



# Botswana National Report for the United Nations Conference on Sustainable Development (Rio+20)



*SEANAMA CONSERVATION CONSULTANCY (Pvt) Ltd.*

*"Environment. People and Sustainability"*

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# **Botswana National Report for the United Nations Conference on Sustainable Development (Rio+20)**

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*"Environment, People and Sustainability"*

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## Abbreviations and Acronyms

AfDB	African Development Bank
AIDS	Acquired Immuno-Deficiency Syndrome
AWF	African Wildlife Foundation
BDC	Botswana Development Corporation
BEDIA	Botswana Enterprise Development and Investment Agency
BHC	Botswana Housing Corporation
BMC	Botswana Meat Commission
BPC	Botswana Power Corporation
BTO	Botswana Tourism Organisation
CBNRM	Community-Based Natural Resources Management
CBO	Community Based Organisation
CEG	Community Escort Guide
CFL	Compact Florescent Light
CI	Conservation International
CKGR	Central Kalahari Game Reserve
CSO	Central Statistics Office
DDP	District Development Plan
DTRP	Department of Town and Regional Planning
DWA	Department of Water Affairs
DWMPC	Department of Waste Management and Pollution Control
DWNP	Wildlife and National Parks
EAD	Energy Affairs Department
EDD	Economic Diversification Drive
EDF	Electricity de France

FAO	Food and Agriculture Organisation
GDP	Gross Domestic Product
GoB-UNPOP	Government of Botswana – United Nations Programme and Operational Plan
HIV	Human Immuno-deficiency Virus
IBAs	Important Bird Areas
ICP	International Cooperation Partners
ICT	Information and Communication Technology
IFAD	International Fund for Agricultural Development
IMF	International Monetary Fund
IWRM	Integrated Water Resources Management
JICA	Japan International Cooperation
KCS	Kalahari Conservations Society
KTP	Kalahari Transfrontier Park
KWh	Kilowatt-hour
LDC	Least Developed Country Status
LEA	Local Enterprise Authority
MDGs	Millennium Development Goals
MEA	Multi-lateral Environmental Agreement
MFDP	Ministry of Finance and Development Planning
MMEWR	Ministry of Minerals, Energy and Water Resources
MW	Mega Watt
NAMPAADD	National Agricultural Master Plan for Arable and Dairy Development
NDB	National Development Bank
NDP	National Development Plan
NGOs	Non-Governmental Organisation
NMT	Non-Motorised Transport
NSO	National Strategy Office
ORI	Okavango Research Institute
SADC	Southern African Development Community
SAP	Strategic Actions Plan
SB	Statistics Botswana
SHHA	Self-Help Housing Agency
UNAUNDS	Joint United Nations Programme on HIV/AIDS
UNCBD	United Nations Convention on Biological Diversity



UNCCD	United Nations Convention on Combating Desertification
UNCSD	United Nations Conference on Sustainable Development
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNIDO	United Nations Industrial Development Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNFPA	United Nations Population Fund
UNHCR	United Nations High Commission for Refugees
UNICEF	United Nations Children’s Fund
WHO	World Health Organisation
WMA	Wildlife Management Area
WSSD	World Summit on Sustainable Development
WUC	Water Utilities Corporation

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## 1. Introduction

The national assessment report is prepared in pursuance of the UN General Assembly Resolution 64/236 to call for a UN Conference on Sustainable Development (UNCSD) to take stock, 20 years after the historic United Nations Conference on Environment and Development (UNCED) or the Rio Earth Summit). The Conference will take place in Brazil on 20-22 June 2012 to mark the 20th anniversary of the 1992 United Nations Conference on Environment and Development, in Rio de Janeiro, and the 10<sup>th</sup> anniversary of the 2002 World Summit on Sustainable Development (WSSD) in Johannesburg.

The objective of the Rio+20 Conference is to secure renewed political commitment for sustainable development, assess the progress to date and the remaining gaps in the implementation of the outcomes of the major summits on sustainable development, and address new and emerging challenges. The Conference will focus on two themes: (a) a green economy<sup>1</sup> in the context of sustainable development and poverty eradication and (b) the institutional framework for sustainable development.

In preparing for the Rio+20 conference, countries and regional blocks have conducted assessments on their progress towards achieving sustainable development, their barriers and opportunities. At a regional and continental level, more attention has been given to the global institutional architecture and the role of various mechanisms aimed at facilitating progress towards sustainable development. In the context of Botswana, engagement has taken place at national level, at the level of the Southern African Development Community (SADC), and at continental level through the African Union process that developed the Africa Consensus Statement to Rio+20.

The Ministers of Africa, in the African Consensus Statement from the Africa Regional Preparatory Conference held in 20-25 October 2011 in Addis Ababa, Ethiopia, emphasized the need to enhance understanding of the Green Economy as a way to protect and sustain natural capital, improve resource efficiency, including innovative financing and sustainable consumption and production, and enhance contributions to sustainable development. They further called on the international community to put an international investment strategy in place to facilitate the transition to a Green Economy. They welcome an exchange of experiences and best practices on innovative policies and practices on sustainable forms of farming, renewable energy development, ecosystem-based adaptation, resource efficient production, and enhancement of natural capital.

In terms of the national process for preparing for Rio+20 Conference, Botswana convened a national workshop on Green Economy in September 7 – 8, 2011 and a National Workshop in January 31 - February 1, 2012 to Review the Zero Draft Outcome Document. The two events have further catalysed discussion on the Green Economy and the importance of Institutional Frameworks (both local and global) in delivering Sustainable Development. The main outcome from the Green Economy Workshop was the preliminary Vision of Botswana's Green Economy as captured in the statements below:

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<sup>1</sup> A Green Economy is one that results in improved human wellbeing and social equity, while significantly reducing environmental risks and ecological scarcities (United Nations Environment Programme, 2011). Operationally, it entails adoption of low carbon options, greater resource efficiencies and social inclusion.



- **Botswana’s competitiveness** is improved through a preferential focus on diverse, productive and sustainable operations
- **Stakeholders are well-networked** so that information flows improve, innovation increases, and partnerships form to achieve shared goals
- **Citizens and poor people in particular are empowered** and thrive in the economy through decent jobs and livelihoods
- **Government incentivises** a Green Economy through enabling conditions, setting high standards across the sectors, and runs its own operations in a consistent (green and ethical) manner
- **Botswana private sector leads growth**, takes initiative and transforms itself to become more efficient and inclusive; domestic investment is mobilised, and responsible foreign investment is attracted, towards *green* infrastructure, goods and services
- **Major issues are properly mainstreamed** including environment and poverty reduction and there is strong leadership to move to action
- **Resilience** is improved through planning that takes a more integrated, coherent, futuristic and outward looking approach
- **Accountability** of all stakeholders is improved, through transparent information on resource stocks, flows and damages and a robust legal framework
- **Built on solid knowledge, scientific and cultural principles** including indigenous knowledge and *Botho* (humanity, respect, courtesy, community, dignity, cultured)
- **Internationally secure and responsible** – cognisant of, and contributes to, Botswana’s dependence on and role in the region and the world

The workshop further identified the sector of natural resources, tourism, energy and waste as candidates for the initial phase of Green Economy in Botswana. A further elaboration of Botswana’s opportunities and challenges for Green Economy was made through the Rio+20 Issues Paper prepared in October 2011. The Issues Paper identifies five building blocks, all of which are considered to be within the realm of the attainable for the country;

- low-carbon energy, infrastructure and transport
- sustainable systems of food production, water and sanitation, and waste
- ways of protecting and sustainably using biodiversity green jobs and livelihoods that ensure social justice and equity, and set real measures for progress and wellbeing
- investment in green sectors, environmental ‘accounting’ and the introduction of new business models
- policy reform which provides for enhanced decision making through broad participation across sectors

## 1.1. Development Context

Botswana remains one of Africa's success stories, having transformed itself from a Least Developed Country Status (LDC) at the time of independence in 1966 to a Middle Income Status within three decades. This transformation was propelled mainly by effective use of revenues from mineral resources such as diamond. Real per capita income rose from US\$250 in 1960 to US\$4,800 in 2008 (in constant 2000 US\$)(World Bank, 2010).

Botswana's economy is dominated by the mining sector, mostly diamonds, which accounts for about one-third of Gross Development Product (GDP), more than 50 percent of total export earnings and around 50 percent of government revenues. Even though the country's overall economic growth record is impressive, it has been volatile in recent years, particularly so since 2003, with real GDP growing at an average annual rate of only 3.6 percent during the period 2003-10, below the Vision target of 8 percent. Thus, trend growth has evidently slowed down in the last decade. This is particularly so since the country is prone to large unanticipated fluctuations in export earnings from the mining sector, as well as recurrent droughts.

Government efforts through the investments of the Botswana Development Corporation (BDC), the National Development Bank (NDB), the Citizen Economic Development Agency (and its precursor the Financial Assistance Policy), the Local Enterprise Authority (LEA), and Botswana Enterprise Development and Investment Agency (BEDIA) are all hands-on endeavours towards economic diversification. At a policy level Government takes guidance from the Botswana Excellence Strategy for Economic Diversification and Sustainable Growth (2008) and from the 2010 Economic Diversification Drive (EDD), a comprehensive strategy framework to pursue economic diversification through various strategies. Sector specific policies such as the draft National Policy on Agricultural Development, the recently approved Policy on Forestry, the 2008 Policy on CBNRM, the draft Wildlife Policy, and others also include reference to and objectives towards economic diversification..

Vis-à-vis governance, the country is a stable democracy and continues to enjoy superior international ratings in good governance and relatively low levels of corruption. In 2011, the Mo Ibrahim Index of Africa Governance ranked Botswana on position 1 in terms of accountability and the rule of law and 3<sup>rd</sup> in Africa for governance. Botswana scored 76 (out of 100) for governance quality and an overall rank of 3<sup>rd</sup> out of 53 countries. On the Corruption Perception Index compiled by Transparency International, Botswana was ranked 32 out of 183 countries included in the 2011 survey.

## 1.2. Environmental Profile

Botswana is a semi-arid country with a south-west to north-east rainfall and temperature gradient. The country is relatively flat, at roughly 900 metres above sea level, with gentle undulations and occasional rocky outcrops. Botswana's physical environment of dry and poor soils accounts for its varied population distribution. The population is concentrated in the eastern parts of the country suited for arable production due to relatively more favourable climatic and soil conditions.

Due to the semi-arid climate, most rivers and streams in Botswana are ephemeral; and as a result, most valleys are usually dry, except during the rains. Perennial rivers include the Okavango and Chobe,

which have their sources outside the country. The Makgadikgadi Pans represent the inland drainage basins into which some rivers, such as the Moseitse, Nata and Boteti, flow during the wet seasons.

#### **a) Climate**

Because of the country's location in the sub-tropical high pressure belt of southern hemisphere in the interior of Southern Africa and away from oceanic influences, rainfall is low and temperatures high. There is, therefore, high inter-annual variability of rainfall and drought is a recurring element of Botswana's climate. Drought adversely affects the already fragile food and agricultural situation in the country and seriously impairs the rural economy and socio-cultural structures

The mean monthly maximum temperatures range between 23°C to 25°C in the northern parts of the country and 21°C to 23°C in the southern parts. The lowest mean monthly temperatures vary between 1°C to 5°C over the eastern areas and 5°C to 7°C in the northern parts of the country. The highest mean monthly temperatures range between 22°C and 24°C and are recorded in the month of January.

#### **b) Vegetation and Soil**

Vegetation types are closely correlated with climate. The vegetation located away from the bush swampland of the Okavango Delta, experience long, dry periods each winter season and recurring summer droughts. The Chobe District in the north has comparatively high rainfall and therefore sustains belts of indigenous forest and dense bush and some exploitable hardwood resources. The Makgadikgadi pans, located further south are surrounded by treeless grass savannah. The mopane tree dominates the north-east and the hinterland of the Okavango, while more than half of the country supports scrub and tree savannah. The tallest trees and most dense forest are found in areas where there are good rains and best soils, while drier regions, mostly in the south and western parts of the Kalahari, support only a low scrub savannah. Low rainfall and poor soils are found particularly in the Kalahari, so that the rangeland supports, at best, a low density livestock and wildlife. Rangeland degradation occurs when the carrying capacity is exceeded, leading to a change in the vegetation patterns of the range.

### 1.3. Sustainable Development Stocktaking

Botswana's review of progress on sustainable development pays particular attention to the investments on human capital that have enabled a functional system of government, a progressive system of education, a country-wide health system and a system of justice that embraces both cultural and modern values. The stocktaking report further recognises the commitments that Botswana has made to the international community in terms of the various treaties and protocols aimed at the country's sovereign development needs but also due recognition of the rest of humankind.

The current thinking on sustainable has not deviated from that of the World Summit on Sustainable Development in 1992 but the focus on human wellbeing has only been more sharpened through the Millennium Development Goals (MDGs). Even as globally, progress has been realised in the attainment of the MDGs, ecosystems continue to suffer and their services to society, (especially poor people) decline making it even harder to fully achieve the MDGs. In taking stock of Botswana's progress towards achieving sustainable development, there is the recognition that the MDGs, though significant in helping to reduce poverty of millions of people, continue to fall short of securing the integrity of ecosystems and their services. The context of sustainable development thus needs to expand the measures of progress more substantially to include ecosystem health. The stocktaking exercise in Botswana has used the Agenda-21 Framework and juxtaposed the Green Economy and Institutional Framework for Sustainable Development elements across the Agenda-21 components. The results are structured into two main sections; (i) Socio-economic Development, Conservation of Natural Resources and (ii) Green Economy Imperatives. The Report ends with an analysis of barriers to sustainable development (of which Green Economy is a part) and policy measures for removing the barriers.

## 2. Social Development Progress and Eradication of Poverty

Despite its impressive growth rate Botswana faces serious challenges related to chronic unemployment and high poverty levels and inequality (for an upper Middle Income Country), exacerbated by the HIV/AIDS pandemic. The unemployment rate worsened from 14% in the early 1990s to 24% in 2004/05 and is estimated at 17.8% in the latest Labour Survey (2011). The unemployment rate for females stood at 21.4% compared to 14.5% for males. Females make up 57.5% of the unemployed, compared to 42.5% for males. The age group distribution suggests that the highest unemployment rate of 41.4% was among the 15-19 years age group, followed by the 20-24 year age group at 34.0%. Except for the age group 60-64, the unemployment rates for females are higher than those for males, peaking at 50.5% for the age group 15-19 years. The unemployed are predominantly young, with those aged 12-24 years accounting for 48%, while those below the age of 30 years constitute 60.8%. Thus, the unemployment rate generally decreases with age. In addition, those with some secondary education, constituting 46% or 80,008 of the 126,349 unemployed persons, had the highest unemployment rate of 24.4%, followed by those with non-formal education at 17.4%, primary (16.4%), no education (10.9%), tertiary (8.4%) and university (5.1%) (Statistics Botswana, 2011).

Poverty levels and inequality are high and the country still reflects low human development indicators, though Botswana's second progress report on the Millennium Development Goals (MDGs) released in November 2010 indicates that the country is on target on most of these goals (Government of Botswana and the United Nations, 2010). Even though preliminary 2009/2010 poverty data indicates that the proportion of people living below the poverty datum line at the national level declined from 30.6% in 2002/2003 to 20.7% in 2009/2010, indicating a decline of 9.9%, incidence of poverty and income inequality are very high for an Upper Middle Income Country (see Table 1 below).<sup>2</sup> The paradox of high and sustained growth rates existing alongside high levels of unemployment and poverty can be traced to the growth dependent on the mining sector with few linkages to the economy hence not pro-poor and inclusive. As the International Monetary Fund (IMF) Article IV Consultations Report (2011) correctly observed, Botswana faces the challenge of improving the quality of its growth and the mismatches between labour demand and supply to tackle high unemployment. Thus, improving the quality of growth – including addressing the high level of unemployment and inequality is important to sustain long-run sustained shared growth.

**Table 1: Income Poverty measures by strata for the period of 2002/03 to 2009/10 (Statistics Botswana, 2011).**

Strata/Region	Head count ratio (%)	% of households < PDL	# of persons < PDL	Head count ratio (%)	% of households < PDL	# of persons < PDL
	HIES* - 2002/03			BCWIS – 2009/10		
Cities/towns	10.6	8.8	39,113	14.0	13.3	51,793
Urban villages	25.4	17.4	138,547	18.8	12.2	123,051
Rural areas	44.8	33.4	321,808	25.5	17.6	198,544
National	30.6	21.7	499,467	20.7	14.7	373,388

## 2.1. Progress on Programmes and Projects

Botswana's rural population continues to be the main focus of poverty reduction in response to the strong evidence poverty having a rural bias in proportions of people living below the poverty datum line (Government of Botswana and the United Nations, 2010). The bulk of the programmes on economic and social development target rural areas through enabling their efficient use of natural resources. Specific programmes and projects contributing to the attainment of social and economic goals are directed by the following; Revised National Policy for Rural Development (Ministry of Finance and Development Planning, 2002), Revised National Settlement Policy (Ministry of Lands and Housing, 2004), and the Community-Based Natural Resources Management Policy (Ministry of Environment, Wildlife and Tourism, 2007). These policies also provide the foundation for sectoral policies on water, energy, agriculture, education, health and social security. The assessment of progress therefore looks across the spectrum of policies, programmes and projects to illuminate areas of success and weaknesses.

<sup>2</sup> This is exacerbated by the HIV/AIDS pandemic. The HIV prevalence rate in Botswana is one of the highest in the world at 17.8% in 2008.

Access to land for residential and productive purposes, and the requisite sanitary conditions form a major part of human dignity and their extreme deprivation could result in deepening levels of poverty. Land administration, allocation and management remain high priorities with costs for services kept way below market rates, for instance, P70/m<sup>2</sup> in urban areas and land allocations made at no charge in tribal land. This noble pursuit to improve access to land achieves optimum results when coupled with an efficient system of land allocations where that prevents multiple allocations as they create artificial shortages and false markets – usually to the detriment of poor people. Even with these challenges, landlessness remains a minor issue in the poverty debate in Botswana. The challenge is with the provision of social services, which for a small population (below 3million), the per capita costs are high (Government of Botswana and the United Nations, 2010). Provision of social services is directed by Urban Development Plans specific to each city, town or township. Rural Development is directed by Village Development plans, currently prepared only for major villages.

Significant progress has been achieved in improving access to decent housing in addition to government providing credit to low-income households for housing. In the case of urban areas, the enforcement of building standards has been progressive, though not without challenges. Building standards for both commercial and residential developments remain a high priority nationally. The standards now include additional requirements for the disabled, pedestrians and cyclists vis-a-vis parking and building access-points as of 2012. They are expected to evolve further to include energy and water efficiency parameters, some of which are at drafting stage. A commensurate commitment in the road construction standards is still lacking but the said standards are currently being revised. These reforms represent bold steps towards improving the quality of urban settlements.

At the residential level, the low-income housing scheme called Self-Help Housing Agency (SHHA) now offers credit only as turn-key delivery. This follows from a merger with the medium and high-income housing parastatal, the Botswana Housing Corporation (BHC). The system of turn-key delivery is meant to address housing standards and thus help poor people benefit from the property market by simply complying with building standards – something that has depressed the market value in low-income areas (where it is needed most). The turn-key solution needs to be acknowledged only as a part-solution that covers only those requiring housing credit. Self-financing households may still continue developing outside the standards, weakening the market value of their investment and that of others. Municipalities therefore need to enforce the standards and educate politicians and residents that building standard are not a deprivation but a benefit the poor need.

*Enforcing Building Standards in low-income urban areas is not to punish poor people. Building Standards are as important to poor people in enhancing their place in the property market as education is to their children. These children still attend school and write the same national examinations as every other child in order to join the mainstream economy; and when they do, life is never the same for that family ever again!*

## 2.2. Progress on MDGs

Education, gender and health-related human development targets have progressed with visible reductions in poverty levels, maternal and child mortality, increases in school enrolment (with gender parity archived) at primary school level. Gender parity has also recorded significant improvements in

the public and business sector (45% in 2009). Gender gaps still exist in specific parts of the country, especially in rural areas. There appears a rural bias of poverty and gender gaps as indicated in the Botswana Census-Based Poverty Map of 2008 (Central Statistics Office, 2008). Some of the phenomenal results include reduction from 40% to 4% of mother-to-child HIV transmission; a 93% national average of population with access to safe drinking water; and an increase of cellular subscriptions from 25% to 77% in 2008 (Government of Botswana and the United Nations, 2010).

Progress in access to safe drinking water and access to energy, especially electricity has multiplier effects on nearly all of the MDGs as they leverage the potential of poor people otherwise suppressed by such barriers as lack of information and poor health. Access to cellular phone as a proxy to the wider access to information and communication technology (ICT) often tags on access to electricity. At phenomenal per capita costs, government has extended the grid electricity to some of the very remote areas. Even with the lowest of connection and consumption rates, such access does provide the spring-board for accessing ICT.

### 2.3. Water Services

Provision of water, energy, education and health services remain high in the development agenda. Water for human consumption is provided through Water Utilities Corporation (WUC), following the recent water-sector reform. WUC also provides wastewater services. Botswana's access-to-drinking water has at 2001 reached 99.5% for urban area and 83.5% for rural areas (Central Statistics Office, 2009). Total surface water capacity is currently at 697.1Mm<sup>3</sup> while underground capacity (developed resources) is at 131,290 m<sup>3</sup>/day. The rate of abstraction of underground water in a number of well-fields exceeds sustainable limits (see Figure 3 below). These are Dukwi, Serowe, Kanye and Tsabong. The three well-fields supply major population centres while the one in Dukwi supplies a small population centre and a nearby mine. Water losses also represent a major water security challenge. At 45% water-losses, water efficiency levels need to be increased drastically. Most villages are at the peak of their resource availability with water losses factored in. A 45% increase in water availability may be achieved by either developing more water resources (assuming

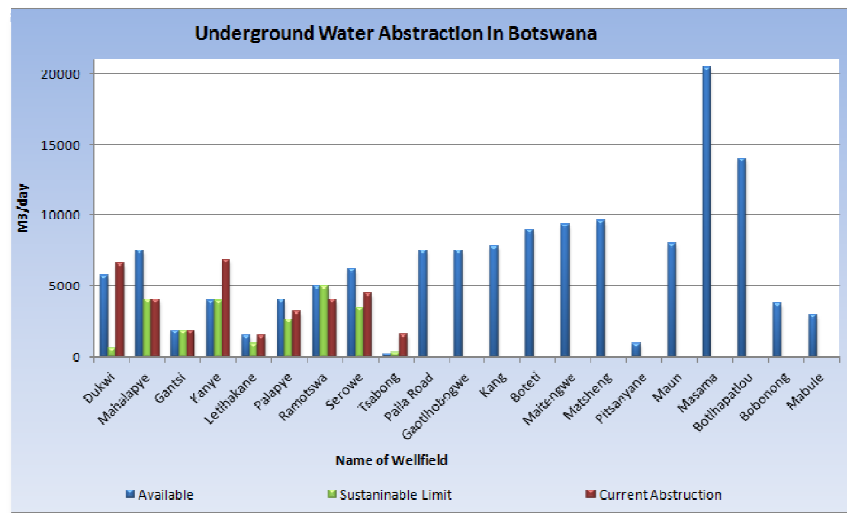


Figure 1: Underground water availability, extraction rate and recommended sustainable off-take levels (Central Statistics Office, 2009).

infinite availability) or reducing water losses. A water-losses management programme should therefore be a major national priority. The highest per capita consumption recorded of 0.433 m<sup>3</sup>/d is

for Selebi Phikwe, a mining town in north-eastern part of the country where mine residents are subsidised for water consumption. This is more than double (2.35x) the rate of Gaborone city, clearly representing a perverse incentive on the water consumption subsidy.

## 2.4. Energy Services

Energy services are coordinated by the Energy Affairs Department (EAD) under the Ministry of Minerals, Energy and Water Resources (MMEWR)(Ministry of Finance and Development Planning, 2010). The Department is currently tabling a national policy on energy services. The policy aims to deliver a more integrated energy package drawing from multiple sources and delivering multiple forms of energy that include electricity and heat, especially in rural areas where the emphasis has been on electricity provision despite the bulk of household-needs for heat energy being met by firewood (see Figure 5 below). According to the snap-shot of 2007 (Figure 4 below), petrol is the most consumed energy source (33%) followed by coal and electricity (25% each), diesel (12%) and other sources at about 1% each including solar (Energy Affairs Department, 2007). Total consumption on petroleum products reached its 1.54Mm<sup>3</sup> peak in 2007 and thereafter declined to about 0.85Mm<sup>3</sup>, thereafter assuming a much lower growth-rate of 5% per annum. The 2011 record was just over 0.91Mm<sup>3</sup> (Energy Affairs Department, 2012). The period of the decline in consumption rates coincides with the global fuel price-hikes and reflects the rate at which the economy was able to adjust to reduced fuel consumption. Vis-à-vis the snapshot of 2007, it does not include firewood, the 1981-2003 trend (Figure 5) however shows firewood consumption being higher than petrol and diesel combined(Central Statistics Office, 2007), and declining only slightly at the end of 2003.

Consumption by sector shows the transport sector as the largest consumer of energy at 43% of the total national energy budget. Mining is the largest consumer of electricity while households are the largest consumers of paraffin. Wood resources are not reflected in the 2007 energy report but are an important and dominant contribution to the energy budget of many households, especially in rural areas. Wood resources are managed by the Department of Forestry and Range Resources under the Ministry of Environment, Wildlife and Tourism.

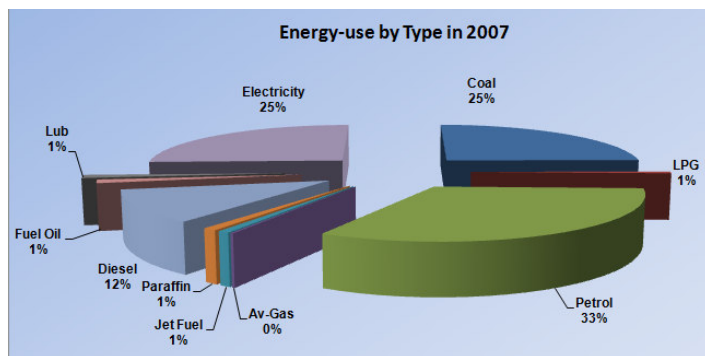


Figure 2: A snap-shot of energy consumption in 2007 showing the different energy sources, measured in Tonnes of Oil Equivalent - TOE (Energy Affairs Department, 2007).



The National Development Plan of 2010-2016 places more emphasis than previous similar plans on renewable energy (solar and biogas) to respond to the abundance of both solar energy and cow-dung in Botswana. The current geographical penetration of electricity is estimated to be over 75% of the

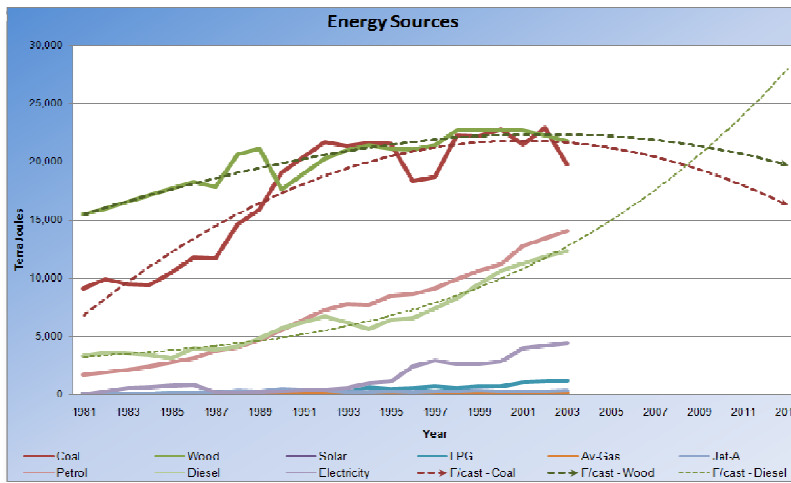


Figure 3: Energy trends for the period 1981-2003 with forecasts on firewood, coal and petrol (original data from (Central Statistics Office, 2007).

villages in the country. Consumption ranges between 1.5 and 1500 KWh per day. With a combination of solar, biogas and wood-efficient techniques, the same coverage could be achieved at cost estimated to be 40% less. To address these efficiency issues, Botswana Power Corporation (BPC) and Electricity de France (EDF) formed a rural energy services franchise called BPC-Lesedi which retails

solar home systems, wood-efficient cooking stoves, heat-retention cooking bags and solar lanterns.

Cleaner energy sources are also being developed for the urban environments. A 1.3MW power-plant driven on solar is under construction in a high-income residential area north of Gaborone city. In addition to matching the consumption, the power-plant will feed excess energy into the national grid. Other opportunities for similar facilities exist although their implementation has been stalled by the lack of a Feed-in Tariff structure. The said structure has been delayed by the lack of consensus on the unit price (P/KWh) to be paid by the Botswana Power Corporation to the Independent Power Producers. These opportunities stand to scale-up energy-generation in rural arid parts of the country where land for establishing solar farms is more readily available.

## 2.5. Rural Development Planning Services

The ability of rural villages to increase and diversify production and income sources, to create sustainable jobs and contribute to the broader national development goals depends to a large extent on their capacity to plan for village development on the basis of locally available resources and to integrate such plans to the district and national plans so as to benefit from the larger infrastructure dispensation and global markets. This is the basis for the Revised National Policy for Rural Development (Ministry of Finance and Development Planning, 2002). Progress to date has been visible on urban development planning and planning for major villages. These plans do however fall short of capturing the full range of sustainable development targets, as evidenced by a number of lags in settlement distribution, wastewater management and transport. Capacity at rural levels for development planning requires scaling up to meet the expectations of the policy. Exemplary investments in rural planning capacity include those associated with the implementation of the Community-Based natural Resources Management policy where in community institutions developed natural resource-use plans, received training in inclusive governance, commercialisation of local

resources and biodiversity conservation. This is now being extended beyond community wildlife management concession to include monuments and relicts.

### 3. Conservation and Management of Natural Resources

The conservation and management of natural resources is one pillar of the three that constitute sustainable development which provides the resource-base on which economic activity derives and on which the society depends either directly (as many rural dwellers do) or indirectly. Botswana has placed environmental management in her top priorities in recognition of the role it places in sustaining the economy and more importantly, the role it plays in supporting the rural poor. There still remain some gaps that are globally systemic of how to make the linkages between natural resources and the economy work for the poor. At best, two policies play a major role in proving the framework for this to happen. These are the Revised National Policy on Rural Development and the Community-Based Natural Resources Management Policy. The former articulates the governance, systems and capacities required to achieve poverty reduction in rural Botswana while the latter devolves the management and user-rights of natural resources to local rural communities. Cascading to the operational levels of sustainable development are sector specific policies to effect (i) social development at various levels, and (iii) transformation of natural and human capital into economic outputs.

#### 3.1. Progress on Programmes and Projects

Programmes and projects on the Conservation and Management of Resources are defined principally in the National Development Plan (NDP 10) and in the respective programmes of support agencies such as Non-Governmental Organisation (NGOs), International Cooperation Partners (ICP) and the Private Sector. The National Development Plan (NDP 10) identifies the following priority areas for the country: Land management and administration; energy, water and biodiversity management.

Conservation of nature is pursued mainly through a network of protected areas of various categories of protection. The total land-area under protection stands at 170,850km<sup>2</sup>, representing a minute increase since 2002, mainly from monuments, sanctuaries and private game reserves. A National Botanical Garden hosts 600 indigenous plant species for ex-situ conservation. Privately-owned protected areas constitute less than ½ a per cent of the total protected area estate of Botswana (Central Statistics Office, 2011). This ratio is one of the lowest in southern Africa. Vis-à-vis wildlife population trends, elephant, buffalo, hippo, tsessebe, lechwe and warthog populations increased significantly during the 2004-2007 period. Other species such as giraffe, zebra, eland, gemsbok and springbok experienced a decline in population size for the same period. These statistics are at national level and localised variations have been recorded (Central Statistics Office, 2011).

Research on natural resources is undertaken mainly by the Department of Wildlife and National Parks (DWNP) and the Okavango Research Institute (ORI). Non-Governmental Organisations such as African Wildlife Foundation (AWF), Kalahari Conservations Society (KCS) and Conservation International (CI) also conduct research through partnerships with international and local researchers. Other research activities done by KCS involve leopard, crocodiles, flamingo, and fish. These are important for illuminating the anthropogenic relations with biodiversity and shaping policy. Other research is implemented through the Okavango Research Institute, Birdlife Botswana and Department of Wildlife & National Parks on natural resources and ecosystems covers.

Collectively, this constitutes the national research agenda. Some of the highlight research is on species ecology, specifically lion and elephant. Research on invertebrates is less common although these are

more immediate indicators of the ecosystem changes. The only notable on-going invertebrate research is on dung beetles. More research is needed on the socio-economics of natural resources. These include impacts of hunting on wildlife, impacts of climate change on biodiversity, especially noting that temperature and humidity influence a number of physiological processes such as the sex-ratio in crocodiles, the migration times of bird species, mating time for mopane butterflies, etc. Further research on nutritional value of various wild fruits is also important to stimulate markets for veldt products.

### 3.2. Protected Areas and other Natural Ecosystems

Botswana has taken a firm stand to devolve the management and use of natural resources to local communities through the Community-Based Natural Resources Management (CBNRM) Policy. The policy has raised the value of wildlife concessions by over 100% in the last 10 years, mainly through rentals by private sector companies for tourism. The policy has also facilitated stronger natural resources governance at community level, with over 105 Community Based Organisations (CBOs) (Mbaiwa, 2011). There is evidence of a steady increase in the area of land under protection as more local communities request for gazettement of protected areas on condition of a devolved management and user-rights framework.

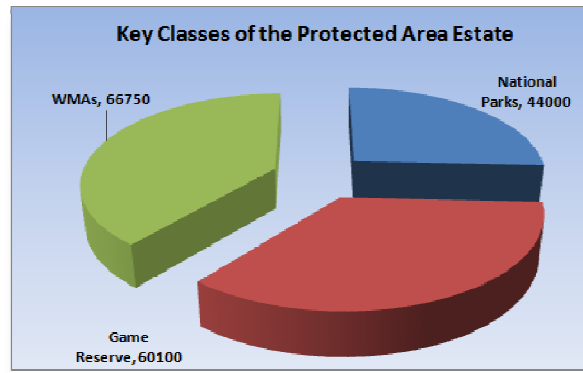


Figure 4: Proportions of various types of protected area constituting Botswana's protected area estate NB: Figures in Km<sup>2</sup>. (Mbaiwa, 2011)

These include Important Bird Areas (IBAs) facilitated through Birdlife Botswana as part of the Wildlife Management Areas (see Figure 6 below). Further work in increasing the area of land under protection is done through the 100-Monuments Programme commissioned through a Presidential Decree. To-date, 30 sites have been identified and Management & Development Plans are under preparation as a pre-requisite for their gazettement. The plans also define the role of local communities in managing the sites and deriving incomes through tourism and cultural exploitation (including music). Other work aimed at combating desertification and conserving biodiversity has covered the Kalahari desert through the support of the French Development Cooperation's FFEM funding implemented through Conservation International (CI). The project covered communal land between the Central Kalahari Game Reserve and Kalahari Trans-frontier Park (KTP)

According to the latest CBNRM Status Report (Mbaiwa, 2011), CBNRM in Botswana was motivated by threats of species extinction due to over exploitation; the inability of the State to protect its declining wildlife resources; land use conflicts between rural communities living in resource-rich areas and resource managers, especially wildlife managers; and the need to link conservation and development objectives and activities. Since the commencement of the policy, a structured approach and set of guidelines by government helped strengthen conditions for conservation in CBNRM areas. All Community-Based Organisation using natural resources are to incorporate natural resource management goals in their constitutions and produce conservation management plans. CBOs have

also been required to prepare annual reports on the implementation of conservation management plans as a pre-condition to receiving wildlife quota for the subsequent year.

Other community-level investments in nature conservation have included the hiring of Community Escort Guides (CEGs) to patrol CBNRM areas and enforce community resources management regulations. They also escort safari operators and community members during hunting excursions.

Tourism has been the main economic activity in the majority of the CBOs managing Wildlife Management Areas. The volume of tourists visiting the national parks and game reserves (see Figure 7) in addition to those in community and private concessions have increased the contribution of tourism to the GDP and the investment in green initiatives that come with wilderness-based tourism. The majority of the tourists visiting national parks and game reserves originate from South Africa and other African countries.

Progress in tourism is admirable, especially in the top-end segment of the market. This is however limited to high biodiversity areas and is vulnerable to global events. Middle to lower end of the market carries a high potential for diversifying the tourism product away from large mammals into birds, landscapes

and culture. Such a diversification will bring with it more local companies into the sector. The Botswana Tourism Organisation is pursuing an extensive marketing campaign to promote other parts of Botswana - capturing the desert and salt-pan ecosystems. The level of use of the existing national parks and game reserve for day trips is low in exception of Chobe National Park. It reflects the low volume of tourism in the areas neighbouring the parks and reserves (see Figure 8 below). This represents another area of growth for the tourism sector, especially involving local communities neighbouring the parks and reserves. Such a Green Economy opportunity needs to be expressed through community development plans, cascaded up into District Development Plans (DDPs) so that the infrastructure planning can be based on supporting local businesses and thus generating more economic returns.

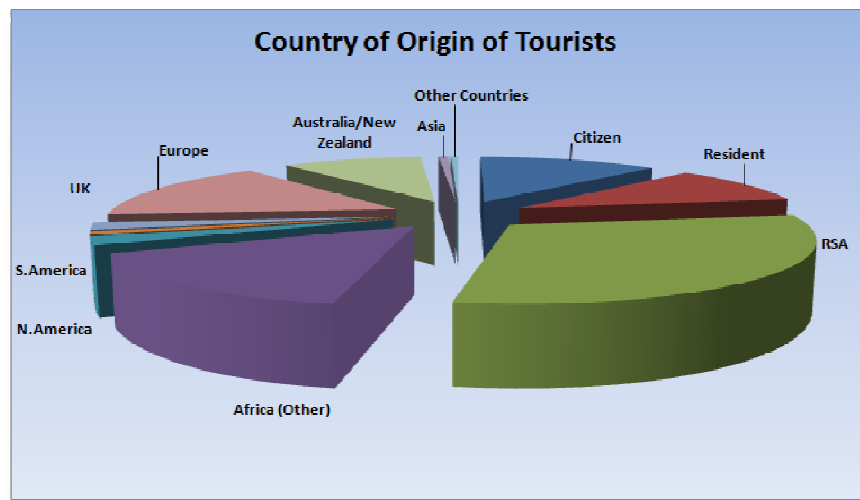


Figure 5: Origin of Botswana's tourists, including those from within the country (Department of Wildlife & National Parks. 2011).

Even with the progress in CBNRM and tourism in Botswana, there still are challenges related to habitat and wildlife management. Wildlife continues to cause livestock and property damage in many communities

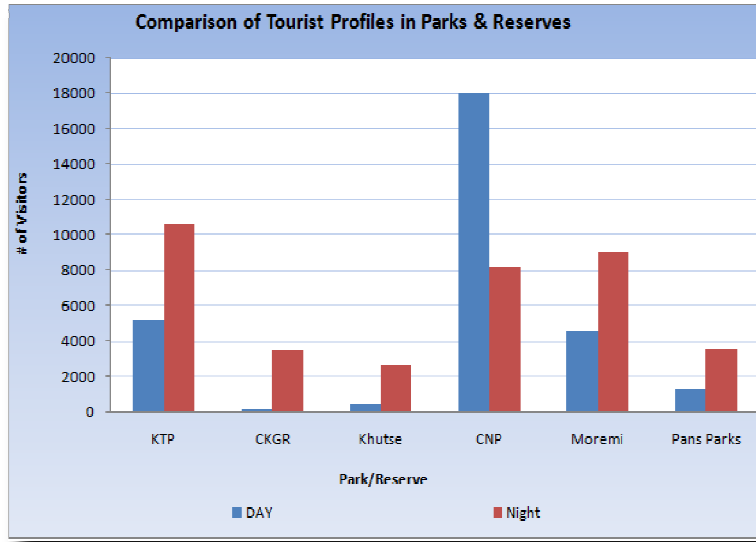


Figure 6: A comparison of Day-use and Over-Night visitors for Botswana national parks and game reserves (Department of Wildlife & National Parks, 2011).

(Ministry of Finance and Development Planning, 2010). The government programme of compensating for wildlife-induced damages is now stretching beyond the BWP5million mark<sup>3</sup>. This rise in costs is attributable mainly to the expansion of livestock rearing into Wildlife Management Areas (WMAs) and the limited community ownership of the programme. The Department of Town and

Regional Planning (DTRP) is leading a comprehensive country-wide integrated land-use planning initiative aimed at inventorying the different land-uses, assessing the ecological systems and reconciling the socio-economic demands and the ecological capacity of the various districts. One of the main output areas of this initiative is to provide a set of win-win scenarios between the various land-uses, especially agriculture and conservation in communal areas.

Another ecosystem challenge is that of wildfires. Large tracks of land burn in many parts of the country each year. The most affected are communal lands which burn more frequently and the fires cover much larger areas than other land categories (see Figure 9 below). In 2006 and

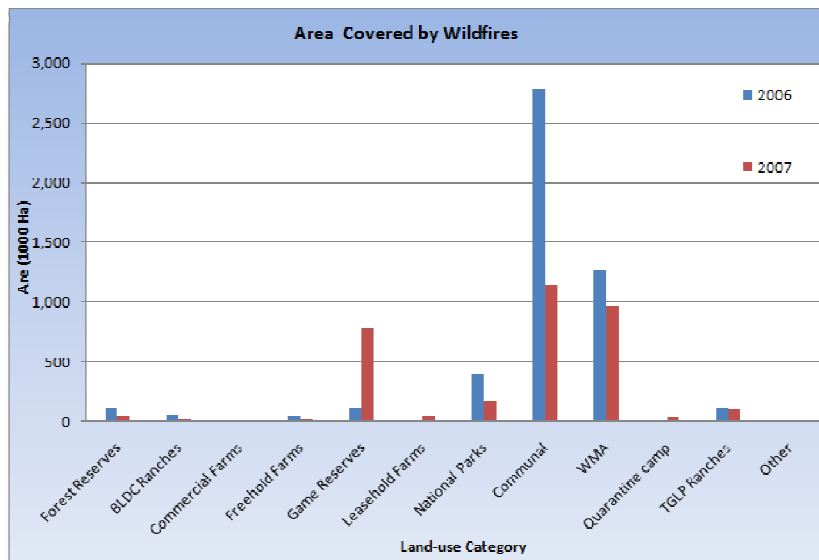


Figure 7: Wildlife coverage across different land uses or 2006 and 2007 (Department of Environmental Affairs, 2007).

2007, communal areas experienced wildfires more than other land-use categories. This skewed

<sup>3</sup> The exchange rate of the US\$/Botswana Pula is about 7.38

pattern reflects the lack of investment and coordination in fire management in communal areas and to a less extent in WMAs. Fire management, just like human-wildlife conflict is still managed at the level of government thus presenting challenges of both prevention and response-times.

### 3.3. Conservation and Use of Water Resources

Botswana's surface water resources, especially rivers and the Okavango delta originate from neighbouring countries and thus require investments in transboundary-level management. The Ministry of Minerals, Energy & Water Resources (MMEWR) houses the International Waters Unit (IWU) whose function is to coordinate with neighbouring countries the management and use of shared water resources. This is achieved through regional institutions (River-basin Commissions) of which there are four covering the Okavango, Zambezi, Limpopo/Shashe and Orange/Senqu river-basins. Each river-basin is to prepare a Transboundary Diagnostic Analysis of its resources, pressures and responses. This has been prepared for the Okavango, Limpopo/Shashe and Orange/Senqu. Strategic Actions Plans (SAPs) have been developed for two of the four, each with a corresponding national Action Plan. Several NGOs have also been involved, e.g. the Kalahari Conservation Society in the case of the Okavango River-Basin and Chobe Wildlife Trust in the case of the Zambezi River-Basin.

Further work in the protection of water resources includes the water sector reform and the development of a national Integrated Water Resources Management (IWRM) Plan. The plan is facilitated by Kalahari Conservation Society as the secretariat of the Botswana Global Water Partnership. The plan, to be concluded in 2012, is meant to increase participation of various sectors in the planning and management of water resources. In addition to human consumption and commercial activities, water demands include quantities required to maintain ecosystems. Water provision in protected areas has increased area accessible to wildlife thus reducing densities and pressure on vegetation especially along the riverine areas. The programme has also abated mortalities that could have occurred from wildlife migrations severed by veterinary cordon fences and the expanding human settlements. Over 40 water points have been established in five (5) protected areas.

Demand on drinking water has been rising sharply in the past decade necessitating a shift from a supply-driven service to an integrated approach that addresses both demand and supply elements of water services. The proportion of the population with access to portable water now stands at 95.8% with urban centres at 99.5%. The majority of human settlements depend on underground water. There are over 25,000 boreholes country-wide with a total estimated abstraction as at 1990 was 76Mm<sup>3</sup>. Abstraction rates are expected to rise in response to the population growth but mainly due to the rising socio-economic conditions that in-turn demand high volumes of water at household levels and increased economic activity (industry). In some of the aquifers as noted in Figure 3, page 13, the sustainable abstraction levels have been exceeded. Of note is the Kanye aquifer where the water-loss rate is also the highest in the country (according to Figure 10 below). This relationship is most unsustainable and underscores the importance of water demand management as a means of ensuring water security.

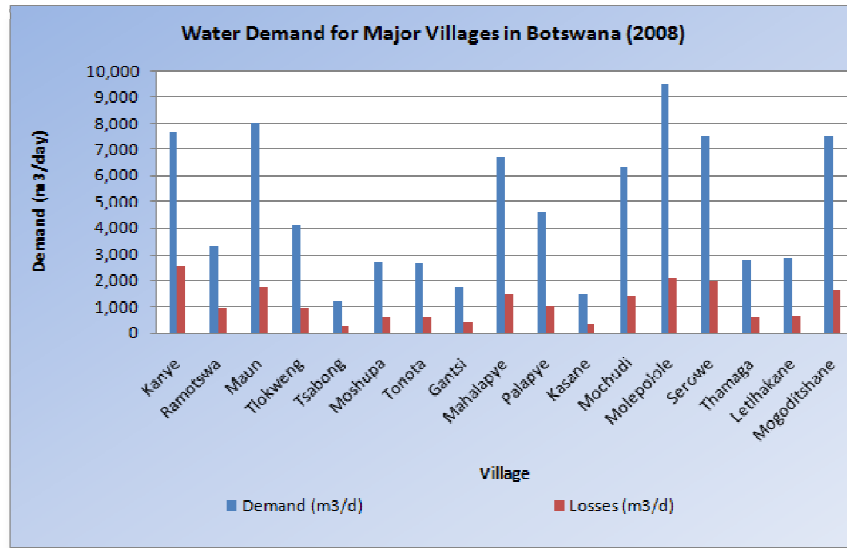


Figure 8: Water demand and losses in major villages (CSO, 2009).

Botswana has also experienced growth in the use of recycled water. Private sector initiatives in grey-water recycling have included stand-alone home-based grey-water recycling systems that provide alternative water sources and reduce pressure on purified water. As compared to processing grey-water in a centralised facility, processing grey-water at-source reduces the costs of running a large central sewage facility and increase the absorption of grey-water back into households which may otherwise just continue using portable water – undeterred by tariff hikes. Currently, Gaborone city alone generates more grey-water than the sewage treatment facility is designed to handle. This over-burden in the system compromises the quality of treated water discharged into the Notwane River. The facility is currently being expanded to handle more sewage and the expansion is funded from government funds. Private sector opportunities exist for financing sewage treatment plants on concessionary basis for the use of treated water and sludge.

Over the past 10 years, the government has expanded the coverage of water-borne sanitation to cover all major villages and urban centres. The proportion of the population with access to portable water now stands at 95.8% with urban centres at 99.5%. Access to sanitation has not had the same level of success (only 79.8% nationally) (Government of Botswana and the United Nations, 2010) due to a number of challenges including costs of water-borne sewage infrastructure in rural areas. With the level of water stress across the country, it may not be sustainable to extend water-borne sanitation (in its current technology) beyond the current level but rather (i) increase the efficiency of the current infrastructure and (ii) establish a roll-out programme for dry sanitation. The lack of accepted alternatives to water-borne sanitation has in part stifled Botswana's progress to achieve as wide a sanitation target as her access-to-drinking-water target.

The governance of water and wastewater has been undergoing revision in the past 3 years with service-provision responsibilities being concentrated under the Water Utilities Corporation (WUC) which before had been responsible only for water provision in urban centres, with major villages serviced by Department of Water Affairs (DWA) and the remaining parts of the country covered by District Councils. Wastewater treatment had been the responsibility of District Councils and municipalities in villages and urban centres, respectively. These services are now under the WUC. The Department of Water Affairs now remains with policy and oversight responsibilities thus reducing the conflict of interest wherein the Department of Water Affairs was, for example providing water and



setting water quality standards for portable water. A similar reform appears to be needed in the case of the solid water and wastewater facilities where DWA and Department of Waste Management and Pollution Control (DWMPC) construct the dams and sewage treatment facilities, then hand them over to WUC for their operation. The role of oversight is thus compromised as design issues remain debated even after the time of handing over. A review of the vulnerability and adaptation requirements for the water sector (Department of Meteorological Services, 2009), reveals that 70% of the waste water treatment facilities use Stabilisation Ponds technology while the remaining 30% is constituted by Activated Sludge, Percolating Filters, Rotating Biological Contactors (RBCs) and Wetlands. Facilities using Stabilisation Ponds technology recorded the lowest level of compliance to design standards for the quality of treated water. The most compliant technology was the Rotating Biological Contractors at 90%. Factors leading to lack of compliance include low operation and maintenance standards.

### 3.4. Management and Use of Waste

Management of waste and toxic chemicals is governed through two main sectors, namely the Department of Waste Management and Pollution Control and the Department of Radiation Control (Ministry of Finance and Development Planning, 2010). Other organisations working in the sector include NGOs and private sector doing awareness creation, waste collection and recycling, respectively. Awareness about waste is coordinated through the National Committee on Environmental Education and covers general waste management principles of Reduce, Re-use and Recycle. Innovative strategies are being tested through community participation in one district (Kgatleng District) where the Department of Primary Health in the Ministry of Local Government is in partnership with the local community to facilitate a community-managed waste collection programme. Other innovations entail private sector support to establish a waste separation deposit centre for pupils of a private school, in partnership with the school management and the parents. Waste is separated into five (5) categories at source (household level) and deposited into appropriately labelled bins located at the school for private recycling companies to collect and recycle. The current range of programmes on waste management covers wastewater, solid waste, clinical waste and oil. Facilities for waste management include sewage treatment centres, metal receiving centre, paper receiving centres, glass receiving centres, oil receptacles, mixed-waste landfills, 1 separated-waste centre. All household waste is collected by the municipalities. Waste from commercial centres is collected by private collectors on contract with the customers. Waste management is also included as a rating criterion in the eco-tourism certification standards managed by the Botswana Tourism Organisation (BTO).

The city of Gaborone alone generates 0.1 tonne per person per annum, adding up to 85 tonnes per day for the entire city. Waste generation is estimated to increase at a rate of 7% per annum (UN-Habitat, 2010). No programmes exist for the management of electronic waste. This has not been a major area as the volume of electronic waste was minute, until the roll-out of Compact Fluorescent Light bulbs which are both ultimately electronic and chemical (mercury) waste. Categories of waste currently gaining high attention by private sector for recycling are metal, paper, glass and water. The sector currently generates over P3million in annual turnover from recycling. The volumes of recycled material are still much lower than those of waste generated.

A programme on management of used oil exists and is facilitated by an NGO named Tshole Trust, formed and financed in part by the private sector dealing in oils and lubricants. The programme covers policy reform on used-oil management, public awareness and providing receptacles for used oil recycling. Awareness activities target schools, general public and Workers Union members. The practice is hailed equally high by employers as a win-win formula.

The volume of used oil collected is estimated at 10m<sup>3</sup>/annum per annum and is still much lower than the volume consumed per annum. The programme has recently been expanded to 3 more districts with additional capacity for 23,000l. Specifications for the receptacles are provided by DMWPC and they disallow the use of fibreglass-made receptacles. Cooking oil collection is also occurring at small scale due to the volumes produced and lack of awareness about the collection programme. Collection currently occurs at food franchises and hotels although many informal businesses and government boarding institutions use cooking oil.

Private sector role in waste management remains largely unexploited. Several companies have plans to expand their operations beyond refuse collection tenders issued by the municipalities to active waste management that entails extensive investments in separation centres and waste processing and packaging. These are opportunities for Public-Private Partnerships but are not being conceived in that light for a number of reasons. Primarily, the concern of private sector is government's slow pace of implementation. The ownership and operation of landfills by the municipality is also seen as resource-wasteful as these are operated sub-optimally. In addition to an organised system of sorting and packaging waste into a resource for the economy, landfill management could also include concessions for methane capture thus making the facilities to be income centres in a more pro-poor manner than charging a levy to poor people entering landfills to collect cans, bottles, metal, and other items for selling to recycling companies.

Hazardous chemicals occur in limited amounts but the main one is mercury owing to its historical use in the gold mining industry, especially the gold panning (indigenous gold mining) wherein mercury is used to separate gold from impurities. The spillages and disposal of such mercury has not been coordinated and monitored. Research in the geographical areas that have had gold mining, mainly north-eastern Botswana, shows occurrence of traces of mercury in fish species, with possibilities of similar occurrence in humans. Other possible sources of mercury introduction to the environment are the indiscriminate disposal of Compact Florescent Light (CFL) bulbs as they contain mercury. There is currently no programme for the collection, storage and disposal of used CFL bulbs.

Civil society activities in solid-waste management include glass receptacles for collection of glass and recycling centres for crushing and packaging glass for export to neighbouring South Africa. The scale is limited as most people lack the means and motivation to sort at-source and transport glass to the receptacle. Benchmarking with other cities shows that recycling of any waste is more effective and sustainable if it is part of a comprehensive and integrated system of waste management within the municipality.

### 3.5. Agriculture, Food Security and the Environment

Agriculture remains a prominent sector in poverty reduction through food security and its entrenchment in rural livelihoods. In Botswana, agricultural production has been progressively declining in terms of output and the numbers of people (households) depending directly on it. The

sector still remains important because of its linkages with poor people. The poor performance of the sector therefore represents an added challenge to the fight against poverty. From 42.7% as a proportion of GDP at independence in 1966, agriculture has fallen to 1.9% as proportion of GDP in 2008. The absolute levels of agriculture-related GDP have also declined sharply (Ministry of Finance and Development Planning, 2010). Livestock agriculture and wildlife often represent competing uses of marginal land; careful management is required to ensure that such land is used to its best advantage. In Botswana there is evidence that among the reasons for the sector's low profitability and below-normal returns is lack of international competitiveness.

The sector in Botswana covers both crops and livestock production. Traditional farming is the most dominant in terms of numbers of people involved (mostly women small-holder farmers) and the geographical coverage. The majority of farmers therefore are small-scale farmers who typically need continued assistance in capacity building to raise production in agriculture. An effective and vibrant extensive service is therefore an important input in improving the performance of the sector and its resilience to market changes and climate change. Major challenges facing the sector include production and business skills, infrastructure and communications, research and new knowledge, and active involvement of small-scale farmers in the value-chain management.

The allocation of agricultural land has been user-driven with limited planning at community or district level on the location of various types of production systems. This has made development of support infrastructure virtually inconceivable, in-turn suppressing agro-industrial and supply chain development. According to NDP10, only 45% of farmers have access to roads, 17% electricity, 22% telecommunication, 64% water for livestock, 66% water for domestic use, 43% water for irrigation, 39% grain storage, 52% markets and 54% sanitation (Ministry of Finance and Development Planning, 2010).

The livestock sector has fared much better over the years, compared to the crop sector. The volumes and diversity of livestock has shown increases (with some fluctuations owing to drought and diseases), except for cattle. Poultry and piggery have shown significant increase. As expressed below in Figure

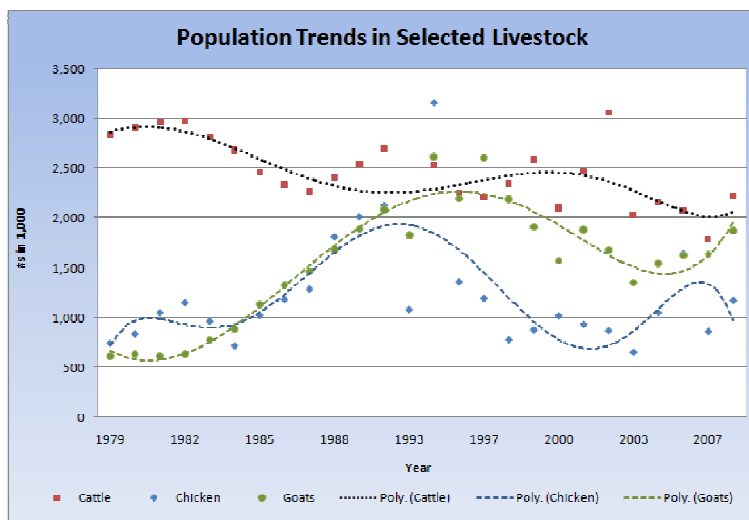


Figure 9: Trends in livestock population between 1979 and 2008 expressed as polynomial trends for cattle, goat and chicken (Statistics Botswana, 2012).

12, poultry has shown some relative increase although with high levels of fluctuations mainly due to diseases (Statistics Botswana, 2012). Goats have had a steady rise from very low levels in 1979. As depicted in Figure 11 below, smallstock (goats and sheep) show a strikingly skewed pattern of ownership in favour of men. This many require targeted policy attention as rural poverty tends to be higher in female-headed households. A similar pattern is evident in

2006, only with an overall lower smallstock population.

Cattle population has reduced slightly from just fewer than 3 million to 2 million. This decline may be attributed to rainfall. A reduction in rainfall and grazing quality may best be addressed not through increases in grazing area (as the land is finite) but through improved systems of land and herd management. Such improvements in herd and range management are needed as cattle farming operates at sub-optimal levels wherein (i) recruitment rates rise and (ii) mortality rates fall but with no commensurate increases in off-take. This is partly due to disease outbreaks which prevent export of beef from affected parts of the country. That notwithstanding, Botswana has progressively undersupplied to the export market despite the costs of sanitary and phyto-sanitary standards that are administered to gain access to such markets. By 2008, Botswana was supplying only 34% of the export quota (Ministry of Finance and Development Planning, 2010). This under-production also imposes costs to the environment as the ageing cattle population consumes more and produces less. Another

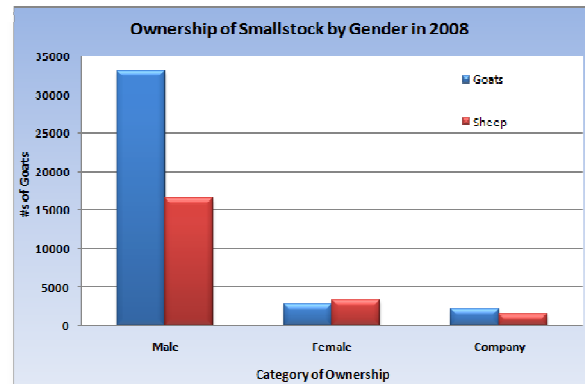
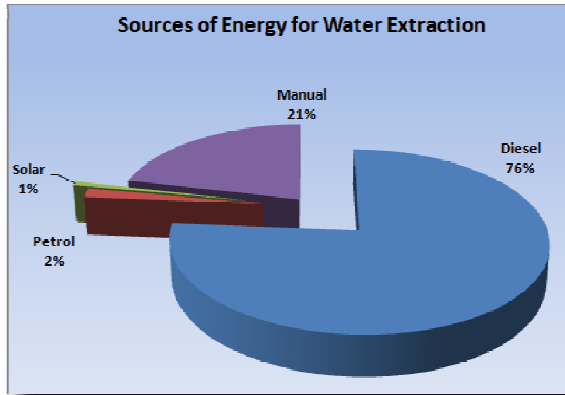


Figure 10: Snapshot of smallstock ownership by ownership categories in 2008 (Statistics Botswana, 2012).

dimension of the cattle production system in Botswana largely untapped in the global market is the organic status of Botswana beef wherein the animals are fed primarily off natural pasture. This attribute fetches a high premium in the global market. In combination with the high sanitary and phyto-sanitary compliances, Botswana's beef would fetch much high prices than it currently is. The draw-back is the sporadic nature of the supply chain as follows; (i) producers do not wean and sell cattle at a specific age thus the cuts tend to differ in size, and (ii) producers sell not on scheduled basis but when there is a problem that requires money thus causing the Botswana Meat Commission (BMC) to lose its place in tight-schedule premium supply contracts. This problem manifests mainly from a lag in extension services (UN Conference on Trade and Development, 2010).

During the implementation of NDP10, livestock farmers will be assisted with drilling and equipping of boreholes in areas where finding water is a problem and resource poor farmers started farming through the supply of start-up stock for small-stock and poultry. Water provision for small farmers based on existing infrastructure and integrated with watershed management present other opportunities in addressing gender imbalances in the livestock sector. With over 21% of the underground water extraction for livestock powered manually (see Figure 13 below), women are likely to face challenges in watering their livestock or risk losing some in exchange for the labour. This will be exacerbated by the crude technologies designed with limited consideration for their use by women. A number of other barriers affecting the participation of women in the agricultural sector were noted in Botswana's Gender and Energy Audit of 2006, notable around energy and technology (Wright, et al., 2006).



**Figure 11:** Sources of energy applied in the extraction of underground water for livestock consumption (Statistics Botswana, 2012).

Crop production has been the most vulnerable part of the agricultural sector due to its heavy reliance on rainfall. As a consequence of low and erratic rainfall, and relatively poor soils, arable production is predominantly a high risk and low input, rain-fed system with low productivity. The production of cereal grains (mainly sorghum and maize) varies considerably from year to year, dependent almost entirely on rainfall with an annual mean production of 46,000 tonnes, but fluctuating from 8,200 to 175,000 tonnes. Crop production continues to experience limits on its growth posed by recurring drought, limited skills, inadequate market access, marketing facilities and inadequate use of improved technology.

About 70% of rural household derive their livelihoods from agriculture. Crop production is mainly based on rain-fed farming. The industry is dominated by small traditional farms with an average size of five hectares. About 63,000 arable farms fit under this category, while only 112 farms are larger than 150 hectares (Statistics Botswana, 2012).

There are signs that crop production and productivity have been declining despite the growing population. Cereal productivity ranges from 300kg/ha for traditional farmers to 2 500 kg/ha for commercial farms. There is need to improve the performance of the arable subsector in order to reduce net importation of food, abandonment of arable agriculture, rural-urban migration and poverty. The majority of small scale farmers lack the necessary inputs for improving production and timely execution of farm operations. It is therefore important to assist them with essential implements and inputs such as fertilisers and seed. The trend between 1979 and 2004 (see Figure 14 below) points to a reasonably high potential for selected crops with production per unit area (kg/ha) going beyond 1,600kg/ha for millet, followed by sorghum and groundnuts. The three crops exhibit consistently higher production efficiency. Due to their high protein value, they deserve to be promoted and supported through a range of policy instruments as a means of addressing rural poverty, food security and nutrition.

Programmes aimed at increasing arable agriculture include the National Agricultural Master Plan for Arable and Dairy Development (NAMPAADD) and ISPAAD. The programme also promotes a more organised land allocation and management through mapping of arable land with over 400,000ha located within productive land.

A number of environment-related challenges facing the agricultural sector include climate change, water, pest control and the use of agro-chemicals. Fertiliser also presents potential problems, especially with the use of subsidies as there are risks of over-application which has been proven to increase the amount of Nitrous gases into the atmosphere and leaching of excess fertiliser into ground water and river systems (Norse, 2011). Unabated, these could, with the application of Full Economic Accounting methodologies, reduce even further below 1.9% the contribution of the sector to GDP.

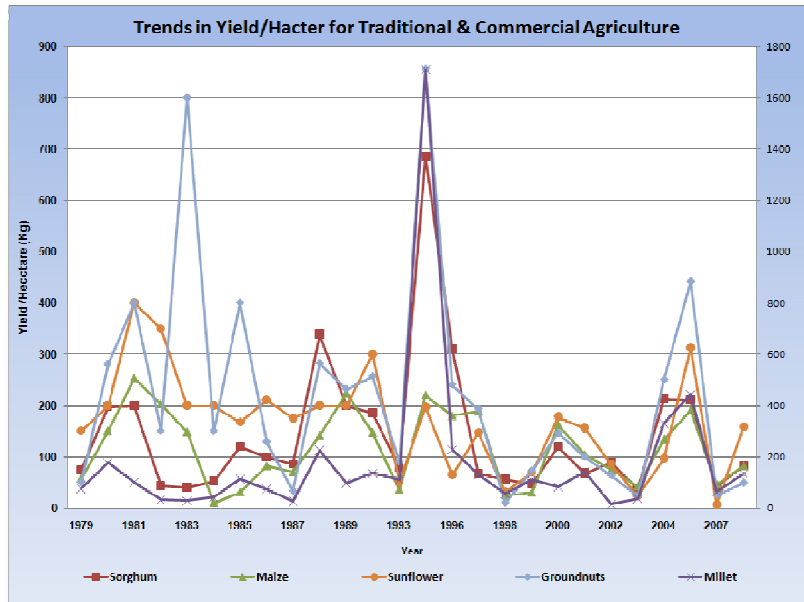


Figure 12: Productivity of selected crops in the traditional sector between 1979 and 2004, expressed in Kg/Ha. (Statistics Botswana, 2012)

A combination of the two technologies, irrigation and fertilizer use can potentially raise small-holder productivity to meet both commercial and subsistence needs, especially where emphasis is placed on food-crops with inherently high productivity as depicted in Figure 14. Two factors need to jointly support this move to raising food security, are (i) extension support on optimal use of irrigation and fertilizers technologies and (ii) inclusion of small-holder farmers in value-chains. The two are not extensive financial investments but fit squarely in the range of “triple wins” global examples of governments placing people at the centre of development. In the context of food security and poverty reduction, most worthy of note are the lessons from Brazil (United Nations Development Programme, 2012), that reflect the multi-sectoral investment platform that raised agricultural production, protected the environment, increased social protection, access to energy, water and sanitation – resulting in nearly halving the poverty head-count ratio.

### 3.6. Institutional Arrangements for Sustainable Development

Botswana has acceded to a number of Multi-lateral Agreements including those on human rights, trade and environment. These facilitate the participation of the country in the international negotiation of a broad range of sustainable development issues such as immigration, refugee hosting, child welfare, environmental management, and trade. Regional agreements and protocols also facilitate participation in such matters as the use and sharing of natural resources (including water), the cooperation on joint research and procurement of essential medical and veterinary drugs, joint infrastructure development for transport and communication and training. Agreements and protocols of relevance to the management and conservation of nature are collectively referred to as Multi-lateral Environmental Agreements (MEAs) and include the United Nations Convention on Biological Diversity (UNCBD), the United Nations Convention on Combating Desertification (UNCCD) and the United Nations Framework Convention on Climate Change (UNFCCC). Botswana also hosts seven United Nations Agencies, namely Food and Agriculture Organisation (FAO), Joint United Nations Programme on HIV/AIDS (UNAIDS), United Nations Development Programme (UNDP), United Nations Population Fund (UNFPA), United Nations High Commission for Refugees (UNHCR), World Health Organisation (WHO) and United Nations Children’s Fund (UNICEF) whose support is coordinated through the Government of Botswana – United Nations Programme Operational Plan (GoB-UNPOP).

From an array of MEAs to which Botswana is a signatory, there has evolved a number of initiatives to address environmental degradation and its impact especially on poor people. Botswana has diligently provided national reports on each of the Rio Conventions. Further thereto, Botswana has developed a Multilateral Environmental Agreements Implementation Strategy and integrated the MEAs into NDPs and national programmes. Notable examples are in the Ramsa Convention for the Protection of Wetlands. Botswana has adopted Wetlands Integrated Planning to ensure wetland threats are managed and ecosystem services are retained. To-date, two (2) such plans have been developed; the Okavango Wetland Management Plan and the Makgadikgadi Framework Management Plan. Challenges in the shared natural resources such as wildlife, fish and water still persist. Most of the MEAs address local threats but provide limited mechanisms for coordination of transboundary threats.

At the national level sustainable development is coordinated as part of the National Development Plan by the Ministry of Finance and Development Planning (MFDP). Sector Ministries are responsible for delivering various components of the national development target through the work of the departments. These are coordinated at the district-level through a District Development Plan (DDP). The DDP is formulated through the facilitation of District Officers responsible for Development and Physical Planners, through which the various input of Departments are integrated.

## 4. Means of Implementation

The overarching Sustainable Development guide for Botswana is the National Development Plan (NDP). The current NDP 10 covers all the pillars of Vision 2016 and a broad range of human development dimensions. The plan therefore lays out the foundation for human development covering the economic, social and environmental dimensions. The activities, projects and programmes are approved centrally for implementation by the respective Ministries and Departments. The local implementation of a coordinated sustainable development programme is the responsibility of the District Councils and Municipalities. Many of the Ministries have local representation and implementation structures.

Sources of financing for sustainable development include government funds, International Cooperating Partners, private sector and civil society. At national level, a National Strategy Office (NSO) has been established to guide strategic positioning of government's role in sustainable development. The office provides strategic input on all policies developed for the country and reviews from time to time the role of various sectors in sustainable development. The NSO also houses Policy Research and Development to inform the strategic direction of various policies of government in meeting the MDGs and the national Vision-2016<sup>4</sup>.

### 4.1. Research and Innovation

As part of the effort to diversify the economy away from minerals, specifically diamonds, the governments has invested in research and innovation, establishing the Botswana University Innovation, Science and Technology (BUIST), Technology Hubs on strategic sectors such as transport, energy, education and agriculture. Due to a small private sector existence, financing and collaboration on research, technology transfer and training appear limited. Research partnerships noted in the area of technology are derived through South-South cooperation. Financing for research continues to be a problem as private sector in Botswana, as in other developing countries is small with limited or no Research & Development budgets. The Botswana Technology Centre (BoTeC) is the only dedicated technology research centre while the replication of technology is done by the Rural Industries Innovation Centre (RIIC) – both government-funded institutions (Parastatals).

Research on an eco-friendly bird deterrent device in coming to fruition following decades of various attempts to deter Quelea birds from crop-land through poisoning, shooting, burning and trapping, all with little success and significant environmental damage. The eco-friendly Quelea deterrent is being developed through collaboration between Ministry of Agriculture (MoA), University of Botswana's Faculty of Engineering, private sector and BoTeC. Other areas of research on technology include solar and domestication of local material for affordable housing.

Research on natural resources is conducted in a number of institutions, including NGO and private sector companies involved in tourism. These include University of Botswana and its Okavango

<sup>4</sup> Botswana's Vision-2016 is about achieving Prosperity for All. It has 7 Pillars as follows; 1. An Educated and Informed Nation, 2. A Prosperous, Productive and Innovative Nation, 3. A Compassionate, Just and Caring Nation, 4. A Safe and Secure Nation, 5. An Open, Democratic and Accountable Nation, 6. A Moral and Tolerant Nation, and 7. A United and Proud Nation.



Research Institute, Department of Wildlife and National Parks, Birdlife Botswana, Kalahari Conservation Society, Conservation International and African Wildlife Foundation. Department of National Museum and Monuments (DNMM) conducts research on new species and their classification. This is especially important for determining levels of endemism of important biodiversity sites. The DNMM also researches on monuments and relics of national and global importance. Since 2002, the number of indentified sites has increased from 20 to 3000 with 110 now gazetted. Department of Agricultural Research (DAR) conducts research on the performance of various breeds of livestock and crops in Botswana climatic and soil conditions. This area of work is critical for climate adaptation as more drought-resistant species are needed to enhance resilience of the agricultural sector.

In addition to research and generating new knowledge, management of knowledge and data is an area of high importance as it provides the evidence for planning and decision-making in pursuit of Sustainable Development. Botswana's data needs are managed through Statistics Botswana (SB) – a newly formed parastatal derived from the former Central Statistics Office (CSO) under the Ministry of Finance and Development Planning (MFDP). SB generates statistics from survey data and from administrative data obtained from various sectors. Administrative data is used to generate statistics for the following categories:

- i) National Accounts Statistics – includes Gross Domestic Product (GDP), GDP per capita, GDP rate of growth and capital formation.
- ii) Price Statistics – a measure of the direction and magnitude of price changes of a fixed basket of goods and services. Statistics produced include cost of living index and inflation rate.
- iii) Trade Statistics – a measure of the flow of goods in and out of the country which allows for an assessment of Botswana's position compared to the world. Statistics produced include commodity and country of origin/destination, and the quantity and value of goods.
- iv) Transport Statistics – provides information on the availability and effectiveness of transport and communication infrastructure and services. Statistics produced include air, rail and road transport, as well as media and communications.
- v) Labour Statistics – provides information on employment levels for various sectors of the economy and average earnings, amongst others.

Other statistics include those of the industry, households, health, education, demography, census, environment, tourism, and agriculture. SB also provides information on selected social and economic indicators for monitoring progress towards achievement of the national Vision 2016 and the MDGs. The statistics are also available on the website at [www.cso.gov.bw](http://www.cso.gov.bw). The challenge with available data is that it is not up-to-date. Only a few of the statistics such as Transport and Communication and Education are up-to-date while others have not been since 2004. This turns decision-making more into guess-work on such important matters as, for example, trend analysis for the horticulture sector which may influence important requirements and investments on water resources, and policies on trade and imports. The challenge is two-fold; (i) it takes up-to 4 years from the survey date to publication of survey results by SB, and (ii) sectors are not submitting data on a consistent basis to SB. Drilling further into the root-cause; most sectors work on manual systems wherein data is still to be entered onto computer spreadsheets. Sectors that work with databases such as Department of Transport and Road Safety fair better as their data is run as queries directly from the database. With

the exponential increase in access to Information and Communication Technology (ICT), the government's e-governance initiative should be making more progress than is currently visible.

Cooperation partnerships have also been facilitated through embassies of the different countries targeting areas of research and technical cooperation. Of note are the following; (i) tourism cooperation between Botswana Tourism Organisation and the Reunion Island Tourism Board; (ii) Okavango Research Institute and Local Authorities in France for Okavango Delta listing as a World Heritage Site.

## 4.2. Financing

Financing for sustainable development is coordinated through the Ministry of Finance and Development Planning. Sector budgets are allocated at the start of each NDP and reviewed on an annual basis. Additional resources, though insignificant are obtained through ICPs and civil society mainly targeting strategic projects aimed at stimulating policy reform or demonstrating alternative technologies. Environment and HIV sectors have enjoyed the highest level of ICP support to-date. Opportunities for PPPs remain largely unexplored as is evident from projects such as bus terminals and landfills that are still funded exclusively from government resources. Budding PPP initiatives exist in the health sector and office accommodation although the health sector is seemingly experiencing problems of sustainability of the PPP. A dedicated institution; the Public Enterprise EPA has been established to facilitate the transitioning of a select government entities into parastatal or private sector. These transitions have not been without difficulties mainly around long-term sustainability and shareholding structures of acquisitions. The perceived loss of jobs has also made the transition more problematic. On the overall, lack of internal capacity within the various ministries of government to conceptualise and implement PPPs has been the biggest challenge. Literature suggests that majority of the PPPs are driven internally and from the highest levels by a realisation by the executives that services needed by their clients may never be delivered under the current regime of finances and skill-base (Moskalyk, 2011).

A National Environmental Fund has been established through a Fund Order and has become a vehicle for financing environmental management in Botswana. The Fund will be replenished by a number of sources including the funds generated by rural communities through the CBNRM, the Ivory Fund and a number of environment-related levies, including the plastic levy and the oil-levy. In the case of the oil-levy, the private sector (though not all) are contributing to the programmes of Tshole Trust – a local NGO. Used cooking oil is being processed into diesel and is used mainly in water pumps and generators.

Further financing opportunities for waste management and other national development needs exists through efficient use of landfills for methane capture. The required reform has implications for retrenchment within the municipalities and this is clearly an area requiring delicate but targeted consideration. Management of protected areas also presents opportunities for Public-Private Partnerships (PPPs) with tourism companies. Table 2: Green Economy Opportunities and Barriers in Botswana; highlights a number of opportunities where government in partnering with the private sector could deliver more economic, social and environmental benefits, more jobs and sustain these efforts for longer.

### 4.3. Institutional Framework for Sustainable Development

Botswana has commenced work towards developing a National Strategy for Sustainable Development. The first national stakeholder workshop identified sectors that possess the highest potential for transformation. The workshop also identified lack of coordination structure for directing and monitoring progress on sustainable as a significant barrier. As has been the practice in other parts of the world, Sustainable Development represents the highest level of performance of the country and is thus commonly placed with the Office of the Head of State. In the Botswana context, coordination of Poverty Eradication has been moved to the Office of the President. In an effort to coordinate development more effectively, the implementation of NDP-10 is carried through Thematic Working Groups, each involving several ministries with a lead (coordinating) Ministry. All the TWGs report to the Office of the President. This has improved inter-ministerial dialogue substantially although challenges still persist which are more systemic and relate to the results expected of each ministry as a contribution to the national development. Another level of complexity is that of the local authorities, i.e. district councils and municipalities.

At the global level, Botswana hosts seven United Nations agencies and works with seven other non-resident agencies. The work of UN agencies in the country is coordinated by the UNDP through the UNDAF and implemented through a Programme and Operational Plan (POP). Sustainable Development is dispersed through both the resident and non-resident UN agencies including the UNEP which carries the bulk of the environmental management support to governments and social and economic pillars supported through a number of specialised agencies such as the World Trade Organisation (WTO), United Nations Industrial Development Organisation (UNIDO) and the Food and Agriculture Organisation (FAO) and through an array of commissions.

## 5. Opportunities and Barriers for Green Economy

On a global scale, Botswana's baseline for achieving a Green Economy is relatively high. This is due to the low level of industrial activity and the presence of the diamond industry which has little or no chemical processing requirements. The industrial footprint has remained small relative to the economic output because of the dominance of diamond as a high-value commodity. Tourism has also contributed to a high Green Economy baseline as its geographical expansion has secured biodiversity areas which may have otherwise been depleted through habitat transformation. The third industry that has contributed to the high baseline, albeit challenges, has been the livestock industry, although more from its failures than its successes. Botswana's beef remains of prime value in the global market due to its organic origins – a feature that has not been promoted by any particular policy of the agriculture sector but rather from the lack of success in the Ranching Policy and related instruments.

On the other hand, the high levels of affluence, albeit concentrated in a small proportion of the population (World Bank, 2010), has stimulated high consumption and thus placing stress on services such as water, energy, biodiversity and waste disposal. If this pattern continues unattended, Botswana will slide back in her human development progress. A number of Green Economy opportunities are identified below for further discussion, with barriers thereto listed in Table 2, page 36. Drawing from the working definition of Green Economy, "An economy that results in improved human wellbeing and social equity, while significantly reducing environmental risks and ecological scarcities (United Nations Environment Programme, 2011).", these sectors improve human wellbeing, especially food security, they effect social

equity, especially through empowerment of women and the rural poor, and they enhance the integrity of ecosystems.

#### **a) Tourism Sector**

Tourism in Botswana is based on natural resources, primarily wildlife. Its long sustenance therefore depends to a large extent on healthy ecosystems. The Botswana Tourism Board's system of ecotourism grading of tourism facilities promoted the integration into the running of tourism establishments, a number of environmental elements. Notable examples are; waste minimisation, energy and water conservation, biodiversity conservation and local community participation (including decent employment). The standards are currently used on a voluntary basis but their wider application can transform the sector and serve as environmental education demonstration centres to their clients. To-date tourism utilisation of biodiversity through CBNRM alone generates over 8,000 jobs directly (Mbaiwa, 2011) and an unrecorded number through ancillary services such as transport, food processing, agriculture, energy, etc.

#### **b) Agriculture Sector**

Investments in extension services represents one of the most strategic investments through which a number of targeted programmes for small-holder farmers, especially women can be implemented. Implementation of weaning and scheduled offtake can increase the production efficiency of the livestock sector, especially in cattle where significant investments have already been made in raising recruitment rates and reducing mortality rates. Other opportunities for a Green Economy exist in the promotion of organic production such as Botswana Beef and many of the produce of rural communities. Further opportunities exist in water and energy conservation. Water for livestock is mainly drawn from underground resources. Without a monitoring programme, there are risks of over extraction (as already the case in a number of well-fields – see Figure 3 pg. 13). Opportunities for a more inclusive economy exist in the improvement of technologies for manual extraction of underground water for livestock as these can improve usability for women and improve their ownership of livestock. Energy-related innovations such as solar-power can improve the long economic viability of the agricultural sector and help to stabilise production costs as petrol and diesel prices tend to fluctuate but generally rising.

#### **c) Transport Sector**

The transport sector is the highest consumer of petrol and diesel in Botswana. Efficiencies in this sector can help to reduce GHG emissions and stabilise production costs of many industries that rely heavily on transport. Transformation is required on reducing the use of private vehicles and switching to public transport, cycling and walking. The current revision of the Roads Design Manual presents opportunities for integrating Non-Motorised Transport (NMT) dimensions into road-design. Currently, walkways and cycle paths are constructed by with no provision for continuity at crossing-points. Settlement planning can also contribute to reducing the transport needs of many urban inhabitants through arresting of city sprawling.

#### **d) Water Sector**

The use of water in the agriculture sector can be reduced significantly through improved irrigation technologies. Energy technological innovations, especially solar-power also present opportunities for Green Economy. Current barriers are predominantly on the perverse incentives provided through subsidies. The use of dams in Botswana is also currently laden with inefficiencies as the

dams are used primarily to contain water with little contribution to other development goals such as tourism, fisheries, estate development and biodiversity conservation. All these are potentially high-value industries.

Water recycling and rainwater harvesting also present opportunities for increasing production in the agriculture sector, raising employment levels and arresting inefficient expansion of agricultural land with no real commensurate production increases.

#### **e) Energy Sector**

Botswana's energy sector carries the highest potential for a heavy-carbon economy than other sectors because of the use of coal in electricity-generation. Measures to be strengthened include technology upgrades for electricity-generation facilities, an energy-mix approach that covers solar, biomass (firewood) and biogas, and energy efficiency in buildings.

#### **f) Education**

The transition to a Green Economy places demands for scaling-up of technology in a number of areas such as grey-water recycling, solar, building construction, air conditioning, etc. Availability of trained artisans for the private sector to draw on is essential for technology to survive. Precedence to-date on the adaptability of the technical and artisanal training centres has not been positive and presents a barrier to the adoption of technology.

#### **g) Human Settlements**

Human settlement management drives the demand for transport, water, energy and natural habitats. Opportunities for Greener Cities rest with urban planning which aims to minimise the sprawl and optimise the use of energy, transport, water and natural habitats. At district level, planning carries the potential to optimise resources utilisation and reduce the existing conflict between livestock and wildlife.

#### **h) Waste**

"Management of waste as waste is wasteful". A significant proportion of the urban waste is material that is in high demand for recycling. The bulk of what is classified as waste is essentially raw material for the next generation of commodities and should therefore generate money not consume it. The most strategic entry point for Green Economy opportunities in waste is the waste separation, preferably at source. The current system of waste management creates jobs that erode human dignity and pose health risks to those who undertake them because waste is not being managed as an economic resource. In addition to reducing environmental damage, creating decent jobs and a vibrant private sector, innovative management of waste can significantly reduce government and municipal spending thus allowing for more investment in other sectors such as education, health, water, energy, transport, communication and agriculture.

Table 2: Green Economy Opportunities and Barriers in Botswana

Sector	Opportunity	Barrier & Risks	Barrier Removal	Institutions Responsible
<b>Water</b>	<b>Dams</b>	Lack of institution with capacity for integrated natural resources management.	Establishment of Dam Management Authorities where a Water Utility is one of users of the dams as could Fishing Companies.	BOCCIM MEWT MMEWR MTI UNDP
	<ul style="list-style-type: none"> <li>• Food Security through fisheries and green jobs in harvesting, processing and transportation.</li> <li>• Green jobs in tourism hotels, boat-houses, water activities and green taxes.</li> <li>• Biodiversity conservation of water-dependent species (the ecosystem to support fisheries)</li> <li>• Maintenance of downstream riverine ecosystem</li> <li>• Real Estate</li> <li>• Flood-risk reduction</li> </ul>	Upstream catchment area not managed and siltation is an eminent risk.	<ul style="list-style-type: none"> <li>• Policy briefing on the economics of dams.</li> <li>• Revision of WUC mandate</li> <li>• Include in MEWT and MoA plans, targets catchment areas for land husbandry.</li> </ul>	NGOs MEWT MoA MMEWR
	<b>Water Demand Management</b>	<ul style="list-style-type: none"> <li>• False-sense of water being available for who can pay.</li> <li>• Utility company interested in sales</li> <li>• Perverse economic incentives (e.g. water consumption subsidy)</li> <li>• Misplaced subsidy e.g. commercial farms instead of small-holder farms</li> <li>• Technology for water-efficient devises costly</li> <li>• Artisanal capacity for handing new technology lacking</li> </ul>	<ul style="list-style-type: none"> <li>• Awareness of Botswana’s critical water situation</li> <li>• Review of Water Tariffs to increase precision of subsidy targets</li> <li>• Redirect subsidies to small-holder farmers, especially women</li> <li>• Redirect institutional household water subsidies to ecosystem restoration</li> <li>• Technology partnerships through South-South Cooperation</li> <li>• Training agenda to be set by user institutions not training institutions</li> </ul>	MMEWR BOCCIM BEDIA MEWT MLG UNDP

Sector	Opportunity	Barrier & Risks	Barrier Removal	Institutions Responsible
		<ul style="list-style-type: none"> <li>Limited scope for community-based planning</li> </ul>	<ul style="list-style-type: none"> <li>DDPs be derived from Community-based plans (PILUMPs)</li> </ul>	
	<b>Increased Storage Capacity</b> <ul style="list-style-type: none"> <li>Additional Dams</li> <li>Aquifers</li> <li>Reduces water transfer infrastructure costs</li> <li>Reduces water loss from evaporation</li> </ul>	<ul style="list-style-type: none"> <li>Technology for aquifer mapping lacking</li> <li>Legislative reform to increase monitoring of aquifer use</li> <li>Economics of alternative technology not understood</li> </ul>	<ul style="list-style-type: none"> <li>Technology acquisition through South-South Partnerships</li> <li>Establish dedicated oversight functions for underground water use with commensurate cost-recovery</li> <li>Increase knowledge generation through research partnerships on underground water science.</li> </ul>	MMEWR MST BOCCIM
	<b>Water Recycling</b> <ul style="list-style-type: none"> <li>Increases availability for non-drinking purposes, especially opportunities food irrigation &amp; food security</li> <li>Strengthens the economic case for investing in high quality wastewater treatment infrastructure</li> <li>Strengthens intersectoral cooperation, e.g. between Water Utilities Corporation &amp; Agriculture</li> </ul>	<ul style="list-style-type: none"> <li>Low social acceptance</li> <li>Infrastructure for distribution of recycled water insufficient</li> <li>Treatment centres overwhelmed by current volumes</li> <li>Private sector exclusion</li> </ul>	<ul style="list-style-type: none"> <li>Public education on wastewater health concerns</li> <li>PPP</li> </ul>	PEEPA MMEWR MEWT UNIDO BOCCIM
<b>Energy</b>	<b>Coal Resources</b> <ul style="list-style-type: none"> <li>Export to Europe and Asia</li> <li>Fertiliser production and increases in food security</li> <li>Coal-bed Methane</li> <li>Solar farms with feed-back into grid</li> <li>Biogas plants in hybrid with solar</li> <li>Firewood management at community-level</li> <li>Biomass</li> </ul>	<ul style="list-style-type: none"> <li>Technology costs prohibitive</li> <li>Uneconomical bias towards grid</li> <li>Bias towards electricity at the exclusion of women's needs for cooking energy</li> <li>DFRR neglect on community rangelands as sources of firewood-based energy</li> </ul>	<ul style="list-style-type: none"> <li>Technology partnerships through South-South Cooperation</li> <li>Awareness at community-level of economics of grid</li> <li>Strengthen voices of women on energy policy making</li> <li>Relief DFRR the management of forest reserves in favour of community rangelands.</li> <li>Place Forest Reserves under DWNP managed as they are currently managed as and are bordering national parks.</li> </ul>	MMEWR NEWT BOCCIM CBNRM Forum MLG JICA

Sector	Opportunity	Barrier & Risks	Barrier Removal	Institutions Responsible
	Solar <ul style="list-style-type: none"> <li>Solar farms with feed-back into grid</li> <li>Reduction in GHG emissions</li> <li>Increasing economic productivity of drylands</li> <li>Localised grid reducing transmission losses in trans-country grid</li> </ul>	<ul style="list-style-type: none"> <li>Limited technology, especially for storage</li> <li>High initial capital investment</li> <li>Information and social barriers</li> <li>Low KWh output</li> <li>Integrated rural (village-based) planning</li> </ul>	<ul style="list-style-type: none"> <li>Scale-up BPC-Lesedi roll-out</li> <li>Establish comparative production costs with coal-generated electricity</li> <li>Plan rural development in an integrated way to stimulate economic benefits of energy provision</li> <li>Subsidies to encourage importation of clean technology</li> <li>Adopt existing solar curriculum into existing list of courses offered</li> </ul>	MMEWR BOCCIM MEWT BURS MoA MESD MLG UNDP/GEF World Bank
	Biogas <ul style="list-style-type: none"> <li>Reduction in GHG emissions</li> <li>Increasing economic productivity of drylands</li> <li>Localised grid reducing transmission losses in trans-country grid</li> <li>Reducing pressure on firewood resources and drudgery of women and children.</li> </ul>	<ul style="list-style-type: none"> <li>Limited technology, especially for storage</li> <li>High initial capital investment</li> <li>Information and social barriers</li> <li>Integrated rural (village-based) planning</li> <li>Limited participation of women and youth in planning</li> </ul>	<ul style="list-style-type: none"> <li>Technology partnerships on South-South Cooperation</li> <li>Initial costs included in government energy budgets for PPPs</li> <li>Village-level planning (PILUMPs) institutionalised through MLG to ensure energy generates the optimal human development returns</li> <li>Women representatives are appointed for PILUM development.</li> </ul>	MMEWR BOCCIM MLG MEWT JICA
	Firewood <ul style="list-style-type: none"> <li>Increasing access to energy</li> <li>Low-cost and affordable to most rural poor</li> <li>Increases biodiversity if managed sustainably</li> <li>Community-based management can reduce collection distances</li> <li>High social acceptability</li> <li>Cultural importance</li> </ul>	<ul style="list-style-type: none"> <li>Centralised managed and issuing of licenses by DRFF leading to unsustainable harvesting.</li> <li>Owners of motorised transport deplete nearby wood resources increasing travelling distances for household-use (women and children)</li> <li>Community lack power to asset management regimes for sustainable use</li> <li>Technologies for efficient firewood</li> </ul>	<ul style="list-style-type: none"> <li>Full inclusion of forestry and range resources into the CBNRM Policy realm so as to delegate management and use to local communities through quota.</li> <li>Support capacity building of local communities in management of forest and range resources (including governance issues).</li> <li>Increase BPC-Lesedi roll-out of wood-efficient stoves and heat-retention bags.</li> <li>Inclusion of forestry and range resources in PILUMPs</li> </ul>	MMEWR MEWT MLG LEA BOCCIM CBNRM Forum



Sector	Opportunity	Barrier & Risks	Barrier Removal	Institutions Responsible
		usage not easily accessible <ul style="list-style-type: none"> <li>Cost of technology prohibitive for poor households</li> </ul>	<ul style="list-style-type: none"> <li>Maintain up-to-date inventories of forestry and range resources</li> </ul>	
<b>Agriculture</b>	<b>Land-use Planning</b> <ul style="list-style-type: none"> <li>Reducing unit-cost of services (electricity, roads, water, extension services, ect0 through aggregation of farmland by primary production type.</li> <li>Coordinating outputs and inputs in different systems, e.g. poultry excreta and horticulture manure, horticulture off-cuts (prunings) and smallstock, piggery feed, etc.</li> </ul>	<ul style="list-style-type: none"> <li>Current system of free-location allocation</li> <li>Village-level planning weak to influence land-use</li> <li>No policy on aggregation of agricultural land</li> </ul>	Strengthen village-level planning (PILUMPs)  Consolidate national land policy to include aggregation of production systems.	MLH LG MoA MEWT
	<b>Water Efficiency</b> <ul style="list-style-type: none"> <li>Wastewater recycling and irrigation expansion</li> <li>Improved technology for irrigation to drip-type</li> <li>Integrated planning of production and consumption for wastewater</li> </ul>	<ul style="list-style-type: none"> <li>Irrigation falling behind the wastewater production</li> <li>Technology uptake for drip irrigation slow</li> <li>Prohibitive costs of drip-irrigation</li> <li>Irrigation uptake slow as is horticulture production</li> </ul>	<ul style="list-style-type: none"> <li>PPPs for wastewater treatment and use</li> <li>Awareness on irrigation technology</li> <li>Financial incentives for irrigation uptake for small-holder farmers, especially women and youth</li> </ul>	MMEWR MoA MEWT BOCCIM
	<b>Soil Conservation &amp; Nutrition</b> <ul style="list-style-type: none"> <li>Improved soil fertility through fertilizer and compost applications</li> <li>Improved soil moisture retention</li> <li>Reduced soil erosion</li> </ul>	<ul style="list-style-type: none"> <li>Awareness about soil husbandry</li> <li>Limited extension services, especially to small-holder farmers</li> </ul>	<ul style="list-style-type: none"> <li>Increase the number of extension officers per farmer</li> <li>Institutionalise performance management to be client-driven</li> <li>Strengthen village-level panning to include targets for soil fertility, soil moisture retention,</li> </ul>	MoA MLG MEWT

Sector	Opportunity	Barrier & Risks	Barrier Removal	Institutions Responsible
	<p><b>Value-chain Management</b></p> <ul style="list-style-type: none"> <li>Increased agricultural output and economic returns</li> <li>Increased food security</li> <li>Increased resilience from close market changes</li> <li>Increased benefits for small-holder farmers and rural poverty eradication</li> </ul>	<ul style="list-style-type: none"> <li>Awareness and access to information about markets</li> <li>Capacity to negotiate contracts and conditions by small-holder farmers with consumer bodies (supermarkets, abattoirs, etc.).</li> <li>Bias towards production-based agriculture to the neglect of consumer needs and location</li> <li>Lack of information on small-holder produce and production system (needed for accessing organic-produce markets)</li> <li>Lack of National Labelling Policy in favour of organic farming produce.</li> </ul>	<p>etc.</p> <ul style="list-style-type: none"> <li>Extension Services to include value-chain management for small-holder produce</li> <li>National Policy on Labelling Standards for organic agricultural produce</li> </ul>	<p>MTI MoA MoH MST UNDP World Bank AfDB JICA</p>
<b>Transport</b>	<p><b>Public Transport</b></p> <ul style="list-style-type: none"> <li>Fuel Efficiency</li> <li>Reduction in imports/exports ratio (petroleum products)</li> <li>Reduction in GHG emissions</li> <li>Reduced volatility of local economy due to global fuel prices</li> <li>Increased ease of doing business (mobility)</li> <li>Reduced economic costs of traffic congestions</li> <li>Overall efficiency in the economy and lower cost of imports</li> <li>Protection of consumers of public transport.</li> </ul>	<ul style="list-style-type: none"> <li>Subsidies mismatch between road, rail and air</li> <li>Over consumption of imported petroleum products</li> <li>No mobility targets set by municipalities for urban areas</li> <li>Limited knowledge on the economic costs of traffic congestion</li> <li>Lack of consumer protection, operating standards or scope for competition as a mechanism for self-regulation</li> </ul>	<ul style="list-style-type: none"> <li>Introduce multiple grades of public transport based on competition as a means for self-regulation</li> <li>Improve oversight on operation of public transport and consumer protection</li> <li>Review costs of infrastructure provision for road transport in general and public transport in particular so they match the income from licences and other income streams</li> <li>Implement low-cost means such as dedicated lanes for public transport and high-pax cars to encourage car-pooling</li> <li>Gravitate towards high capacity buses for high-density routes.</li> <li>Investigate PPPs for rail freight as primary mode and public transport as secondary.</li> </ul>	<p>MTC MMEWR MEWT MTI MLG (GCC, FTCC, LTC) World bank JICA</p>

Sector	Opportunity	Barrier & Risks	Barrier Removal	Institutions Responsible
	<b>Non-Motorised Transport</b> <ul style="list-style-type: none"> <li>Reduced GHG emissions</li> <li>Healthier citizens</li> <li>Reduced traffic congestion</li> </ul>	<ul style="list-style-type: none"> <li>Lack of continuity in walking and cycling lanes</li> <li>Poor signage for NMT</li> <li>Lack of legal protection for pedestrians and cyclists</li> <li>Low social acceptance of walking and cycling</li> <li>Lack of design standards for NMT facilities</li> <li>Limited capacity of present cadre of engineers in NMT</li> <li>Lack of integrated planning that takes into account that people naturally walk and that cycling takes less space than motorways</li> </ul>	<ul style="list-style-type: none"> <li>NMT Design standards integrated into National Roads Design standards</li> <li>Increased visibility of NMT signage</li> <li>Legal reform to increase protection of pedestrians and cyclists</li> <li>Awareness and publicity to improve image of walking and cycling.</li> <li>Introduce NMT modules in university Planning Curriculum</li> <li>Expand the scope of planning to include walking and cycling, especially in urban areas and major villages</li> </ul>	MTC MLG OP MLH
<b>Waste</b>	<b>Waste Water</b> <ul style="list-style-type: none"> <li>Reducing load on treatment plants by separating grey-water at source</li> <li>Improved standards for treated water increases usability</li> <li>Private sector investments in PPPs for Treatment plants.</li> <li>Utilization of treated water for irrigation and food security</li> </ul>	<ul style="list-style-type: none"> <li>Information barriers - most institutions not aware of grey-water recycling</li> <li>Technology barriers to grey-water recycling – many systems breakdown and are never repaired due to low artisanal capacity.</li> <li>Excessive load on treatment plants results in lower quality of treated water and thus lowering its usage.</li> <li>PPPs legal framework absent to facilitate private sector involvement</li> <li>Awareness of the PPP potential in Wastewater Treatment limited.</li> <li>Lack of framework for wastewater as a tradable commodity and input to agricultural production</li> </ul>	<ul style="list-style-type: none"> <li>Tighter budgets for municipalities in favour of PPPs.</li> <li>Framework for PPPs within municipalities</li> <li>South-South and North-South technology transfer partnerships on wastewater management</li> <li>Framework for promoting on-site grey-water utilization for institutions and private homes.</li> <li>Awareness programmes on wastewater as a commodity with emphasis on agricultural production.</li> <li>Framework for trading in wastewater with emphasis on agriculture and food security.</li> </ul>	MLG MFDP MMEWR MoA MTI BOCCIM

Sector	Opportunity	Barrier & Risks	Barrier Removal	Institutions Responsible
	<p><b>Solid Waste</b></p> <ul style="list-style-type: none"> <li>• Waste Separation at-source</li> <li>• &gt;70% of waste recyclable</li> <li>• Green jobs through waste recycling</li> <li>• PPPs for waste management</li> <li>• Energy generation and GHG emission reduction through methane capture and biogas</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of Framework for PPPs within municipalities</li> <li>• Lack of an integrated solid waste management strategy</li> <li>• Limited knowledge of the economics of waste management</li> <li>• Limited technology and artisanal capacity for waste management</li> </ul>	<ul style="list-style-type: none"> <li>• Tighter budgets for municipalities in favour of PPPs</li> <li>• South-South and North-South technology transfer partnerships on waste recycling</li> <li>• Awareness programmes on waste management and economics thereof</li> <li>• Framework for trading in solid waste with emphasis on methane capture</li> </ul>	<p>MLG MFDP MEWT MMEWR MTI BOCCIM</p>

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