1981/82 reflecting the spurt of investment activity in the mining sector during that period. After 1981/82 a decline set in hitting the lowest level of 17.1 in 1985/86. Perhaps the decline is a reflection of the drought years when resources were channelled into consumption to alleviate the effects of the drought on the rural population. The figures for the period after 1985/86 were not available at the time of writing, but it is clear that given the planned target growth rate of 5.2% in NDP 7, 17.5% of Gross Capital Fixed Formation is too low. It is likely that the figure increased after 1986 when increased revenue from diamond sales enabled the Government to exceed development expenditure ceilings in the NDP 6. The record of achievement over the period is commendable but it seems that if the growth is going to be sustained in the future a minimum figure of 25-27% will be required.

1.2.3 THE SIZE AND STRUCTURE OF POPULATION AND LABOUR FORCE GROWTH AND PROJECTIONS

1.2.3.1 Size and Structure of Population

According to the 1971 population census, the total population of Botswana was 597,000; this increased to 941,027 by the 1981 census and by mid 1986, it was estimated at 1,123,000. The population growth rate of Botswana during the past decade or two of 3.4% per annum is perhaps one of the highest in the world. This high population growth rate with its implications of high fertility has great impact on labour force growth and development. It is estimated that if the present growth rate remained, the population of Botswana will double every two decades.

The first consequence of this high population growth rate is the high dependency ratio i.e. the proportion of children under 15 to adults in the economically productive ages 15-64. In 1985 dependent children under the age of 15 and older persons above the age of 65 constituted 48.0 and 3.8 of the total population respectively. The working age adults represented 48.2%. This implies that if all working age adults are gainfully employed, each will be supporting approximately 1.1 non working persons. If we consider a situation as obtains in Botswana, where a large number of the economically active population is unemployed, the implications of this high dependency ratio are quite clear. This high dependency means that the economy will have to devote an increasingly high proportion of its GDP to providing food, clothes, education, accommodation and health facilities to its dependent population. The population growth rate has further implications for unemployment. That is, even if it were possible to bring down the rate of growth of population today, it will not have any impact on the number of people joining the labour force during the next decade or two since those who will join the labour force have already been born. This means that the economy should expand fast enough to secure gainful employment for the increasing number of the potential labour force.

Table 1.6

DISTRIBUTION OF DE JURE POPULATION BY AGE AND SEX 1981-2001

Age	1981			1991			2001		
	Males %	Fem. %	Males per 100 Fem.	Males %	Fem %	Males per 100 Fem.	Males %	Fem %	Males per 100 Fem.
0-14	48	45	99	48	46	98	47	45	98
15-65	48	50	90	49	51	91	51	52	93
65+	4	5	78	3	3	80	2	3	73
All Ages	100	100	93	100	100	94	100	100	95

Source: Central Statistics Office: Population Projections

Table 1.6 shows the distribution of the de-jure population by age and sex the years 1981, 1991 and 2001. The table shows that among the male population, percentage in the age group 65+ decreases from 4% to 2% as one moves from 1981 to 1991 to 2001; the percentage of the male adult population in the age group 15-65 years increases from 48% to 51% over the same period while that of the males in age group 0-14 remain relatively stable.

For the female population, those in the age group 0-14 remain relatively stable (45%) during the period while those in the age group 15-65 increase slightly from 50% to 52%; the percentage of those above 65 years declines from 5% to 3% during the same period. Thus for both males and females, there is a shift in favour of the age group 15-65.

Table 1.7 shows the population between 1971 and 2001.

Table 1.7

POPULATION PROJECTIONS 1971-2001 (All figures in '000)

	1971	1981	1991	2001
A. DeJure population	647	967	1357	1894
B. Absentees Abroad	63	42	22	-
C. Non-citizens	11	16	23	-
D. De facto population	595	941	1358	1897
(a) - (b) + (c)				
E. Maximum linked population (a) + (c)	658	983	1380	-

Source: Central Statistics Office: Population Projections

The de-jure population increased from 647,000 to 967,000 between 1971 and 1981 and is expected to reach 1.4 million in 1991 and 1.9 million in 2001. The second row of the table shows that between 1971 and 1981 the migrant population abroad (mainly in South Africa) declined from 63,000 to 42,000 and this is expected to reach an all time low of 22,000 in 1991. It is expected that all migrant workers will have returned to Botswana by the turn of the century perhaps because of the changes in the pattern of recruitment of the South African mines in which the majority of them are employed. The population of non citizens increased from 11,000 to 16,000 between 1971 and 1981 and is expected to increase further to 23,000 by 1991. This is perhaps due to the fact that in the immediate post independence period, there was need to recruit foreigners into high level administrative and technical positions since there was dearth of sufficiently qualified Batswana to fill these positions. It is envisaged that by the year 2001 the Government's policy of localization would have succeeded in replacing all foreign workers with qualified Batswana. The interpretation of the 4th and 5th rows are in order.

Table 1.8

PROJECTIONS OF DE FACTO POPULATION ACCORDING TO URBAN RURAL DISTRIBUTION 1971-1991 (000)

	1971	1981	1986	1991
Urban population*	63 (11%)	166 (17%)	233 (21%)	311(23%)
Rural population	532 (89%)	775 (82%)	899 (79%)	1047(77%)
De facto population	595(100%)	941(100%)	1132(100%)	1358(100%)

Source: Central Statistics Office: Population Projection

* Urban areas are defined as Francistown, Gaborone, Jwaneng, Lobatse, Orapa, Pal Selebi Phikwe and Tlokweng.

Table 1.8 shows the distribution of de-facto population between urban rural areas. The table shows the rapid pace of urbanization in Botswana. Between 1971 and 1981 the urban population increased from 11% to 18% of the total de-population; in 1986, 21% of Botswana were located in the urban areas and it is expected to increase to 23% by 1991. This rapid growth in urbanization is not unexpected since as it becomes increasingly difficult to obtain gainful employment in the rural areas and employment opportunities in South Africa dwindle, the alternative open to the economically active population, especially the male, is to move to the new urban centres. This process is likely to continue unless there is a determined effort on the part of the Government to adopt and implement a policy of decentralization and location of industrial enterprises in the larger rural towns.

1.2.3.2 Labour Force, Employment and Unemployment

According to the Labour Force Survey (LFS) 1984-85 there were 367 thousand people in the labour force and this constituted 37% of the total population. The remaining 627 thousand people or 63% of the total population were classified "economically inactive" (See table 1.9).

Table 1.9

POPULATION: BY LABOUR FORCE STATUS, SEX AND URBAN/RURAL 12 MONTHS ENDING 30-04-85

LABOUR FORCE	URBAN			RURAL		
	Male	Female	Total	Male	Female	Total
Employed	34,683	24,381	60,064	104,726	110,063	214,789
%	57.7	42.3	100.0	48.8	51.2	100.0
Unemployed	9,037	18,164	27,201	24,317	41,578	65,895
%	33.2	66.8	100.0	36.9	63.1	100.0
Total Labour Force	43,720	43,545	87,265	129,043	151,641	280,684
%	50.1	49.9	100.0	47.0	53.0	100.0

Table 1.9 Contd.

LABOUR FORCE	TOTAL		
	Male	Female	Total
Employed	139,409	135,444	274,853
%	50.7	42.3	100.0
Unemployed	33,354	59,742	93,096
%	35.8	64.2	100.0
Total Labour Force	172,763	195,186	367,949
%	47.0	53.0	100.0

Source: LFS 1984/85 extracted from Table 1 page 32.

Out of the total labour force, 47% were male and 53% female; the 274,900 who were actually employed were almost evenly divided between males and females. The proportion of female among the unemployed in the labour force was 64.2% while the male proportion was 35.8%. This indicates that of all those who do participate in the labour force, females are much more likely to be unemployed.

1.2.3.3 Location of the Labour Force

Of the total force of 367,949, 87,265 or 23.7% are located in the urban areas while the remaining 280,684 or 76.3% are in the rural areas. Given the fact that cash employment is available mostly in the urban areas, this implies that a sizeable proportion of the labour force is either disguised underemployed or visibly unemployed.

1.2.3.4 Projection of the Labour Force

The projections described here are based on those made by Tumkaya (1986) on the basis of the 1981 population census since there are no projections based on the LFS 1984/85. The projection assumes a de-facto population projected under medium variant assumptions.

Table 1.10

PROJECTIONS OF THE TOTAL LABOUR FORCE BY SEX

Year	Male	%	Female	%	Total	%
1981	189,070	(59.7)	127,418	(40.3)	316,488	100
1991	271,285	(60.3)	178,288	(39.7)	449,573	100
2001	388,057	(60.0)	259,177	(40.0)	647,234	100

Source: Tumkaya: *"An Overview of the Population Situation in Botswana"* A Paper presented at the Conference on the Population and Development for Members of Parliament and House of Chiefs, September 4-6 1986, Botswana.

Table 1.10 shows the total labour force for the years 1981, 1991 and 2001 based on Tumkaya's projections. From a base of 316,488 in 1981; the total labour force is expected to reach 449,575 in 1991 and 657,234 in 2001. This implies an average annual growth rate of 3.6% between 1981 and 1991 and 3.7% between 1991 and 2000. This also implies that between 1981 and 1991, the total annual addition to the labour force is about 13,308; the corresponding figure for the 1991-2001 period is 19,766.

About 16,537 people will join the labour force. It is evident from Table 1.10 that sexual composition of the labour force is likely to be relatively stable around 60% male and 40% female up to the end of the century. (Note that these projections do not take account of migrants who might possibly be returning from the Republic of South Africa.

1.2.3.5

Formal Employment

Rapid Economic growth has led to parallel increases in formal sector employment. Employment in the formal sector has grown from 41,300 in 1972 to 168,500 in 1988 implying an annual growth rate of 9.2% which compares favourably with growth in real GDP over the same period. Table 1.11 shows that between 1980 and 1988 the share of formal sector employment between Private/Parastatal and Government has remained relatively stable in the ratio of 2:1. Growth in private sector employment over the period has been slightly higher than for Government. Under the NDP 7 the private sector is expected to play a much greater role in employment generation than it has so far done.

Table 1.11**FORMAL SECTOR EMPLOYMENT 1980-1988 (000)**

	1980	1981	1982	1983	1984
Government	29.5	32.6	34.4	37.3	39.6
Private & Parastatal	53.9	64.8	65.7	63.3	70.4
Total	83.4	97.4	100.1	100.6	110.0
Government as (%) of Total	35.4	33.5	34.4	37.1	36.6

	1985	1986	1987	1988	Growth 1980-1988 %
Government	45.6	50.7	52.8	56.7	8.5
Private & Parastatal	71.2	79.4	97.4	111.3	9.5
Total	116.8	130.1	150.2	168.0	9.2
Government as (%) of Total	39.6	39.0	35.2	33.6	-

Source: CSO. Statistical Bulletin, 1986, 1989

1.2.3.6

Unemployment

Despite the growth in formal sector employment over the years, Botswana continues to experience acute unemployment. Some of the factors contributing to this growing unemployment have been identified as the high rate of population growth leading to high rate of entry into the labour force, returning migrants from South Africa and the drought which has beset the economy for the past few years. Estimates of unemployment have been provided by the 1981 Census and the LFS 1984/85. Table 1.12 shows the comparison of unemployment from these two sources in 1981 and 1984. This comparison must, of course, be viewed against the background of the different methodologies and concepts employed in both sources. Although the comparison in Table 1.12 indicates a trend of increasing unemployment between 1981 and 1984, since 1985 some progress has been made in improving the employment situation. Over the period September 1985 to March 1989 formal sector employment grew at the rate of 12.4% per annum (NDP 7, 1991). This rate of employment growth outstripped growth in the labour force, implying a reduction in both the rate and level of unemployment.

Table 1.12

COMPARISON OF UNEMPLOYMENT 1981 CENSUS AND 1981/85 LABOUR FORCE SURVEY BY AGE

Years	<u>1981 CENSUS</u>				<u>1984/85 LFS</u>			
	Unemployed Persons		Rate %		Unemployed Persons		Rate %	
	Male	Female	Male	Female	Male	Female	Male	Female
12-14	502	485	5.8	11.1	366	221	5.8	8.9
15-19	3498	5413	15.1	25.2	3971	6299	20.8	37.5
20-24	3682	6038	13.0	21.6	5993	10851	24.5	34.4
24-34	3798	4022	8.9	12.4	6211	10115	16.5	22.6
35-44	1686	989	5.7	6.0	3018	1188	11.7	14.5
45-54	791	301	3.5	2.8	1931	2055	9.0	9.1
55-64	358	90	2.2	1.3	925	855	6.6	6.1
65+	145	43	1.1	0.8	656	168	1.8	1.8
N/S	208	77	6.5	4.2				
TOTAL	14668	17458	7.8	13.7	23071	31752	11.6	20.4

Source: Selected Economic and Social Indicators, 20th Anniversary Issue, Table 20, p28.

The unemployment rates in this table from both sources refer only to people who said they were actively looking for work and hence they have been made comparable to some extent. Both sources indicate that unemployment is higher among females than males and that unemployment has increased significantly for both sexes since 1981. The tables also give the unemployment rates for both males and females in different age groups. Both sources indicate that for both males and females, the unemployment rates are higher for the age groups 15-19 and 20-24 years and that for all age groups below 34 years, the unemployment rates for females exceed that of males.

Table 1.13

**UNEMPLOYMENT RATES BY AGE, SEX AND URBAN/RURAL
+12 MONTHS ENDING 30 APRIL 1985 (%)**

Age Last Birthday	URBAN			RURAL		
	Male	Female	Total	Male	Female	Total
15 - 19	49.6	60.4	56.4	23.9	13.1	32.7
20 - 24	31.5	49.2	41.6	27.1	11.8	36.0
25 - 34	17.1	37.5	27.5	22.5	31.2	27.7
35 - 44	12.1	31.1	20.7	18.2	24.6	21.9
45 - 54	10.7	30.2	18.0	16.9	16.7	16.8
55 - 64	14.5	28.6	19.2	12.2	12.9	12.6
65 - w	23.1	9.5	19.2	9.4	8.3	9.0
TOTAL	20.7	41.7	31.2	18.8	27.1	23.5

Table 1.13 Contd.

URBAN + RURAL			
Age Last Birthday	Male	Female	Total
15 - 19	27.9	18.0	37.7
20 - 24	28.8	44.1	37.8
25 - 34	20.5	33.0	27.6
35 - 44	16.2	26.1	21.6
45 - 54	15.5	18.3	17.0
55 - 64	12.5	13.9	13.2
65 - w	10.2	8.3	9.5
TOTAL	19.3	30.6	25.3

Source: Labour Force Survey 1984-85, Table 10, p13.

Using the broader concept of unemployment (which includes persons available for work but not looking for work as well as those actively looking for work), the LFS 1984/85 compares the unemployment rates for the urban and rural areas (see table 1.13). Except for the age groups 25-34 and 35-44 years, the urban unemployment rates are much higher than the rural for all age brackets, but especially for the younger age groups. Thus urban unemployment among the youth constitutes a real problem. It ranges from 41.6% for the 20-24 age group to 56.4% for the 15-19 age groups. In the rural areas, the age groups particularly affected are the 15-19, 20-24 and 24-35 groups. Table 1.13 shows the age/sex unemployment rates for both males and females in the urban areas; except for the age group 65 and over, the unemployment rates for females far exceed those for males in all other age groups. For the age group 15 and under 20 the female unemployment rate is as high as 60.4%.

In the rural areas, the female rates exceed the male rates for all age groups except 45 and under 55 and 65 plus. When we combine the rural and urban, the female rates for all ages except 65 plus exceed the male rates.

1.2.4

INTERNATIONAL TRADE

The Economy of Botswana, like most LDC's, is a very open one. In fact, in the case of Botswana, the ratio of exports and imports to GDP has exceeded 1 in most years. Thus the purchasing power of exports in terms of imports i.e. the barter terms of trade is an important determinant of the extent to which increase in physical output reflects proportional increase in national welfare.

Table 1.14

**PRINCIPAL EXPORT COMMODITIES PERCENTAGE
SHARE IN TOTAL EXPORTS (%)**

YEAR	Meat & Meat Pro ducts	Lives Ani- mals	Hides & Skins	Dia- mond s	Cop- per Matte	Tex- tiles	Other	Total	Meat Dia- monds Cop- per	Dia- monds Cop- per
1980	7.20	0.03	0.78	60.74	20.69	4.01	6.55	100	88.6	81.4
1981	18.20	0.03	1.37	40.56	24.00	4.82	11.02	100	82.8	64.56
1982	17.00	0.05	1.52	52.03	13.8	5.85	9.75	100	82.8	65.8
1983	11.35	0.03	0.81	66.60	9.44	4.73	7.04	100	87.4	76.0
1984	7.25	0.02	1.31	71.93	7.95	4.70	6.84	100	87.0	79.8
1985	7.00	0.02	0.83	78.84	8.62	2.09	5.60	100	91.4	84.4
1986	8.32	0.02	0.70	83.30	8.38	2.96	8.10	100	89.5	81.2
1987	3.41	0.03	0.30	83.1	4.8	2.41	5.81	100	91.3	87.9
1988	4.42	NA	NA	74.25	13.92	NA	NA	100	92.6	88.2

Source: CSO

1.2.4.1 Exports

Botswana's principal exports are diamonds, meat and meat products, copper nickel matte and textiles. Table 1.14 shows the share of principal export commodities in total exports between 1980 and 1988. During the period, the share of the principal commodity, diamonds, fluctuated between 52% in 1982 to 83% in 1987. In 1988 the three most important export items - diamonds, copper nickel matte and meat and meat products alone accounted for 92.6% while only the first two - products of the mining sector accounted for 88.2%. The importance of the products of the mining sector for international trade is clear. Like a typical LDC, these export items are primary products.

1.2.4.2 Imports

Botswana's imports range from consumer items to intermediate and capital goods. As table 1.15 shows, the percentage shares of principal import items in total imports have remained remarkably stable since the early 1980's. The most important items are Food, Beverages and tobacco, Machinery & Electrical Equipment, Vehicles and Transport Equipment. Their shares in total imports in 1987 are 16.1%, 16.6%, 15.4% respectively; these are closely followed by chemicals and rubber products (9.8%), Metals & Metal products (9.4%), Textiles & Footwear (8.8%) and Fuel (7.2%).

Table 1.15

PRINCIPAL IMPORT COMMODITIES: PERCENTAGE SHARE IN TOTAL IMPORTS (%)

Year	Food Beverages and Tobacco	Fuel	Chemical Rubber Products	Wood and Paper Products	Text-iles Foot- wear
1980	15.7	13.1	7.8	3.2	8.4
1981	14.2	12.7	7.8	3.1	9.2
1982	16.5	14.1	8.2	3.9	9.7
1983	19.1	12.7	8.3	3.5	9.3
1984	18.5	10.3	8.5	3.3	9.2
1985	17.5	11.5	8.1	3.2	8.1
1986	16.7	8.4	9.4	3.6	7.8
1987	16.1	7.2	9.8	4.6	8.8

Table 1.15 cont'd

Year	Metal and Metal Products	Machinery and Electric Equipment	Vehicle and Transport Equipment	Other Goods	Total
1980	11.0	16.0	11.8	12.7	100
1981	11.5	16.4	12.4	12.7	100
1982	9.3	13.8	11.7	12.7	100
1983	9.8	12.8	11.6	12.9	100
1984	9.2	16.5	12.9	11.7	100
1985	9.2	16.9	13.7	11.7	100
1986	9.2	16.5	16.7	11.5	100
1987	9.4	16.6	15.4	12.1	100

Source: CSO

1.2.4.3

Direction of Trade

Traditionally the principal source of Botswana's imports has been the Republic of South Africa(RSA) whereas the main market for her principal exports has been the EEC. Between 1980 and 1983 the common Custom Area (predominantly South Africa) accounted for 86% of Botswana's import trade but this fell to 77.2% between 1984 and 1987 (table 1.16) which implies that RSA was becoming slightly less important towards the end of the eighties as a source of imports for Botswana. The table shows that other African countries (mainly Zimbabwe) and the EEC were becoming important markets for Botswana's imports. During the eighties, EEC established itself as the main market for Botswana's exports; the share of Botswana's exports going to their market gradually increased from 63.4% in 1980 to 90% in 1987. This predominance of the EEC can be explained by the very heavy influence imparted by the growth in diamond exports which go first to Europe before proceeding to the main markets in USA and recently Japan. Also, the shift in copper-nickel exports from North American destinations to being exported to Zimbabwe and Europe has further contributed to USA share of export reducing from 21% in 1980 to 0.2% in 1987. The share of RSA and other African countries also showed a decline (Table 1.17).

Table 1.16

DIRECTION OF TRADE IMPORTS (%)

Year	Common Custom Area	Other Africa	E. E. C	U. S. A	All Other	Total Imports
1980	87.0	6.7	2.5	3.0	0.8	100
1981	87.6	6.3	2.8	2.2	1.0	100
1982	86.5	6.4	4.0	1.6	1.5	100
1983	83.1	7.4	6.5	1.1	2.0	100
1984	78.2	8.8	9.7	1.9	1.6	100
1985	74.4	7.5	12.4	2.8	3.0	100
1986	76.7	7.6	8.7	2.8	4.2	100
1987	79.6	7.7	9.1	1.1	1.8	100

Source: CSO 1989 Statistical Bulletin

Table 1.17

DIRECTION OF TRADE EXPORTS (%)

Year	Common Custom Area	Other Africa	E. E. C	U. S. A	All Other	Total Imports
1980	6.6	8.4	63.4	21.0	0.5	100
1981	16.6	10.5	48.3	24.3	0.3	100
1982	11.3	13.2	62.8	11.9	0.8	100
1983	8.3	9.2	74.7	7.4	0.4	100
1984	8.8	4.0	77.8	8.2	1.2	100
1985	5.6	3.9	84.7	5.3	0.4	100
1986	5.6	6.0	87.6	0.2	0.5	100
1987	4.2	4.8	90	0.2	0.3	100

Source: CSO Statistical Bulletin 1989

1.2.4.4 Balance of Payments

Botswana's Balance of payments since 1977 is shown in table 1.18. The balance of current account, before 1983, fluctuated between -P171.2 million in 1981 and P29.5 million in 1979. The balance was in the red in four of the six years between 1977 at 1982. Botswana's balance on current account changed in 1983; from a surplus of P2.1 million in 1983, this increased to P1,154.7 million in 1987, it fell to P798.2 million in 1988. This change in the balance on current account position was made possible mainly by the increased diamond sales after 1982 and is reflected in the balance of visible trade (i.e trade in services) - was negative throughout the period so that it was the turnaround in visible trade in 1982 which arrested the deficit in the balance of trade which had characterized the period between 1977 and 1984. Transfers recorded positive figures throughout the period.

Table 1.18**BALANCE OF PAYMENTS 1977-1985 (MILLION PULA)**

	1977	1978	1979	1980	1981	1982
B/Visible	-36.8	-54.2	-0.1	-45.1	-239.0	-122.6
Total	-21.0	-50.8	-75.6	-115.4	-48.5	-58.5
Invisible						
Total Goods & Services	-57.8	-105.0	-75.7	-160.5	-287.5	-181.1
Total Transfers	79.4	67.2	105.0	99.2	116.3	119.9
B/Current Account	21.6	-37.8	29.5	-61.5	-171.2	-61.2

Table 1.18 cont.d

	1983	1984	1985	1986	1987	1988 Adjusted
B/Visible	27.5	122.4	444.9	458.6	1322.4	1086.2
Total	162.7	-240.8	-364.4	-344.4	-451.1	-647.0
Invisible						
Total Goods & Services	-135.2	118.4	80.5	114.2	871.3	439.2
Total Transfers	137.3	132.3	170.4	210.2	283.3	357.0
Current Account	2.1	13.6	250.9	324.4	1154.6	796.2

Source: Statistical Bulletin 1986, Vol. 11, No. 3, CSO extracted from Table 8.

1.2.4.5

Foreign Exchange Reserves

Revenues from sales of diamonds, copper nickel matte and meat and meat products, the three principal export items, have enabled Botswana to accumulate large foreign exchange reserves. Gross international reserves, stood at \$344 million in 1980; by 1987 it had increased to \$2054 million, representing an annual growth rate of 20% and sufficient for 17.6 months of import coverage. (World Bank 1989). At the end of December 1990, the reserves stood at P6260 or \$3324 million at the prevailing exchange rate of \$0.5320=P1.00 (Bank of Botswana: Bulletin Vol. 8 No. 4 Oct.-Dec.1990).

1.2.4.6

External Debt

Botswana's debt situation for 1970, 1980 and 1987 is summarized in table 1.19. Total long term debt disbursed and outstanding is shown in the first row and short term debt in the fifth row. The 6th row shows the total external debt position. Thus Botswana's total external debt rose from \$17 million in 1970 to \$156 m in 1980 and \$517 in 1987. These absolute debt figures in themselves do not mean much unless they are related to GNP or export of goods and services. Long term debt disbursed and outstanding as a percentage of GNP stood at 21% in 1970, 18% in 1980 and 38% in 1987 (see row 2). Row 4 (a) and (b) show the crucial ratios - long term debt service as a percentage of GNP (row 4a) and as a percentage of export of goods and services. These ratios are a guide to the capacity of Botswana to service its debt without compromising its development objectives.

Table 1.19

EXTERNAL DEBT (SELECTED YEARS)

	1970	1980	1987
(1) Total long Term Debt disbursed and Outstanding * (\$m)	17	152	514
(2) (1) as % of GNP (%)	21	18	38
(3) Total Interest Payment on long term debt (\$m)	0	7	32
(4) Total Term Debt Service			
(a) As % of GNP (%)	0.7	1.5	5.2
(b) As % of Exports of Goods and Service (%)	1.0	1.7	3.7
(5) Short Term Debt (\$m)	-	4	3
(6) Total External Debt: (1)+(5)(\$m)	17	156	517

* Consisted of only public and publicly guaranteed debt.

Botswana had no private non-guaranteed debts or IMF credit for all 3 years.

Source: World Bank: Sub Saharan Africa From Crisis to Sustainable Growth 1989.

The current global debt problem, as already indicated above, is a familiar story. Botswana has been extremely prudent in incurring external debt and, over the years, it has stayed within debts limits that it is capable of servicing. It has avoided the practice of borrowing for both consumption and investment in anticipation of future revenues. As already mentioned above, Botswana will need to resort to borrowing during NDP 7 and beyond as it moves the centre of gravity of its economy from dependence on minerals to dependence on industry and service sectors. One hopes that the same prudence which has guided it in the past will prevail in the future.

1.2.5

Distribution of Income and Wealth and the Problem of Poverty

The concept of absolute poverty, i.e., the proportion of the population of a country living below a certain specified minimum level of subsistence income necessary to assure the basic essentials of food, clothing and shelter - a poverty datum line (PDL) - has gained currency as an estimate of the magnitude of poverty. While recognizing the conceptual problems in assessing poverty standards and even establishing minimum nutritional standards, there seems to be a general consensus on this index as a meaningful measure of the extent of poverty. For any given country which established its own poverty line, comparisons can be made over time.

In Botswana three indices of PDL have been calculated since 1975. The first PDL was calculated for the rural household in 1974/75 and indicated that 45% of rural households were living below the PDL. The second one was calculated for urban areas in 1976 which suggested that at least 36% and possibly as much as 47% of urban households were living below the PDL. The third PDL was calculated in 1989 on the basis of information contained in the 1985/86 Household Income and Expenditure Survey (HIES). The results of this last exercise show that for the country as a whole 59% of households lived below the PDL in 1985/86; this index was 69% for rural household, and 30% for urban households. A comparison of the 3 PDL would seem to indicate that absolute poverty has increased in rural areas, while there has been a slight improvement for urban households. Such a direct comparison seems to give a mistaken impression for three reasons. First it must be observed that the basket of goods used in the 1989 PDL had been substantially expanded compared to that of the 1974/75 PDL. Secondly the 1989 PDL was calculated on the basis of the 1985/86 HIES, which was conducted in the midst of the drought which hit the rural population much more severely than the urban population. Thirdly the 1974/75 survey was more comprehensive and, in addition, to cash incomes, and household consumption of own produce, included increases in stock of crop production, increased worth of livestock and imputed rentals for huts (NDP 7 page 35). Since these aspects were omitted from the HIES one would want to think that the two surveys are strictly not comparable. This leads one to the conclusion that while admittedly, there is still widespread poverty in rural areas, there has been considerable improvement in recent times. The basis of this poverty is the widespread unemployment in the rural areas which has already been touched upon above.

1.2.5.1

Income Inequality

A measure of the degree of income inequality which is employed by economists is the Gini coefficient. This index of inequality ranges between zero (implying complete equality in the distribution of income) and one (a case of absolute inequality in the distribution of income - i.e. an extreme case where all the income accrues to only one person in the society). The closer the index approaches 1, the greater is the degree of inequality and vice versa. Here again the Gini coefficient can be calculated for a given country at two points in time to see how the distribution of income has changed over time.

On the basis of the 1974/75 survey, the Gini index was 0.60. The Gini index calculated on the basis of the 1984/85 HIES was 0.674 for rural and 0.563 for urban households. Both measures relate to cash income. When one takes account of income in kind, the ratios are 0.477 and 0.536 for rural and urban households respectively. This implies that cash incomes were more unevenly distributed in the rural areas between the two time periods; this is also true for the nation as a whole since nationally, the Gini Index was 0.556 for all incomes and 0.703 for cash incomes. The uneven distribution of cash incomes is to be expected when one considers the sources of total income in the rural areas. The HIES data indicate that rural households have on the average more varied sources of income - 34% from cash earnings, 23% from business profits and 15% from income in kind. For urban households cash earnings mainly from paid employment contributed 81% of total income.

1.2.5.2 Distribution of Wealth and Assets

In rural Botswana, wealth is held in the form of cattle which give people access to both consumption goods and productive assets (in the form of draught power). Thus the distribution of cattle constitutes an essential basis for the distribution of income. In Botswana, the distribution of cattle is very highly skewed. The RIDS survey of 1974/75 indicates that 45% of rural households do not own any cattle; the Gini index worked out from this study for the distribution of cattle owned by rural household is as high as 0.795 which means that cattle is even more unevenly distributed than both cash and total incomes (cash plus kind). A study conducted by MOA in collaboration with FAO in 1974 (MOA, Report on a Study of Constraints on Agricultural Development in the Republic of Botswana, Gaborone, 1974 pp 65-66) also indicates that 73% of households that do not own cattle are female headed.

This has led to a situation where livestock virtually does not provide any source of income for a large number of poor households. The situation also implies that 45% of rural households do not have access to any draught power and hence arable farming does not provide much source of income. It is hardly surprising that, according to the RIDS figures, *"while the richest 2.7% of the rural households derive 64% of their income from livestock, for the lowest 10%, it is as low as 5% and for the next 35% it is only 7%"* (Oomen 1983 page 60). The 1985/86 HIES shows that 44% of rural households do not own cattle - thus there has been virtually no change in the proportion of cattleless households. There are no comparable figures for the distribution of cattle ownership among households who own cattle for the two surveys. However data from MOA survey (MOA Livestock and Crop Survey 1978, MOA Gaborone 1980 p.14 MOA Statistics (MOA, Botswana Agricultural Statistics 1983, p23) give the picture below: (See Table 1.20)

Table 1.20

CATTLE OWNERSHIP BY SIZE AND HOUSEHOLD

<u>No. of cattle</u>	<u>% of Households</u>	
	<u>1978</u>	<u>1983</u>
1-10	20.7	25
11-20	22.9	24.5
Total	43.6	49.5

The figures show that in 1978, 43.6% of cattleholding families held less than 20 cattle; by 1983 this figure had reached 50% of cattle holding families.

1.3 The Natural Resource Base

The development and prosperity of Botswana, as also its economic problems, can be understood in a large measure within the context of its natural resource base and the natural environment. These natural resource bases include climate, geology, soils, vegetation, water and wildlife. Water is the most basic because its supply has a direct effect on other activities, notably agriculture and mining.

1.3.1 Geology and Minerals

Fig 1.1 shows a simplified geological structure of Botswana. More than two thirds of the country is covered by a thick mantle, exceeding 600 m. of the Kalahari sands. It is thought that rich mineral deposits, including oil, may occur beneath the sands but their discovery will require intensive and expensive exploration. The results of the recent Botswana-Canadian drilling exercise in one of these areas are awaited. However, in the Makgadikgadi Pans (Sua Pan) area brine deposits estimated at 16 billion cubic metres are being exploited; the project was commissioned in March 1991. The plant is expected to produce annually 300 000 tonnes of soda ash and 650 000 tonnes of salt and later to recover some quantities of potash, lithium and bromine.

Below the Kalahari sands has been found some rich aquifers such as the one that is the source of water for Jwaneng Town. (Water is discussed in detail in the section below).

Diamondiferous pipes have been discovered within the Kalahari; at Orapa and Letlhakane in the north and at Jwaneng in the South. Table 1.21 shows diamond

production and its value in the last five years. Jwaneng is the leading mine (8.41 million carats in 1989), followed by Orapa (6.06 million carats in 1989) and lastly, the much smaller Letlhakane mine with 0.77 million carats. It is estimated that the current levels of extraction production can be sustained well into the 21st century.

Almost occurring at the edge of the Kalahari Desert (but also found elsewhere) are sedimentary rocks, one of the most important of which, economically-speaking, are the Karroo rocks. The Karroo rocks contain Botswana's coal. (More detailed discussions concerning coal will be found in the energy section).

Table 1.21

DIAMOND PRODUCTION IN 1970-1989

YEAR	Production (000 carats)	Estimated Value (000) Pula
1970 to 1975	11 528	110 652
1976 to 1979	12 245	327 087
1980	5 101	214 292
1981	4 960	202 082
1982	7 768	407 147
1983	10 731	538 288
1984	12 882	874 439
1985	12 634	894 975
1986	13 100	1111 421
1987	13 225	1200 000
1988	15 229	1700 000
1989	15 252	2513 000
Total	134 655	10093 383

Source: Department of Mines Annual Report

The basement rock outcrops are found in the eastern part of the country. These contain most of the country's known base metals such as copper, precious metals such as gold, and ferro-alloys such as manganese, nickel and cobalt.

The most important minerals mined are copper and nickel from Selebi Phikwe and from the smaller Selkirk mine near Francistown. In 1990 the production of copper-nickel matte amounted to 37,600 tonnes (Rep. of Botswana, 1991:13). At the present rate of extraction the Selebi Phikwe mines are expected to operate until 2002 at least and probably beyond, the viability of the project is continually haunted by the volatile markets, especially low metal prices. Table 1.22 shows production and value of copper-nickel matte since 1970.

Table 1.22

COPPERNICKEL PRODUCTION 1970-1989

YEAR	Production of Matte) (Tonnes)	Estimated Value Pula (000)
1970 to 1975	23 177	30 042
1976 to 1979	142 618	219 971
1980	40 099	83 258
1981	46 565	79 439
1982	45 685	61 172
1983	48 083	68 395
1984	51 845	77 528
1985	51 504	126 013
1986	47 930	119 916
1987	43 233	142 629
1988	57 530	433 404
1989	49 754	508 826
Total	648 028	1 950 593

Source: Department of Mines - Annual Report 1989

1.3.2 The Soils

Botswana is not well endowed with good soils. At least two thirds of the country is covered with soils derived from the Kalahari sands, which are characteristically poorly structured and unproductive, although they have been described as showing good response to different fertilizer application, provided of course the water factor is adequate. They are highly absorptive and, because there is often not much deep percolation, they support shallow rooted vegetation.

The soils of eastern Botswana, the area physically described as the hardveld, are ferruginous tropical type. They have two subdivisions; one based on the sandy parent material and the other on the granites and metamorphic rocks. The latter soils are very extensive in eastern Botswana. All Botswana soils are vulnerable to erosion under present dry climatic conditions; yields are affected by drought. Most of the soils are not suitable to irrigation either; so that areas with good irrigation potential such as Chobe have poor soils.

1.3.3 Climate

Climate, especially rainfall is a significant factor of the environment, a fact long recognized by the indigenous people of this country who welcome their visitors with a slogan "come with rain" and end their ceremonies with another "Pula" - rain.

The climate of Botswana is generally semi-arid to arid as a result of the location of the country close to the sub-tropical high pressure belt in the Southern hemisphere. The climate is characterized by among other things, high day time temperatures with a mean maximum temperatures in summer of 30-35 degrees Celsius, which cause high evaporation and transpiration. Evaporation rates average 2,2 mm, which is in excess of annual rainfall.

Rainfall is seasonal and 90% of it falls between November and March. Mean annual rainfall varies from 650 mm in the north through 500 mm in the east to 250 mm in the west. The rain falls typically in heavy down pours and is soon lost in run-off. Another feature of the rainfall is its variability in both time and space; variability is inversely related to the amount of rainfall received. (fig.1.2).

The above description helps to explain why drought is an endemic feature in Botswana's climate. Research into past rainfall patterns has established what appears to be a periodicity of roughly 20 years in the recurrence of serious drought that last several years and affecting most of the country. There is, however, no evidence yet of long term climatic change, although fears of this happening globally have been expressed. Man's activities have been found to be affecting the atmosphere to the extent that they can result in changes in climate.

Climate has a number of serious consequences. It affects soil moisture and low and unreliable rainfall makes arable agriculture highly risky. During the recent drought (1981/82-1986/87) food production fell to between 4% and 10% of the country's requirements. Secondly, climate affects forage and a drought can have disastrous consequences for the livestock sector. During the last drought cattle were reduced from nearly 3 million in 1982 to 2.3 million in 1987. Thirdly, it affects the amount and distribution of surface water and the recharge of ground water.

The country receives a large amount of sunshine varying from 300 hours to 3,500 hours, which is only being marginally harnessed at present in photovoltaic installations and for solar heating.

1.3.4 Water

Water is a critical resource and one that is greatly influenced by climate, particularly rainfall. The main source of water is ground water. Surface water is mainly (95%) restricted to Chobe and Ngamiland Districts in the north. It is estimated that 11-12 billion cubic metres of water flow into the Okavango Delta but most of this is lost to evaporation. The other river systems are the Marico/Limpopo (750 million cubic metres), the Zambezi/Chobe (30 billion cubic metres) and the rivers in the eastern Botswana (10 million cubic metres) The flow of the rivers in

Eastern Botswana into the Limpopo is estimated at 602 million cubic metres. The rivers in the Makgadikgadi region are estimated to generate about 102 cubic million metres.

The use of waters of the Chobe and Limpopo/Marico systems is subject to international agreements. Botswana thus can extract only half of 25% of the waters of the latter system. The potential river water yield available to Botswana does not exceed 1,5 billion cubic metres. This is because of constraints such as unreliable rainfall, few damnable sites and losses due to evaporation and seepage etc. In all, not more than 15% of the potential surface water is harnessed. Because of the poor surface water supply and its distribution, the country has to place a relatively heavier dependence upon ground water supplies.

There are more than 14 000 registered boreholes and they meet about 60% of Botswana's water demands for domestic, mining, livestock and industrial needs. Recent estimates suggest that ground water resources may be in the region of 100 000 million cubic metres, but only less than 1% of this, mainly in eastern Botswana, is rechargeable. The rate of recharge in the Kalahari is felt to be below sustainable extraction even in good years. The implication is that the aquifers - underground water reserves - in the Kalahari may be mined. The situation with ground water is a cause for concern generally as water levels have been declining and thus contributing to serious water shortage in the rural areas.

Botswana's total water demand stood at 120 million cubic metres in 1990, and 50% of this was consumed by the livestock sector and limited irrigation (only 1380 hectares are under irrigation). In general, the trend in water demand is upward in concern with population growth and economic development. For example, total urban water consumption increased at the rate of 11% per annum from 10,4 million cubic metres in 1985 to 15,7 million cubic metres in 1989.

1.3.5 Vegetation, rangelands, forestry and veld products

The forests and woodlands of Botswana constitute an important resource as they are a source of energy, provide materials for construction, fencing and crafts and assist in maintaining the natural environmental balance. The grass, as indeed are some trees, is a source of forage and helps to protect the soil from the elements of erosion.

The natural vegetation of Botswana is predominantly savanna with scattered trees and a field layer of grass. Open grasslands occur in areas such as the Makgadikgadi Pans. To the north and east of the country the vegetation is mainly woodland, the dominant species being mophane (colophospermum mophane), acacia spp and combretum spp. The wetland of the Okavango and the Chobe have grass, flood plains and riparian woodlands. The woodlands comprise primarily the hardwood species, notably mukwa (pterocarpus angoleensis) and mukusi (Baikiea plurijuga), both of which have significant economic importance. The vegetation has been affected by fire and grazing and in very few places does a natural climate vegetation occur.

Annual increment is currently estimated at 9 100 000 tonnes is slow and uncertain on account of low and erratic rainfall combined with sandy soils. Studies on wood resources are few and unreliable. One done in 1983 estimated that the total biomass of growing stock in eastern Botswana amounted to 236 000 dry tonnes (+ or -25%). A more recent study has estimated the average standing crop in eastern Botswana on all types of land at 15,8 tonnes per hectare.

Total demand is approximately 700 000 tonnes per year, which is apparently lower than the incremental figure. However, one has to consider a number of factors, interalia, that (a) only a smaller share of the area which is covered by woody biomass is accessible for fuel wood extraction, and (b) agricultural land clearing constantly reduces the areas under vegetation. Consequently, fuel wood crisis is now being felt in parts of eastern Botswana near the major towns and villages. Indeed in these area there has been an over utilization of resources that has led to serious degradation of natural resources. The supply/demand problem of fuelwood is expected to deteriorate in the mid-1990's in the low density areas as well.

1.3.5.1 Natural vegetation and rangelands

It has been estimated that about 60% of the country's land mass (35 million hectare) is potentially suitable for livestock grazing. Attempts have been made to work out the carrying capacity, both actual and theoretical, of the land (Arntzen and Venendaal, 1986). The potential carrying capacity can be defined as the average number of hectares of rangeland required to support one livestock unit (LSU) (1LSU equals 450 kg of live weight) without adverse environmental effect. The carrying capacities vary from district to district - from 8 hectares to a maximum of 27 hectares, while the median value is 17 hectares.

Suffice it to note that the work that has been done in Botswana suggests that the country's rangelands cannot carry more than 3,5 million LSUs on a permanent basis, assuming that about 60% of the country is allocated exclusively to livestock grazing. The existing numbers of livestock are already at the theoretical limit and have surpassed it in many places.

1.3.5.2 Forestry

Aspects of forestry have been covered under vegetation. There are not many large commercial forests in Botswana except in the Chobe District where forest reserves have been created. The forest reserves and their estimated reserves of timber are given in Table 1.23 below.

Table 1.23

FOREST RESERVES AND THEIR ESTIMATED TIMBER RESERVES (IN CUBIC METRES)

Chobe Forest	147 510
Kasane	35 700
Maikaelelo	40 000
Sibuyu	72 000
Kazuma	30 000
Kasane Forest Extension	Not known.

Source: Forestry Unit Ministry of Agriculture.

There are three companies involved in the commercial exploitation of hardwood species, notably mukwa and mukusi. Each company is permitted to fell 5000 cubic metres of the above species and unlimited amounts of other species. The total volume of wood extracted from the concessions is about 15 000 cubic metres. Companies pay royalties to the Government. 90% of the production is exported to the neighbouring countries. The exploitation of this timber has, however, not reached its production potential.

In many other parts of Botswana, vegetation is exploited for building materials, firewood, fencing and the manufacture of crafts. Some of these areas, as already noted, have experienced severe deforestation. The causes of deforestation are many and include:

- a) increasing population growth, which has led to increase in demand.
- b) the inability of new institutions to develop and enforce regulation that protect the use of these resources to the extent that the chiefs used to do before independence.
- c) the sharing of the social costs of diminishing fuelwood resources by the entire community which does not give the incentives to the individual not to over-utilize the resource.
- d) the development of a market for fuelwood has encouraged the over-cutting of trees; in some cases even the green ones; and
- e) the felling of trees to clear land for arable production.

Reforestation projects are still limited in scale. There is an estimated 636 hectares under woodlots, especially of eucalyptus species.

1.3.5.3

The Veld products

Veld products include plants, insects, various clays, and haematic and mineralised soil used by women for decorating their houses and pots. (These exclude all forms of wildlife, fish and domesticated plants)

Wood would normally be included but is excluded as it has already been discussed above. Normally there is no control on the utilization of these products except through social custom. In Botswana a licence is, however, now required for collecting the grapple plant, (Harpogrophytum Procumbens).

There has not been sufficient research into this sector to give more concrete data. However, it is known that the low income groups are more likely to benefit from collecting than other groups. Indeed some of the production, like the Mophane Worm, have been known to have demand beyond the borders of Botswana. There has also been an over-harvesting of some products, the reduction of which has affected the living standards of local people, as the price of the product has risen sharply.

1.3.6

Wildlife and fisheries

Botswana contains considerable number and variety of wildlife. There are 164 species of mammals, 550 birds, and 157 reptiles, 80 fish and 38 amphibians. An indication of population estimates of different species was given by Countrywide Range and Animal Assessment Project of the 1970's (DHV Consulting Engineers 1980). The numbers were considerably reduced by drought of the 1980's although there are signs of population recovery.

Wildlife is found in the country's three National Parks and Game Reserves, as well as outside protected areas. Botswana has Controlled Hunting Areas (CHAs) designated outside protected areas, where harvesting of game is controlled through a licensing system administered by the Department of Wildlife and National Parks (DWNP). Some animal species are completely protected from any form of consumptive utilization. Included in this category are 35 bird and mammalian species with limited habitat and/or endangered such as black and white rhinos (Diceros bicornis and Ceratotherium simum respectively), cheetah (Acinonyx jubatus) etc. Organized large scale poaching has not, so far, been a problem. DWNP has well trained anti-poaching units deployed throughout the country, that are assisted by the Botswana Defence Force along international boundaries.

Elephant (Loxodonta africana) populations are large and growing rapidly. The population estimate for 1991, being some 63,000. The Department of Wildlife and National Parks' Elephant Management Plan recommends amongst other things, culling a relatively small fraction of the elephants herds so as to maintain the population at about 60,000, in equilibrium with the available elephant range and to also minimize elephant related conflicts, of property damage, that particularly affect rural communities. Implementation of these recommendations is being hampered by the placement of the African elephant in Appendix I of the CITES Convention, which

prohibits trade in elephant products. Botswana has entered a reservation against Appendix I listing of the African elephant.

Wildlife has an important role to play in the economy of Botswana. The wilderness and its wildlife form the primary attraction for the tourism industry, through game viewing and safari hunting. Wildlife is also used as a source of meat and other products in subsistence hunting; is captured alive for restocking commercial game farms and supports a range of secondary industries such as tanneries, taxidermy studios, curio shops etc.

Use of the wildlife resources has considerable potential for expansion through new uses and through intensification of existing uses. Also, in global terms, wildlife in Botswana has considerable non-use value, for example, "option" and "existence" value. This non-use value is high in developed countries and, if markets could be developed, there is potential to capture it for Botswana. Generally, within this "cattle country", wildlife is a resource that is not yet highly appreciated.

Fishing is not an important activity except in Northern Botswana, where there is a tradition of eating fish caught from the vast surface waters of the Okavango and the Chobe. In 1986-87 production amounted to approximately 1 900 tonnes although potential production is estimated to be 10 000 tonnes. Only 200 out of the nearly 12 000 fishermen are commercial; the rest fish to satisfy their subsistence needs. This sector is considered to have a potential for growth and a possibility of creating 3 000 jobs exists. However, there are problems of remoteness of the producing areas in relation to main markets and sources of supply of equipment, traditional attitudes and occasional droughts.

1.3.7 Energy

The primary sources of energy are woodfuels, coal and petroleum products. Aspects of woodfuel have already been discussed under vegetation. As already noted renewable energies, notably wind and solar, are contributing only marginally to the country's energy requirements. Demand for both electricity and petroleum fuels doubled between 1980 and 1988/98 to satisfy the needs of fast growing sectors.

The proven coal, mainly steam coal reserves, amount to 40 million tonnes; sufficient to maintain the present Morupule colliers for about 60 years at current levels of production of 700 000 tonnes. However, production is expected to increase to one million tonnes soon to satisfy demand from the new soda ash mine at Sua Pan. The total coal resources are estimated at 20 billion tonnes - which implies that only a small proportion needs to be mineable for the coal resources to sustain the country's energy needs for centuries.

The only coal mine is owned by Anglo American Corporation. However, the Government has recently entered into negotiations with the company with the view to acquiring equity in the company. The coal is sold to the power station, owned by the parastatal, the Botswana Power Corporation, which is close to the colliery and to the copper-nickel smelter at Selibe Phikwe.

1.3.8 Biological diversity

This may be defined simply as maintaining the variety of different genes, the variety of different species, and the variety of different ecosystems. It is recognized that different species interact and interrelate in different ways within the environment in which they are found. Thus the extinction of a species can and does affect other species. Therefore, to ensure maintenance of life on earth, a wide diversity of species, each with a particular role to play, have to be conserved.

These diversities exist in Botswana in both plant and animal life. Agricultural research is very much involved in various programmes of genetic diversity with both crops and animals (Campbell et al; n.d). However, very little work has been done with species of wild plants. In the same way two broad biogeographic zones with major ecosystem types within them have been recognized. Such classifications and divisions have implications for land use. A plea has been made to reserve the fragile Kalahari environment for wildlife (Cooke, 1985), while efforts have been made in agriculture to identify the agro-ecological zones.

1.3.9 Land Use

Botswana is 582 000 km² in area, which is the same size as France. The total population is about 1.2 million and 80% live in the rural areas, concentrated mainly in the eastern part of the country.

There are six major categories of land use: namely grazing land (77% of all land), arable land (2%), national parks and game reserves (17%) swamps and open water (2.7%), forests (0.5%) and urban and industrial land (0,1%). The figure for grazing is higher than the figure quoted above. The difference is that the latter figure refers to ideal grazing land whereas in practice, any land, whether it is suitable for grazing or not, which is not used for any purpose may be used for grazing if water and some grazing are available.

Another important factor related to land use is land tenure. In Botswana, there are three major categories of tenure; viz - communal (70% of all land), stateland (25%) and freehold (5%).

Aspects of land have been alluded to already in the discussions of various resources, e.g. forestry, wildlife. In this section attention is given to livestock and arable agriculture.

With respect to livestock, the question of rangelands has already been covered. What must be emphasised is that there is a problem of overgrazing which the Ministry of Agriculture is trying to address. One of the solutions is to increase the off-take in the communal areas, in which are found over 85% of the cattle stock. The spatial distribution of livestock is largely determined by the availability of grazing and water. As already noted the ownership of livestock is highly skewed.

With respect to arable agriculture, it is estimated that not more than 6% of the country is suitable for this activity. Most cultivation - mainly of sorghum, millet and pulses - takes place in the communal areas or the traditional sector. The commercial sector in freehold farms specializes in livestock farming. However, productivity in the traditional sector is much lower; it was 241 kg/hectare as against 748 kg/hectare in the commercial sector in arable agriculture in 1988. In general, arable agriculture productivity has remained stagnant for the last two decades. Constraints include not only unfavourable climatic conditions, but also an array of other factors such as access to economic resources such as labour and draught-power and poor technology.

Production tends to fluctuate with rainfall. The uncertain and erratic rainfall makes arable farming a highly risky undertaking. Government programmes to improve the sector and to cushion producers against risks have resulted in increasing costs to the country.

1.3.10 Summary

It can be noted that Botswana's national environment is hostile. The climate, the soils and even vegetation are not favourable. However, the country contains some rich mineral deposits, particularly of diamonds and coal. Much of the country still awaits exploration. In the short and medium term, no major mining projects are expected to develop. The discovery and exploitation of some minerals has transformed the economy. The renewable resources, notably of arable and livestock agriculture, and forestry need to be developed in an environmentally sustainable way. Tourism, which is dependent upon the wilderness and wildlife resources is one of the major earners of foreign exchange.

1.4 The Role of Natural Resources in Economic Development

The importance of natural resources (both renewable and non-renewable) in Botswana's economic performance since independence cannot be overstated. In fact the dependence of natural resources has been considerable, and this is in terms of production, consumption, employment and international trade.

1.4.1 Production

In 1967/68, the Agricultural sector, comprising crops, livestock, hunting and gathering, and depending directly on renewable natural resources contributed 41.7% of GDP (in constant 1979/80 prices). This was the single largest contribution of any sector to GDP. The other significant sectors at the time, Government, Trade and Hotels, Manufacturing, Financial Services and Transport, contributed 17.5%, 11.3%, 8.2%, 6.6% and 5.4% respectively. The contribution of Mining which was virtually

non-existent was 1.6% (See National Accounts of Botswana). As we observed in the introduction to this chapter, this predominant position of Agriculture was eroded over time and by 1988/89 its contribution had dwindled to a mere 3.3% of GDP (also in constant 1979/80 prices). The change in the structure of the economy which we observed in the introduction is different from the kind of structural change usually observable in developed countries where there is a shift from primary production to secondary and eventually tertiary activities as the development process unfolds. In fact in these latter countries, the shift from the primary sector is made possible by productivity increases which facilitate absolute increases in the output of that sector.

In the case of Botswana, this is hardly the case. Here there have been both absolute and relative decreases in the contribution of Agriculture. As can easily be seen from table 1.1, the volume of agricultural output (in 1979/80 prices) declined in absolute terms from P87.7 million to P59.7 million, representing an annual rate of decline of 2.7% and reflecting decreases in productivity in that sector. Between 1967/68 and 1988-89 mining increased its share of GDP from 1.3% to 45%; thus over the period the economy shifted its dependence, in terms of production, from renewable to non-renewable natural resources. Perhaps it is a misnomer to call it a structural transformation; dependence if perhaps a more appropriate term. One can have a better appreciation of Botswana's dependence on natural resources if one considers the fact that the impressive strides made over the years in the social and economic sectors have come about as a result of reliance on the revenues obtained by direct exploitation of renewable and non-renewable resources.

It is not only in Agriculture and Mining that the country's dependence on natural resources for production can be assessed. For production, industry depends on raw materials from the agricultural sector; this applies to major industries in the country such as breweries, meat processing, soap, milling and textiles. This dependence is rather limited at the moment, given the size of the manufacturing sector. However, as the projected structure of the economy proceeds and emphasis is shifted from the mining sector to industry, the dependence of industry on agriculture is likely to increase. Moreover, the planned diversification within the agricultural sector itself from livestock and crop production to the exploitation of forestry products, development of horticulture, dairying, poultry, piggery and fisheries is likely to increase the dependence of the economy on natural resource, albeit indirectly. Thus it is the nature of dependence on natural resources that is likely to change from direct to indirect. This is in fact the whole essence of development. This change in dependence on natural resources will lessen the vulnerability of the economy to the dangers involved in direct dependence on renewable and especially non renewable natural resources.

1.4.2

Consumption

The remarkable decline in the relative importance of Agriculture in terms of its contribution to GDP conveys a mistaken impression about its significance in terms of consumption activities in the economy. It is estimated that some 77% of the total population live in rural areas and derive their livelihood from agriculture; this, of

course, does not mean that the rural population is solely dependent on agriculture. An examination of the sources of rural household income shows that agriculture does not provide the major share of rural income. The RIDS referred to above indicates that in 1974/75 - a year of good rainfall - combined livestock and crop production accounted for 45% of total rural household incomes while the HIES puts this figure at 26% in 1985/86, a year of drought. The reasons for agriculture's inability to sustain the rural population are not hard to find. They are the result of the innumerable constraints under which the sector has had to operate. These include such physical constraints as low and highly variable rainfall and poor soils; others are "(i) *the current land tenure system...*, (ii) *lack of developed market infrastructure input delivery systems and repair services*, (iii) *inadequate management skills and inappropriate technologies*, (iv) *limited underground and surface water sources*, (v) *poor access to credit resources (especially draught power and labour)* and (vi) *few alternative investment opportunities for diversification which could relieve the fragile rangeland from overstocking and degradation*". (NDP VII Agricultural sector).

Thus the extent to which Agriculture is able to support the rural population in terms of their income and sustain development is highly dependent on the Government's ability to grapple with these complex and adversely mutually reinforcing constraints. The mere recognition of these problems and the political will to address them constitute the first step in the right direction.

Another index of Agriculture's significance in terms of consumption activities relates to energy consumption derived directly from natural resources - woodfuel and coal. Woodfuel still has the largest share of over 50% in total final energy consumption reflecting the fact that the majority of the population lives in the rural areas where woodfuel is the predominant source of energy supply. Coal, mainly consumed by the mining sector and other industrial enterprises provides 13% of final energy consumption (NDP VII Energy Sector).

In terms of the direct consumption, wildlife and veld products have traditionally played a significant role as sources of food and income, particularly in the sparsely populated northern and western parts of the country. Wildlife is particularly important for tourism and subsistence hunting especially for the poor households in western Botswana. Presently veld products which are essential for consumption and income earning activities of the rural population are mopane worm, mokola palm, grapple plant and thatching grass. While the actual extent of local dependence on these products cannot be properly assessed, it is believed that wildlife and the development of veld products hold much promise for sustained development in future if the environmental problems associated with them can be arrested.

1.4.3 Employment

We have observed above that development in the sectors relying directly on the exploitation of natural resources - mining and the livestock sectors have acted as the propelling force behind the growth in income that was experienced by Botswana since the early seventies. However in terms of the contribution of these sectors to formal employment, their performance has fallen far below expectation. The growth

in the cattle population since independence has been phenomenal. At the time of independence in 1966, drought had reduced the cattle population to 1.237 million; however between that period and 1982, the cattle population increased to 2.979 million or an annual growth rate of 5.6%. A combination of favourable conditions ranging from intensified animal disease control, increased provision of water by drilling boreholes, favourable weather conditions and continued Government support, among other things, were responsible for this growth. These will be discussed at greater length in Chapter IV.

As the drought period started to intensify after 1982 the cattle population started to decline and, by 1987, it was down to 2.3 million. Growth in the cattle population again resumed as the drought receded and preliminary estimates indicate that in 1989 the cattle population stood at 2.5 million (MOA : Botswana's Agricultural Policy: Critical Sectoral Issues and Strategy for Development 1990 page 5). Smallstock (goats and sheep) increases over the period have also been tremendous. The significance of the cattle sector lies in the fact that over the years, it has contributed more than 85% of total agricultural incomes. However owing to the skewed nature of cattle distribution which we have already alluded to above, and the fact that livestock farming is land rather than labour intensive, the benefit from that sector in terms of income and employment generation has not been widespread. According to a World Bank Study *"the development of the livestock subsector has so far made only a limited contribution to mitigating the problems of rural employment and poverty"* (World Bank: Economic Memorandum on Botswana Oct. 1985 pg. vi).

In contrast to the growth experienced by the livestock sector, the performance of the arable farm sector has been characterised by serious shortfalls. Owing to the numerous constraints mentioned above, the arable farm sector has not been a particularly attractive sector. Table 1.24 shows data on area planted, production of crops (sorghum, maize, beans/pulses, millet and oilseeds) and total cereal imports between 1975/76 and 1988/89. Even in years of good rainfall before the onset of the prolonged drought of 1980/82-1986/87 large quantities of food had to be imported to supplement domestic production. The share of the agricultural sector as a whole, between 1980 and 1988, in total formal employment fluctuated between 8.0% and 5.6% (See Table 1.3). Data on employment in traditional agriculture is hard to come by; however the LFS 1984/85 estimates this as 121,500 or 33% of total formal and informal sector employment.

Table 1.24

AREA PLANTED, PRODUCTION OF CROPS, (SORGHUM, MAIZE, BEANS/PULSE, MILLET AND OILSEEDS) AND CEREAL IMPORTS (1975/76-1988/89)

	75/76*	76/77*	77/78	78/79	79/80	80/81	81/82
Hectarage planted (000) Hectares	261	255	260	180	287	290	204
Production in (000) tonnes (a)	77	74	50	10	49	58	19
Total Cereal Imports (c) (000) tonnes	39	52	16	162	109	79	111
	82/83	83/84	84/85	85/86	86/87	87/88	88/89
Hectarage planted (000) Hectares	229	203	211	243	290	360	260b
Production in (000) tonnes (a)	16	9	20	22	22	116	60b
Total Cereal Imports (c) (000) tonnes	174	172	187	185	158	NA	NA

a - Production and Cereal Import figures rounded off to the nearest thousand. Domestic crop production includes oilseeds i.e sunflower and groundnuts whose output is very insignificant or less than 1 percent of the total.

b - Projected figures

c - Total Cereal imports include wheat, rice and processed products of all the cereals.

* No survey conducted during 1973/74 - 1976/77
Production levels were subjectively determined

Sources: Agricultural Statistics -1967/89, MoA
Central Statistics Office - 1975-1987.

We have already seen the performance of the mining sector in terms of contribution to GDP and employment above. (See Table 1.2). The inability of the mining sector to contribute to employment in proportion to its share of GDP is based on the fact that it is capital and skill rather than labour intensive.

1.4.4 International Trade

In terms of contribution of natural resources to international trade, Botswana's economy exhibits characteristics typical of LDC's. Since independence a preponderance share of exports has come from the primary sectors - Mining and Agriculture. Before mining came on the scene, Botswana's exports consisted of meat and meat products, live animals, hides and skins and a small proportion from the textile industry. Thus exports comprised predominantly of produce of nature; the mining sector has only shifted dependence of exports on renewable natural resources to dependence on non-renewable resources.

As table 1.14 shows, since 1980 the share of the three most important items in total exports - meat, diamonds and copper/nickel matte - has progressively increased reaching 92.6% in 1988.

It is evident from above that, to a considerable extent, Botswana's production, consumption, trade and employment activities have been sustained by the natural and environmental resources of the country to varying degrees. At the moment Agriculture and Mining are the sectors most dependent on these natural and environmental resources; in addition, as population increases, further pressure is exerted on the resources through direct consumption activities relating to energy, veld products etc. This development has brought in its wake massive resource degradation of the rangeland, soil erosion, depletion of soil nutrients, water resources etc. that threaten the ability of environmental and natural resources to sustain further development. The nature and pattern of economic expansion in future will determine the sustainability of the environment and the nature of environmental problems that are likely to arise. The constraints on and opportunities that exist to address these environmental issues constitute the subject matter of Chapter 4.

CHAPTER 2

2.0 NATURAL RESOURCES AND ENVIRONMENTAL ISSUES

2.1 Introduction

The Botswana National Conservation Strategy had identified five major natural/environmental issues; namely and in order of priority:

- a) Growing pressure on water resources as a result of increasing population, urbanization and development;
- b) Degradation of rangelands, which reflects poor or inadequate management;
- c) Depletion of wood resources as a result of commercial exploitation and harvesting for woodfuel;
- d) Over exploitation of some veld products to an extent that their regeneration capacity for both subsistence and commercial harvesting have diminished;
- e) The pollution of air, water, soil and vegetation resources.

These issues are discussed separately below.

2.2 Pressure on water resources

Chapter 1 underlined the fact that water was the key to development in Botswana. It also estimates the available known resources. It must be emphasized that there are still many gaps in our knowledge of water resources, e.g. not enough information on aquifers and the rate of their recharge but also on what should be the maximum sustainable rate of consumption.

Water is needed for all human activities. Table 2.1 shows current (1980) water consumption by sector. Livestock followed by settlements, is currently the leading consumer. Mining and irrigation are also major uses of water. However, demand patterns are expected to change in the future. Demand for water in settlements is expected to grow rapidly so that by 2020 they should account for more than 50% of total consumption. The shares of other sectors are expected to reduce that of livestock by more than half (Fig. 2.1).

Table 2.1 WATER CONSUMPTION IN BOTSWANA (1990)

Sector	Demand (millions) 10 m3	Percentage %
Settlements:		
domestic	15.6	13.3
commercial/industrial	4.1	3.5
institutional	6.6	5.7
losses	7.5	6.4
Sub total	33.8	28.9
Mining	20.7	17.7
Energy	2.2	1.9
Agriculture:		
irrigation	18.81	16.1
livestock	35.3	30.2
forestry	0.1	0.1
Sub total	54.2	46.4
Wildlife	6.0	5.1
Total	116.9	100

The major problem is that demand for water is increasing rapidly and thus placing considerable pressure on existing stocks. The main response so far has been to find additional water sources or expand existing water works. In the last drought the strategy of suppressing demand was also implemented in Gaborone.

The increasing demand is creating water shortage. Water shortage is related to five major factors; viz:

- Population growth and distribution;
- Rapid expansion of human activities, especially in the south-eastern part of the country;
- Location of surface water resources away from main population concentrations;
- Limited knowledge about ground water resources; and
- Rising incomes and standards of living.

Population growth and urbanization are the major components of rising water demand. The population of Botswana is growing rapidly. Between 1971 and 1981 as already noted the annual rate of growth was 3.4%.

Simultaneous with population growth has been the change in population distribution, particularly urbanization since independence in 1966. In the last decade, for example, the rate of urbanization was around 10% per annum. Table 2.2. show this phenomenon by individual city. It is obvious that population growth, especially in Gaborone, is rapid. Thus the analysis of increase in consumption since independence has revealed that it has been highest in Gaborone, where it stood at 1,36 million cubic metres per day in 1966 but had increased about seven fold to 9,38 million cubic metres per day in 1989. In the last decade the total water consumption is estimated to have grown at a rate of 3,5% per annum.

Table 2.2 GROWTH OF URBAN POPULATION (1964-2001)

	1964	1971	% change 1964-71	1981	% change 1971-81	1986*	2000*
Gaborone	3 855	18 436	+ 378	58 656	+ 237	95 163	248 896
Francistown	9 525	19 903	+ 109	31 065	+ 67	43 837	96 993
Lobatse	7 613	12 920	+ 68	19 033	+ 59	23 829	39 246
S/Phikwe	-	4 940	-	29 467	+ 511	41 382	89 781
Orapa	-	1 209	-	5 229	+ 330	7 387	16 533
Jwaneng	-	-	-	5 568	-	10 308	34 369

Source: Central Statistics Office

Independence came with improvements in living standards. One indicator of this is the growth of the GDP per capita from P50 in 1966 to P4 900 in 1991. However, the majority of the people are poor and their incomes fall below the Poverty Datum Line. In the large villages (most of them with populations of over 5 000) and in self-help housing areas in urban areas, central and local Government provide stand pipes. There is, however, a trend towards more private connections particularly in villages near urban centres and this has implications for water demand. Whereas per capita water consumption from a stand pipe is 15 litres, that from private stand pipe is 60 litres; it was 40 litres during the early 1980s.

One major source of demand is livestock. Livestock population has increased over the years. The increase in demand has been proportional to the increase in these

numbers. The cattle are dependent upon ground water supplies, which is problematic because of such factors as low rate of recharge.

It has already been mentioned that the supply of water, especially with regards to ground water, is declining. However, exploration for water is continuous. One way of dealing with the supply problem is to develop an integrated water plan with a national trunk linking both ground and surface sources (Viak, 1985).

This is all the more important because even surface water resources are problematic because; (a) they suffer losses from high evaporation rates; (b) largest sources occur where demand is presently low; (c) quantity and reliability are influenced by the size of the catchment areas and amount of rainfall received; and (d) catchment areas for largest sources lie partly or wholly outside the country. It has therefore been necessary to negotiate water supply agreements with neighbouring South Africa, in which lie one of these catchments. Even with these arrangements it is expected that by 2010 the present and future known supplies will not be able to cope with demand and it may be necessary to exploit the waters of the Chobe in the north.

In urban areas and large villages water is institutionally supplied by the parastatal Water Utilities Corporation and the Government Department of Water Affairs respectively. However, in smaller settlements, in cultivated and grazing areas, most of the supply is from informal sources; pans, open wells etc. However, boreholes, dams and haffirs may be important especially for watering stock. Most of the boreholes are privately owned. Under the present technology, the cost of providing water to these small communities is 13 times higher than that of providing water to large villages. Classen (1980) therefore recommended that small scale supplies at farming areas were best developed by hand dug wells, protected springs, subsurface dams and rain water catchments with cistern constructed below the ground.

Water is a crucial resource, almost a right. It is almost free to users of stand pipes and small dams; being subsidized by other users. No development is possible without it. Thus its availability influences agricultural production and population movements between settlements and farming areas. Even urban activities are dependent on the availability of water.

Thus the drought of the early 1980's caused a moratorium on all major construction projects in Gaborone and this resulted in the increase in unemployment. This had ripple effects because some of the businesses in the low income areas experienced a drop in business.

As in most instances it is thus the poor who suffer most from the water shortage. This is as true of the urban as it is of the rural situation.

The drop in the water table in the Kalahari has hit the Basarwa communities harder than others. The Basarwa have responded by migrating to villages and game-settlements where there are permanent water supplies (Woto, 1987).

To conclude, water is a very crucial resource without which development is possible. The demand for water is increasing rapidly as a result of fast population growth and economic development. Every attempt is being made to meet this demand. Thus shortage of water would be disastrous for the economy.

2.3 Degradation of rangelands

Chapter one outlined the range resources of Botswana and noted that the livestock numbers were already beyond the range's carrying capacity. In this section we explore why this situation has arisen, how it has developed and its social and economic consequences.

The traditional grazing system is in open bush (veld) and the response to diminishing grazing resources is to move to unused areas. Therefore, as the eastern part of the country became increasingly overstocked, there was a trek westwards, particularly since 1960, into the 'empty' Kalahari. This development was facilitated by the borehole technology. Therefore the answer to diminishing grazing resources has never been to use the land more intensively, such as growing of fodder. Livestock and range management practices, especially in the communal sector, have not changed significantly over the years. Because grazing is on communal land, there is no incentive for individual farmers to reduce their numbers. Further, even those who have acquired commercial ranches still want to retain their grazing rights in the communal land.

Botswana preference for livestock farming is nonetheless rational. The returns from the sector are high. Ranching is better suited to the environmental conditions than arable agriculture, and the prices paid are favourable. There are no other significant income-generating activities in the rural areas. Therefore the contribution of livestock to total household income is very important, in the case of livestock owning households. The marketing system is well-established and the prices are influenced largely by the two major markets, the EEC and the South African, both of which pay relatively good prices.

The growth in livestock population especially of cattle, which had been checked by the last drought has since been restored. This has implications for grazing resources in a society where the grazing system is still extensive.

There is now no more land to move to in order to solve the problem of overgrazing. Stocking rates have continued to increase as the number surpass the carrying capacity (Table 2.3). There is overstocking in most parts of the country. The other major cause of overstocking is low offtake rate (around 8%) in the communal sector.

Table 2.3**POTENTIAL CARRYING CAPACITY ESTIMATES BY DISTRICT (HA/LSU)**

District	Estimated based on rainfall	Theoretical approach
Southeast	12	5-12
Kgatleng	12-16	9-20
Central	8-21	5-46
North East	16-21	21-34
Chobe	8-12	2-16
Ngamiland	12-21	2-26
Ghanzi	16-21	5-34
Kgalagadi	21-27	13-46
Southern	12-21	5-100
Kweneng	12-21	9-26

Source: Arntzen and Veenendal

Overstocking is the major cause of environmental degradation as manifested by bush encroachment, soil erosion and, in some places, desertification. Bush encroachment is a process where a grass layer has gradually disappeared to be replaced by wood species. It is a process that takes place in stages:

1. The most nutritious palatable and perennial grasses gradually disappear due to selective grazing and are replaced by less palatable species;
2. Bare patches develop as the grasses disappear; the most unpalatable herbs increase;
3. Grasses disappear completely and the open spaces are taken over by unpalatable herbs and bulbous plants (Van Vegten, 1981, 1982). This is the situation in large parts of eastern Botswana, especially surrounding settlements.

Soil erosion is considered a serious problem in Botswana (Arntzen and Veenendaal, 1986). However, there are few studies that quantify erosion in grazing areas (see below). Forms of erosion that have been identified are wind, sheet, rill and gully erosion. Wind erosion is more widespread in the west while gully erosion is prevalent in eastern Botswana.

Desertification is reached when, among other things, large scale disappearance of vegetation and water sources and destruction of the soil have occurred. This is brought about by a number of the changes in local climate, increased run-off, severe soil erosion and further reduction of vegetation cover. In areas around some villages and in some grazing areas in the Kalahari desertification has crept in.

The degradation of the range has a number of consequences. They are environmental, economic and social. Soil erosion reduces the productivity of the land. A recent study in one area of the North East District has estimated soil loss and loss of cultivated area as a result of soil erosion (Table 2.4). The table shows that in the 40% of the area erosion is very serious and in order to reverse the heavy soil loss, expensive conservation measures are needed. This is not to imply that conservation measures are not needed in other areas. When the productivity of the areas is reduced, so is its carrying capacity. The final result is declining living standards.

Table 2.4 ACTUAL SOIL LOSS FOR THE CFDA AREA AND AGRICULTURAL FIELDS AND PREDICTED SOIL LOSS FOR MOST SUITABLE SOIL UNITS FOR TRADITIONAL DRYLAND FARMING (IN TONS/HECTARE/YEAR).

Soil Loss	Actual soil loss Total CFDA area		Agricultural fields	Predicted soil loss (ha) area	% suitable area
0-2.5 (t/ha/y)	18,044 ha	40%	3,572 ha 25%	9,640	33%
2.5-10	10,784	23	3,128 ha 22%	7,720	27
10-25	7,664	17	2,832 ha 20%	6,684	23
25	9,192	20	4,804 ha 33%	4,804	17

Source: F Barnhoorn et al (1990).

This has economic implications. It means that the productivity of the land will continue to decline until measures are taken to utilize it carefully. This is likely to even affect the livestock sector, which is major contributor to the rural economy and to exports.

The lack of natural grazing resources is likely to hit small householders harder. The small households, with 20 or less herd of cattle, are not likely to afford to purchase fodder for their livestock. The loss of livestock will also have implications for the arable sector as it will mean loss of draught power. The failure to arrest the degradation of the range is therefore likely to have negative effects on the poor and may even lead to the increase in their numbers.

2.4 Depletion of wood resources

Chapter 1 has outlined the wood resources of the country. It has already been mentioned that the major use of wood is energy. Wood use is highest in eastern Botswana, where the population is concentrated. The area includes most towns and large settlements. The surrounding areas are increasingly facing fuelwood shortage and this is affecting the poor households much more. At the same time the removal of woody vegetation is leading to deforestation and other environmental problems.

At a national level there is no shortage of firewood but shortages are being experienced in some localities. Firewood is the major source (60%) of domestically supplied energy. Per capita consumption lies between 0,5-1 tonnes per year. Per capita consumption is lower in urban areas, even though here, it is also one of the major sources of energy. Consumption is influenced by a number of factors: a) socio-economic factors (the richer households consume more, especially in winter), b) size of households (large households use less on average) and c) availability (shortage may induce conservation). Normally people gather firewood for themselves, but the maximum distance for headloads is considered to be 5 kilometres. In most large settlements the preferred wood species no longer exist within this distance. Therefore people have to purchase firewood.

The major ingredient of increasing demand is rapid population growth, especially in certain localities. The leading one is the South East region around Gaborone where firewood supply is now insufficient. In these areas people have to purchase wood and the price is ever increasing and thus making other alternatives such as paraffin viable. However, such substitutes may be too expensive for the poor households, who may therefore resort to collecting live wood by cutting and burning trees.

Studies estimate that demand for firewood will increase rapidly in the future. Urban demand, even though per capita consumption is lower, is likely to increase faster than rural demand. Thus wood shortage, especially in the South-east is likely to intensify.

Increasing wood shortage is going to have a number of consequences. First, the price of firewood, in areas where it is already for sale, is likely to increase. This will hit the low income households, which are less likely to afford substitutes. The net effect will be to lower even further the living standards of such households. The Rural Income Distribution Survey of 1974/75 showed that income derived from collecting wood was quite significant.

Secondly, increased wood use leads to deforestation. However, in this case wood use works in combination with other vegetation uses. Nonetheless, areas around large settlements have clearly suffered deforestation, and, with population growth, this is likely to continue. The woody vegetation is gradually replaced by shrubs. The absence of trees encourages soil erosion. In the Kalahari region, when deforestation combines with overgrazing, the process of degradation can advance to

desertification.

In the case of commercial forests, studies have established that the current methods of exploitation are technically and economically inefficient. It has been estimated that only 15-20% of the timber cut in the forest finally reaches the market. The company needs to use more up-to-date technology.

Much vegetation is still lost to arable agriculture. Traditionally, methods of increasing agricultural production have been extensive. This applies even to some Government programmes such as the recent Accelerated Rainfed Arable Programme (ARAP).

2.5 Over-utilization of Veld Products

Veld products were defined in chapter 1. It was also noted that the consumption of these products contributes significantly to income of some rural household. The consumption of veld products used to be significant in the past. In historical times veld products were the major sources of sustenance for the starving population during drought. The problem is that some of these resources are being depleted because, of increasing demand, wrong attitudes and poor management.

There are a wide array of products that are gathered for food, building and medicines etc. These include at least 150 wild food plants and encompass an equally wide range of insects as well as caterpillars, locusts, flying ants, beetles and bees. Many rural people, especially those in the lower income bracket, make use of them for their livelihood. For these groups, veld products may be a more important source of income than livestock. This was clearly demonstrated by the data of the Rural Income Distribution Survey. Income from gathering was very significant (Fig. 2.3). Veld products gathered were estimated at least at P50 million per annum two years ago.

Most people collect for their own use. However, there are some products such as the grapple plant and silk cocoons that are now collected on a commercial basis. In 1987, for example Botswana Game Industries company, bought more than 400 tonnes of silk cocoons estimated at P600 000.

Evidence suggests that there is an over-exploitation of some of the veld products which is contributing to their depletion. While this is true of many products, the main ones threatened are the mokola palm (used for making baskets), thatching grass, and the grapple plant (*Harpagophytum procumbens*) collected for medicines. The grapple plant is depleted in parts of the western districts, where commercial exploitation began. Attempts are now being made to exploit it in a sustainable way and nurseries have been developed. Thatching grass is depleted in more densely populated areas; a consequence also of overgrazing and drought.

The causes of declining veld resources are many and overlap with the ones affecting the other resources above. The first one is rapid population growth. The second is overgrazing. Thirdly, as resources become scarce people ironically use destructive methods of harvesting. There is also poor management of range resources such as burning of thatching grass. Finally, there is increased tree felling for various purposes, notably for agriculture.

The cycle of depletion starts around the settlement and spreads outwards. In the process, people have to put more effort into harvesting, traders start to emerge and less suitable methods begin to be used. The poor households' participation diminishes as they cannot afford the extra effort needed to exploit the resources. Thus, the depletion of resources may have a detrimental effect on the livelihood of the rural poor.

Scarcity causes the prices of a product to rise. Thatching grass, for example, has become so expensive as to be unaffordable. It is now almost a situation of inverted snobbery with the rich using thatch while the poor use imported building materials like corrugated iron!

2.6 Pollution

Except for littering, most forms of pollution are not yet serious in Botswana. However, it is considered that as the country develops, pollution is likely to become a problem. Efforts are therefore made to deal with the problem before it gets out of hand.

In Botswana, there are seven possible sources of pollution; namely a) mining and quarrying and subsequent purification of the ore; b) mine and refuse dumps; c) power generation; d) motor vehicles; e) human excreta f) oil g) chemicals and h) solid waste disposal.

2.6.1 Air Pollution

The Department of Mines has air pollution monitoring stations at Selibe Phikwe (10), Lobatse (1), Francistown (1), Gaborone (4), Morupule (2) and Palapye (1). It is obvious that most of the monitoring is concentrated at Selibe Phikwe, where the copper-nickel smelter emits sulphur dioxide into the atmosphere and additional pollution comes from the coal-fired power station.

Morupule at Palapye, is the only colliery and close to it is the country's 132 MW coal-fired power station. Gaborone has few industries but it has the highest density of motor vehicles. Francistown and Lobatse are commercial and industrial towns.

Air quality in most parts of Botswana other than Selibe Phikwe is considered to be good with regards to sulphur dioxide concentrations.

Even at Selibe Phikwe more than 85% of the residential areas (1988) record acceptable levels of sulphur dioxide. Other parts of the country, however, suffer pollution from wind-blown dust and smoke from cooking and heating fires.

2.6.2 Water Pollution

Water pollution mainly consists of increase of nitrate content in underground water through cow-dung and faecal matter. The major routes are the pit latrines, sewerage ponds and boreholes. Boreholes adjacent to pit latrines generally record high nitrate content. In some areas e.g. Ramotswa, nitrate levels in some boreholes exceed W.H.O standards.

2.6.3 Soil and Vegetation Pollution

These two are related to air and water pollution. For example, the sulphur dioxide emissions at Selibe Phikwe have affected some vegetation in the surrounding region. However, research has revealed that the sulphur and heavy metal content of both soil and vegetation are within the normal range of plant metabolism.

Another source of soil/vegetation pollution may be chemical fertilizers and pesticides that are being used in commercial farming areas. Because commercial farming is still on small scale, this problem is not likely to be a large scale. But the spraying of pesticides, particularly for tsetse flies in the north, is likely to have some environmental effects. Another possible source of vegetation pollution is spraying to destroy the queilea birds.

2.6.4 Solid Waste Pollution

A recent study on urban solid waste disposal found that the methods of disposing solid wastes were still poor and crude. They included tipping all types of wastes (industrial, residential and commercial) together in poorly designed landfills.

Secondly there are limited competence in differentiating between hazardous and non-hazardous wastes. Thirdly there was limited recycling of by-products to reduce quantities of wastes generated. fourthly, there was a tendency on the part of authorities towards reducing the cost of environmental management at the expense of long-term damage to the environment. Indeed, even the enforcement of existing regulations was inadequate. The regulations governing the disposal of different wastes were found to be definitely inadequate. Finally there is lack of institutional coordination to deal with matters relating to environmental pollution (Segosebe and Van der Post, 1990).

CHAPTER 3

3.0 RESPONDING TO THE CHALLENGE: CURRENT POLICIES, PROGRAMMES AND PRACTICES

3.1 Introduction

This chapter reviews the Government response to environmental issues. This includes the policies that have been pursued and laws that have been enacted. It is not possible to review all policies, laws and programmes. The chapter will also look at other aspects such as institutions, training and education and private initiatives specifically those of NGOS.

3.2 Government policies and laws

Among the major policies that the Government has pursued since independence has been (a) To increase livestock production and productivity in a sustainable fashion; (b) To conserve agricultural land; and (c) To provide reasonable access to a safe water supply to the whole population, and (d) To diversify the economy using revenues from the mining sector. The Government has now elaborated its development goals, in the extent of conservation, as follows:

- a) To develop new and better uses and optimize existing uses of natural resources;
- b) To diversify the rural economy;
- c) To emphasize environmental education;
- d) To develop links with neighbouring countries concerning resource conservation; and
- e) To establish a balance between population growth and natural resources availability.

The working of the above policies will be seen partly through the programmes and the laws that have been implemented. With respect to legislation, an array of laws that are meant to address the use (and protection) of environment have been passed. Some of them are reviewed below:

3.2.1 The Tribal Land Act

The Act provides for the establishment of Land Boards, which have since 1970 taken over from the chiefs the duties of allocating and overseeing the use of land. Their powers and duties are defined in the Act. There is provision also for the cancellation of any land grant for failure to observe restrictions (including improper use of land) imposed under the provisions of the Act.

3.2.2 Town and Country Planning Act

The main aim of the act is to provide for orderly development on land; it insists on planning before any development can take place in gazetted areas - until recently, urban areas. It provides for the grant of permission to develop land and for control of any such development. The Minister can declare an area a planning area, and once this has been done surveys have to be done, consultations with all individuals likely to be affected undertaken, and a development plan prepared.

3.2.3 The Agricultural Resource Conservation Act

The purpose of the Act is, among other things, to make provision for the conservation of Botswana's agricultural resources, notably soil, vegetation, water, and animals. It established and defined the powers and functions of the Agricultural Resources Board, which includes the appointment of district conservation committees and sub-committees. The Act also provides for the Board to make conservation regulations and orders including stock control.

3.2.4 The Water Act

The Act provides for the ownership of water rights, granting of water rights, development of water sources (particularly the spacing of boreholes), and the conservation of water. The act also provides for a) the prohibition of use of water in any area except through the express authority of local authorities; b) the conditions attached to use of water; c) the quantity of water that may be abstracted; and d) the inspection of the works for taking appropriate measures, if necessary.

3.2.5 Mines and Minerals Act

The Act provides for the orderly prospecting for and exploitation of minerals by seeking to protect the environment. It provides for, among other things, the activities to be performed such as filling up shafts, pits and excavation etc. after the prospecting or mining rights has expired. It further provides for (a) the treatment of tailings ore; (b) protection of cracks or mouths of shafts; (c) protection of landscape where alluvial deposits are exploited; and (d) fencing of water containing poisonous substances.

3.2.6 Fauna Conservation Act

The main aim of this Act is the protection of wild animals. It contains regulations regarding the types and numbers of animals to be hunted and specifies the hunting areas. It also provides for, among other things,

- a) game reserves and sanctuaries including those that are privately owned and
- b) the control of exportation and importation of animals, trophies, meat as well as sale and manufacture of articles from game products.

3.2.7 The National Parks Act

The Act provides for the zoning off of certain areas containing wild animals, fish, vegetation and other objects of geological, ethnological, historical and scientific interests for the benefit, advantage and enjoyment of the people of Botswana. It further provides for the control and management of these parks.

3.2.8 Wildlife Conservation and National Parks Bill

The Bill, currently being promulgated proposes to amalgamate the Fauna Conservation Act and National Parks Act and their allied regulations.

3.2.9 Atmospheric Pollution (Prevention) Act

The Act provides for the prevention of the pollution of the atmosphere caused by industrial processes. It provides further for the appointment of pollution control officers as well as inspectors.

3.2.10 Forest Act

It aims at protection of forests through the establishment of forest reserves and also provides for the local authorities to recommend the declaration of forest reserves and protection of certain tree species.

3.2.11 Herbage Preservation (Prevention of Fires) Act

This Act provides for the prevention and control of forest fires which destroy the vegetation. It requires written notice for burning any areas, even if the area is privately owned. The Act also provides, among other things, for the construction and maintenance of fire breaks.

3.2.12 Locusts Act

The Act provides for the destruction of locusts. It obliges any individual whose land is invaded by locusts to report to the nearest authority.

3.2.13 Borehole Act

The Act provides for drilling or deepening of boreholes beyond 15 metres.

3.2.14 Aquatic Weeds Control Act

The Act provides for the control of importation of aquatic weed into Botswana and their movement from one place to another within Botswana. It further gives power to the Minister to prohibit the importation of such plants and gazettement of surface waters infested with such weeds.

3.2.15 Plant Diseases and Pests Act

The Act aims to prevent the introduction of plant diseases and pests and controlling their spreading. This is achieved by providing for among other things import permits for imported plants and power to quarantine such plants and even to destroy diseased plants.

3.2.16 Public Health Act

The Act is very extensive providing for, among other things, the control of diseases subject to International Health Regulations, prevention of the spread of smallpox, prevention of spread of diseases including venereal diseases, regulation of sanitation, protection of foodstuffs in places of sale, and prevention and destruction of mosquitoes.

3.2.17 Fish Protection Act

The Act whose aim is to protect fish and the fishing industry. The Act gives the Minister power to make the necessary regulations.

3.2.18 Some comments regarding environment legislation

The above laws are not exhaustive. Indeed there are some acts that deal with some environmental issues indirectly.

It is agreed that Botswana has adequate legislation covering environmental protection. The laws fall under different ministries and authorities and this causes overlaps, and even conflicts. The UNEP Clearing House Mission to Botswana recommended a project for the collation, streamlining and updating of the environmental legislation, which was accepted by Government.

Another observation regarding environmental laws is that they are not strictly enforced mainly because of lack of sufficient institutional support. There is a shortage of manpower to enforce the laws and there is need for more education before laws can be enforced.

3.3 Institutional developments

As already mentioned, the control of the use of the environment and natural resources was exercised by the chiefs before independence. The role of chiefs was, however, more allocative than management. Since independence in 1966, new institutions have been established. The Department of Town and Regional Planning has been responsible for coordinating environmental management as well as most of the spatial planning in the country. However, the newly instituted National Conservation Strategy Coordination Agency has recently taken over the coordination of environmental management. The Department of Water Affairs is responsible for providing water to large settlements and ensuring that there is no water pollution. The Department of Wildlife and National Parks is charged with the management and conservation of the country's wildlife resource. The work of the Department of Mines has already been described above, as has that of the Ministry of Agriculture. The Meteorological Department deals with all matters pertaining to weather and agro-meteorology.

The above are the central Government ministries/departments dealing with various aspects of the environment. It is obvious that these responsibilities are scattered, creating need for co-ordination. Co-ordination is however done by the various inter-ministerial committees.

In the rural areas, the Land Boards, set up by the Land Acts of 1968 and 1979, perform the functions of land allocation for all land uses, regulate land use and adjudicate disputes relating to land in communal areas - functions that were formerly performed by the chiefs. The Land Boards have power to withdraw rights to use land if conditions of grant, including the condition to use it properly are not followed.

The Land Boards have, however, not fully established themselves. The quality of their work is generally unsatisfactory; being characterized by poor record-keeping, infrequent field visits, and lack of knowledge of the law and incompetence in implementing it. The cause of this is poor and limited knowledge, which is being addressed through training and posting more staff. District Councils also play an important role in environmental-resource matters, particularly in the provision of water to small settlements.

3.4 Budgets and expenditures

It is not easy to separate funds Government spends on environmental management and conservation from other expenditures. For example, although funds budgeted for Environment Management Activities in the 1985/86-1990/91 period amounted to P35 000, the actual amounts spent must have exceeded this figure. Table 3.1 gives budgets of selected environmental and resource projects for the same

period under different ministries. It is obvious from the table that substantial amounts are budgeted for environmental projects particularly in the Ministries of Agriculture, Commerce and Industry and Mineral Resources and Water Affairs. The figures do not include the recurrent expenditures of some of the institutions that are involved with the management of the environment. For example, in 1989/90 nearly P10 million was set aside for Land Boards. There are also a few gaps; P30 000 is currently budgeted for air pollution control. There has been some donor support for some of these activities. The EEC has donated funds amounting to P230 000 towards the activities of the National Conservation Strategy. Other support has come from the International Union for the Conservation of Nature (IUCN), USAID and UNDP.

Table 3.1

BUDGETS OF SELECTED ENVIRONMENTAL AND RESOURCE PROJECTS AND PROGRAMMES BY MINISTRY 1985/86- 1990/91 (PULA 000)*

	1985/ 86	1986/ 87	1987/ 88	1988/ 89	1989/ 90	1990/ 91
1. Finance and Development Planning						
a) Technology Centre	500	500	500	500	500	500
2. Agriculture						
a) Livestock Development Project	100	100	100	100	100	100
b) Foot & Mouth Disease Control	100					
c) Improvements of Disease Control	93	113	93	93	93	1
d) Veterenary Cordon Fence	200	200	200	200	200	200
e) Fisheries Investigation and Development	47	60	40	50	40	40
f) Small Dam Building	750	750	450	450	450	450
g) Soil Conservation	80	50	70	50	50	70
h) Rural Afforestation	127	117	150	150	150	150
i) Soil Mapping Project	30	30	30	30	40	40
3. Commerce and Industry						
a) Rural Industries Innovation	640	910	963	1020	1079	1100

	1985/ 86	1986/ 87	1987/ 88	1988/ 89	1989/ 90	1990/ 91
b) Wildlife Conservation and Development	242	242	438	438	438	424
c) Wildlife Conservation Education	13	16	13	13	13	10
d) Gaborone Wildlife Reserve	54	113	56	3	3	3
e) Maun Wildlife Training Centre	156	259	65	30	24	10
f) Wildlife Management and Development	66	80	92	108	104	104
g) Tourism Development	104	154	211	253	254	254
4. Local Government and Lands						
a) Development of land institutions	204	337	343	343	337	308
b) Implementation of Integrated land use plans	304	324	310	213	211	208
c) Environmental Sanitation	150	276	318	318	307	307
d) District Council Water Supplies	515	927	927	927	927	927
e) Environmental Management Activities	35					
5. Works and Communications						
a) Agro-meteorological Services	69	23	22	33	34	33
6. Mineral and Water Affairs						
a) Shashe Dam Raising					4000	5500
b) Energy Technology Substitution	72	244	293	293	293	341
c) Rural Energy Supplies	55	255	255	255	255	255
d) Rural Domestic Renewable Energy Technology Extension Services	81	152	70	180	70	70
e) Alternative Energy Development	353					

	1985/ 86	1986/ 87	1987/ 88	1988/ 89	1989/ 90	1990/ 91
f) TGLP Ground Water Surveys	100	1300	1600			
g) Evaluation of Underground Water Resources	2900	1700	2400	1600		
h) Ground Water Resources Monitoring and Recharge Studies	161	234	160	7	7	7
i) Airborne Magnetic Survey	1200	558	60	50		
j) Mineral Exploration of the Kalahari	150	150	150	50		
k) Lands Area Water Supplies		200	75	75	75	75
l) Hydrological Studies of the Okavango	20					
m) Regional Water Development			3500	3500	2300	
n) Major Village Water Planning	350	350	100			
o) Aquatic Vegetation Control	60	125	125	60		
p) Appropriate Water Technology	23	32		21	21	21
q) Legal Assistance on Water Laws	20	20		20		
r) Re-use of Waste Water	50	50				
s) Upgrading and Expansion of Major Village Water Supplies	3000	3900	3560	4150	3350	3700
t) Village Water Supplies	6190	4410	6615	6615	6615	6615
u) Air Pollution Control	10	43		25		
7. Health						
a) Health Education Programme	68	68	68	68	68	68
b) Control of communicable diseases	125	595	1165	573	577	565

Source: National Development Plan 1985-91

3.5 Environmental Impact Assessment (EIA)

Every major project is by policy now expected to be subjected to rigorous environmental impact assessment before it is implemented. Legislation that will legalise this requirement is in the pipeline. Recently, a new dam for Gaborone had to be resited when the EIA showed the overall impact would be negative. The new soda ash mine at Sua pan was subjected to some EIA before implementation of the project started. The topics examined ran from various aspects of the physical environment, to human activities.

3.6 Programmes and Projects

In this section we review some of the major programmes and projects; it is not possible to review all the programmes and projects the Government has implemented in the last two decades.

3.6.1 The National Policy on Tribal Grazing Land and Land Use Planning Projects

One of the major programmes that has been implemented recently is the National Policy on Tribal Grazing Land (TGLP), which was launched in 1975. The aims of TGLP were:

- a) To stop overgrazing and degradation of the range through grazing control and better range management.
- b) To promote greater equality of incomes in rural areas; and
- c) To allow growth and commercialization of the livestock industry on a sustained basis (Rep. of Botswana, 1975).

The aims were to be achieved by zoning the country into three categories - commercial, communal and reserved land. The exercise has, however, concerned itself mainly with the commercial sector. Five hundred ranches, each of them 6400 hectares have been demarcated and given out on 50 year leases to individuals (54,4% of ranches) and to syndicates and associations (45.6%). The ranches were to be fenced and the farmers were expected to adopt improved livestock and range management practices. It was assumed that the exclusive use of land, for which economic rent was to be charged, would give the farmers an incentive to look after their farms properly.

In the communal areas, it was hoped that land tenure would continue to be communal but that improved farming methods such as stock control would be introduced. It was also hoped that the removal of some herds to the commercial

farms would create more space for remaining farmers. Reserved areas were to be set aside for future use for those with no or few stock.

Progress in the adoption of good land husbandry methods has unfortunately been slow. The farmers, who have taken up leases, were apparently keen to enjoy exclusive rights so that *"most of the TGLP ranches are still poorly managed"* (Ministry of Agriculture 1989).

The TGLP project was implemented in 1978 and came to close in 1984. The total expenditure was P8 772 000 of which P6 767 000 came from the World Bank. TGLP was, however, incorporated into the National Land Management and Livestock Project, which was conceived in 1985/86 and implemented in 1986/87 financial year. The project places greater emphasis on land use planning and management on sustainable basis. The TGLP component has been widened to include game farming, sheep and goat, and piggery. The project has nine components namely headquarters expenses, district land use, land boards, land utilization, trek route development, livestock extension, National Development Bank, project co-ordinating unit, and consultancies. Actual expenditure has lagged far behind the estimates. The main reasons for this are: (a) the land use planning has been slow to start; b) it has not been easy to mobilize people to adopt good management practices; and (c) there has been a severe shortage of drillers for the development of ranches. The total estimated expenditure was initially P31,7 million with US \$10,7 million from the World Bank. However, the total costs have since been scaled down to P23,3 million.

Land use studies have been undertaken in the Southern and Kweneng Districts, the Gaborone region, and an ecological zoning study in the Okavango region. The studies have been carried out with SIDA financial support. The terms of reference for the Gaborone Study were:

- a) to prepare a regional study of the wider Gaborone Region which, based on ecologically sound resources utilization, provides a framework for the settlement structure, use of land and water and for the provision of infrastructure.
- b) to prepare, for part of the region as a pilot study and in direct connection to the Statutory Gaborone Planning Area, a comprehensive physical plan with a particular emphasis on the conservation for development aspects;
- c) to assess the feasibility of applying existing legislation, e.g. Town and Country Planning Act, to agriculture land use and environmental planning, emphasizing particularly the ecological aspects as well as looking into the need for an institutional arrangement which could study and decide upon suitable environmental approaches to resolve areas of conflict (Environmental Impact Assessment) (Swedeplan, 1989).

A plan along somewhat similar lines has been prepared under the funding from USAID for the ecologically fragile Makgadikgadi Pans Region (Central District Land Use Planning Unit and Kalahari Conservation Society, 1989). What this means

is that there is now an acceptance that land use planning should be guided by sound ecological principles.

3.6.2 Arable Land Development Programmes (ALDEP)

In 1980 the Government launched a programme aimed at improving production in the arable sector called ALDEP. ALDEP had three goals:

- a) to increase production of food crops to enable the country to become self-sufficient, and even to export surpluses;
- b) to improve incomes, especially of small farmers; and
- c) to create jobs (estimated to number 10 000-12 000) and thereby reduce the rate of rural-urban migration.

ALDEP has subsidized inputs - draught power, implements, fencing materials and the development of water. Among the conditions attached to accepting the ALDEP packages is the adoption of good farming methods. ALDEP also gives credit for seasonal inputs and is involved in the strengthening of the extension services. The ALDEP programme is having some impact on arable production. Recent evaluation studies have shown that the aided farmers: (a) plant and harvest larger area per farm than non-participating farmers; b) harvest larger proportion of planted farms; and c) raise production per farm. The thrust of the Ministry of Agriculture is, however, changing away from self sufficiency in food crops given the hostile environment and the consequent costs involved in overcoming these obstacles. The policy has shifted towards food security.

3.6.3 The National Settlement Policy (NSP)

One of the major concerns of the Government is disparity in incomes between the rural and urban areas. The major aim of NSP is to promote balanced development in the country and to reduce some advantages that have been enjoyed by some towns, particularly Gaborone. The overall goal of the Policy is to develop a long term strategy for integrating physical, environmental and economic planning. This provides a framework for the distribution of investment based on the settlement's potential, which takes into consideration amongst other things conservation needs, economic potential, economic base and linkages to surrounding rural areas.

It is proposed to create a three-tier hierarchy of settlements. The first tier is composed of centres with a minimum of 20 000 people. These are big towns and the very large villages, and all are expected to be centres of manufacturing. The secondary centres include the smaller mining towns and some large villages which are secondary centres and sub-district centres. They have smaller catchment areas, to which they are expected to offer services. The last tier is composed of small villages in farming areas. At this level the focus is on the development of services that aid

agricultural production. The Government policy is to improve water supply and provide a primary school for every village or settlement of 500 people.

3.6.4 The Communal First Development Area (CFDA) rural development strategy

Immediately after independence the rural development strategies were sectoral. Recently the Government moved towards a more integrated rural development. The policy is now to divide each district into production zones and to concentrate development efforts in one zone at a time. Among the principles involved in the selection and operation of a CFDA are:

- a) the area should be representative of the entire district so that its experience can be replicated elsewhere;
- b) the planning and implementation of the strategy should concentrate on agricultural production and employment creation in the non-agricultural sector;
- c) special attention should be given to land use planning and the strengthening of rural institutions; and
- d) the CDFA programme should be coherent and integrated.

3.6.5 Sanitation Programme

The Government has launched the National Sanitation Programme. The programme involves providing rural households with improved pit latrines through a subsidised self help scheme. The improved pit latrines should be safe and protected from contaminating the surrounding areas. In the urban areas it has been felt that the high population densities achieved in the low income Self Help Housing schemes makes pit latrines unsuitable on health and environmental grounds. For the above reasons, the provision of water-borne sanitation will be extended to all types of residential plots in urban areas. Although the standards of service that will obtain in the urban and rural areas differ, the objective in both cases is to reduce the incidence of diseases as well as to support wider primary health care and environmental protection programmes.

3.6.6 Other programmes to ensure a healthy environment include the following:

- (a) special measures are being examined to prevent the contamination of urban water supply from various sources;
- b) efforts are being made to address the effects of toxic and hazardous substances;
- c) the issue of the use of chemicals in agriculture is receiving attention; and

- d) an inter-ministerial committee has been formed to deal with the problems arising from the effluents from industries.

3.7 Training, education and public awareness

3.7.1 Formal Education

It has already been noted in chapter 1 that the attitudes of the people of Botswana to wildlife leave much to be desired. The problem of littering has also been mentioned. It is obvious therefore that some great effort is needed towards environmental education. However, it is pleasing to note that some elements of environmental education are already being taught both in the formal and informal sectors of education.

The aim of environmental education should be to acquaint all sections and levels of the population with the nature and working of their own and related environments, the possibilities which the environment offers and its limits for human activities that sustain human life. It should also address the problems that these activities pose to the environment. The basic aim should be to inculcate conservation values.

The formal sector involves the primary and secondary school syllabi approved by the Ministry of Education. Secondly it includes institutions of higher learning - the University, National Health Institute, the Polytechnic, the Teacher Training Colleges, Botswana Agricultural College and Maun Wildlife Training School. Within the primary and secondary sectors, it is specifically the Department of Curriculum Development and Evaluation that has to ensure that aspects of environmental conservation necessary to change present attitudes are introduced.

At the primary level, which is seven years, elements of environmental education are covered in Nature Study, Science and Social Studies. There is need, however, for more detailed coverage as it is at this stage that attitudes are formed. The Secondary level is made of the Junior Secondary part, where most students end, and the Senior part. The Junior part does address topics, though not sufficiently, in such subjects as agriculture, social studies and Integrated Science. The Senior level or Cambridge addresses some issues of environmental education in Geography, Science and Agriculture.

At a higher level, both the University and Botswana Agricultural College offer courses on conservation. The Maun Wildlife School specializes in the conservation of wildlife.

There are a number of problems in the way of formal environmental education. Most schools do not have facilities such as electricity and slide projectors to show some films. Secondly many teachers are not trained in this field or do not appreciate the importance of this type of education.

3.7.2 Non-Formal Education

The problem of environmental education goes beyond formal system of education. There is lack of awareness of the importance of conservation at all levels including the senior civil servants. Legislation on its own will not succeed if the people do not appreciate the need for the laws. It is therefore important that there should be an all-embracing system of non-formal education that should inculcate values of conservation. It is also true that environmental education will not be easily acceptable to poor people with limited choices. The cause of environmental education will be enhanced by the increase in socio-economic standards.

The people of Botswana learn in a non-formal way from the multitude of educative forces in their environment - family and neighbours, work and play, religious activities, the Kgotla, newspapers, books, radio broadcasts and other media including folk media.

There are a number of institutions that are involved with non-formal education. They include the Department of Non-Formal Education of the Ministry of Education, Departments and Units within the Ministries of Agriculture, Health, Commerce and Industry and Local Government and Lands. The Rural Extension Co-ordinating Committee in the Ministry of Finance and Development Planning co-ordinates the programmes of all these departments. In addition some NGO's such as the Kalahari Conservation Society are involved. The efforts of all these institutions is co-ordinated by the Environmental Education Reference Group.

The target groups of non-formal education are a) political and traditional authorities and development workers; b) children still at school; c) children who have never been at school; d) primary education drop-outs or new participants in the National Literacy Programme; e) adults who are still at school or passed through formal education sector; f) adults who have never attended or do not possess any literacy skills, and g) some specific groups such as wood-cutters, hunters, traditional doctors etc, who gather resources for commercial purposes.

The methods followed vary. The Department of Non-Formal Education emphasizes functional literacy. The materials used are specific and deal with economic, social and environmental issues of the district and the country. The extension workers of the Ministry of Agriculture work with groups of farmers with follow-ups to individual farmers where necessary.

The same method is used by the community development officers of the Ministry of Local Government and Lands. Radio broadcasts are also used and various ministries are given air time on the radio. Some of the information is communicated through regular newsletters and popular theatre. Some other information can be picked up from newspapers, and Botswana now boasts about six newspapers.

It is clear therefore that there are many channels of education, both formal and informal, through which environmental education is communicated. However, we are still long way towards reaching most people of this country.

3.8 Research and development

Beyond the learning situation, there is need for constant research on the nature and quantity of available resources. Such knowledge is vital to decision-makers. In Botswana, some Ministries have their own research units. Also the National Institute of Development Research and Documentation of the University of Botswana has a specific environmental research programme.

A number of studies on environmental issues have been carried out by the National Institute of Development Research and Documentation, Government ministries and consultants. Some areas such as fuelwood have enjoyed greater attention than others. However, even in those sectors where a considerable amount of research has been done, there are still many gaps as the report has shown. It is obvious that there are gaps on the state of existing natural resources - their abundance, distribution and how they are utilized and by whom.

3.9 Private Initiatives

Outside Government, conservation work is carried out mainly by the non-Governmental organizations (NGO's). The principal ones in the area of natural resource utilization are the Botswana Society, the Kalahari Conservation Society (KCS), the Forestry Association of Botswana (FAB) and Thusano Lefatsheng.

The Botswana Society has organized a number of symposia on the environmental and resource utilization in Botswana. These have included a) production from Semi-Arid Areas with particular reference to Botswana (1971); b) Symposium on drought in Botswana (1978); c) Settlement in Botswana (1980); d) The Management of Botswana's Environment (1984); e) Developing our Environment (1987) and f) Tourism in Botswana (1990). In addition it publishes a regular journal called Botswana Notes and Records.

The Kalahari Conservation Society, exists to promote knowledge about Botswana's natural environment, particularly the wildlife and its environment and natural resources, and raise funds for these activities. KCS provides a forum for the discussion of issues relating to the environment and natural resources. In addition to occasional meetings, it also publishes a regular newsletter. The Society research is of consultancy nature and it is in close cooperation with Government ministries. It has financed a number of studies. The work of the KCS is, however, heavily biased towards environmental education.

FAB and Thusano Lefatsheng work closely particularly with the Ministry of Agriculture. FAB is concerned with the conservation of trees, promotion of agro-forestry and extension work in forestry in co-operation with other organizations doing research in forestry. Thusano Lefatsheng is more concerned with conservation, production and utilization of veld products such as medicinal plants and fruit trees.

In general, the NGO's are greatly involved in natural resource conservation and have excellent working relationships with the Government. Besides the NGO's, there are other organizations such as parastatals that have an interest in natural resources conservation, mainly because they use them. These include the Botswana Development Corporation (BDC) which is involved in extractive industries such as irrigation agriculture, dairy farming, fruit farming, ranching etc., and the Botswana Livestock Development Corporation which is in livestock marketing.

They are:

- a) Growing pressure on water resources arising from increasing competing use of water for human, livestock, wildlife, industrial and other consumption.
- b) Depletion of wood resources as a result of exploitation for commercial and domestic use.
- c) Baseland degradation.
- d) Overuse or exploitation of some veld products resulting in the damage to their regenerative capacities to cater for both commercial and subsistence needs.
- e) Pollution of air, water, soil, and vegetation resources.

Constraints

For clarity and ease of elucidation, we have divided the constraints into Technical, Institutional/Research and Monitoring, Legal-Legislative, Implementation, Capacity, Institutional Capacity and Economic/Socio-Political Constraints. Before applying these constraints to the environmental issues, there is need to briefly explain them.

Technical constraints are those that are directly related to the social fabric and which are difficult to eradicate in the long run to eradicate. These include poverty, ill health and population which have conditioned

CHAPTER 4

4.0 PLANNING FOR SUSTAINABLE DEVELOPMENT

4.1 Introduction

In this chapter we shall address ourselves to the constraints to the sustainable use of resources and the environment as well as the opportunities that exist for removing these constraints. The environmental issues or problems which are selected for consideration are explained in Chapter II and they coincide with those that are considered in the National Conservation Strategy (NCS) and reflect the priorities of the country.

They are:

- a) Growing pressure on water resources arising from increasing competing use of water for human, livestock, wildlife, industrial and other consumption.
- b) Depletion of wood resources as a result of exploitation for commercial and domestic use.
- c) Rangeland degradation.
- d) Overuse or exploitation of some veld products resulting in the damage to their regenerative capacities to cater for both commercial and subsistence needs.
- e) Pollution of air, water, soil, and vegetation resources.

Constraints

For clarity and ease of elucidation, we have divided the constraints into Structural, Informational/Research and Monitoring, Legal-Legislative, Implementation Capacity, Institutional Capacity and Economic/Socio-Political Constraints. Before applying these constraints to the environmental issues, there is need to briefly explain them.

2.1 Structural Constraints

These are constraints that are firmly rooted in the social fabric and which are impossible in the short run, or, extremely difficult in the long run to eradicate. Factors such as poverty, social mores and practices which have conditioned

peoples's attitude to the use of environmental resources come under this set of constraints. Under this category also come human and livestock population growth. We include this last factor because people's attitudes to birth, size of families and accumulation of cattle which have implications for the use of environmental resources do not easily respond to policy initiatives and are almost insensitive to legal enforcement where the latter exists. There are other factors here which are peculiar to specific issues and they will be mentioned in the discussion of those issues.

4.2.2 Information/Research and Monitoring Constraint

Existence of information, its analysis and monitoring mechanism constitute the starting point of policy formulation. Unless one has information on what one wants to conserve, one has the capacity to analyse this information and a mechanism to monitor how the object of conservation is changing over time, there is no way one can successfully undertake the complex task of environmental conservation. The amount of information that is required for any environmental issue depends on the already existing data base of the issue; it will therefore vary from issue to issue as we shall observe below.

4.2.3 Legal/Legislative Constraints

This is broadly divided into national laws and legislative provisions and international agreements on environmental resources both within the country and traversing national boundaries. In some cases, there may be no laws or acts in place to regulate the use of environmental resources at all; yet in others these acts may exist but were probably addressed to issues pressing time so that they do not make any provision for the use and management of resources. In other cases their non-existence or failure to address the environmental issues at hand can impose a constraint on the sustainable use of resources.

4.2.4 Implementation Capacity Constraint

Laws and legislative provisions regulating the use of resources may exist but unless the institution entrusted with their implementation and enforcement have the capacity to do so, they are as good as if they did not exist. The capacity for implementation may be administrative, technical, organizational, financial or infrastructural. The lack of implementation capacity has led to unsustainable use of resources in most LDC's, and, as we shall see, Botswana is not an exception, although strenuous efforts are being made to contain this constraint.

4.2.5 Institutional Capacity

The implementation of any policy has to be within some form of institutional framework. Are there institutions - both private and public - entrusted with its implementation? These are some of the relevant questions to be addressed here.

4.2.6 Economic and socio-political constraints

Environmental concerns are a relatively recent introduction to economic policymaking. Most LDC's, primarily concerned with problems of poverty, inequality and unemployment, have always designed policies to tackle these issues with little or no consideration for the implications of these policies for the environment. In the light of the current environmental concerns it is necessary to see to what extent current economic and socio-political policies lead to unsustainable use of resources.

These categories of constraints are not meant to be exhaustive; there are obviously some others that have not been considered here. The environmental issues as well as the constraints mentioned above must not be seen in isolation; the same thing applies to the opportunities that exist for resolving the constraints. It is necessary to note that some of the constraints may apply to all the issues while others may not necessarily apply to some issues. Where a particular constraint is not particularly applicable to any particular issue, it will not be discussed under that issue.

4.3 Application of Constraints to Environmental Issues

4.3.1 Pressure on Water Resources

As we have seen above, water is the most important natural resource in Botswana and lack of access to it puts constraint on virtually all aspects of development, including crop production, rangeland, wildlife, forests and soils. The rate of growth in the human population which we have observed is very high by any standards and the subsequent increases in the population's consumption and production activities put a severe strain on the sustainable use of water; this is equally applicable to the livestock population which, since 1965, has been increasing faster than the human population. Prevalence of widespread poverty, particularly in the rural areas, and the general attitude to the use of water also do not augur well for sustainable use of the resource.

It is generally believed that the pressures of poverty limit the planning horizon of the poor and lead them to adopt short term survival strategy. The implication here is that they do not have any conservational concerns in their use of the water and other natural resources to which they have access.

Therefore the fight against poverty to ensure security of access to the basic needs of life must be seen as an attempt to widen their planning horizon to ensure the sustainable use of resources.

Most of the suitable surface water resources of Botswana, about which much information is available, are concentrated in areas which are sparsely populated in the Chobe and Okavango areas in the north and northwest. The east and south east which are rather heavily populated rely mainly on underground water which is the other source of water resources in Botswana. Owing to the difficulty and cost of transferring water from the surface water abundant areas to the water scarce areas, there is need to develop and properly manage the underground water that exist in the other parts of the country. This can only be done when there is a great deal of information about its potential and its recharge mechanism. Unfortunately this information is inadequate. This inadequacy of information applies also to other possible sources of water such as rainfall harvesting and methods of conserving water, such as water storage methods and techniques to prevent or reduce evaporation and prevent water pollution. Again the lack of information makes it impossible to monitor underground water levels on a large scale. The Government has shown awareness about and concern for the problems and intends to address them in the coming years. There are already groundwater recharge studies in progress and it is anticipated that they will be continued into the next plan and that these studies will be focused more in the west where little information is currently available. Success in this area should break the Information/Research/Monitoring constraint.

Botswana's total annual consumption of water is estimated as 120 million cubic metres in 1990. In terms of use 35.6% is for livestock, 35.1% for irrigation, 12.6% for mining, 11.6% for urban areas and 5.1% for villages.

Various institutions are involved in the supply of water; water for livestock and irrigation is mainly the responsibility of private owners though subject to permission in accordance with the Tribal Land Act and the Water Act. Mines may make their own arrangements for their water supply although, again, subject to permission according to the Water Act. The copper nickel mine whose supply of water comes from the Water Utilities Corporation (WUC) is the only exception here. Supply of urban and rural water and various tasks connected with water management, control and research are scattered among a number of ministries, departments and parastatals. These institutions include the Ministry of Mineral Resources and Water Affairs (MMRWA), Ministry of Local Government and Lands (MLGL), Ministry of Agriculture (MOA) and the Water Utilities Corporation. It is believed that this kind of institutional arrangement is unsatisfactory since the duplication of effort and possibilities of clash of policies that are likely to occur do not make for sustainable use of water. It has been suggested that a change be effected to effectively coordinate the activities of these various bodies under one central body and it is hoped that the National Water Master Plan will address itself to this problem. Capacity of institutions to implement policies is a nationwide problem owing to the general shortage of professional and technical manpower. In this regard, the water sector is not an exception. This implementation capacity constraint is one which can be broken only in the long run.

Under the Legal/Legislative Constraint it may be asked whether the Water Act, and other legislative provisions pertaining to the use and management of water which are embodied in other acts lead to the sustainable use of water. It may further

be asked whether any agreements are in place for joint or multiple exploitation of water resources that are shared with Botswana's neighbours. With regard to the second question, in 1986/87 the results of a study - the Limpopo Water Utilization Study - conducted under the aegis of the Joint Permanent Technical Committee (RSA and Botswana) and the Limpopo Basin Technical Committee (Botswana, RSA & Zimbabwe 1986) -revealed the possibility of establishing a regional water supply which can be of a major significance to Botswana, of course, provided agreement can be successfully concluded between the parties involved (NDP VII Water Sector). Such agreements and joint ventures are possible, especially within the framework of SADCC and it will be in Botswana's interest to pursue them.

With regard to the first question, it is observed that since the Water Act and other legislative provisions were not enacted specifically with environmental concerns in mind, they need to be strengthened as a set of tools for improving water management in general and livestock practices in particular. This is one aspect of the water problem that has been given elaborate consideration in the National Water Master Plan.

The final constraint on sustainable use of water relates to the pricing structure for all consumers, both in the urban and rural areas. In the past, Government policy on water rates has been based on three principles of equity, efficiency and affordability. The equity principle implies that consumers should have access to water to cover at least their basic needs; efficiency, from the perspective of pricing, means that the supply of water should be cost effective i.e. in other words, consumers should, as much as possible meet full economic cost of supply. The affordability principle demands that no one should be denied access to water necessary to meet his basic needs for want of ability to pay. On the basis of these principles the following pricing system will apply in future:-

- in both urban and rural areas water supplied through public standpipes would be supplied free of charge;
- water supplied through private connections would be charged at different graduated rates (lower for rural areas and higher for urban areas).

This means that for a certain minimum quantity of water meant to cover basic needs, the rate would be set low for both urban and rural consumers although the minimum rate for rural consumption will be lower than for urban consumers to reflect income disparities. Subsequent consumption beyond the minimum quantity will attract higher rates based, of course, on the initial concessional rates. Over time there would be progressive increments in these graduated rates to reflect long run marginal cost. The difference between this pricing scheme and what obtained in the past is that, rural consumers paid the same rate irrespective of the amount of water consumed, the stepped rates were introduced in the rural areas in 1990. The idea behind this pricing policy is to induce consumers to make economic use of water to ensure sustainable use.

Thus, in effect, the new pricing policy will in the long run remove the economic constraint and ensure sustainable use of water.

4.3.2 Rangeland and Grazing Areas Degradation

This environmental issue is perhaps the most intractable of all the environmental issues and the concern of the Government is well founded. We have already observed above the overwhelming dependence of feed supply on the natural range, the extent to which the rangeland has already been degraded as a result of overgrazing especially in the communal areas, and the implication for the livestock sector of further degradation of the rangeland.

With regard to the issue of rangeland and grazing areas degradation it is perhaps appropriate to link the Information/Research/-Monitoring, Institutional and Implementation Capacity constraints directly to the Legal/Legislative constraint and discuss them together to appreciate how their operation resulted in unsustainable use of resources. In the post independence period certain legal and legislative provisions were enacted, among other things, to regulate the allocation of tribal lands and promote better land management practice with the view to ensuring the sustainability of the use of land. These legal and legislative enactments are the Tribal Land Act (TLA) of 1968 and the Tribal Grazing Lands Policy of 1975 as we have seen above. Were the provisions in these acts enough to achieve the environmental objectives embodied in them? An answer to this question will give us a clue to the effectiveness or otherwise of this constraint. Again the TLA and TGLP established certain institutions to achieve their ends. Were these institutions sufficient or do they need to be further strengthened? Did these institutions have the requisite data base and monitoring mechanism to achieve their objectives? And, finally, did they have the implementation capacity - administrative, technical, organizational and infrastructural to carry out the responsibilities entrusted to them? If the answers to these questions are no, then one is forced to the inescapable conclusion that indeed these constraints are effective constraints to the use of sustainable resources and hence need to be modified in one way or another. In theory, the TLA and the TGLP at the time of their enactment appeared well set to provide the much needed solutions to the problem of land degradation. The basic institutions created to implement the provisions of the two acts are the Land Boards.

Various comments and studies on the operation of the Land Boards seem to convey the impression that not only were the enactments themselves not strong enough, the institutions established to implement their objectives had neither the information and the monitoring mechanism, nor the implementation capacity to function properly. It is worth quoting some of these sources.

Some studies have traced the Land Board's inability to regulate land distribution and settle disputes to lack of adequate facilities and technical capacity, inadequate planning and duplication of efforts with other institutions such as the tribal authorities in delineation of land and water rights (Christopherson et al 1969); others have shown that Land Boards lacked the ability to enforce stock rates on TGLP

ranches hence enabling TGLP livestock to graze in communal areas as well as in demarcated areas. Such practices promote, to a significant degree, overgrazing and land degradation (Agric. Sector Assessment 1989 pg.121).

All these problems have led to suggestions for the amendment of the Tribal Land Act to incorporate Specific Guidelines for land allocation, maintenance of records, tenure rights, transfer of rights and, above all, mechanism for the enforcement of its provisions. (M.A Oomen: Rural Development: Experiments and Experiences of Botswana. ILO SATEP 1984).

Other suggestions relate to the selection process of the Board Members and the specification of the kind of advice and land administration information they are supposed to provide to land users. Specifically it has been suggested that Board Members should be selected from people who are more familiar with land issues and land administration and that they should have more collaboration with institutions which are involved with land matters. (R.M. Kwerepe, Senior Range Ecologist: Memo to Director, DTRP, April 1991).

In spite of these problems, opportunities exist for removing these constraints and they will be discussed in a subsequent section of this chapter.

In terms of the structural constraint, the increase in human and livestock population coupled with scarcity of arable and grazing land has resulted in increasing resort to marginal land with consequent degradation of the rangeland. Furthermore unsustainable use of land has been reinforced by the traditional view of land as a common property which is subject to unlimited supply. Again poverty which drives people to take a short term view of the use of resources has played its role in making an unsustainable use of land. There are other factors of a structural nature peculiar to this environmental issue which tend to strengthen the structural constraint. There are well developed infrastructure in the form of veterinary services, trek routes, and other facilities for cattle marketing, and well developed extension services, processing facilities, and commercial bank credit facilities. These make investment in the sector very attractive, thus increasing the livestock population.

The last constraint, the Economic/Sociopolitical constraint, also functions to promote unsustainable use of grazing land. These may be analysed in terms of the systems of subsidies including extension services and facilities, BMC producer prices, current marketing opportunities and the tax structure. The livestock sector derives a great deal of benefit from a battery of Government subsidies in the form of an investment in boreholes, vaccines and drugs, trek routes, fencing, artificial insemination, the bull subsidy scheme etc. In fact it is estimated by the MOA that in 1981 subsidies constituted 55% of the cost of production in the livestock sector (IBRD; Botswana Agricultural Sector Memorandum, Dec. 1981 pg.21). Because of Botswana's preferential access to the EEC market granted under various rounds of the Lome Convention, the price of Botswana's beef is higher than world market or RSA price. Estimates done in 1982 indicate that price obtained by BMC for 100 kg boneless beef was about 30% higher than the world market price (ILO SATEP: World Employment Programme: The Employment Challenge in Botswana 1987 pg.

176). The producer price obtained by the farmer is equivalent to the export price less all BMC costs which still exceeds the world market price. Together with generally low taxation on the cattle industry and substantial amount of tax evasion owing to lack of records on cattle ownership, these prices and subsidy advantages favour investment and reinvestment in the industry leading to overstocking, overgrazing and range degradation.

4.3.3 Depletion of Wood Resources

Fuelwood forms the major source of energy for the rural population and a large size of the urban poor. In fact it is estimated that 45% of the fuelwood used by households is for energy (Gibson 1988). Given the high increase in population and widespread poverty in both rural and urban Botswana, it is easy to see how binding the structural constraint is. The increased demand for woodfuel resulting from population increase has created localized shortages of wood around villages and towns, especially in the Kgalagadi districts (Agricultural Sector Assessment 1988). This shortage of wood has created two problems. First it has resulted in dramatic increase in the amount of time spent on searching for wood and this in turn has reduced time available for agricultural and domestic activities in the rural areas. Secondly resort to such desperate alternatives as cow dung and crop residues adversely affect soil fertility (Gibson 1988).

The Information/Research/Monitoring constraint is also binding since data on wood use, until recently were extremely limited (Arntzen et al 1986). Studies which have been conducted since the early eighties as a result of the concern for deforestation are very few and narrowly focused on firewood; hence little knowledge about use for other purposes (Arntzen et al 1986). There is a Forestry Division Staff responsible for monitoring wood exploitation but the increased demand for wood makes enforcement rather difficult.

Since Government regulation of wood use is minimal, the legal/legislative constraint is also binding. Laws exist for regulating the exploitation of wood but are hardly enforced. Again both institutional and implementation capacities of Government bodies responsible for forestry management and administration are extremely low. According to the Agricultural Sector Assessment, *"the limited institutional capacity of the Government makes it difficult to conceive or implement a medium or long term development strategy. Thus there is no comprehensive forestry policy"* (pg.128).

We can evaluate the Economic/Sociopolitical constraints by looking at the effect of Government subsidy packages under Arable Lands Development Program (ALDEP) and the Accelerated Rainfed Arable Program (ARAP) on the use of wood. ALDEP which was introduced in 1980 focused on resource poor smallholders (defined as those holding less than 10 hectares of land, owning less than 40 herds of cattle and earning less than P3,600/per annum). Among the numerous subsidies given under this program included a subsidy for fencing. ARAP was introduced in 1985 and was similar in concept to ALDEP. ARAP also gave subsidies for fencing and destumping. Studies have shown that destumping promoted the removal of trees

for arable farming without any compensating gain in crop yields (Gibson 1988). Furthermore since more than 50% of household demand for wood is for farm and livestock fencing, the subsidies provided under the program for fencing increased the rate of tree cutting. Thus the ultimate effect of Government policy on wood was to promote unsustainable use of it.

From the above, it is clear that the depletion of wood resources is a very serious problem. Here all the constraints are binding, implying that there is clearly unsustainable use of wood resources in Botswana.

3.4 Overexploitation of Veld products

Veld products are mainly used for food (mophane worms or phane, a variety of plant vegetables), income generation through trade (phane for export to RSA, mokola palm, grapple) and building (thatching grass). The exploitation of the products provide food and income mainly for women and the rural poor. Population increase and increased population concentrations have led to increased utilization of these products. In fact mokola palm (young leaves used for basket making), grapple and thatching grass have been identified by the Agricultural Resource Board and district officers as threatened (Arntzen 1986). There is virtually no data on magnitude of use. Like wood products, all the constraints are binding; thus the country is experiencing an unsustainable use of these products.

3.5 Industrial and Urban Pollution

Population growth and industrialization bring in their wake both air and water pollution. Botswana is at a stage where such pollution is relatively limited and generally confined to specific locations - urban areas where there is concentration of industries (both water and air pollution) and Selibe Phikwe area and its environs (mainly air pollution). This makes it relatively easier to contain the problem before it gets out of hand. Groundwater contamination is increasingly being detected around large villages; littering and refuse dumping appear to be a major problem throughout the country.

Here the information that exists is rather rudimentary and is related to the limited environmental monitoring programs. Notable efforts to monitor and control pollution involve the siting of boreholes, the designation of protection zones around major water supplies and the monitoring of emissions at the BCL smelter in Selebi Phikwe. It is recognized that major shortcomings exist in monitoring, licensing and administration standards and the enforcement of legislation on pollution. Of special importance is the need for increased regulation of emissions at their sources. These problems will need to be addressed in preparation for expected future increases in pollution. A number of legal/legislative provisions exist on pollution but their enforcement is a problem. Thus most of the constraints identified above are seriously binding.

4.4 Opportunities for Sustainable use and Protection of Resources from Depletion

4.4.1 Introduction

It has been asserted that development and conservation are two sides of the same coin and that unless the goals of both are pursued together, short term improvements in living conditions would be achieved at the painful expense of future generations. To the extent that most of the renewable natural resources are owned and controlled by individuals and organisations, e.g. farmers, livestock owners, communities, small enterprises and industrial organizations, the responsibility of conserving these resources and protecting the environment lies primarily with these individuals and organizations. In the case of non-renewable resources of the mining sector, the Government, in partnership with private firms, has participated in the investment for their exploitation and therefore assumes responsibility for monitoring their management. The starting point for solving the conservation problem is to tackle the structural factors that exert pressure on the use of renewable natural resources. In Section 4.1, we have identified these factors as being the growth in human and livestock population, poverty and hardened attitudes or lack of awareness of society towards the unsustainable use of resources. The solution of the problem from this long term perspective, therefore, devolves on measures to arrest the rate of growth in human and livestock population, address the problem of poverty at its roots and mount a campaign to educate the population on the use of resources.

4.4.2 Population growth

All environmental problems, including those considered in this paper, are driven fundamentally by population growth. We have already analysed in Chapter 1 and 2, the population of Botswana, its structure, distribution, characteristics and how it is likely to change during the next two decades. To recapitulate, we noted in these chapters that although the present population of Botswana is only 1.3 million, its rate of growth of 3.4% per annum is among the highest in the world and it also implies a high rate of fertility: we also noted that although at the moment a large proportion of the population lives in the rural areas (77%), the rate of growth of the urban population is high (6.5%). With the present population of 1.3 million and a land area of 583,000 square km, it is tempting to argue that Botswana needs to increase her population. In fact some cynics have advanced this argument and intimated that Botswana need not worry about population issues. But such a cynical view stops short of the extent to which the total land area, including renewable and non-renewable resources, has the potential to sustain or provide life support to an ever increasing population.

The high growth in population in the context of Botswana's under-development has the effect of not only slowing down the pace of development but also exerting pressure on natural resources and the environment thus exacerbating the existing

environmental problems and creating new ones. We have already seen the effects of the high dependency ratio implied by the high population growth rate. Apart from this, it also increases the financial resources required to provide education and health facilities. Thus the spread of existing resources over an ever increasing population makes it difficult to properly grapple with problems of under-development. Table 4.1 shows the projected requirements for educational facilities between 1985 and 2015 if the present population growth and fertility rates continue.

Table 4.1 PROJECTED REQUIREMENTS FOR EDUCATIONAL FACILITIES AND FINANCE

	1985	2000	2015
Primary School Enrolment	223,100	385,000	695,000
Primary School Teachers	6,700	12,000	21,700
No. of Primary Classrooms	4,400	8,000	14,500
Primary Recurrent Expenditure (P million)	26.6	47.3	85.5

Source: Population Factors and Development, CSO, MFDP, MOH 1987.

Calculations indicate that between 1985 and 2015, primary school enrolment, required primary school teachers and primary school classrooms will all be expanding at the rate of 3.9% per annum, the recurrent budget for primary education will also be increasing at the same annual rate. The per capita GDP projection between 1985 and 2015 indicates that per capita GDP will be declining at the rate of 0.08% per annum. It is clear that under these circumstances the country cannot cope with the required expansion in primary educational facilities and finance. This is only part of the picture. When we talk about projected requirements of facilities and finance for post primary education, the picture is even gloomier.

With regard to health, the CSO notes three effects of high population growth and high fertility rate on the attainment of objectives in the health sector.

- a) High fertility leads to high rates of sickness and deaths among infants and mothers;
- b) High rates of population growth results in sharp rise in women of child bearing and children under 5 years - a section of the population at highest health risk and likely to require health services;
- c) The increase in population growth increases the need for personnel, facilities and funds.

Health is a very important component of development, but unfortunately we do not have very good indices for evaluating the health of a society. The

conventional indices usually employed are the number of hospital beds per 1,000 of population. These indices are input rather than output of health services. A basic weakness of these indicators is that neither gives any idea about the distribution of health services so that they are poor indices of the state of health of a society. However for want of a better index we employ these here. A more preferable indicator would have been morbidity i.e the number of persons sick from identifiable diseases as a percentage of the total population. Since data on this index is not available we use the percentage of high risk population as a proxy for morbidity - albeit a poor one.

Table 4.2

PROJECTED REQUIREMENTS FOR HEALTH FACILITIES AND FINANCE

	1985	2000	2015
Regd. No. of Beds per 1000 pop.	3.2	3.1	3.2
Regd. No. of Physicians per 10,000 pop.	1.6	1.55	1.57
High risk pop. as % of total pop.	43	41.9	43
Annual Health Expenditure (Pm)	34.9	61.4	110.5

Source: Population Factors and Development, CSO, MFDP

According to Table 4.2, in 1985 the number of beds for 1,000 population was 3.2 while the number of physicians per 10,000 population was 1.6. Though these figures are low by the standards of the developed countries, they are among the highest in Sub-Saharan Africa. The projections made to the years 2000 and 2015 reflect a continuation of the present level of services. The high risk population figures indicate the percentage of total population in need of medical attention - namely women in their fertility years and children under 5 years; by every standard this section of the population is high - obviously because of the high birth and fertility rates.

The ability of the country to take care of the medical needs of the high risk population and maintain the level of services offered will obviously depend on the rate of growth of population. Viewed against the background of a declining per capita income over the period, the writing on the wall is too clear. Annual health expenditure is projected to grow at an annual rate of more than 4%. The question is, can the economy cope?

These two examples of the effects of population growth on education and health clearly demonstrate that the problem of eradicating poverty will not be an easy one given the present population growth rate.

Added to these is the problem of unemployment arising from the high annual increases in the labour force - also the result of high population growth rate (See Chapter 1).

As already observed above, rapid population growth exerts pressure on renewable natural resources and affects the environment adversely. For example, in the rural areas where the majority of the population lives, population increases lead to the use of marginal land for both arable and livestock farming leading to soil erosion, deforestation and land degradation, especially given the present system of land management. Also noted above is the dependence of the rural population on wood resources for energy, fencing and construction. It has been observed that even current consumption levels of firewood are already creating problems so that with population growth, there is going to be an increase in the consumption of firewood, especially in the large rural towns with consequent deforestation and land degradation. Further high population growth rate will lead to increased use of water for both human and animals, and given the present scarcity of water, especially surface water, this will result in the depletion of water sources. Similarly, groundwater will be affected by sinking of more boreholes and overpumping of existing boreholes so that water is pumped out faster than replenished; groundwater levels will sink, thus affecting plant growth and resulting in deforestation. Finally high population growth in the rural areas will further worsen the over-exploitation of veld products and threaten wildlife by the expansion of farming and cattle grazing.

The effect of population growth in the urban areas is no better, and perhaps even worse than in the rural areas. With urban population increasing at 6.5% per annum there will be increased pressure on the use of water for both household and industrial purposes and on land for the provision of residential and communal structure.

As noted by the Population Environment Working Group of the International Steering Committee on Population and Development, " *Possibly the worst and most visible problem connected with rapid urban growth is waste and pollution. A large group of people concentrated in a small area, such as Gaborone and Francistown, or large industrial enterprises in places such as Lobatse and Palapye produce large quantities of waste materials. Many of these are dumped indiscriminately. This inevitably leads to pollution. Air is polluted by the indiscriminate burning of waste materials and by the rapidly growing number of cars (which also cause traffic congestion and noise pollution). Streams and groundwater are polluted by the dumping of oil and chemicals and by factories releasing polluted water. The soil can become polluted by the dumping of toxic wastes, such as heavy metals present in batteries, which potentially cause cancer. The general public also contributes through littering, Overcrowding in households and in slum areas is also caused by rapid growth of the towns. The environmental conditions in such areas are health hazards and result in diseases*".

Admittedly the environmental problems do not result solely from population growth. However rapid population growth exacerbate these problems and makes their solution difficult. The solutions suggested in the second part of this chapter are only

temporary solutions. Long term solutions require a delicate balance between the livestock and population growth and the renewable resources of the economy. Slower growth of population in both urban and rural areas will facilitate the solution to the problems of the environment and reduce poverty at the same time. Although the Government's present approach to the problems of population growth is limited to creating public awareness of the effects of high population growth and fertility rates on development, it recognizes the need for a comprehensive population policy which includes rural development, migration policy and family planning. Some components of this comprehensive population policy namely rural development and family planning are currently being pursued in isolation but they need to be formulated and implemented with a broader framework of population policy.

As we have seen in the first part of this chapter, the problem of natural resource conservation and management has many dimensions, and is also all embracing. Nonetheless opportunities exist for addressing it; these opportunities take the form of planning, research and education, use of economic incentives and disincentives, reform of legal/legislative provisions and enhancement of institutional and implementation capacities. In the second part of this chapter, we shall look at these opportunities in the context of the conservation issues discussed in the first part.

4.4.3. Planning, Research, Training and Education

National resource conservation and management like development, needs to be planned; planning requires the collection, organization and analysis of data as well as a close study of the inter-relationship between the variables bearing on any of the environmental issues discussed above. We already observed above that Government preoccupation with the problem of poverty since the early post independence era has in the past diverted attention from environmental concerns. Thus development policy in the past has taken little or no cognizance of the environmental implications of specific policies. In relation to the conservation and management of water, the just completed National Water Master Plan has adequately addressed the planning and policy issues among other things; meanwhile further research efforts should focus on collecting and analysing data on ground-water resources and recharge rates, rainfall harvesting and water storage methods, techniques to prevent or reduce evaporation, recycling of treated effluents, pollution prevention methods, cost effectiveness and environmentally acceptable water transfer scheme. Research is already under way in some of these areas e.g. Department of Agricultural Research (DAR) research on water harvesting, and these efforts need to focus on explaining to the masses of the people how water conservation, improved water usage, water hygiene and pollution prevention can contribute to general wellbeing and improvement in living standards.

On range degradation we have seen how the institutions entrusted with land allocation and range management under the TLA and TGLP had virtually no data base. Unsustainable use of land also arises from lack of training for farmers in livestock/rangeland management techniques, inadequate knowledge about the range carrying capacity and traditional views about the extent of land available and hence usage practices. In this area opportunities exist for providing increased educational campaigns to cover the value and finite nature of land, the need for better

management as well as the range carrying capacity. Research, development and extension work need to be extended to include the improvement of multiple land use and management practices and the adoption of more intensive livestock management practices. Furthermore research has to be undertaken into traditional attitude on cattle ownership and ways to change them as well as methods to increase community involvement in land management.

On the issue of wood depletion, we observed that the non-existence of any planning has resulted in virtually no data being collected on wood use; the dearth of forestry extension staff and other skilled forestry personnel has impeded research in this area. The need to update the Government Forestry Policy and draw up a comprehensive National Forestry Management Plan to include improved conservation and management, establishment of additional woodland areas and development of the Botswana Forestry industry is compelling. Training to supply the required forestry extension and skilled personnel would be required; there is also the need for additional research focusing on comparative performances of species, cost effectiveness of wood substitutes and/or domestic energy systems and agro forestry. It is also necessary to build the data base by compiling detailed inventories of wood resources, together with data on growth rates to act as a basis for long term planning.

Education needs to focus on a public awareness campaign aimed at the public and Government officials which identifies potential employment and income generating opportunities in forestry and stresses the need for conservation.

We have seen the importance of veld products as the source of employment and income for the rural population especially the poorest section as well as the unsustainable exploitation of these products. The major problem identified in this sector is the almost complete lack of information on the incidence and use of veld products. This places a major constraint on future planning for utilization and conservation. To address this problem there is need to incorporate collection of veld products explicitly into rural development plans. To facilitate this, it is necessary to prepare an inventory of all veld products since little is known about their uses and actual value to the economy. A good start has been made by a study on veld products commissioned by the MCI and this needs to be built upon. On the issue of education, training and research the Government recognizes the need to collaborate with non-Governmental organizations (NGOs) and private sector interests in initiating a research-based educational campaign to cover values and limited availability of specific veld products, effective harvesting techniques and methods, storage and processing possibilities, opportunities in regeneration and commercial cultivation projects as well as use of substitutes. Investigations should be initiated into the contribution, life cycles, environmental requirements, uses of veld products and possibilities of their domestication.

In the area of urban and industrial pollution, information and monitoring call for the improvement and expansion of existing environmental monitoring programs with special emphasis on distant areas which may be affected by industrial emissions, for example, villages downward of Selibe Phikwe. To facilitate the implementation of suggested monitoring and legislative initiatives, there is need for Government to

organize training programs in the field of environmental engineering. Finally there is need to initiate a series of public education campaigns covering the possible effects of pollution on human and natural resources and methods of pollution prevention.

4.4.4 Economic Incentives and Disincentives

Economic incentives and disincentives provide one of the best and most effective opportunities for ensuring sustainable use of natural resources. There are two important issues here, namely pricing of scarce resources to reflect their scarcity values and pricing of resource to incorporate externalities detrimental to present or future users of resources. Resource pricing to reflect their scarcity value promotes better resource allocation among competing users as well as conservation of resources. In taking their production and resource allocation decisions, enterprises do not take account of the detrimental effects of their activities on society as a whole. Since these efforts do not enter their cost calculations, their profit levels are usually higher than is warranted. Thus if it is possible to internalize the environmental cost of private sector activities, use of resources would be more judiciously handled, leading to effective resource conservation. While pricing of resources to reflect scarcity values is based on normal supply and demand considerations, internalization of detrimental externalities entails the use of tax devices. The problem with the latter, however, lies in identifying and evaluating the amount of damage caused.

We have already described above how the progressive elimination of the subsidy element in the amount of water consumed beyond what is required for meeting basic needs will lead to economic use of water.

From the discussion above, reasons for overgrazing seem to be related to the following factors, namely, producer prices to cattle owners, the system of subsidies, the tax structure and the nature of property rights. It has been suggested that there is need for revision in the BMC procedure for determining its prices to farmers. At the moment the producer price to livestock farmers is based on export parity price less all BMC costs. Such a procedure does not lead to adequate deductions to ensure a reasonable return on BMC capital; the result of this is a higher producer price for cattle, leading to overstocking and hence overgrazing. Again the numerous subsidies which livestock sector enjoys need to be reviewed with a view to maintaining only those that will ensure the sustainability of the industry while removing those which can easily be accommodated by cattle producers. There is also the need to reform the taxation of the industry.

These reforms will have the effect of redirecting expansion investment from livestock enterprises and easing the pressure of overstocking on the rangeland. With regard to the nature of property rights two issues need to be addressed. The dual grazing rights which allow TGLP ranches to resort to communal areas for grazing when their ranches are overgrazed need to be abolished. This will enable TGLP ranchers to introduce proper land management practices on their ranches, and make them truly commercial enterprise. The second issue related to property rights devolves on the rent paid by cattle owners on the land used. In the past this rent has not been commercially set to reflect the potential profitability of the land; this should

be corrected to ensure proper use of land. A major policy proposal is to allow individuals and groups to fence in the communal areas. This will permit the commercialization of livestock production as farmers will be responsible for the management of their own grazing resources. Such a proposal will enable those farmers to fence those lands over which they have existing de facto grazing rights.

Community used watering points will remain communal and will not be eligible for fencing, unless the whole community elects to form a group for that purpose (NDP VII Agricultural Sector).

On the issue of wood depletion, the Government intends to investigate the possibilities of offering financial incentives and other forms of Government assistance in the establishment of windbreaks and amenity trees plantations. Also the encouragement of the use of wood substitutes in areas of severe shortages through subsidies is to be promoted.

The over-exploitation of veld products is to be addressed by Government providing subsidies to assist communities to find access to substitute products where depletion has occurred and also investigate the use of price incentives and capital grants for commercialization of new veld products.

4.4.5 Legal/Legislative Reforms and Provisions

The legal and legislative reforms and provisions also offer opportunities for ensuring sustainable use of resources. Here, in most instances the legal and legislative provisions exist except that they either do not take adequate cognizance of environmental factors or they do not provide for effective mechanisms for enforcement. This is particularly true with the issues of land degradation and urban and industrial pollution. With the former there is need to revise existing legislation particularly with regard to the Tribal Land Act, the Agricultural Resources Conservation Act to give greater authority to Land Boards and also to ensure that they are provided with effective enforcement mechanism. Again TGLP leases would need to be redrafted to include proper management practices as has been discussed above under economic incentives and disincentives. With regard to industrial and urban pollution the proposed amendment, strengthening and expansion of existing legislative provisions is perhaps the most comprehensive, and it may be worthwhile to quote in verbatim from the NCS Action Plan.

Legislative Additions and Amendments.

- Introduction under the NCS Act of a mandatory EIA provision for any environmentally significant development project.

- Amendment of existing legislation to incorporate the polluter pays' principle, as well as a stricter licensing requirements based on action to reclaim polluted sites, proper disposal of wastes and treatment of industrial discharges.
- Compulsory registration of potentially polluting activities, including import and export of chemicals; this would include full use of international data bases (e.g. International Register of Potentially Toxic Chemicals) and introduction of the 'prior informed consent' principle (i.e. notification to a country that a substance has been banned, or severely restricted, in the country of origin or by other importing countries).
- Extension of existing standards covering the quality of all gaseous, liquid and solid emissions/wastes associated with settlements and industrial processes.
- Strengthening of the Atmospheric Pollution (Prevention) Act to include mobile source emissions, prescription of emission values and ambient air quality standards, and monitoring of industrial processes.
- Strengthening of the Water Act against pollution of public waters, including ground-water, specifically regarding regulation of discharges into public waters ('public waters' are broadly defined as all water flowing over the surface of the ground or contained in a watercourse, and underground water available by means of works).
- Strengthening of the Public Health Act to cover protection against pollutants.
- Provision of a comprehensive legislative code for management of wastes by local Government authorities, via a licensing system for waste-specific disposal sites, and rigorous controls over siting and operation of such sites.
- Legislation should be considered which regulates use, storage, labelling and marketing of agricultural chemicals.
- Emphasis needs to be placed on cooperation between relevant authorities in enforcement of all legislation concerning pollution prevention and control.
- Pollution prevention and control requirements should be taken into consideration in all land use planning activities to minimize harmful effects on human and natural resources (NCS Action Plan pg. 26-27).

Legislative reforms relating to the water, wood and veld products issues are indicated below:-

Water: There is need to review and amend the Water Act with special emphasis on rationalizing supplies and strengthening provisions for aquatic weed control, the Act also needs to be strengthened to make it a tool for improving

environmental management in general and livestock management in particular. In addition it is suggested that the proposed NCS Act should incorporate a provision making it mandatory to apply Environmental Impact Assessment procedures in evaluating all water schemes.

Wood Resources: It is proposed to amend the Forest and Agricultural Resources Conservation Acts to incorporate provisions which make it mandatory for all communities to undertake replanting and associated protection of trees.

Veld Products: Existing legislation should be examined and amended, where necessary to control the exploitation of veld products, protect and restore depleted stocks, and to conserve rare and potentially threatened plants.

Wildlife Resources: It is proposed through the Wildlife Conservation and National Parks Act, to introduce certain changes to facilitate optimum and more effective use of the wildlife resources and to also increase penalties for contraventions of provisions of the Act, considerably

In the light of these considerations the Government has formulated a National Conservation Strategy (NCS) to deal with these numerous environmental problems. The details of this strategy will be considered in the concluding chapter of this report.

4.4.6 Role of Local People and NGO's

We shall, however, conclude this chapter by considering the role of indigenous peoples, regional, district and village level organizations as well as women in resource management. The role these people and organizations play or are capable of playing may offer opportunities for improving on resource management and ensuring the sustainability of resource use. Apart from individuals who, by their diverse activities, get involved in natural resource management, there is a great number of regional, district and village level institutions - both modern and traditional - whose responsibilities bring them into contact with resource management. Two important issues have a bearing on the use of resources by individuals and those institutions referred to above need to be noted.

The first issue relates to individual resource management in the rural areas. Where there is scarcity, for example, of land and water resources, community objectives are likely to guide the process of allocation of these resources to individuals; thus comprehensive land use planning which will ensure sustainable use of land by individuals, becomes necessary and possible. However, in a situation where individuals believe that land for both arable and livestock production is virtually inexhaustible and that they have a right to it, they are likely to adopt practices which do not lead to sustainable use of it. A great deal of studies have shown that this is precisely the attitude of most of land users in rural Botswana (e.g. see Marquardt, *"Research on Access to Land in the Communal Areas: Preliminary Draft Report"*; Gulbrandsen, *Access to Agriculture Land and Communal Land Management in Eastern Botswana*; Chris Brown: *Institutions Research Project, IRP, Applied Research Unit MLGL 1983*). This attitude offers partial explanation to the

low rate of adoption of improved practices. To the extent that it makes economic sense to farmers to maximize total output by bringing larger hectareage under production rather than to produce more per hectare, their land use practices are likely to lead to land degradation. With respect to overgrazing, the IRP research cited above (Chris Brown, 1983) revealed that although people are aware that overstocking leads to deterioration of the range and erosion, this awareness, nonetheless, does not lead to any proposals for action.

This lack of action is explained in terms of the general belief that *"the amount of rainfall received rather than the stocking rate or management practices is the crucial factor determining the condition of the range"*. Another explanation for lack of action is based on the fact that most people do not consider stock limits feasible. Such beliefs and attitudes lead to fatalism about grazing conditions and consequently to inaction. Several studies have shown that these beliefs and attitudes persist so long as communities do not have control over their resources. Thus it has been suggested, and indeed accepted by Government, that the necessary thing to do is to establish local community control over grazing resources. This underlies the decision to permit community and/or individual fencing in the communal areas. If local control over grazing is established and realistic stock controls imposed, then technical measures become possible.

The second issue relates to whether traditional resource management institutions such as the Kgotla, the traditional overseers etc, are still relevant to sustainable resource management practices. Here there is no consensus. While some studies recommend the full integration of the overseers and other traditional land allocation authorities with the Land Boards on account of the former's comprehensive knowledge of local conditions, others express grave doubts about the usefulness of these traditional institutions in matters relating to effective resource management practices.

There is no doubt that if the NCS is to succeed, participation of the local people and the numerous local institutions will have to be enlisted in one way or another. What needs to be done in this area devolves primarily on education and training, given the fact that the Government is doing all it can to address the problem of poverty.

CHAPTER 5

5.0 AN AGENDA FOR ACTION

5.1 Strategies for Sustainable Development: National Perspective

In the light of the consideration discussed in the foregoing chapters, the Government has designed a National Conservation Strategy Action Plan which provides a framework for co-ordinating and administering the proposals geared to improving the sustainable use of the country's natural resources. The acceptance of the need for the preparation of the NCS arose from the Government's cooperation with the United Nations Environment Programme (UNEP) in the preparation of the Clearing House Technical Mission report in 1983. Like the National Development Plans (NDPs) which have been implemented since independence, the NCS embodies programs and project proposals as well as policies to achieve them. The essential difference between NDP's and NCS is that whereas the former are geared to achieving specific economic and social objectives within the constraint of the country's financial and manpower resources, the latter is primarily concerned with how the objectives can be achieved without unduly jeopardising the natural resource base at the expense of future generations. Both are similar in the sense that they involve the deployment of resources - both financial and manpower; however, whereas in the NDP's the deployment of resources are meant to produce goods and services for the population at large, in the case of the NCS, the use of resources is designed to prevent the destruction of the natural resources base which constitutes the pool from which financial resources are constantly being extracted. In that respect both are complementary - in the sense that one cannot be achieved without the other in the long run.

5.1.1 Objectives

The NCS has two primary objectives as well as a series of goals grouped under development goals and conservation goals. The primary goals are to pursue policies and measures which

- a) increase the effectiveness with which natural resources are used and managed so as to maximize the beneficial interactions of natural resources while minimizing the detrimental environmental side effects.
- b) integrate the work of the sectoral Ministries and interest groups in the country, thereby improving the development of natural resources through conservation, and vice versa.
- c) Development Goals:

The development goals cover the following, namely

- i) the development of new and better natural resources, which are sustainable;
- ii) the optimization of the existing uses of all natural resources;
- iii) the development of multiple rather than single purpose, natural resource uses;
- iv) the diversification of the rural economy in order to generate new jobs;
- v) the increased education of, and participation by all members of society in improving the environment;
- vi) the development of links with neighbouring countries in conserving resources;
- vii) the establishment of a balance between population growth and supply of natural resources.

d) Conservation Goals

- i) the conservation of all ecosystems, wildlife and cultural resources;
- ii) the protection of endangered species;
- iii) the maintenance of stocks of renewable resources (e.g. veld products), while increasing their sustainable yields;
- iv) the control of the depletion of exhaustible resources (e.g. minerals) through exploitation at optimal rates;
- v) the distribution of incomes and rewards, more equitably, in the interest of conserving natural resources;
- vi) the cost-effective restoration of degraded renewable natural resources, including improved capacity for regeneration of the veld;
- vii) the prevention and control of pollution.

It must be noted that these development and conservation goals are not mutually exclusive; on the contrary, they are mutually reinforcing. For example the equitable distribution of incomes is basically a social or developmental objective but to the extent that it improves the income position of the poor and widens their planning horizon, it leads to sustainable use of renewable resources.

5.2 Environmental Issues

The NCS identifies environmental issues of particular concern to the country. These issues are mentioned and discussed in the preceding chapters, but, for emphasis, they may be briefly recalled here:

- 1) Growing pressure on water resources resulting from increases in population, urbanization and development;
- 2) Degradation of Rangeland Pasture Resources due to a variety of management and other factors;
- 3) Depletion of Wood Resources both in commercial harvest of forests and as the main source of domestic fuel in most settlements;
- 4) Overuse or Overexploitation of some Veld Products (Natural products of the desert: fruits, fungi, tubers etc.)
- 5) Pollution of the air, water, soil and vegetation resources.

Other issues which have an important bearing on the conservation of natural resources such as resource pressures arising from the growth in human population, the depletion and conservation of wildlife resources and the need for improving public awareness about natural resource problems and opportunities are also addressed by the NCS.

Again it may be recalled that these issues are not isolated issues; they interlink with each other in a dynamic way for example, pollution prevention has effect on all the other issues.

5.3 Strategy framework

The strategy framework consists of four different types of measures, namely,

- a) the provision of economic incentives and the used of disincentives. These are required respectively to stimulate sustainable development and to discourage overutilization (overexploitation) of natural resources.
- b) the enforcement of existing laws/regulations and where appropriate, the introduction of new legislation.
- c) improvement of planning and administrative procedures. This requires that full recognition is given to ecological needs, through the definition of resource use zones.

- d) the expansion of facilities directed at improving environmental education, training and research activities as well as at raising public awareness about environmental issues. It is envisaged that conservation education will be specifically included in school and teacher training curricula.

Five general types of incentives are envisaged, namely those which will:

- i) promote good pasture management
- ii) encourage rangeland restoration
- iii) encourage diversification into new economic enterprises through an extension of the Financial Assistance Policy (FAP) and other annual awards to the winners of Environmental Improvement Competitions;
- iv) encourage land tenure changes, especially in communal grazing which lead to improved management;
- v) establish new forms of investment opportunities.

At the same time the Government intends to investigate in detail the design of appropriate disincentives for possible use in conserving the country's natural resources.

It is recognized that legislative reforms can play an important role both in addressing most of the key issues and in supporting diversification. However, it is acknowledged that, in the short term, there is a limit to the improvements which can be achieved through legislative measures. This applies to measures of all types: enforcement, reform and innovation. There is general recognition that too much reliance on legislation should be avoided and that high priority needs to be accorded to persuading and encouraging the public to act in ways which are environmentally beneficial.

5.4 Strategy for Action - "Solution Packages"

The NCS has designed "solutions packages" to address each of the issues. These are specific application of the measures outlined above under strategy framework about the environmental issues. These were essentially discussed in Chapter 4 above.

In devising the 'Solution Packages' for the key issues, prime consideration has been paid to:

- a) the acceptability of the solution to the main target groups;

- b) the proven technical and financial feasibility of the solutions;
- c) the availability of institutional capacities necessary for effective implementation;
- d) the need to establish incentives which will make the results of diversification into new rural enterprises as financially attractive as those obtained from livestock and arable production.

5.5 Proposed Action and Project Programme: Summary

1. Below we describe briefly the list of priority projects, resource requirements etc.
2. Table 5.1 features those central/local Government projects considered to be of top priority for immediate implementation, based on their community-based orientation and/or perceived immediate benefits. In order to address the main environmental issues as well as to involve all pertinent implementation authorities, the list includes one project for each issue and one for each ministry/department.
3. Table 5.2 shows the resource implications, in terms of cost and personnel requirements, for all projects included in this document, regardless of the sponsoring organization or implementation authority. Projects are categorized by resource sector and by implementation organization.
4. Table 5.3 lists the approximate costs for the proposed institutional changes necessary for BNCS implementation.
5. Finally, as part of the most recent workshop of Natural Resource conservation Society of Botswana, held in July 1989, requests were made to local representatives to submit natural resource project proposals. Eight proposals were received and their descriptions were brief and very general. Most concerned re-forestation in the form of tree planting or woodlot/nursery establishment. Others included fencing off areas prone to human/wildlife conflicts around the Chobe National Park; thatching grass production in Nata; donga filling; and fencing/tree planting around a spring in Seleka.
6. As more details become available and funding sources are identified for these projects, they (and any future submissions under NRCS) will become an important element of the village-based approach. This approach will be emphasized in the early stages of BNCS implementation.

Table 5.1

"TOP" PRIORITY BNCS PROJECTS LISTED BY ISSUE AND IMPLEMENTATION AUTHORITY

ISSUE	PROJECT TITLE	OBJECTIVE
Rangeland Degradation	Application of Rangeland Research results on pilot and extended scales	Based on past research results, and utilising current studies, the objective is to apply the findings to farm scale operations. Areas of emphasis include observation and monitoring degradation processes, rehabilitation and improved management (including use of fodder crops and investigation of poisonous plants.
Wood Utilization	Establishment of Village Woodlots	To establish woodlots in five villages in the CFDA, Central District; the area is severely deforested and overgrazed. The woodlots will be community-based and managed.
Water Resources	Utilization of Waste Water in Town and Village Woodlots	With technical assistance from an experienced forest engineer, nutrient-rich waste water could be used to irrigate tree plantations, woodlots etc.
Veld Products	Establishment of Handicrafts Research and Extension Work	To continue and expand upon field investigation of traditional harvesting sites, consultations and surveys of veld products stock, propagation and investigation of materials.
Pollution	Demonstration of Cost-Effective ways of managing Public Services	To expand upon existing efforts in providing sanitation facilities (pit latrines, litter collection services, funds for a litter competition, and an educational publicity campaign. Proposed to cover one village in each district.

MINISTRY/ DEPT.	PROJECT TITLE	OBJECTIVE
Local Government and Lands	Preparation of Radio Plays	Cooperating with Non-Formal Education, the goal to produce radio plays which deal with causes and consequences of environmental problems, solutions of such problems and potential benefits.
Agriculture:		
- Forestry	Establishment of Agro-forestry Research	Initiation of a short-term study to examine the most appropriate forms of agro-forestry for Botswana, leading up to a long term programme of agro-forestry research and extension.
- Fisheries	Improvement of Management Expertise	Fisheries management specialists would train Botswana professionals in management legislation and enforcement of conservation restrictions, data recording, extension, gear technology and marketing.
Commerce & Industry:		
- Wildlife	Establishment of Game Harvesting Units	To increase participation and realize greater benefits for rural communities from wildlife resources.
- Tourism	Preparation of the Okavango Delta Tourism Plan	To compile information on existing tourist attractions, prepare and evaluate potential tourist development strategies.
Mineral Resources and Water Affairs	Extension of Air Pollution Controls	An increase in equipment and manpower is necessary to more effectively monitor sources and effects of air pollutants nitrogen and sulphur.
Mineral Resources and Water Affairs	Improvement of Institutional Waste-Water Systems	To improve currently substandard sewage treatment facilities at 12 educational facilities in Botswana, the project will address particularly the current risk to public health.
Ministry of Education	Analysis of Current Non-Formal Environmental Education System	A project to assess the potential of current programmes to incorporate environmental education, to identify linkages between decision-makers and target audiences, and to determine cost-effective media technologies.

Table 5.2

PROJECT COSTS AND PERSONNEL REQUIREMENTS, BY RESOURCE SECTOR* 1

SECTOR	COST (Pula)	ADDITIONAL PERSONNEL* 2	ADDITIONAL NUMBER OF MAN YEARS *3
Crops			
Agro-Forestry Research	620,000	4	10
Soil Conservation	1,945,000	14	63
Raising Vegetables in benches	563,289		
Sub-total	3,128,489	18	73
Fisheries			
Ecological/Biological Research	1,168,000	3	3
Management Expertise	919,000	5	14
Effects of Tsetse Fly Spraying	310,000	2	4
Sub Total	2,397,000	10	21
Forestry			
Upgrading of Nurseries	650,000	16	40
Establishing Village Woodlots	275,000	8	32
Establishing Woodland Management Areas	200,000	5	11
Sand Dune Stabilization	250,000	4	16
Development of Forest Reserves	25,000		
Development of National Forest Policy	N/A	N/A	
Forest Policy	N/A	N/A	
Forest/Woodland Management	N/A	N/A	
Indigenous Woodland Management	N/A	N/A	
Educational Programme	N/A	N/A	
Agro-Forestry Programme	N/A	N/A	

SECTOR	COST (Pula)	ADDITIONAL PERSONNEL* 2	ADDITIONAL NUMBER OF MAN YEARS *3
Promotion of Small-scale industries	N/A	N/A	
Management/Utilization of Chobe Reserves	N/A	N/A	
Sub Total	1,400,000	33	99

*1 Project descriptions are provided in Section 5 or Annexa A.

*2 The numbers do not include casual/temporary labour, i.e. short-term, non professional posts. The numbers represent the new posts which will need to be established in the course of implementing the NCSAP.

*3 Totalled over the five-year planning period (some projects cover less than five years).

Veld Products

Handicrafts Extension and Research	67,400		
Veld Products Inventory	110,000	6	18
Moramba Bean Pilot Project	737,136	2	12
Thatching Grass Production	429,387	2	8
Sub Total	1,343,923	10	38

Wildlife

Game Harvesting Units	4,603,650	N/A	
WMA Management Plans	1,763,950	N/A	
Wildlife Utilization Units	4,113,250	5	25
Firebreak/Boundary Construction	1,135,800	N/A	
Water Supplies	4,498,000		
WMA Boundaries	1,893,000		
Moremi Wildlife Reserve Management Plan	N/A		
Wildlife Utilization	10,900,000		

SECTOR	COST (Pula)	ADDITIONAL PERSONNEL* 2	ADDITIONAL NUMBER OF MAN YEARS *3
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Sub Total	30,667,650	5	5
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Tourism

Okavango Delta Tourism Plan	331,200		
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Tourism Plans - Other Regions	993,600		
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Sub Total	1,324,800		
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Mining

Air Pollution Control	945,000	9	30
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*1 Project covers 6 years

Non-Formal Education

Non-Formal Environmental Education System Analysis	30,000		
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Analysis of Current Environmental Awareness	45,000		
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Alternative Methods of Environmental Education	45,000		
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Mobile Information Centre	443,000	3	12
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Environmental Awareness Through Functional Literacy	380,200		
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Forest Extension	204,000		
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Wildlife Education Unit	795,600	N/A	
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National Environmental Education Resource Centre	848,300	3	12
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Veld Products Utilization/Cultivation Extension	578,000	N/A	
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Video Production	360,000		
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Outreach Programme	256,120	1	4
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SECTOR	COST (Pula)	ADDITIONAL PERSONNEL* 2	ADDITIONAL NUMBER OF MAN YEARS *3
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Seminars	330,000		
Sub-total	4,315,200	7	28

Social Values/Traditions

Radio Play	980		
Film Project	100,000		
Popular Theatre	32,000		
Tree Planting Competition	24,615		
Sub-total	157,595		

Settlements

Public Service Management	710,000		
Parks/Open Space Establishment	946,800		
	1,656,800		

Regional Cooperation

Identify Regional Resources Linkages	850,000	4	12
Regional Resources Inventories	510,000	4	12
Manpower Development	550,800		
Regional Action Plan/Environmental Awareness	122,400		
Natural Resources Commission	N/A		
Sub-total	2,033,200	10	24

Meteorology

Expand Meteorological Station Network	3,100,000		
Livestock Conduct Range Research	2,256,088	4	12

SECTOR	ESTIMATED COST (Pula)	ADDITIONAL PERSONNEL* 2	ADDITIONAL NUMBER OF MAN YEARS *3
Rehabilitation Resources	N/A	N/A	
Sub Total	2,256,088	4	12
Land Resources			
National Land Resources Inventory	N/A	N/A	
Implement GIS	N/A	N/A	
Water Resources			
Improve Institutional Sewage Systems	1,415,000	N/A	
Forestry Technical Support/Waste Water Reuse	68,300	1	2
Prepare Water Use Manuals	N/A		
Pollution Protection of Water Resources/Solid Waste Disposal	1,317,750		
Sub Total	2,801,050	1	2
TOTAL	50,601,326	105	352

Table 5.3 ESTIMATED FINANCING REQUIREMENTS - INSTITUTIONAL CHANGES

ACTIVITY	COST (Million/year)
- Establishment and operation of both the "NCS Advisory Forum" and the NCS Co-ordinating Agency:	0.6-0.7
- Additional funds required to cover existing organizations, throughout all sectors of Government, so that they can play their full part in implementation of the NCS:	21.4*
- Commissioning of the special training, R&D, data collection, promotional and monitoring programmes mentioned earlier (see sections 3.4, 3.5, 3.8, and 6.1 to 6.7, respectively).	0.35-0.4
- Phased implementation over a five-year period of 42 priority projects recommended by the respective ministries, in the course of preparing their background technical reports:	average 0.2

* This figure is the sub-total for the two Ministries (Ministry of Education and Ministry of Commerce and Industry (Department of Wildlife and National Parks) which provided estimates of likely costs. Figures from other Ministries were not available at the time of writing; they will be incorporated as they are made available, most as the NDP VII process is further completed.

5.6 Elements of Implementation

5.6.1 Public Relations

There will be several key elements in publicizing the BNCS Action Plan and its achievements. The first of these is identification of the intended audiences. Given the significant consultative role played by the different groups in the preparation of the BNCS, it will be especially critical to continue their involvement. One particularly important target group is school-age children. Continued environmental education programmes should highlight the efforts of Government, via the NCS, to address pressing environmental issues.

The second element is the approach to be used. At the local level, methods employed during the public discussion campaign, i.e. addressing kgotla meetings, should be employed again. On a broader scale, radio programmes and newspaper articles, produced on a regular basis, should keep the public informed of progress made under the BNCS. As a primary and early education/information tool, the NCS video, especially the recently produced Setswana version, should be utilized on a widespread basis through both TV and cinema outlets.

Finally, consideration needs to be given to those responsible for facilitating public relations efforts. Above all, Government leaders and politicians need to demonstrate both knowledge of and commitment to the BNCS. Such action, along with the 'politicians' access to the public, can assist the process of gaining understanding, acceptance and action on the part of all Batswana. The Natural Resources Conservation Society, which will facilitate projects at the village level, should, at the time, play an important public relations role. Also, the Environmental Education Reference Group has expressed interest in integrating the aims of the BNCS into its activities. It will play an important role as a coordinating body for environmental education.

5.6.2 Monitoring and Review

The effectiveness of BNCS projects, and indeed of the entire NCS process, can only be gauged by a comprehensive, ongoing monitoring and review programme. Such a programme hinges on the availability of a solid base of natural resources data and system of 'physical accounts'. Currently, such basis information is lacking in most resource sectors. According to the Natural Resources Accounting Consultancy report issued in October 1989, the data needs are most critical in the following resource sectors: water resources (particularly ground-water), forestry/wood resources, and veld products.

Although information gaps exist, it is nonetheless necessary to define a proposed framework for monitoring and review. It is envisaged that some monitoring can take place while simultaneously plans for increased data gathering are getting under way. In fact, the Natural Resources Accounting report proposes a project to prepare a set of satellite natural resource accounts (NRA), to be included in support of NDP VII as well as the BNCS Action Plan. It is estimated that the NRA project, which is complementary to the proposals to establish both an environmental statistics unit and a cadre of district environmental planners, will span 5 years and cost a total of P2.4 million.

Monitoring and review should be considered on both a short-term and long term basis. In short-term, responsibility will be with the respective implementation authority or agency (central or local Government, NGO, parastatal, etc). These bodies will be required to submit project reports to the NCS Co-ordination Agency on a quarterly or six monthly basis. This will enable the NSCSA in turn to undertake immediate reviews and to provide feedback on the progress of projects.

In the long term, the NCS Co-ordination Agency will be responsible for an annual/biennial 'State of the Environment Review'. This will take into account the direction and progress of ongoing NCS projects, as well as the physical data to be collected as part of the natural system in which natural resources accounting and environmental review go hand in hand with each other.

5.6.3 Implementation Responsibilities

5.6.3.1 Organizational Involvement

It is expected that a wide range of authorities will share responsibility for implementing BNCS projects. Although some responsibilities are clear, e.g. line ministries or departments in charge of national level projects, there is potentially also some degree of overlap, particularly concerning NGO's, who may oversee national as well as community-based projects.

In theory, the number of possible implementation authorities is considerably larger as projects move from the national to the village level.

The role of the NCS Co-ordinating Agency, as its name implies, will be to provide overall co-ordination of projects between the various authorities, at all levels. The Agency will also perform a significant monitoring and review function, as described earlier in this document. At the national level, the sectoral ministries and departments will be the primary implementation authorities, along with parastatals, NGO's and other private sector interests. Some large scale projects will also take place under the guidance of a 'steering committee'. It would be desirable to have a representative of the NCS Co-ordinating Agency on such steering committees as they arise.

At the district level, the various organizations such as District Councils, Land Boards, District Development Committees, (the latter primarily, as these are responsible for preparation of district development plans) are likely to guide implementation of BNCS projects. They could be assisted in some areas by development organizations such as Brigades and rural development association.

Finally, at the village level, the Natural Resources Conservation Society of Botswana will be an important co-ordination and implementation body. Projects at this level will have significant local involvement, and in a sense will be implemented 'by the people' via the Village Development Committees, women's groups, youth groups etc.

In summary, it should be emphasized that these 'implementation levels' are not exclusive. All of the projects are designed to benefit ultimately all people and natural resources in Botswana. Hence, co-ordination and co-operation of all pertinent authorities, and the individual sectors or localities involved, will be required to see these projects through to success.

- Institutional Requirements

Given the diversity of resources, projects, and implementation authorities involved, the need was clearly defined during the preparation of the BNCS for the establishment of an overall co-ordinating body. The main functions of this organization are to advise and to monitor progress on BNCS activities. In reality two bodies will fulfil these functions at the Governmental level. The BNCS Advisory Board and its Secretariat, the BNCS coordinating Agency will work closely, with local, district and central Government authorities, parastatals, and private organizations in meeting the broad goals of the BNCS. Actual project implementation will remain the responsibility of the respective ministries or organizations.

The role of the BNCS Co-ordinating Agency will, among other things, be to:

- facilitate co-operation between the various implementation bodies previously mentioned;
- identify opportunities for legislative, educational and monitoring activities;
- identify funding sources;
- provide and help in the procurement of technical expertise as required; and
- help the line ministries to discharge their environmental responsibilities.

In general, the Co-ordination Agency will encourage the execution of a range of projects, both short term and long term, with the intent of involving as many sponsoring agencies as possible and meeting the various natural resource needs in Botswana.

In discharging these responsibilities the BNCS Co-ordination Agency will be assisted through the nomination of Environmental Liaison Officers within the central and local Government organization. This will facilitate the essential dialogue, which is required between the NCS Co-ordinating Agency and the line ministries/departments and local authorities, responsible for ensuring the sustainable use of Botswana's natural resources.

As noted in the BNCS, the establishment of these new Governmental bodies could be considered a 'middle course', a balance between an institution sufficient to handle the important and specialized responsibilities of NCS implementation, and the establishment of a new Ministry or Department. Perhaps, however, the formation of such should not be ruled out for the future. The suggestion of five professionals to initially staff the 'co-ordination agency' is considered conservative, but also sufficient given that no precedent is in place to adequately determine the staffing needs of such an agency. Similarly, the proposed growth of this staff to 12 after five years could also be considered conservative. The important point to consider is that responsibility for environmental and natural resources matters must be kept unto itself, and not

shared with other duties. If this is possible in the currently proposed scheme remains to be seen. If not, strong consideration must be given to formation of a separate Environmental/Natural Resources Agency.

Finally, it will be necessary to draft enabling legislation, on 'NCS Act' which will set forth the requirements necessary for full and proper implementation of the BNCS. These would include the following:

- a mandate to conserve and enhance the environment;
- the procedural responsibilities of the Advisory Board and Co-ordination;
- coordination responsibilities between sectoral Ministries and the aforementioned bodies;
- requirements and schedules for EIA preparation;
- guidelines on preparation of state of environment reports;
- if felt necessary, penalties for failures to comply with critical elements of the NCS, e.g. EIA preparation.

5.7 STRATEGIES OF SUSTAINABLE DEVELOPMENT INTERNATIONAL PERSPECTIVES

5.7.1 Introduction

Botswana is aware that its production and consumption activities create environmental problems not only for the country but also for the World as a whole and vice versa. These major forces associated with economic development that shape global environmental change have been identified; these are energy use, deforestation and population growth. The environmental effects of these forces have created global concerns in recent years and led to a host of conferences to try to find solutions to these problems.

5.7.2 Energy Use:

Energy use, more than any other human activity, exacerbates the global environmental change, greenhouse gases, acid rain, nuclear waste, smog and oil spills.

Greenhouse gases such as carbon dioxide, methane, nitrous oxide, chlorofluorocarbons (CFC's) and carbon monoxide accumulating in the atmosphere threaten to warm the earth's climate leading to flooding of coastal cities and shifting

of rainfall patterns; furthermore they lead to global ozone reduction, creating a hole in the ozone layer of the earth and exposing all life to dangerous levels of ultra violet radiation. Acid rain carried by wind across international boundaries has damaged large areas of forests. The high consumption of energy in the Developed Countries (DC's) and the growing need for energy to sustain economic growth with the high population increase in the LDC's suggest the size of potential energy demand and the extent of the associated environmental problems that will accompany rapid economic development in the LDC's. The need for global action to arrest this problem cannot be overemphasized.

The starting point in arresting the problem is to create awareness, particularly in the LDC's, about the seriousness of the problem. There seems to be a general view in these countries that the Developed Countries which consume a disproportionate share of total world energy should bear responsibility for addressing the problem. This is a rather negative approach to the problem which Botswana does not share. Given the level of development and resource limitations in the LDC's, it is clear that the LDC's are the least capable of protecting themselves against the adverse effects of energy use. The United Nations and some of its specialized agencies such as the UN Environmental Programme, UNDP as well as other global bilateral organizations are better placed to create awareness among LDC's through seminars, conferences and workshops. Once awareness of the problem has been created, countries can then be persuaded to subscribe to the various international conventions and protocols which have been drawn up during the past few years. For example, the Helsinki Declaration adopted at the First Meetings of the parties to the Vienna Convention on the Protection of the Ozone Layer (March 1985) and the Montreal Protocol on Substances that Deplete the Ozone Layer (Sept. 1987) called on the states that had not done so to join the Vienna Convention and its Montreal Protocol. Botswana's production of the controlled substances is virtually nil. However, motivated by a strong desire for global solidarity, the Government of Botswana decided to ratify the Vienna Convention and the associated Montreal Convention and announced its decision to do so to the Second Meeting held in London in June 1990.

As the earth's climate changes, the variability of climate will increase, and the more climate extremes may be experienced. Botswana is an arid and semi-arid country in the Southern African Subcontinent and vulnerable to recurrent droughts which disastrously affect the already fragile food and agriculture situation in the country. The consequence of global warming are expected to adversely affect our area and enhance the frequency and severity of droughts. This is a matter of great concern to Botswana and hence Botswana is keenly interested in the climate change issue and is carefully watching development in this regard. Botswana has been regularly participating in international meetings on the subject of climate change and supporting the activities of the Intergovernmental Panel on Climate Change (IPCC) sponsored jointly by the WMO and UNEP.

Secondly opportunities exist in the field of technology for addressing the problem of energy use. Experts believe that the information and technologies that form the basis of ecologically sustainable development are already in existence, and

although, new technologies and further research will aid development, the existing technologies can be tapped to achieve considerable success in conserving energy.

According to a world renowned specialist on conservation of biological resources, *"In 1981 LDC's with low incomes spent 61% of their export earnings on oil imports. Using oil more efficiently would alleviate a portion of the debilitating balance of trade deficits that plague most of the Third World. Better use of renewable energy resources would have even more direct impacts. Biomass (mostly wood) accounts for 40% of energy use in developing countries; increased energy efficiency in cooking-stoves and other apparatus could lessen the many problems associated with deforestation. Nevertheless, less than 1% of all international aid has been earmarked to improve energy efficiency, and, not surprisingly, relatively few development projects take advantage of efficiency gains. The absence of energy-efficiency projects from development portfolios cannot be attributed to economic or technological shortcoming. That projects stressing energy efficiency can succeed and help both the industrial sector and the rural poor has been proved with an improved Kenyan savings in fuel amounting to 1.5 million tons of wood (Walter V.C Reed: Sustainable Development: Lessons from Success" in Economic Impact No. 71 1990/91)*. Still in relation to technology, it has been suggested that there is need to resort to less polluting forms of energy generation (e.g. generation of electricity) and renewable forms of energy (e.g. solar power). Here the international community, especially Developed Countries can greatly assist by increasing the component of developing aid going into energy-efficiency.

5.7.3 Deforestation and Population Growth

The other two forces associated with economic development that shape global environment change are deforestation and population growth. Increased logging, agricultural expansion and urban growth which are the result of increased population growth, contribute to the destruction of forests. Deforestation undermines development by destroying watersheds, reducing fuel and contributing to global climate change. Botswana is very much aware of this problem and we have seen in the preceding chapters how the growth in both human and cattle population are threatening existing forests leading to resort to poor and marginal land. While admittedly the halt to deforestation can be better handled at the country level through tree planting, internalization of technology in agricultural practices and better land use and management, the propelling force behind it, that, is, increased population growth poses a more complex problem. The population problem and what can be done is at the country level, solution devolves on making aid available for family planning and population-related studies.

5.7.4 Conclusion

The so called global commons arising from energy use, deforestation and population growth constitute a common problem for all countries - whether developed or less developed. If each country had the resources to promote ecologically sustainable development within its own borders, perhaps the problem will not assume the proportions that it has at the moment. However, it is unfortunately true that some

countries do not even have the resources to arrest their more pressing problems of poverty, malnutrition, unemployment and inequalities in the distribution of incomes. This makes it difficult to these set of countries to incorporate environment concerns in their development strategies. Furthermore the debt burden of these countries severely limit the resources available to them for development. The current threat to life on this planet makes a compelling case for new perspective on the world debt problem and on development assistance to LDC's.

REFERENCES

Arntzen, J.W. and E.M. Veenendaal (1986). A Profile of Environment and Development. Gaborone, National Institute of Development Research and Documentation.

Brown, C. (1983) Institutions Research project (IRP) Applied Research Unit MLGL

Campbell, A.C. et al (n.d.) The Contribution of Biological Diversity as a Resource to the National Conservation Strategy

Central District Land Use Planning Unit and Kalahari Conservation Society (1989). Proposed Land Use Plan for Makgadikgadi Region. Gaborone, Ministry of Local Govt. & Lands

Christopherson K.A. et al (1989) Botswana Action Program and Plan. USAID Natural Resources Management Support Project.

Classes, G.a. (1990) Small Scale Rural Water Supplies, Gaborone Government Printer.

Cooke, H.J. (1985) "The Kalahari Today - A Case of conflict over resource use". The Geographical Journal 151 Part 1 pp.75-85.

DVC Consulting Engineers (1980) Countrywide Animal and Range Assessment Project 7 volumes Gaborone, Ministry of Commerce and Industry and European Development Fund.

Economist Impact/71: A Quarterly Review of World Economics: Economic Development and Environment, 1990.

Gibson D.C. (1988) "Forest, Veld and Wildlife Resources: Towards Sustainable Development"

Hitchcock, R. (1982) Competition and conflict: Peasant, Pastoralists, Hunter-gatherers" in R.P. Werbner (ed) Land Reform in the Making London, Rex, Collings.

Hubbard, M.E.V. (1983) Botswana and the International Beef Trade Before C1990-1981 PhD. Thesis, University of Sussex.

Ministry of Agriculture (1989) National Land Management and Livestock Project Monitoring and Progress Report 1989-89, Gaborone

Nchunga, M.L. (n.d) National Conservation Strategy: Wildlife (Animals). Gaborone Dept. of Wildlife and National Parks.

Oomen M.A. (1984) Rural Development: Experiments and Experiences of Botswana

Seers, D (1969) "The Meaning of Development" International Development Review Vol.11 No. 4.

Segosebe, E and C Van Der Post (1980) Urban Industrial Solid Waste Pollution in Botswana: Practice, Attitudes and Policy Recommendations (Gaborone, University of Botswana, Dept. of Environmental Science, mineo).

Swedeplan (1989) A Comprehensive Physical Plan for Greater Gaborone Region Gaborone, Ministry of Local Government and Lands.

Tumkaya N (1986) "An Overview of the Population Situation in Botswana" CSO.

Van Vegten, J.A. (1981) Man-made vegetation changes: An example from Botswana's savanna Gaborone, National Institute of Development Research and Documentation (NIR)

Van Vegten, J.A. (1982) "Increasing Stock numbers on deteriorating rangeland in R.K. Hitchcock (ed) Botswana's First Livestock Development Project and Its Future Implications Gaborone, NIR pp98-107.

World Bank: (1985) Economic memorandum on Botswana.

World Bank: (1989) SubSaharan African: From Crisis to Sustainable Growth

Woto, T. (1987) The Experience with small-scale Desalinators from Remote Area Dwellers of the Kalahari, Botswana, Kanye Rural Industries Innovation Centre

OFFICIAL DOCUMENTS

Bhalotra Y.P.R. (1991): The Atmosphere of the Living Planet. Dept. of Meteorological Service.

Bhalotra and Ramothwa G.K. (1989): Threat of Climate Changes. Dept. of Meteorological Services

CSO: Labour Force Study (1984/85

- : National Accounts of Botswana
- : Population Projections
- : Statistical Bulletin 1986, 1989
- : Selected Economic and Social Indicators
- : 20th Anniversary Issue 1986
- : Population Factors and Development 1987.

MoA: Agriculture Sector Assessment: A Strategy for the Development of Agriculture

MMRWA: National Water Master Plan (1991) Vol.2-5

MFDP: National Development Plans 6 (1985) 7, (1991).

MLGL: National Conservation Strategy: Action Plan.

Rep. of Botswana (1975) National Policy on Tribal Grazing Land, Gaborone, Government Printer

Rep. of Botswana, (1991) Budget Speech 1991. Gaborone, Government Printer.

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There has been some donor support for some of these activities. The EEC has donated funds amounting to P230 000 towards the activities of the National Conservation Strategy. Other support has come from the International Union for the Conservation (IUCN), USAID and UNDP.

