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**Okavango River Basin Transboundary
Diagnostic Assessment (TDA): Botswana
Component
A Socio-Economic Profile of River
Resources and HIV and Aids in the
Okavango Basin, Botswana**

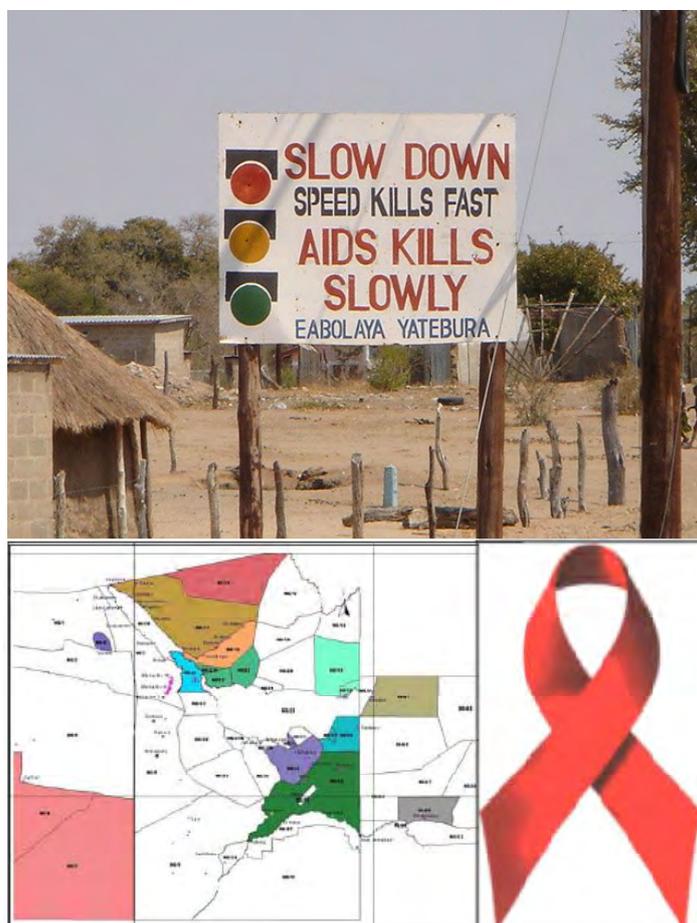
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*Environmental protection and sustainable management
of the Okavango River Basin*

EPSMO

OKAVANGO RIVER BASIN TRANSBOUNDARY DIAGNOSTIC ASSESSMENT (TDA): BOTSWANA COMPONENT



Final Report

A SOCIO-ECONOMIC PROFILE OF RIVER RESOURCES AND HIV AND AIDS IN THE OKAVANGO BASIN, BOTSWANA

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Executive summary

Livelihood/income diversification multi-local residences and migration characterize human adaptation to flood/climate variability in the Okavango basin. Arable and livestock farming, formal employment, government social safety nets, remittances and fishing, constitute key sources of livelihood for a significant proportion of the Delta population. Although arable agriculture is primarily dryland or rain-fed and less dependent on drawing water from the Okavango River, it still remains the key food system. There is limited, if any, commercial irrigation based arable farming. *Molapo* farming (*flood recession*) along the Okavango River seasonal flood plains, although hailed by most farmers as the most productive food system, faces tenure rights and other legislative challenges. There is ample evidence that variability of livelihood and or food systems of Okavango basin residents' speaks to local adaptations to variability in flood regimes/cycles. Key transboundary issues therefore are that, in order for the pristine status quo of water resources in the Okavango basin under high/low flood scenarios, much will depend very much on how, communities/households on the one hand, adapt contemporaneously or will adapt over time. On the other hand, the effectiveness of local adaptation is determined by national policies/programs. Government interventions can either capacitate or incapacitate strategies depending on whether there is flexibility to address evolving impacts of flood variability on dynamic interconnectedness between water and non water livelihoods. The integrity of Okavango Delta water as natural resources cannot be treated in isolation from other symbiotic natural resources based livelihoods/food systems.

Gender, water resources and poverty dynamics in the Okavango basin indicate that men and women are constrained in different and often unequal ways as potential participants or beneficiaries' water resources. One direct water related resource that cuts across age and gender is fishing. Whereas generally some natural resourced based livelihood activities in the are gender specific, others cut across age and gender. Under conditions of stress however, 'resource use often redefines traditional gender roles to include 'gendered switching' and commercialization.' The majority of households in gazetted settlements draw potable water from communal standpipes, those in ungazetted settlement abstract untreated water from river flows and hand-dug wells when the river is not flowing. Unreliability of water-supply and distance from homesteads has resulted in men with donkey carts dominating collecting water in ungazetted settlements in the Delta. Gender interacts with other dynamics that include, household structure and asset profile (wealth and poverty levels). Unfortunately, headcount poverty rate in Ngamiland is very severe (40% and 50%) in Ngamiland east and Ngamiland west respectively. Furthermore, Ngamiland west has high proportion of women headed households with low levels of human capital development. Studies from elsewhere indicated that women tend to benefits different from men in the fishing industry (marketing and processing). Building on work already done by the BIOKAVANGO Project, the feasibility of transboundary aquaculture projects in the three riparian countries should be considered. This should be done in tandem with gender analysis that critically examines dimensions of poverty with the view of formulating pro-poor, pro-growth small/medium program. The key issues being that assuming that gender roles at trans-boundary level cannot be assumed to be fixed. This assumption can result in intervention that would miss the dynamics of water and other interactive natural resource utilization, such as, consequently lead to inappropriate policies or programs in the Okavango Basin.

Although as a country, Botswana has comprehensive HIV and AIDS policies and reasonably resourced national programs intervention aimed at disease prevention,

support and mitigation HIV Prevalence, incidence, trends and access issues still remain a challenge. New challenges include the number of HIV positive individuals is expected rise and there will be a gradual spread of the HIV virus across districts. In Ngamiland the surging rates of new infections is around 4.76%. Delivery of AIDS services faces some challenges regarding access. Approximately 36% of the districts populations are > 60km from an ARV clinic. Whereas planned infrastructural and institutional developments in the Delta would enhance access to HIV related services, the down side of these is that these changes are also likely to lead to increased cross boundary migration which inadvertently increased risk of exposure to HIV transmission.

The link between HIV and AIDS and natural resource based livelihood has been neglected. Whereas the revised National Policy on HIV and AIDS (2006) has put some sectors in the fore-front, the role of natural resource based sectors such as agriculture; fisheries, water and CBNRM were not clearly defined in the National Policy on HIV/AIDS. Case studies from four key water related sectors suggest that the impact of AIDS on these sectors is verifiable, but in general, natural resource institutions (NRM) or managers approach to HIV and AIDS have been inward looking with regard to addressing the problem, their program interventions have shifted away from hard realities of AIDS to soft targets around “wellness” in the workplace. A case study of a viable government/safari HIV outreach partnerships is discussed in the context of policy and program partnerships in the basin. HIV is a human crisis. It is not easy therefore to link funding HIV interventions with natural resource management projects/programs. However, government/private partnerships transboundary project akin to the one spear headed by Kalahari Conservation Society (with Safari Operators) between Botswana, Angola and Namibia. Evidence from several Sentinel Surveillance Reports, the Botswana AIDS Impact Survey II (BAIS 2004) and III (BAIS 2009) indicate that Francistown – Kasane; or the Francistown - Selebe - Pikwe trade routes, seems to be HIV transmission pathway. Opening up the Maun-Shakawe – Molembo trade route could mean manufacturing another HIV transmission conveyor belt. The health needs of those people involved in cross-border trade, as well as those people who offer services to these people, such as sex workers.

Although there are numerous HIV and AIDS Program interventions, there are key ones whose challenges have transboundary implication. Focus has been given to three key intervention AIDS programs in Botswana. These are antiretroviral therapy (ART) roll-out, prevention of transmission from mother to child (PMTCT), Sexually Transmitted infections. With regard to ART, there are concerns over primary and secondary resistance to ARVs, mothers and access to Dry Blood Spot (DBS) of HIV children born HIV positive, changes in normative behaviors of long term survivors of ARVs and long term monitoring of virologic failures. With regard to PMTCT, it is poor male involvement in PMTCT. Pregnancy predisposes a woman to increased risk of exposure to infection. Another challenge has to do with pressure on women to bear children. More than 80% of HIV positive women and over 90% of women on HAART reported having more than one pregnancy. STIs facilitate HIV transmission by increasing both infectious and HIV susceptibility. The expansion of STI surveillance system in border crossings and high transit sites is urgent. AIDS interventions are dynamic in relation to human behavior. These dynamics include mortality, default, extended survival, demographic shifts, prevalence and incidence. All these factors have transboundary implications vulnerability to flood/climate variability for some social groups



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Chapter 1: A socio-economic profile of River Resources and HIV and AIDS in the Okavango Delta

1.0 Introduction:

The Okavango Delta is located in Ngamiland district in northwestern Botswana. The district is the third largest in the country. In official documents, the district is described in various ways by different government departments and this can be confusing. Table 1 below summarizes the various descriptions. The Okavango river runs through the district, with the upper panhandle in what has been describe invariably as Ngamiland north/west, Okavango or health District 1. The lower delta roughly falls within Ngamiland south/east or Ngami /health district 14. For purposes of this Report, I will use Ngamiland (Figure 1b) to refer both the upper and lower delta and, where appropriate, differentiation will be made with specific reference to either to Okavango or Ngami sub districts. Villages in the districts (figure 1b) will be used as case studies to illustrate cross cutting transboundary issues in the Okavango basin.

This report gives a critical appraisal of existing literature to assess the status quo of river resources in the Botswana portion of the of the Okavango river basin. The Report uses case studies from villages in the upper and lower part of the Okavango river in Ngamiland to suggest the interface between national and transboundary issues. However, key transboundary issues with implications for policy and program interventions will be highlighted in the form of a summary discussion.

The objective of this report is to:

- Review existing literature in relation to river resources and HIV/AIDS for each of the representative social areas.
- Assess gender dynamics in the use of water as well as other river ecosystem resources for the Botswana portion of the basin in general and for selected sites in detail

In order to meet these objectives, and for easy flow of issues, the Report is divided into five sections (chapters). Chapter one examines existing literature with regard to access and utilization of river resources in the context of the dynamics of livelihoods diversifications with particular emphasis on local adaptation strategies to variability and what is referred to as multilocal livelihoods. Context specific short-term coping and long-term adaptive strategies were used respond to drying of the river channels. The key transboundary issue from these case studies is that government policy/program interventions aimed at reducing climatic variability must proactively enhance, rather than constrain the locality driven adaptive capacities. Not only are sources of livelihood and household coping or adaptive strategies in the Okavango basin varied, but these activities are multi-local in a transnational Diaspora. Chapter 2 focuses on gender dynamics in the utilization of river resources with particular emphasis on poverty context in the Okavango river basin. In Botswana generally, and in the Okavango basin specifically, men and women are constrained in different and often unequal ways as potential participants or beneficiaries' natural resources. Structural poverty is a major factor in the Okavango basin that needs to be addressed. Chapter 3 HIV Prevalence, incidence, trends and access challenges. Compared to other African countries, Botswana has comprehensive HIV and AIDS policies and reasonably resourced national programs intervention aimed at disease prevention, support and mitigation. But there are new challenges particularly with regard to HIV prevalence and incidence. Rates of new infections in the district are relatively high (4.76%).

Delivery of AIDS services faces some challenges regarding access. Access to treatment is also critical. Approximately 36% of the districts population is > 60km from an ARV clinic. Some districts face more challenges than others due to a number of factors, some of which are policy related, others as a result of uneven regional development interventions especially those related to social development. Chapter 4 focuses on HIV and AIDS and natural resource based livelihood. The chapter focuses on the impact of HIV and AIDS on three key natural sectors resources which are dependent on services of the Okavango Delta, namely, agriculture, fish and community based natural resource management (CBNRM) projects. The chapter also examines impact of HIV and AIDS on, natural resource institutions (NRM) and gives a case study of government/safari HIV outreach partnerships.

The last chapter focuses on three key intervention AIDS programs in Botswana with specific reference to Ngamiland district. These are antiretroviral therapy (ART) roll-out, prevention of transmission from mother to child (PMTCT), Sexually Transmitted infections. These programs have key transboundary implication. With regard to ART, there are concerns over primary and secondary resistance to ARVs, mothers and access to Dry Blood Spot (DBS) of HIV children born HIV positive, changes in normative behaviors of long term survivors of ARVs and long term monitoring of virologic failures. With regard to PMTCT, it is poor male involvement in PMTCT, due to pressure on women to bear children, more than 80% of HIV positive women and over 90% of women on HAART reported having more than one pregnancy. STIs facilitate HIV transmission by increasing both infectious and HIV susceptibility. The need to expand STI surveillance system in border crossings and high transit sites to prevention of new infections is highlighted.

Table 1: descriptions of Ngamiland/Okavango delta region

	Ngamiland/Okavango delta	
	Upper Delta	Lower delta
Government Department Central Statistics Office (CSO)	Ngamiland North	Ngamiland South
Household Income and expenditure Survey	Ngamiland West	Ngamiland East
Administrative District	Okavango sub-district	Ngami sub-district
Ministry of Health	Health district 1	Health District 14

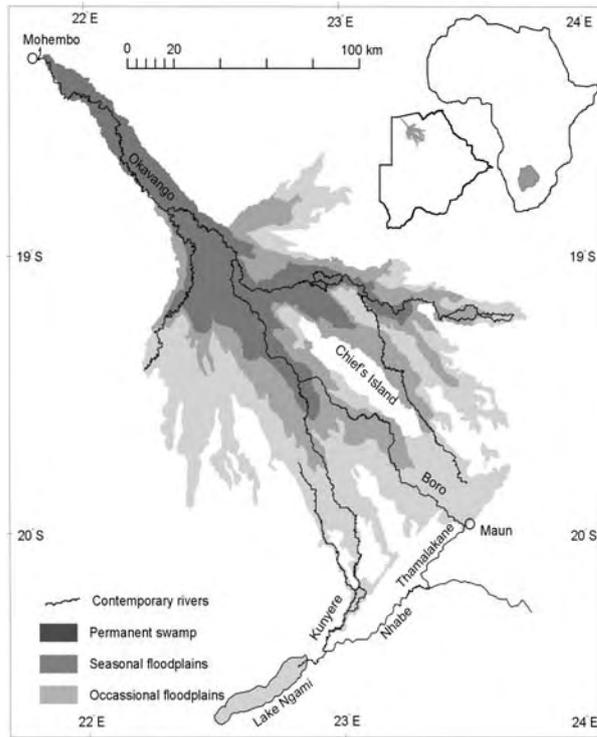


Figure a 1: Okavango Delta (Source, HOORC GIS)

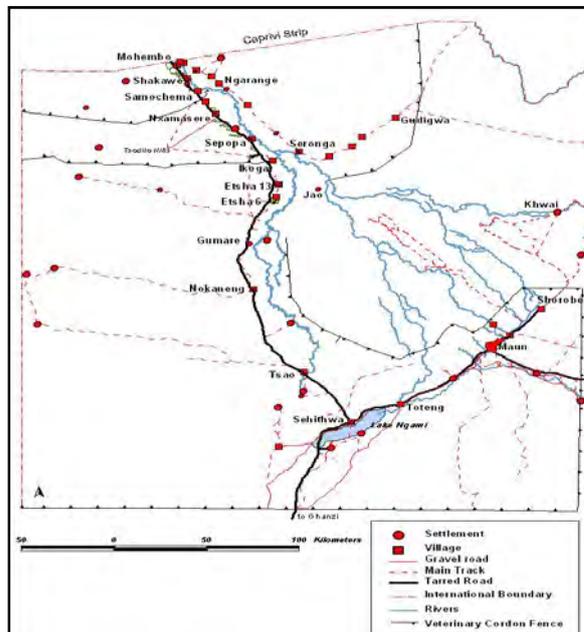


Figure a 2: Ngamiland District (Source: HOORC GIS Lab)

1. 01. Methodology

Data for the report was derived from extensive literature review of secondary and grey literature. Data was also collected from semi-structured interviews with key informants in various NRI and other government departments.

1.1 Livelihood diversification and adaptation to variability

Numerous socio-economic surveys have documented different ways in which communities in the Okavango basin are risk averse, and how they diversify livelihood activities to cushion themselves against short and long term income fluctuations (Applied Development Research Consultants, 2001; Kgathi et al, 2004, Kgathi et al 2006; Kgathi, Ngwenya and Wilk, 2007;). Studies in other similar fresh water wetlands system and lakes in Africa also suggest that communities in those areas diversify sources of income as a strategy to cushion themselves against shocks, for instance Bene et al (2003) with specific reference to the Yaere Flood plains in Lake Chad Basin; Geheb and Binns (1997) with particular reference to fishing cum farmers communities in Lake Victoria in Kenya; Sarch and Allison (2000) with regard to African inland fisheries in general. Similar observations have been made in other parts of the world such as Brazil (Cordel and McKean, 1992), Canada (Berkes, 1977) and Spain (Freire and Garia-Allut, 2000).

From the scenarios describe above, whether in Africa, North America or Latin America, people switch between farming and fishing in response to seasonal and inter-annual variations in fish availability, or spatial variation in fish stock (offshore/inshore, part fisher/fulltime fishers), location of fishing grounds and gears used. Flexible mixing of livelihood activities in the Okavango basin, however, is not haphazard. Household across and within villages prioritize and rank livelihood activities differently depending on a number of factors. The community seasonal calendar fluctuates between resource abundance and scarcity. Some of activities are year round and have peaks during certain times of the year. For instance, beer brewing often reaches a peak during the agricultural off-season. This implies that households have to cushion themselves against likely adverse effects during income/food transitional periods. Mixing of activities depends on household asset qualification, access rights to river resources, formal and informal employment opportunities, household structure/labour availability and level of resource contribution to household income and or food security (Kgathi et al 2004).

1.1.1 Migration and adaptation to shocks

According to Ellis (2000), migration is of growing significance as rural people seek to diversify livelihoods. Gwebu (2003) define migration, in the context of Botswana, as the permanent relocation from one administrative unit to another. In Ngamiland, a range of shocks and stresses are co-factors for social migration. Internal migration processes in Botswana include rural-town; rural-rural; town-town and town-rural and patterns of migration tend to reflect regional developments linked to the country's ecological conditions (with the south east and the eastern being the main sender regions and the north and west the least sources of origin for inter-regional migrations) (Gwebu, 2003). This is more so especially in Ngamiland during long-lasting droughts or disease outbreaks when the crop and livestock sector were simultaneously affected (such as in 1995/96 droughts and outbreak of the cattle lung disease) where many individuals or households relocated from the rural villages to urban villages such Maun, Shakawe and Gumare in search of employment opportunities.

The Okavango Delta has experienced a relatively high level of migration in recent years, for instance, an analysis of the 2001 Census data reveals that the Census District of Ngami Delta had a temporary migration rate of 13.2 in 2000/2001, which was the highest in Botswana, and this is attributed to the rapid development of

tourism (Gwebu, 2003). Other Census Districts of Ngami South and Ngami East had lower net migration rates of 3.5 each, as the tourism activities there are lower. Kgathi and et al (2004) study of five villages (Gudigwa, Seronga, Etsha 6, Sehitwa, Shorobe) in the Okavango Delta, found that the drying of the river channels in these study areas has acted as a push factor for migration and local mobility (intra-district mobility). Migration is therefore one important strategy for individuals to cope (short term or adapt (long term) to shocks or stresses in the Delta.

Informal interviews revealed that those who remained in the above localities when others out-migrated to Shorobe were mainly the poor households, as they could not afford the costs of relocation. On the other hand, those who out-migrated to Maun from Shorobe were mainly the economically active. This is confirmed by the fact that the village of Shorobe has a very high proportion of the population of those who are over the age of 65 years. In Sehitwa, 54% of the households reported that some people out-migrated to a number of areas such as Tsau, Maun, Setlatla, Maila, Naune, and Dobe as a result of the drying of Nhaba River and Lake Ngami (Table 1.2). In these areas, groundwater or surface water could easily be obtained. It was also reported that others moved their livestock to other areas, including those near the buffalo fence such as Kgomotshwaana and Habu, where there was plenty of groundwater. However, most of the respondents complained that in these areas, predators were a problem for their livestock (Kgathi et al, 2004).

Table 2: Frequencies of households who emigrated

Village	Frequencies	Number of households (N)	% Frequencies
Gudigwa	2	18	11.1
Sehitwa	15	28	53.6
Shorobe	10	17	58.8
Etsha 6	8	36	22.2

Ngwenya and Thakadu (2007) also found that many villagers maintain multiple residences. Sankuyo residents for instance, were owners of residential plot/s in Maun Some migrate seasonally or intermittently between two or more localities to do 'piece jobs.' In both scenarios, access to kinship support networks facilitates migration flows and or investment opportunities across localities. Elmhirst (2008) conceptualizes multi-local livelihoods in two ways. Firstly in the temporal sense, multi-locality is seen in terms of movement of people through different spaces. Secondly, multi-locality is viewed spatially in terms of networks that link different household members across localities/borders as they seek and or derive livelihoods in different places. Elmhirst (2008) differentiates between migration as a response to crisis and livelihood failure, and migration as an accumulation strategy, in which social and economic remittances' may play an important transformative role in people-environment relationships. Multi-local livelihood pose national and transboundary challenges regarding policy/program interventions that assume geographical boundedness basin communities

Diversity of livelihood activities notwithstanding, the majority of Okavango basin residents tend to rank agriculture (arable or livestock) first, formal employment second and government assistance third most important. In general, traditional arable farming is an extensive system with minimal input and occasionally fair, but more often low returns. Other livelihood activities include basket-making, fishing, community based tourism or community based natural resources management

(CBNRM) projects. The case studies by Kgathi et al. (2004) and Ngwenya and Thakadu (2007) reflect variations in incomes based on natural and non-natural resource exploitation within and across villages in upper and lower Delta (Figure 1 and Figure 2). The figures indicate that for a significant proportion of households depend on formal safety nets provided by government (in the form of drought relief/labour intensive public works, social welfare packages for under-fives, orphans, indigent persons, community home based care, school feeding, old age pension and war veterans) and informal safety nets such as remittances.

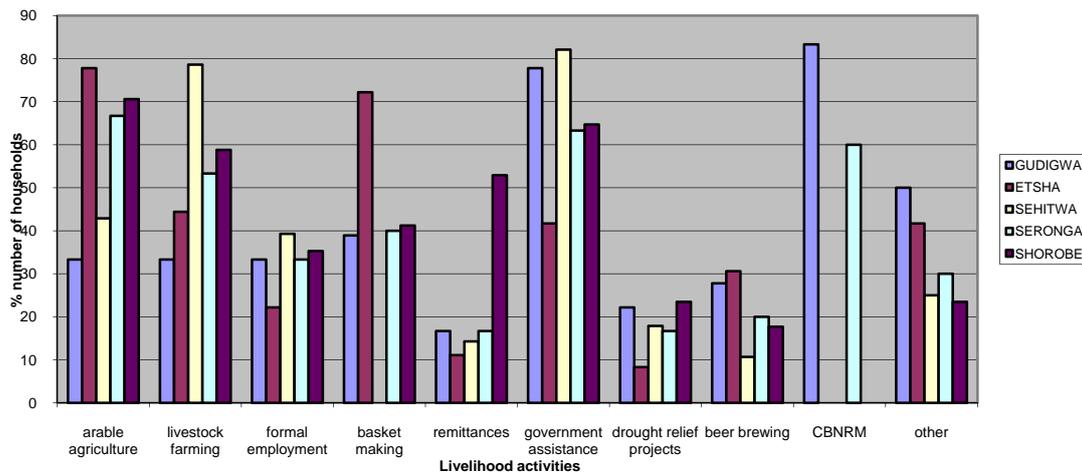


Figure 1. 1: Livelihood activities in five villages (Source: Kgathi et al, 2004)

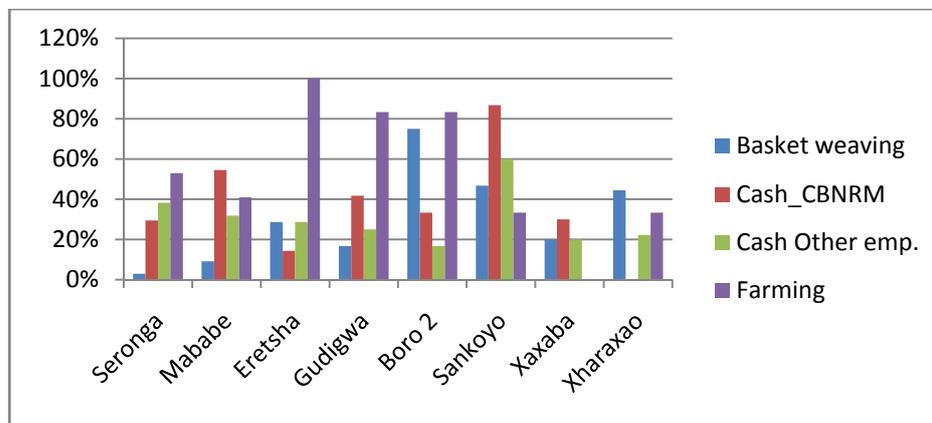


Figure 1. 2: Livelihood activities in CBNRM villages (Source Ngwenya and Thakadu, 2007)

According to Stringer et al (2009:2), adaptation is a process of deliberate change in anticipation of, or reaction to, external stimuli and stress. Kgathi et al (2004) revealed that the main strategies adopted by Sehitwa households to the drying of Nhabe River and Lake Ngami for instance, were digging of wells, switching from molapo to dryland farming and dependence on government for water supply. For some of the households, the drilling of wells was a short-term coping strategy before adaptive or more permanent strategies were adopted. Figure 3 shows actual adaptive strategies to drying of the river in three villages.

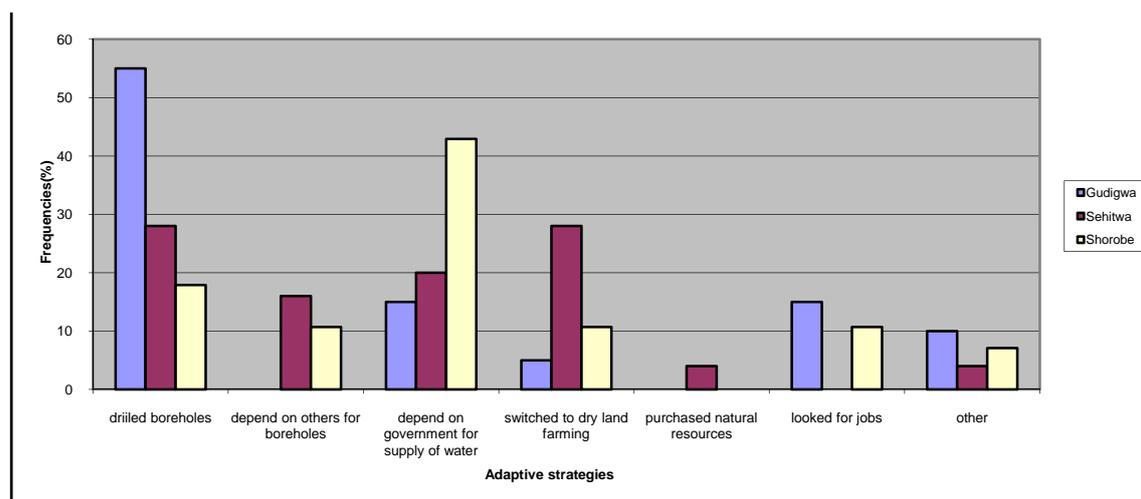


Figure 1. 3: Adaptive strategies in Gudigwa, Sehitwa and Shorobe (Source: Kgathi et al 2004)

Kgathi and et al. (2004) found that the drying of the river channels in these study areas has acted as a push factor for migration and local mobility (intra-district mobility). Migration is therefore one important strategy for individuals to cope (short term or adapt (long term) to shocks or stresses in the Delta. Informal interviews revealed that those who remained in the above localities when others out-migrated were mainly the poor households as they could not afford the costs of relocation. Those who out-migrated to Maun from Shorobe were mainly the economically active. In Sehitwa, 54% of the households reported that some people out-migrated to a number of areas such as Tsau, Maun, Setlatla, Maila, Naune, and Dobe as a result of the drying of Nhaba River and Lake Ngami. In these areas, groundwater or surface water could easily be obtained. Others moved their livestock to other areas where there was plenty of groundwater. Dube and Sekhwela (2008) argue, in the context of communities in the Limpopo River basin, considered local communities' adaptive capacity to climate variability including differential nature of vulnerability to risks of specific social groups. Studies in Botswana (Prah, 1978; Hitchcock, 1978 and Cooke, 1978) have also documented different ways in which local communities historically coped with and or adapted to climate variability (in particular drought condition)s. The adaptive capacity of local communities to environmental as well as resource variability has been of interest to other scholars. Wehbe et al. 2006 (www.aiaccproject.org) analyzed adaptation to climate variability of local communities in Argentina and Mexico, Dabi et al. (2008) in Nigeria, Stringer et al (2009) in southern Africa.

In summary, variability of livelihoods in the Okavango basin represents an unprecedented human adaptability to climate variability. Local communities in the Okavango basin, are likely to experience what has been referred to as 'double exposure', that is, the interaction of global political and economic changes with climatic risks and their effects on households and development opportunities (Eakin, 2005). How communities adapt contemporaneously or will adapt in the foreseeable future is in part determined by households, communities, and governments. However, the effectiveness of local adaptation measures is determined by national policies. Government interventions can either capacitate or incapacitate strategies depending on whether there is flexibility to address evolving impacts of shocks on livelihoods.

Chapter 2 - Gender and poverty context of access natural resources in the Okavango Basin

2.0 Introduction: gender relations in NRM in Botswana

It has been noted that despite the importance of gender now being widely acknowledged, in practice it often remains a marginal concern and frequently simply added on to mainstream development policy and program and practice (Magnus, 2003). Men and women are constrained in different and often unequal ways as potential participants or beneficiaries' natural resources. In the Okavango basin, as is in the Botswana as a whole, gender relations are deeply embedded in and through policies and programs associated with natural resource management. Cassidy 's (2001) analysis of CBNRM projects for instance, noted gendered imbalances both in terms of participation and benefits distribution. Neglect of gender analysis can lead to misinterpretation of the specific characteristics of women and the constraints under which they are assumed to operate. However, men's and women's interests are neither the same nor completely unconnected to each other. Also men and women resource users are not a homogenous group sharing the same interest's interests in natural resources access and utilization.

This chapter will also use case studies to illustrate the different ways in which access to natural resources in the Okavango basin is inflected by 1) gendered relations and, Household 'headship' in the context of poverty. Gender relations are often structured through norms and institutions (Elmhirst & Resurreccion, 2008:9) and determine different ways in which men and women derive and maintain the integrity of natural resources in the Okavango basin.

2.1 Intersections of gendered and other dimensions of social difference

Kgathi et al. (2004) established that participation in specific natural resource based and non-natural resourced based livelihood activities in the Okavango basin is determined by gender. Livelihood activities such as beer brewing and basket making are associated with women rather than men, and these activities give much lower incomes. The District Drought Committee progress reports of Ngamiland also reveal that women have tended to dominate men in drought relief/labour intensive public works activities. During the period 2003/2004, 80% of those who participated in these projects in Ngami sub-district were women. Similarly, a higher proportion (65%) of those who participated in these projects in Okavango sub-district during the period 2002/2003 were women. Studies in other parts of Botswana also reveal that women are more associated with labour intensive public works programmes (LIPWP) than men. According to Gobotswang et al (2002), the proportion of women who participated in LIPWP in Botswana increased from 24% in 1986 to 75% in 2000. Kgathi et al. (2004) found that most of the women participants in Shorobe were the heads of households, who tended to be resource poor. Because men had alternative options, they had a lower participation in drought relief/LIPWP projects as they are lowly paying (they were paid P10 per 6-hour day).

Other livelihood activities in the Delta cut across age and gender. Noticeably, children, men and women hunt for fish in the Okavango Delta, either seasonally in summer in the flood plains or for extended period in the main channels, some wholly or partially for consumption or sale (Ngwenya and Rammai, 2008; Mosepele, 2001;

Ngwenya and Mosepele, 2008). These resource user groups share certain fishing grounds while other fishing grounds remain exclusive. Therefore are likely to have differing and sometimes conflicting needs, interests and priorities. Policies and natural resource management regimes and development intervention programs therefore both nationally and basin wide, have to pay attention to gender.

There are also livelihood activities with great overlap between men and women, the difference being a matter of degree. In some villages, for instance Xaxaba, Shorobe, Shakawe, both men and women cut grass, river reed and collect veldt products and water lily (Applied Development Research survey (2001). Men hunt for wildlife and birds but in some villages they also harvest water lily (tswii), an otherwise predominantly female activity. This tells us that gender relations can be redefined through unusual micro-practices and places in everyday life. Assuming that gender roles are fixed can result in missing the dynamics of natural resource utilization, such as 'resource use switching and or commercialisation' and consequently lead to inappropriate gender blind policies or programs in the Okavango Basin. There need for context specific and historically nuanced understanding of gendered property rights (water and land) (Meinzen-Dick & Zwarteveen, 1998), gender dynamics in local participation in development programs and community based institutions (Agarwal, 2001, Cornwall, 2003), gender geographical mobility (Elmhirst, 2008), livelihoods and resource use (Leach, 1994). Policy and program interventions in the Okavango basin must make explicit the existing unequal gender roles (with regard to specific livelihood resource, land, water, fish, CBNRM, tourism etc) and aspects of the relations that needs to be transformed to enable equitable and sustainable gender development. Lack proper assessment of gender specific constraints is likely to entangle implementers in their own gendered behaviors (Buchy and Rai 2008).

2.2. Dynamics of water use and redefining gender roles

Social benefits of access to potable by through community water points include decreased distance to water point and reduction in water borne diseases. At a more basic level, provision of safe water is necessary for taking medication and for reducing the risk of diarrhoea and skin diseases. Water collection for domestic purposes in the Okavango delta depends on whether or not there is reticulated water in the village. Those riparian villages with reticulated water are less likely to obtain large volumes of water from the river or any of its channels.

A socio-economic survey of 645 households in riparian and non-riparian communities in the Okavango delta undertaken by Applied Development Research Consultants (2001) reported that 22% of those who collect water from the river directly, use it for cooking, 45% for washing, and 45% for watering livestock. It is interesting to note that households in these communities specifically state that water collected directly from the river is not used for drinking purposes. Water for cooking is boiled water and hence safe to ingest. Perhaps the influence of public health campaigns has had an effect on raising awareness among the rural residents. These findings concur with Ngwenya and Kgathi (2006) study on home-based care giving and access to water. The study found that caregivers cope with water supply unreliability in respective villages by specifically reserved and apportioning potable water for their patients to drink and or take medication. They use water from the river to bathe the patients, do laundry and for cooking. The respondents in the study were cautious and shied away from giving untreated water either to their patients or young children. However, inland Delta rural remote communities such as Jao and Xaxaba, who have no water reticulation in their villages, and who depend largely on drawing water from the main

river channel, are of the opinion that the water from the main channel is safe to drink and does not necessarily cause diseases.

Ngwenya and Kgathi (2006) found that households adopted five main coping strategies when faced with lack of water: 1) economised on the use of water by either re-using waste-water or using water sparingly, 2) utilised stored water from reserve tanks 3) collected water from other sources such as rivers and boreholes, collected water from government institutions and also 5) bought water (Figure 2.1). The above-mentioned coping strategies are associated with socio-economic and health costs. For instance, economising on water by reducing the number of meals cooked may adversely affect the nutritional status of households. This may further weaken the health of HIV/AIDS patients. Although inland Delta, rural remote communities such as Jao and Xaxaba where water is less likely to be polluted by domestic animals and human waste were of the opinion that the water from the main channel is safe to drink and does not necessarily cause diseases (Ngwenya and Kgathi, 2006). However, the use of river water by patients (including young children) in response to water shortage in places such as Gudigwa and Seronga was associated with the risk of diarrhea and other opportunistic infections.

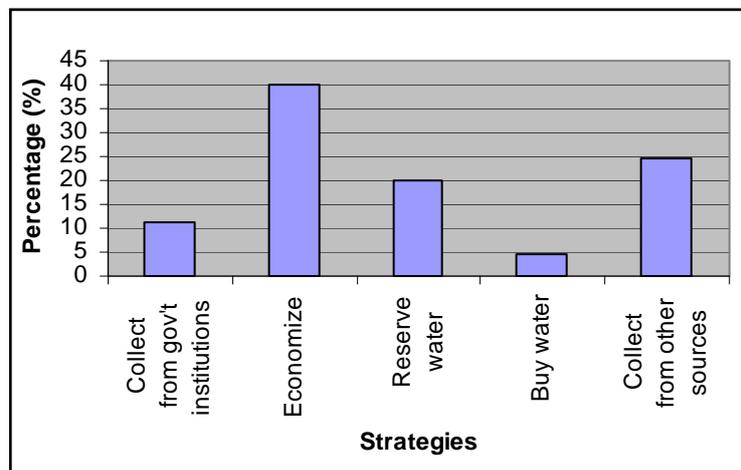


Figure 2. 1: Figure Strategies for coping with unreliability of water supply (Source Ngwenya and Kgathi, (2006).

The literature on water and poverty suggests that the unreliability of water supply tends to influence household water consumption such that areas with high unreliability of water supply tend to have low water consumption (Howard and Bartram, 2003). Ngwenya and Kgathi (2006) study found that the village of Shorobe had the highest unreliability as well as the lowest per capita consumption. The majority of households in ungazetted settlements in order to satisfy their domestic water requirements through abstracting untreated water from river flows and hand-dug wells when the river is not flowing. It has been found that men with donkey carts dominate in collecting water in ungazetted settlements in the Delta. The dominance of men in water collection and use of donkey carts is due to water sources being too distant from homesteads (Mazvimavi and Mmopelwa, 2006).

2.3 Patterns of water use at household level.

In Botswana, water supply to rural villages such as those of the study areas is the responsibility of the District Councils. The Department of Water Affairs has the overall responsibility for supplying water to the major urban villages, whereas the Water Utilities Corporation is the main supplier of water to the urban centres. A large part of the population in Botswana depends on groundwater sources for its water supply (SMEC et al., 1991). Although surface water sources account for 35% of the total supply, they provide 90% of water used in urban areas. In contrast, the majority of rural villages obtain their water from groundwater sources which account for 67% of the total water supply in Botswana (Arntzen et al., 2000). The 2001 Census revealed that villages with a population of 1000-4999 in Botswana had 96.5% of their households with access to piped water. Ngwenya and Kgathi (2006) survey revealed that the proportion of households with access to piped water in their study area was 95%. And water consumption ranged from 50 m³/day in Gudigwa to 183 m³/day in Sehitwa. In per capita terms the figures ranged from 55 l/c/d in Shorobe to 82 l/c/d in Sehitwa (Table 2.1). The figures include consumption by schools, health clinics and the construction sector. The actual household per capita consumption figures (without consumption by government institutions etc) should be much lower than these figures.

Table 3: Water demand, standpipes and private connections in the study areas.

Village	¹ Projected to 2005 population $P_n = P(1+r)^n$	² Demand m ³ /day	Demand l/c/d	Borehole supply m ³ /d	Number of Standpipes	Number of Private connections
Sehitwa	1796	147.0	81.8	620	20	126
Shorobe	1160	63.4	54.7	76	15	72
Etsha6	3195	183.3	57.4	700	7	120
Seronga	1995	154.5	77.4	176	12	78
Gudigwa	890	49.6	55.7	90	7	20

Source: NWDC, Water and Waste Water Department (2005).

¹Used 2001 population data (census). Average growth rate is 4.2% as per DWA design manual, but on consideration of migration of people after drought problems and CBPP, it has been assumed to be 5%.

²Calculation of demand has included schools, hospitals, police stations and secondary schools.

2. 4 Household 'headship' and resource access.

Household 'headship,' is also a factor in access to natural resources. According to Terry (1986), 57% of 60 weavers interviewed in Gumare and Tubu were from households headed by women. Kgathi et al. (2004) study, in which 48% of households were de facto female headed and 52% were male headed, found that of those households reporting that they received permanent destitute allowance, 13% were female-headed households as compared to 8.6% of the male-headed households. The p value for the Chi square was 0.06 (2 df), which is close to the threshold p value for significance of 0.05, but not significant. The researchers hypothesised that a significant relationship could be found if the sample was larger. The association between access to destitute allowance and female-headed households could reflect the fact that these households are generally poorer compared to male-headed households. Figures 2.1 to 2. 6 show rankings of income flows from sources such as molapo farming, dryland farming, CBNRM, livestock and remittances in five villages of Gudigwa, Seronga, Etsha 6, Sehitwa and Shorobe by type of household head (Kgathi et al, 2004).

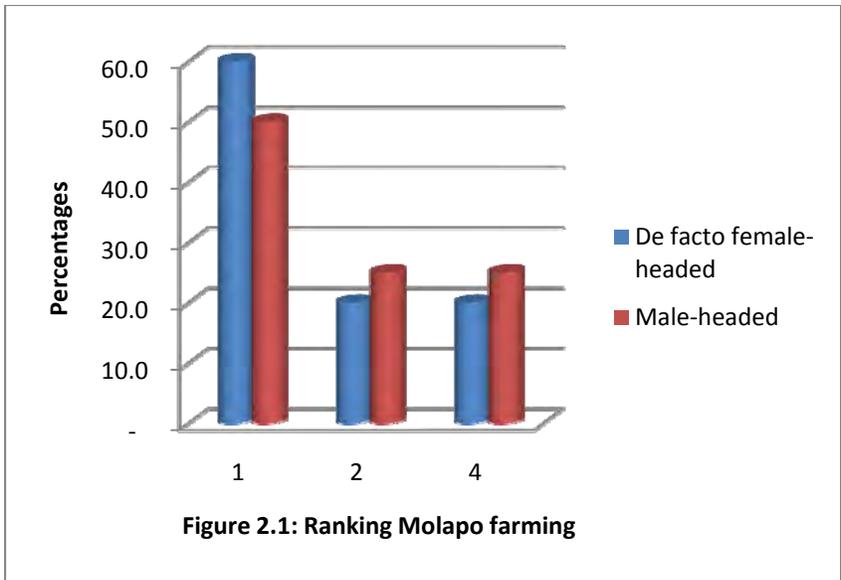


Figure 2.1: Ranking Molapo farming

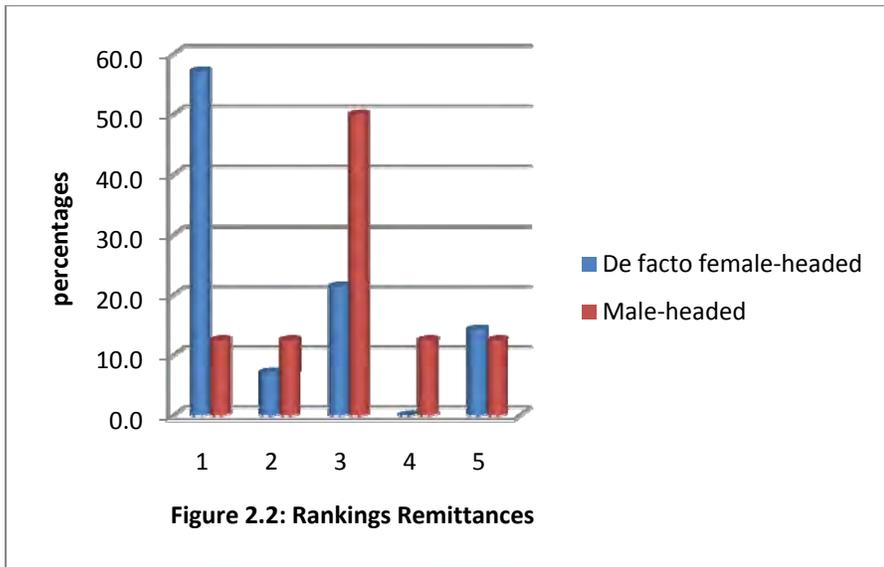


Figure 2.2: Rankings Remittances

Figure 2. 2: Rankings Remittances

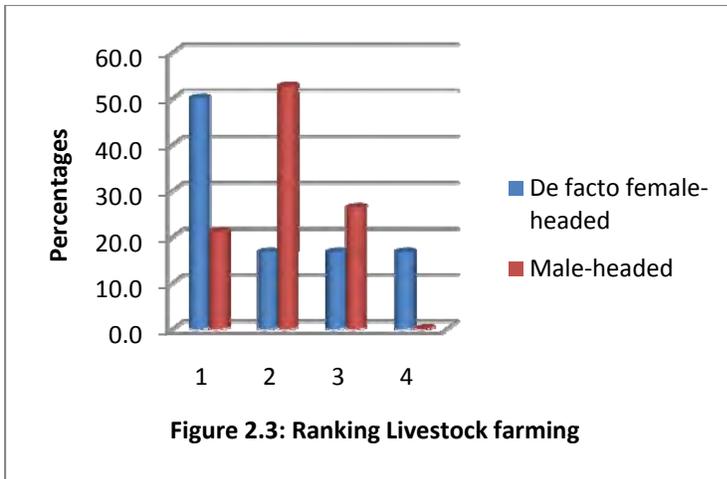


Figure 2. 3: Ranking Livestock farming

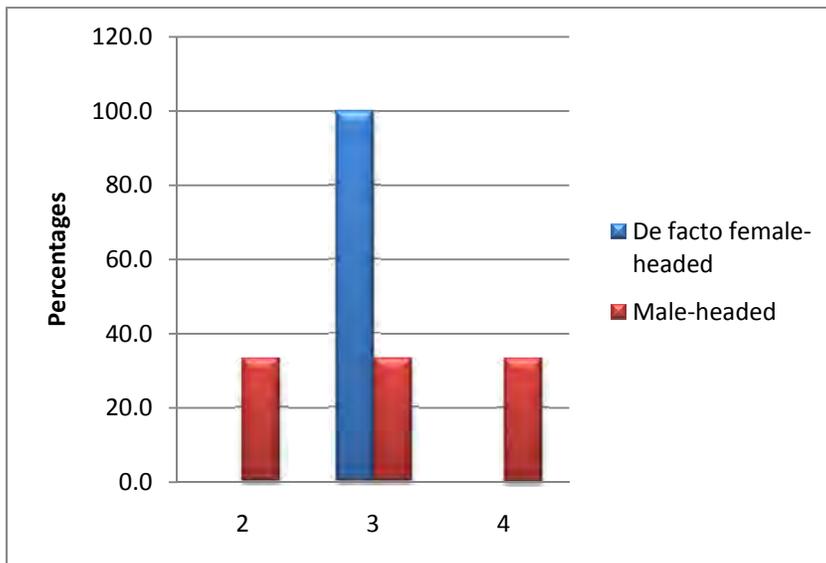


Figure 2. 4: Ranking CBNRM

2. 4.1 Female household headship: 'feminization of poverty? Or feminized poverty?

The 2001 Census results indicate that there were a total of 404, 706 household heads in Botswana. Of these, 182, 637 (46.14%) were female, while 201, 940 (53.86%) were male (CSO, 2002). Although Ngamiland district as a whole is one among three district with the highest male headed households (at 70%), however, Ngamiland west has a high rate of women headed household at 59.3% (CSO, 2006). Also, Botswana poverty map (CSO, 2008) reveal that headcount poverty rate in Ngamiland is severe (40%) and is above 50% in Ngamiland west (Figure 2.5). Furthermore, when disaggregated by gender and household headship, the depth and severity of poverty in Ngamiland west is also apparent.

With regard to average household size, again Ngamiland west has 7.9 persons compared to the national average on 6.48 and a very high incidence of critically ill persons, 2.9% compared to the national average of 2.7%; 54.1% unemployed females (compared to 45.8% males (CSO, 2006) and literacy rates on people 15 and older of 66% compared to Ngamiland East 89% and 89% at national level of (Botswana Literacy Survey, 2004).

From the above described status quo especially as it pertains to Ngamiland East, a question can be asked, does the above scenario reflect what has been described in literature as the 'feminization of poverty', and if so, what implications, if any ,does the prevailing status quo have for natural resource access and control in the Okavango delta.

According to Chant (2006), feminization of poverty means that

- women experience a higher incidence of poverty than men
- women experience greater depth/severity of poverty than men (i. e. more women are likely to suffer 'extreme' poverty than men
- women are prone to suffer more persistent/long-term poverty than men
- women disproportionate burden of poverty is rising relative to men
- women face more barriers to lifting themselves out of poverty

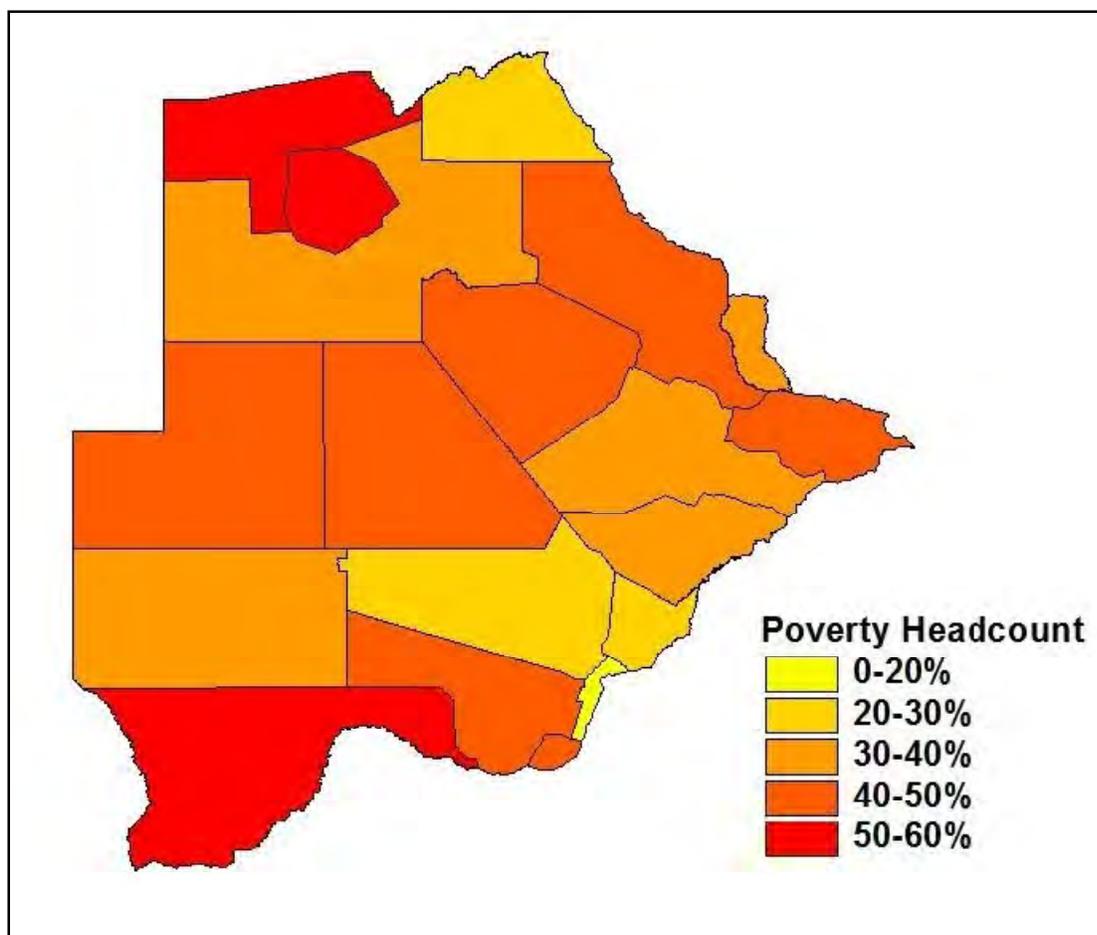


Figure 2. 5: Botswana Poverty Map (source, CSO, 2008)

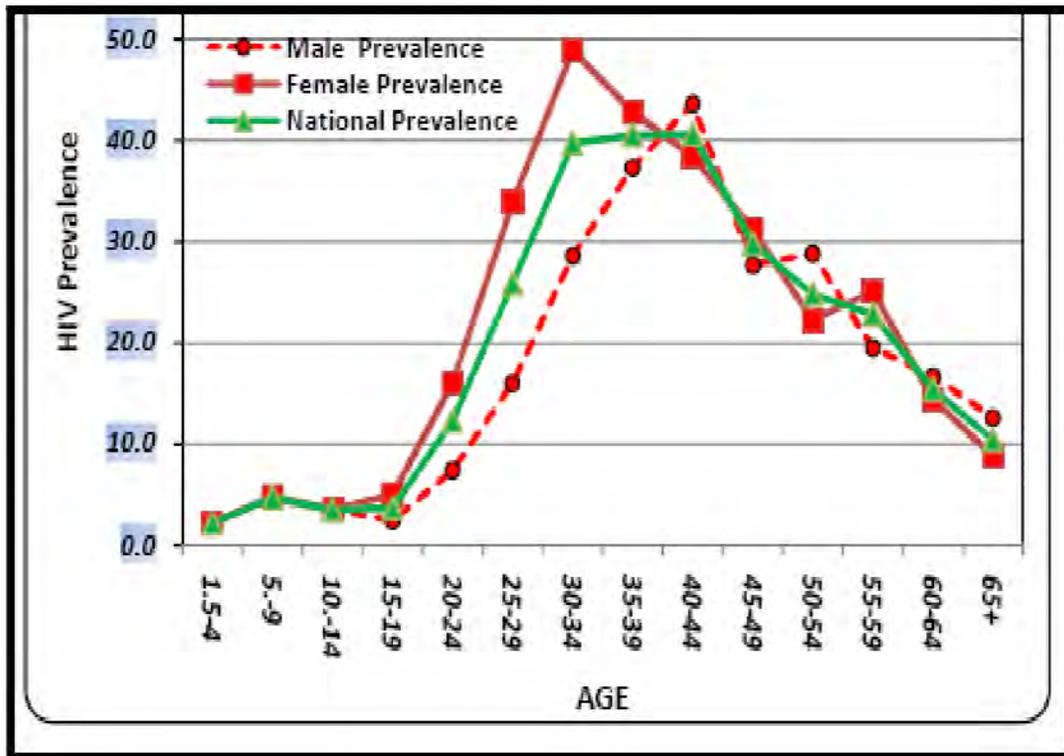
Ample literature has shown that poverty is a multidimensional process. Although income is pivotal in assessment of poverty, a gendered framework of deprivation should include *inter alia*,

- restrictions in access to private and public goods (education, health infrastructure and so on) which compromise human capability/functioning
- asset poverty, encompassing not only material assets such as land and property, but also less tangible assets such as social capital which form part of a livelihood portfolio
- subjective dimensions of poverty such as self-esteem, dignity, choice and power
- aspects relating to social exclusion such as marginalization through lack of political participation and social dialogue (Chant, 2006).

Care should be taken not to stereotype women headed households, equally, care should be taken for instance not to gender stereotype natural resource utilization in the Okavango Delta. Emphasis has to be on the dynamic social, political and contextual relations. These are mediated by women's complex relations with men, kin and other social actors. Women therefore dynamically respond to complex environmental realities, and may enter into and engage in social relationship with men within natural resource institutions in their community.

Chapter 3: HIV Prevalence, incidence, trends and challenges

According to the recent 2008 Botswana AIDS Impact Survey III (BAIS III), national HIV prevalence rate stands at 17.6% (20.4% females and 14.2 males). The HIV incidence rate nationally is 2.9% (3.5% for females and 2.3% for males) (CSO, 2009). Figure 3.1 shows prevalence by age and.



Ngamiland west has a prevalence rate of 16-18.9 % and Ngamiland east is the most hard hit with a prevalence rates of between 19 and 21.9%. The Ngamiland East district also has ‘high incidence zone’ of HIV infection (5.0% and above). Incidence is higher among males than females (CSO, 2009). Figure 3.2 HIV prevalence by district and gender

NSF provides details of anticipated response during the planning period. The key goal areas of Botswana's NSF are:

- Prevention of HIV infection
- Provision of care and support
- Strengthened management of the response
- Psychosocial and economic impact mitigation
- Provision of strengthened legal and ethical environment.

In 2008, Botswana launch of the “Minimum HIV Prevention Package” (MIP), an aggressive National Plan for Scaling Up HIV Prevention 2008-2010 (NACA HIV and AIDS Information Package, 2008)¹ towards universal access to treatment. The Plan defines a minimum set of activities for district, civil society organizations and the private sector intervention plans. These include:

- Prevention of sexual transmission (reducing multiple and concurrent partners, age appropriate youth and school based activities, condom education and promotion, reaching most at risk populations, prevention with positives, voluntary – safe- male circumcision).
- HIV Counseling and Testing (HCT) (Expanding HCT service availability, intensifying targeting males for HCT, increasing HCT among youth, promoting HCT campaigns, couples and worksite testing, standardization of national guidelines and protocols).
- Prevention of Transmission from Mother to Child (PMTCT) (intensification of post-test and supportive counseling to ANC, scaling up-peer mothers Program, promoting male and couple counseling).
- Management of sexually transmitted infections (STIs) (through active screening for asymptomatic STIs, increasing partner tracing and management, promoting patient delivered partner therapy, intensifying programming with sex workers and their clients, aggressive condom distribution).
- Prevention of blood borne transmission (promoting voluntary non-remunerated blood donation, strengthening universal precaution).

The current Ngami and Okavango sub-district 2008/009 HIV plan and collaborating partners in the private sector (especially the tourism sector) and civil society (such as Botswana Family Welfare Association, Maun Counseling Center, Thuso Rehabilitation Center and so on), amply reflect provisions of the MIP (MDSAC,2008/009). Furthermore Ngami sub-district is one of the 7 (Chobe, Francistown, Mabutsane, Selebe Pikwe, and Serowe) designated ARV roll-out project sites eligible for support from ACHAP and receive additional funding to support its core activities. Funding is made to carry out activities within the NSF geared towards increasing coverage of HIV/TB treatment services to eligible patients. This is done through three key areas, infrastructure development (provision of equipment, upgrading health and storage facilities), capacity building/technical assistance (training of health workers through Kitso program, salaries) and procurement and distribution of commodities (condoms and IEC material), partnership with NGOs (BOFWA, BOCAIP, BONEPWA etc) and DMSAC (District Multi-sectoral AIDS Committee).

Recent preliminary results of the Botswana AIDS Impact Survey III revealed by the Central Statistics Office (CSO, 2009) show that HIV prevalence in Ngamiland South stands at 19.8%

¹ NACA, 2008. The National Response, HIV and AIDS Information Package).

(16.4% for males 22.6% females) and incidence of 4.76% for both sexes. With regard to Ngamiland North it is at 16.5% (10.9% males and 21.0% females) and incidence of 3.89 %. The rates of new infections in the district is relatively high such that Ngamiland South incidence (4.76%) now compares with Selebe Pikwe (4.66% incidence) (CSO, 2009).

It is estimated that in 2007, the Okavango sub-district, has approximately 54 442 people of which 16.5% (8,982 people are infected). Ngami district has approximately 75 000 people, assuming that 19.8% or (14 850 people are infected). Because antiretroviral therapy prolongs life, the numbers of infected is expected to increase over time in most districts as more people access antiretroviral therapy. The country's population is expected to continue growing, although at a lower rate than the past (Dorrington, Moultrie, and Daniel, 2006). Figure 3. 1 show different population by 2020 based on CSO and model projections. The CSO and model projections are very close for Ngamiland West (Okavango sub-district).

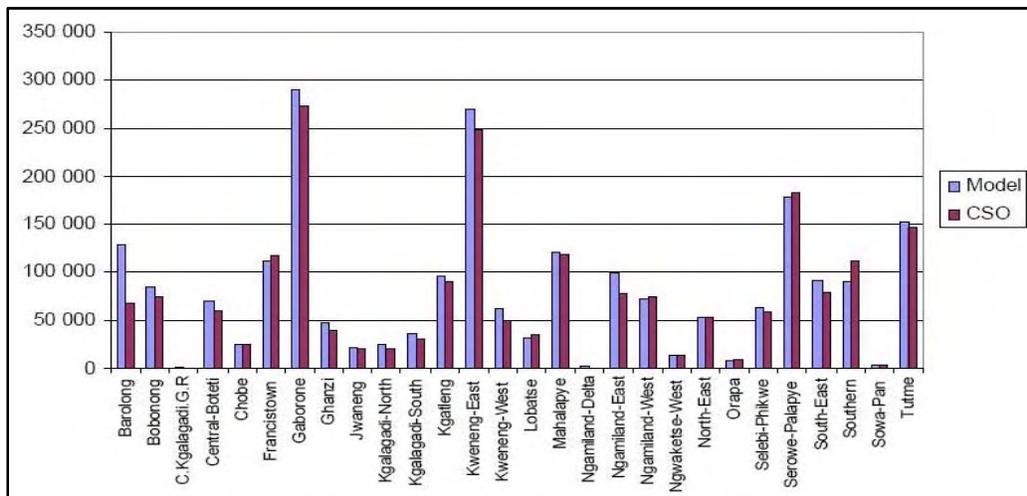


Figure 3. 1: Population Census by sub-district by 2020 (Source: Dorrington, Moultrie, and Daniel (2006, pp:48)

Country wide, the HIV prevalence rates peaked in 2000 (at around 25%. HIV prevalence would be higher if ART is widely used because of the longer life expectancy of HIV + individuals on ART. Although death rates from HIV related factors should decline significantly, it is postulated that with successful ART roll out, the number of HIV + individuals would rise from around 250 000 to 350 000 by 2020. Figure 3.2 gives countrywide estimated new infections each year.. Adult prevalence, a widely used indicator, is the percentage of the population between ages of 15 and 49 infected by HIV. Figure 3.3 gives numbers infected by census district and figure 3.4 estimated by age of all adults over the age of 15 years using BAIS II Survey (NACA, 2008). The timing and spread of the virus varies considerably between census districts with the epidemic being early and severe some districts and late in others. The severity of the impacts within and across livelihood sectors is also likely to vary considerably.

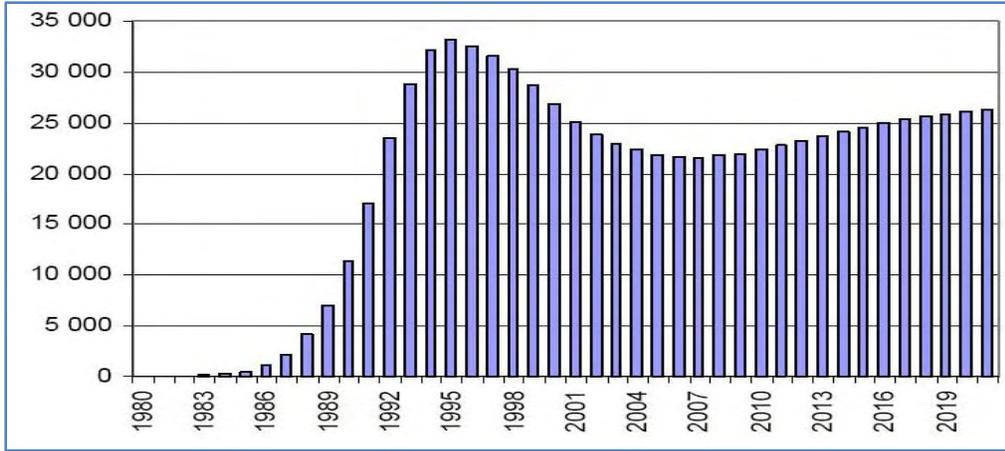


Figure 3. 2: estimated new infections each year (source: Dorrington, Moultrie, and Daniel, 2006, pp48)

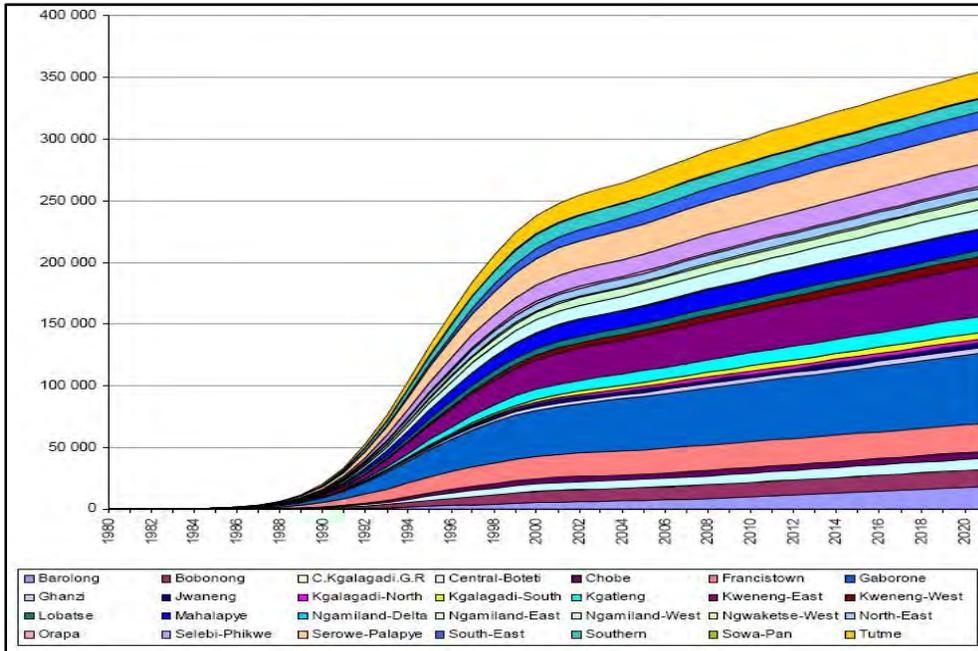


Figure 3. 3: Numbers infected by census sub-districts and year (Source: Dorrington, Moultrie, and Daniel (2006, pp:50)

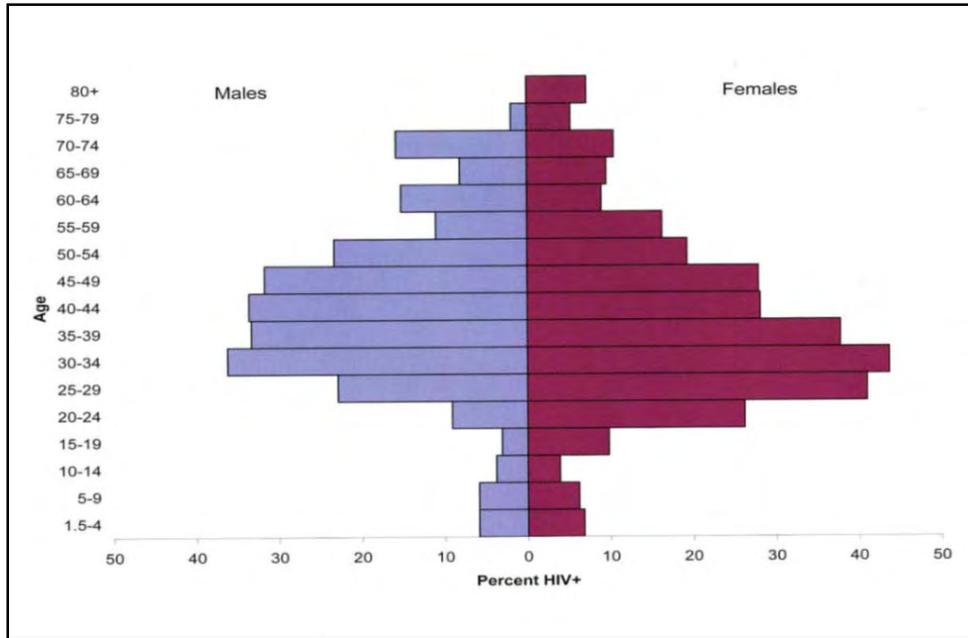


Figure 3. 4: Estimated Prevalence by age to all adults: Source, NACA, 2008 HIV/AIDS in Botswana: Estimated trends and implications based on modeling, pp9).

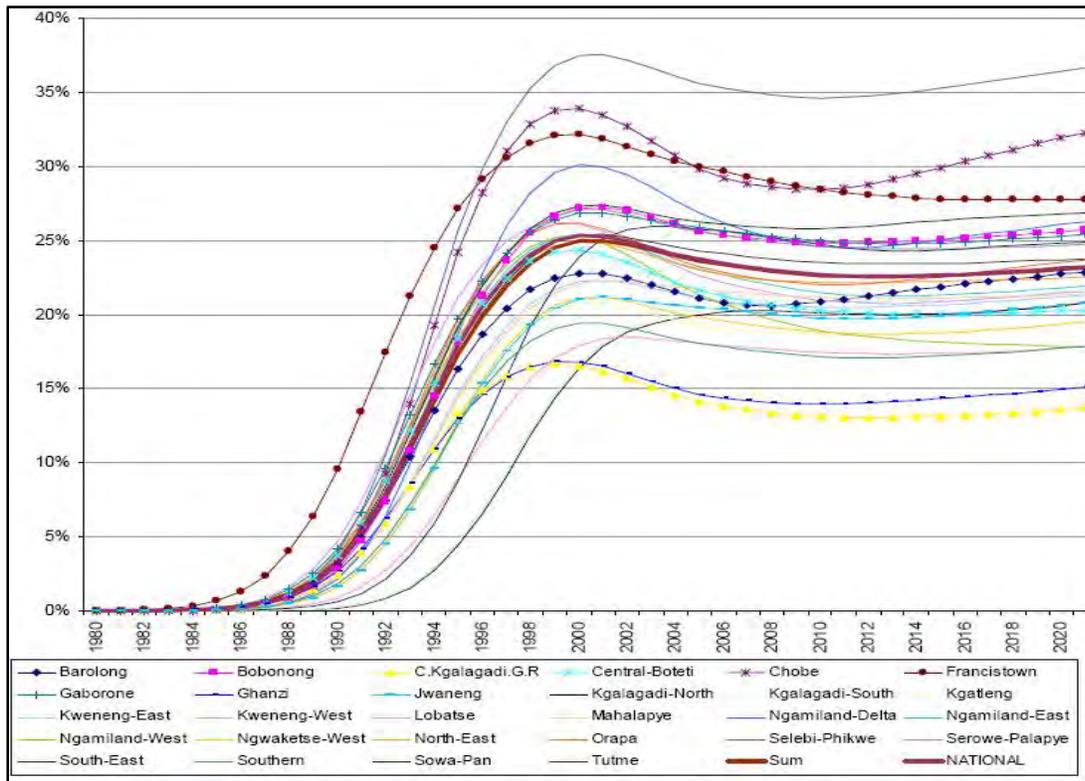


Figure 3. 5: Gradual spread of the HIV virus across districts .(Source: Dorrington, Moultrie, and Daniel (2006, pp:49)

3. 1 AIDS service delivery, settlement patterns and access

Delivery of AIDS services faces some challenges regarding access. Some districts face more challenges than others due to a number of factors. But one of the major service access determinants in Botswana is determined by the country's National Settlement Policy (1998) definition of a settlement, and hence its social service entitlement. The Policy defines a village as a traditional settlement that is established on tribal land, and has a minimum population of 500 people². There are rural settlements however, which do not meet the 500 people criteria, but because of their special features, for instance scattered Basarwa localities in the Okavango Delta, a special consideration is made to accord them a village status although their population threshold is lower. Rural settlements with populations between 250 and 499 are often referred to as "remote area settlements."

According to the policy, social service provision (health, education, power, communication, water and sanitation) follows a hierarchy of settlements according to population size and or status of the settlement (urban, urban village, rural or remote). Large settlements and district headquarters receive high order services such as referral and primary hospitals, while small or unrecognized settlements receive low order services such as health posts and mobile stops (Table 3.1). The problem is that in Ngamiland, 50% of populations live in settlements less than 500 people which have not been classified as remote area dwellers. Because of the vastness of the district and predominantly gravel roads/sandy tracks, access to services remains a challenge. Some health facilities are likely to have physically expansive catchments areas consisting of scattered satellite settlement in the form of *meraka* (cattle posts) or *masimo* (ploughing fields). Outreach health services to rural and remote areas are managed either by clinic or health post personnel within a given catchment area. Maun as a district headquarters has two hospitals (one government and the other private), 12 health clinics (8 publicly owned by the district council and the remaining 4 either by government departments (Botswana Defense Force or Department of Prison Services) or an NGO (BOFWA) and 12 health posts. Clinics in Maun manage about 30 mobile clinics (Table 3.2). All the health posts are publicly owned by the NWDC (NWDC 2006/7 Annual Report). With regard to Okavango (Ngamiland west/Health District 1) primary health care services are provided by 9 clinics, 16 health posts, and 30 mobile stops manned by nurses. Gumare primary hospital is the sub district (Table 3.3).

According to Magole, Ngwenya and Butale (2005), In Ngamiland, 29.7% of residents have access to a hospital, 89.2% to a clinic, 27.0% to a health post and 18.9% to a mobile clinic (BAIS II, 2004). In Maun, approximately 39% have access to a hospital, 92% to a clinic, 50% to a health post, and 25% to a mobile clinic. There is a problem of access. First emanating from the way in which the Botswana settlement policy defines a village which results in approximately 50% of the districts population disadvantaged from optimizing human services. Secondly, the district is vast and with poor physical service infrastructure. Most settlement are difficult to access except through 4 x 4 vehicles which can travel of gravel roads or heavy sandy tracks. Within district service delivery variation is due uneven infrastructural and institutional development, resource capacity. Ngami sub-district, for instance has an added advantage over Okavango as it is one of the 7 designated ARV roll-out project sites eligible for support from ACHAP. As a ARV roll-out site, Ngami sub-district receive additional funding to support its core activities whereas Okavango depend on central government funding to carry out activities.

² The 1991 Population Census defines an **urban-village** as a settlement with a population of 5,000 or more persons with at least 75% of the labor force in non-agricultural occupation, an urban area is a non-agricultural commercial center regardless of the population size.

There are no NGO branches such as BOFWA in the Okavango sub-district to can play a gap-filling service role. These are found in Maun.

However, the picture is likely to changes due to the fact that the National Development Plan 10 (NDP10) has provision for a primary hospital in Shakawe. Ngamiland District Development Plan (DDP 7 2009/2010 – 2015/2016) has proposals for infrastructural development under the Ministry of Health including the upgrading primary hospital in Gumare and possible construction of a primary Hospital in Sehitwa and the Institute of Health Sciences somewhere for 2009/2010. Other developments include the Ministry of Works and Transport proposed construction of Mohembo - Gudigwa road and upgrading the Etsha 6, Gumare and Sehitwa road. With regard to development of human capital, the proposed education and skill development institutions under the Ministry of Education include a college of education, three senior secondary schools (Gumare, Sehitwa and Maun respectively), vocational training college in Sehitwa, a technical college in Sepopa and Tsau, non-formal education center in Sehitwa, Etsha 6 and Shakawe. Whereas all these infrastructural and institutional developments are welcome and will greatly enhance the district's human capital, population growth centers and centers of commerce, create employment opportunities, the down side of it is that these changes are also likely to lead to increased risk factors of HIV transmission. Table 3.4 shows some planned developments to upgrade existing health posts in Okavango.

Facility	Available Services	Physical description	Location and population
Mobile Stop	Limited PHC services	No fixed facilities	Very remote areas
Health Post	Community based worker at first contact, primary health care, case finding/follow-up, Period visits by mobile health teams	3 rooms and a toilet Staff house in remote areas	500 – 1000 in rural area
Clinic without maternity	Maternal/child health, Preventive work (as health post), Diagnosis and Treatment of common diseases, simple lab work, Case finding/follow-up with emphasis on TB	5 rooms, covered area, toilets, vehicle and 2 staff houses	5000 – 10 000 in rural areas 10 000 or more in major villages and towns
Clinic with maternity	As above, including deliveries	As above plus maternity unit, vehicle and 3 staff houses	As above. Maternity wards depends on area's needs
Primary Hospital	As at clinic, Supervision of clinics and health posts, General in-patient care, Lab tests, X-rays and surgery	20 –70 beds, 4 – 12 maternity beds, 16 – 58 general beds, Out-patient facilities	Mainly in villages and remote areas. Depends on area's need (Gumare)
District Hospital	As at primary hospital, Specialist services for serious and complicated health problems, Preventive, curative and rehabilitative care, In-patient care for more complicate health needs	Primary hospital on a larger scale 70 – 400 beds	Major villages and towns (Maun, Letsholathe Hospital)
Referral Hospital	As district hospitals, Specialist clinical services	400+ beds	Gaborone and Francistown

Table 3. 1: Health service delivery hierarchy

Mother Clinic *maternity	Mobile stops under each clinic	H/Posts under jurisdiction of mother clinic	Mobile stops under each Health Post
Maun Council clinic	Xhoo, Tsutsubega, Gogomoga, Mosu, Nxaraga, Pompong, Nxabega, Chitabe, Xigera, Kanana, Sandibe, Xudum,	Somelo	Marothodi/Hyenaveld
		Komana	Makgalo, Phatswe,
Boseja clinic	Xhobe, Vumbra, Kaporota, Baines, Stainley's camp, Duba camp	Disana	Samedupi
		Kubung	Thamalakane east
Sedie clinic	Boro, Jao, Jakana, Kwetsane, Seba, Tubu, Macatooth	Mathapana	Sexaxa, Boronyane, Matsaudi
Boyei clinic	Xaxaba, Xharaxhao, Gorukhu, Xhoga,	Shashe	
		Thito	Kgantshang, Tsakanoka, Dikgathong, Shashe bridge, Xhugana, Camp Okavango, Kwara camp, Shinde
Sehithwa*	Phathane, Solabompe, Polokabatho	Thoteng	Makgwelekgwele, Xamote, Tsokung, Legothwane
		Bodibeng	Mathamagana, Spanplerk, Mathabologa
		Bothatogo	Pelobotlhoko, Polokabatho
Makalamabedi clinic*	Bonno, Phenyo, Palamaokue, Mphoyamodimo	Chanoga	Mawana, Tatamoga, Xhana
		Phuduhudu	
Tsau clinic*	Xhangoro, Mapute, Kaure	Kareng	Botshelo, Tjevaneno, Mosarasarane
		Makakung	Xunxa, Matlhomahibidu, Roomane
		Semboyo	Naune, Maila
Shorobe clinic*	Daunara, Quaxao ,Ditshiping	Mababe	Khwai, Xakanaka
		Sankuyo	

Table 3. 2: Ngami/Health District 14 Clinics and their catchment areas

Clinic with Maternity	Health post	Mobile stop
Shakawe*	Nxamasere, Gani, Nxomokao	Samochima, Tsodilo, Xhauga, Xaudumo, Diniva, Shaikarawe, Setutu, Senono, Xaree
Etsha 6*	Etsha 1, Nxaunxau,	Chombona, Xara
Nokaneng*	Habu	Kwende, Boajankwe
Qangwa*	Xaxa	Dobe, Xhooshe, Magopa
Seronga*	Gudigwa, Beetsha, Gunotsoga, Chukumuchu	Jao Flats, Eretsha, Mokgacha, Vumbura, Seshokora
Xakao*	Mogotho, Ngarange, Kaauxwi, Sekondomboro	Kaputura, Tobera

Table 3. 3: Okavango/Health District 1 Clinics and their catchment areas



Figure 3. 6: Mobile Clinic Source: Ngami 2008/9 Progress Report

Health post	Population served	Kilometers from nearest health facility
Beetsha	2317	45
Nxamasere	2971	18
Ngarange	2242	15
Kauxwi	2494	5
Nxomokao	1948	10
Sekondomboro	1126	10
Mogotho	1022	35
Gudigwa	1082	71
Tube	1076	15
Nxauxau	796	121
Chukumuchu	305	102
Etsha 1	800	10
Habu	780	38
Ikoga	887	21
Gunotsoga	666	21
Xaxa	306	45

Table 3. 4: Health posts earmarked to be upgraded in the order in which they appear.

3.2 Access to Antiretroviral Therapy (ART)

In 2002 antiretroviral therapy (ART) was made available through the MASA program for free to Botswana citizens through public health facilities. By 2005 a phased roll-out plan resulted in a dramatic increase from initial 4 to 32 treatment sites in all 28 health districts in the country. Consequently, the treatment deficit was gradually reduced from 36% of those eligible in 2004 to 11% in 2005. In order to further expand access, a number of satellite clinics have been developed with the capacity to dispense, screen and dispense drugs or screen only.

It is estimated that currently, 80% of all people on treatment are enrolled through the public sector. Figure 3.7 indicate ARV Therapy (ART) enrolment in public sector sites (April 2006 – September 2008). In 2008, the enrolment was 90 921 end of September, up from 85 541 at the end of June, representing an increase of 6.3%. In Ngami sub district, October – December 2008 indicates that 2, 268 patients are enrolled on ART and that there has been a steady increase in the number of patients.

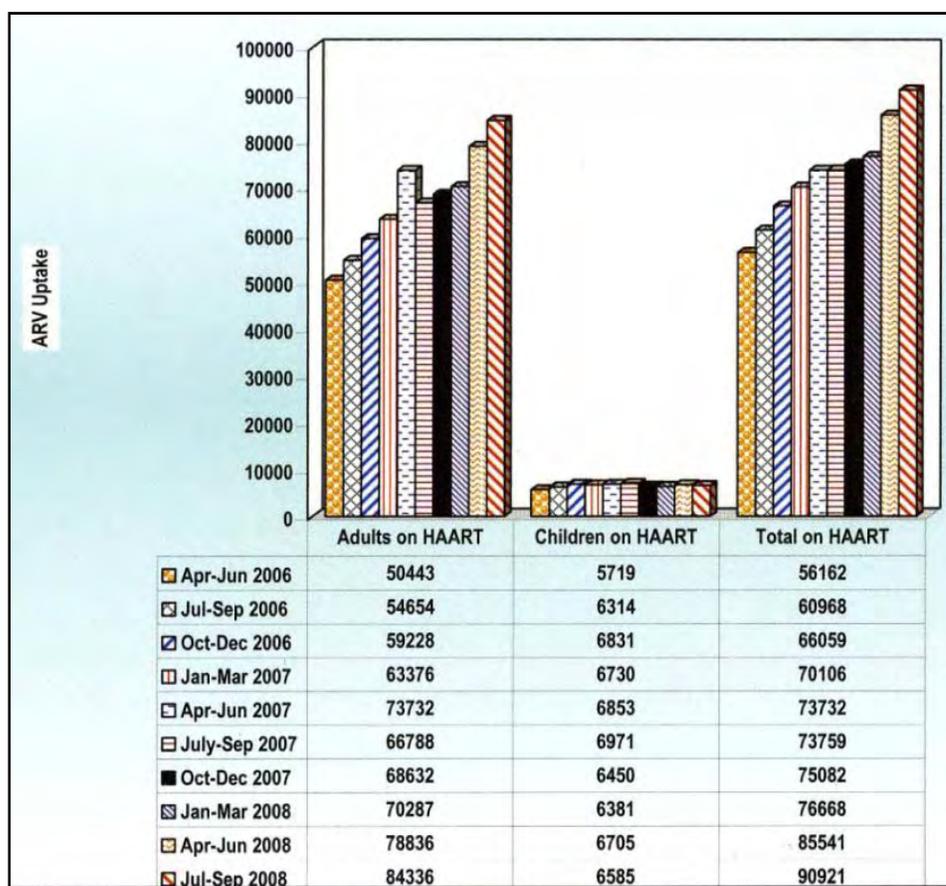


Figure 3. 7: ARV Uptake in Government Masa Sites,(April 2006-September 2008)

In the Okavango, Shakawe and Seronga health facilities that dispense ARV drugs on site, Xakao, Nokaneng and Etsha 6 only do the screening. In Ngami sub-district, out of the 8 clinics, 6 dispense on site and 2 on outreach (Makalamabedi and Tsau). The District hospital in Maun screen and dispense (Figure 3.8). This implies that, compared to Okavango, Ngami sub-district offers more ARV screening and dispensing services to patients. Figure 3.9 map key shows that

compared to other districts, Ngamiland has the highest number of settlements (46%) that are > 60km from an ARV clinic. This implies that approximately 36% of the districts population. Figure 6.2 overlays HIV prevalence by district of both sexes (based on sentinel data of 2006) and the number of settlements and distance from ARV clinics/services. Figure 3 .10 shows that overall, 94 locations are < than 5 km from the ARV clinic, 287 are within 6 km -30 km; 140 within 31 km – 60km; and 56 settlements are > 60 km from ARV clinic. This further demonstrates the problem of small scattered settlements and access to social services.



Figure 3. 8: Clinics providing ART services in Botswana (Source: Ministry of Health, Department of HIV/AIDS Prevention and Care, Monitoring and Evaluation Unit)

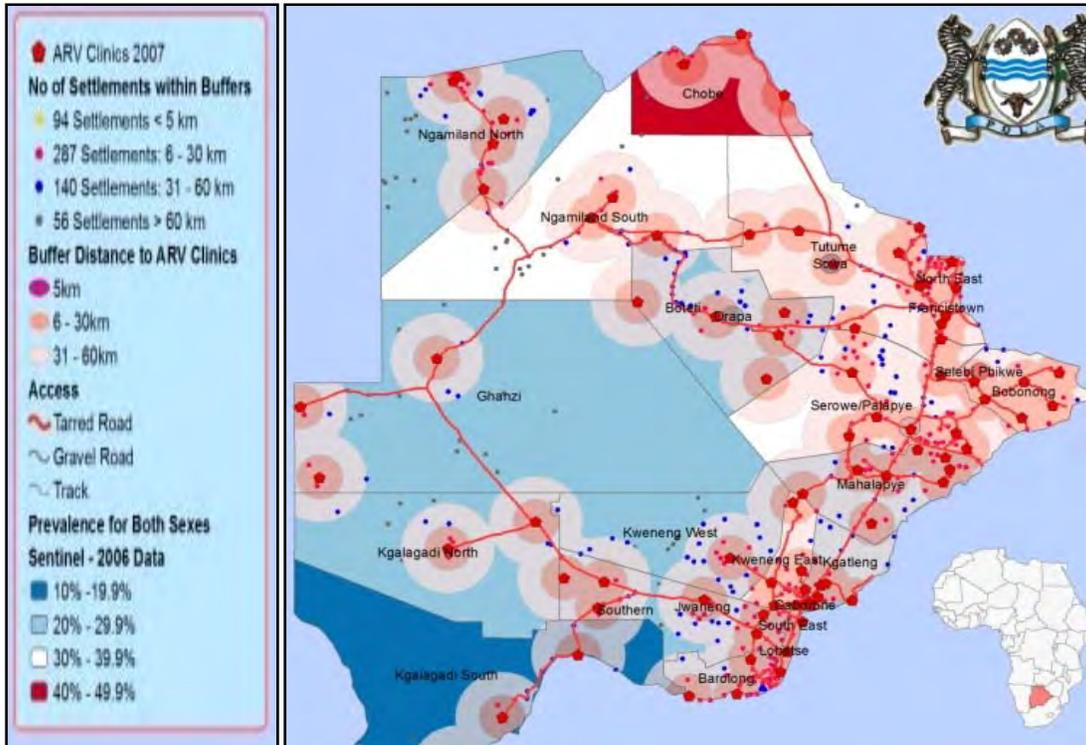


Figure 3. 9: Clinics providing ART services in Botswana (Source: ministry of Health, Department of HIV/AIDS Prevention and Care, Monitoring and Evaluation Unit).

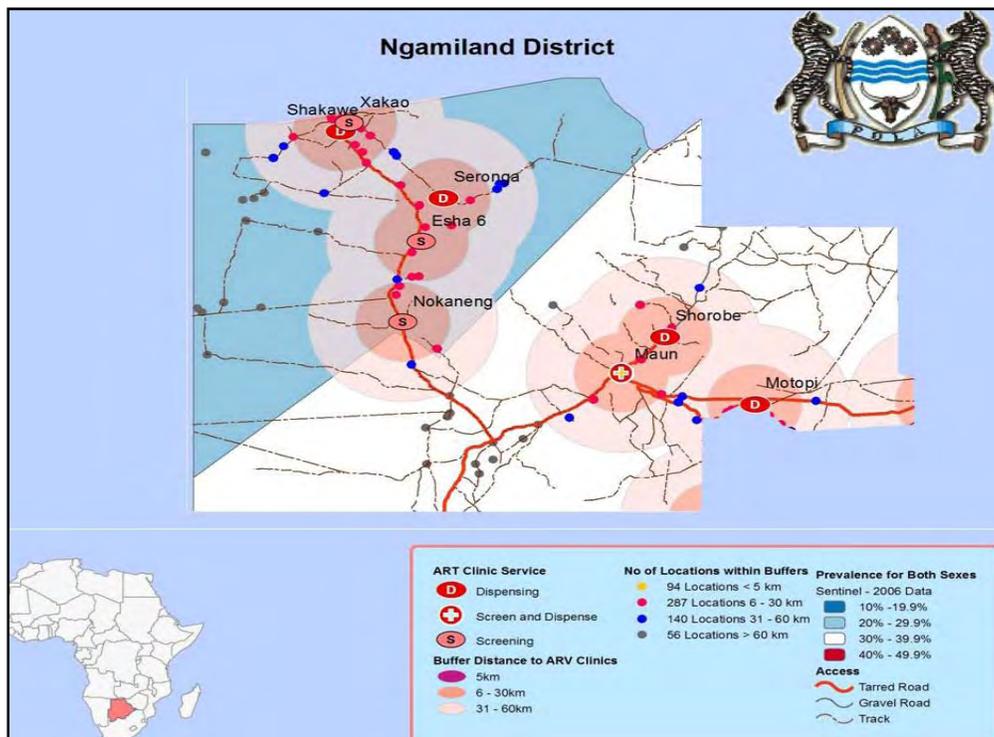


Figure 3. 10: Clinics providing ART services in Ngamiland (Source: Ministry of Health, Department of HIV/AIDS Prevention and Care, Monitoring and Evaluation Unit).

Chapter 4: HIV and AIDS and natural resource based livelihood

4. 1 Introduction:

Whereas the revised National Policy on HIV and AIDS (2006) has put some sectors in the fore-front, the role of natural resource based sectors such as agriculture; fisheries, water and CBNRM were not clearly defined in the National Policy on HIV/AIDS. Unfortunately, in Ngamiland, a significant proportion of the district population's livelihoods are derived from these. Numerous case studies of the linkages between HIV/AIDS and natural resources management in Kenya, Namibia, South Africa (Johnson and Freeman, 2002), Uganda (Ruhweza and Thangphet, 2001), Malawi (COMPASS, 2003) and elsewhere (Thangphet, 2001) have demonstrated HIV/AIDS impacts on natural resources management and provided insights on how to mitigate the effects (Oglethorpe and Gelman, <http://www.frameweb.org/>). Erskine's (2004) comprehensive study on impacts of HIV/AIDS on a conservation agency, rural livelihoods, natural resource use and management in KwaZulu Natal found that HIV/AIDS undermined the internal capacity of conservation agencies. The impacts of the HIV/AIDS pandemic in Botswana, like elsewhere in developing countries, cuts across all livelihood systems. Logically, the scourge has adversely impacted the natural resources or conservation sector. These include, but are not limited to, loss of human capacity for natural resources management (NRM), changes in land use and natural resources access (Africa Biodiversity Collaborative Group, 2002).

Chapter focuses on the impact of HIV and AIDS on four key natural sectors resources which are dependent on water related services of the Okavango Delta, namely, water, agriculture, fish and community based natural resource management (CBNRM) projects. The chapter draws insights from the Sustainable Livelihood Framework (SLF) (Ellis, 1998, 2000; Scoones, 1998) as applied by Gillespie (2006) to show how HIV and AIDS affects, and is affected by livelihoods.

The frameworks show how people's risk for contracting the HIV virus will be governed partly by the susceptibility of a livelihood system and that AIDS has effects on assets and institutions. According to Gillespie (2006), on the 'upstream' of infection, specific socio-economic factors fuel infection rates including gendered inequalities - which translates to inequities in resource access and opportunities. These gendered imbalances in turn, make it difficult for example, for women and girls to negotiate safe sex, and for young girls to avoid in inter-generational and or transactional sex with older men. With regard to the 'downstream' side of HIV infection, AIDS poses a threat to production, declining through labor productivity, inability to purchase input, increased spending, changes in livelihood patterns, loss of property, declining yields that threaten of food and nutrition security, and the emergence of specific forms of vulnerability.

Food insecurity and vulnerability to food insecurity is influenced by institutional, economic, cultural and political dynamics. Those who are most vulnerable to food insecurity and poverty are often those facing multiple stresses and overlapping vulnerabilities. These might include, for example, drought and illness or death of a household member due to HIV and AIDS or other illnesses. The social groups most vulnerable to poverty and food insecurity in Ngamiland are the aged, youth, single mothers, female-headed households and the unemployed.

Institutional management of NRI is highly affected by HIV. Mullins (2001) argues that HIV and AIDS has a two-pronged effect on institutions, namely that institutional staff members are people living in communities and that, due to the nature of their work, they are more vulnerable

to contracting the virus. Secondly some NRM sectors have high-risk occupations. Workers tend to be mobile and are likely to work in remote and marginal areas away from their families. When HIV virus infects a staff member, impacts are felt at four levels at varying degrees; i.e. household, community, institutional and sector level. Weakened institutional capacity impacts negatively on organizational ability to carry out its core business and to deliver extension services and support to client communities. Also, Soefftestad (2001) observed that the workload for extension workers in Malawi increased as they were forced to look after survivors of their deceased colleagues. The death of institutional staff members also leads to loss of skills, knowledge, expertise and institutional memory. Institutional effects are in themselves a measure of vulnerability and will determine strategic responses that households or communities adopt to deal with the threat.

4.2 Access to Portable water and HIV and AIDS

The unreliability of portable water supply in some the Okavango basin villages can last one or two weeks due to poor communication between the water operator and the office which supplies fuel for engine which pumps water, and the high frequency of absenteeism from work by water engine operators mainly due HIV/AIDS related illnesses or attendance of funerals (Mwankenja, 2005, pers comm.). The findings were consistent with some of the problem areas associated with the HIV and AIDS epidemic in southern Africa as identified by Ashton and Ramasar (2004, p9). Some of these problems are as follows: 1) decline in productivity as a result of the epidemic 2) increase in staff turnover as a result of the morbidity and mortality of staff and. 3) increase in the poor quality of drinking water as a result of the deterioration in water personnel which may lead to "increased public health risks." The findings are also in conformity with the views of Kamminga and Wegelin-Schuringa (2003) who contend that the epidemic also adversely affects the quality and quantity of the service provided by the water sector as a result of an increase in mortality and morbidity of the staff in this sector.

Nxesi (quoted by Kamminga and Wegelin-Schuringa, 2003) argues that access to safe water and sanitation is one strategy among others for managing AIDS related opportunistic infections. AIDS infected and affected individuals and families need to stay in hygienic conditions, free of harmful germs and bacteria. Access to sanitation, especially flush toilets for very sick patients, is important since they may be too weak to walk outside the house to relief themselves. HIV and AIDS problem is worsened by the reduced access to potable water supply among households who collect water from communal standpipes, mainly because of the high opportunity cost involved in water collection and also because of the intermittent supply of water. This problem can led to an increase in the use of water of poor quality and other practices of poor hygiene. The adoption of these practices has the potential to increase the risks of public health, further worsening the condition of HIV and AIDS patients with impaired immune systems. In addition, the epidemic also adversely affects the productivity of the water personnel due to an increase in mortality and morbidity of staff and the general population. The opportunity cost of water collection was the only factor which could limit water consumption as water is not purchased by those who collected water from communal standpipes. However those with private connections (both outdoor or indoor) pay for water, and the tariff structure is progressive such that the charge for the highest use band (over 41 m³) was P8.15 which is seven times the charge of the lowest use band (up to 5 m³) of P1.25, the aim being to take account of the use of water for the basic human needs and also to penalize those who use a lot of water (DWA, 2004).

On the other hand, water consumption for CHBC households who collected water from communal standpipes was less than 20 l/c/d. According to Howard and Bartram (2003), at this level of consumption the minimum basic needs are achieved, but basic hygiene may be greatly compromised as the water is not sufficient for household use. The average time spent on water collection from the standpipes per day was 21 minutes, whereas the average distance walked by 93% of the households to and from the collection points was less than 500 m, and only 3% of the households travelled more than 500 m to collect water. According to Howard and Bartram (2003), access to water as determined by distance is considered to be of an intermediate level if it is between 100 m and 1000 m, whereas in terms of time, it is considered to be of basic level if it takes about 5 minutes to 30 minutes, and to be of intermediate level if it takes about 5 minutes.

4. 3 Agriculture in the context of HIV and AIDS

Given the fragile nature of the agricultural sector in Botswana caused by climatic limitations and that a significant proportion of the country's population, almost 80%, depend on subsistence arable agriculture to sustain their households, one would have imagined that the role of this sector feature prominently in the revised National Policy on HIV/AIDS. Unfortunately, the role of the agricultural sector in the country's AIDS prevention, treatment, care and support has not been made as explicit as for other key ministries and thus remains obscure as it is lumped together with other ministries and parastatal under section 4.14 of the Policy. The link between a key food production sector, household food security, poverty and HIV is missing in key policy documents, notably the National Policy on Agricultural Development (1991), the Revised National Food Strategy (2000), National Plan on Food Security and National Strategy for Poverty Alleviation (2003). According to the Ministry of Agriculture's AIDS Coordinating Unit, to date, no comprehensive study has been done in Botswana to demonstrate how HIV and AIDS interact with shock prone agricultural sector in the country. It is difficult to imagine how, without empirical assessment AIDS effects on agriculture, the ministry come up with appropriate policy/program interventions. A study by Gobotswang et al. (2004) on the impact of HIV and AIDS on food security and agricultural production in Botswana suggest the following effects:

- Reduction of labour capacity and a shift from productive work to care-giving activities coupled. Agricultural production is affected through an increase in fallow land, less time used on livestock health and management, land clearing, cultivation, weeding and pest control among rural households, notably due to illness, lack of labour and draught power, as well as the increase in care needs in the household;
- Shift in investments from agricultural inputs and management, e.g. livestock nutrition and health, to pay for medicines, transports and funerals;
- Migration from urban to rural areas by people that are sick, with resulting increase in care-giving responsibilities in rural areas;
- Reduction in number of meals eaten per day among illness-afflicted households; and
- In line with the overall population, the extension services are experiencing reduced work capacity and absenteeism among staff.

Gobotswang et al. (2004) also found that HIV and AIDS tend to lead to changes in decision-making patters within the household. In the livestock sector, for instance, decision making was shifting from male head to sons, wives, and sometimes also to daughters, but the general trend among households affected by the epidemic was that less time is spent on livestock management.

4.3.1 Gender, agriculture, HIV and AIDS

In Botswana, the majority of the rural population and small-scale farmers are women (2001 Rural Household Survey), and are as such more likely to be illiterate, less informed about rights, and have less access to information, productive resources and opportunities for paid employment than urban people and male counterparts in rural areas. Legislative, cultural and institutional mechanisms are all used to restrict women's rights to land, leading to marked gender inequality in land tenure.

In Botswana, there are approximately 113,000 agricultural holdings. The majority are headed by men, while 35% are headed by women (near 40,000). There are 62,000 married or cohabiting men heading a rural household. It can then be assumed that there are a matching 62,000 married or cohabiting women living in male-headed holdings. In addition, there are almost 40,000 female-headed households, implying that there is a total of 102,000 adult women on agricultural holdings, indicating that women by far outnumber men in rural areas (total number of male holders is 73,334) (CSO 2004).

The customary law, under which most women in rural areas are married, also disadvantages women in that it confers almost all decision making powers for productive assets to men. Although the Government of Botswana has made efforts to amend the Land Policy and the Marital Act to allow women to acquire immovable assets, the implementation of these instruments at local levels and financial institutions remains problematic because officers have not been retrained on how to interpret the new regulation and thus still continue to deny women access to land and credit. Even after the removal of marital powers from the Marital Act, some financial institutions still demand that for women married in community of property need authorization from their spouses to acquire property. The Marital Power Bill excludes women married under Customary Law. Similarly, women married in community of property are denied communal land by land boards in cases where their spouses already have piece of land even though the policy states that they could be allocated a piece of land.

A study in Zambia reported that most victims of property grabbing normally do not want to take legal action against the culprits for fear of unnecessary confrontations with relatives of the deceased. Similarly, as more people die of AIDS, traditional practices of inheritance are becoming a source of grief and subsequent hardship for widows. The deaths of husbands worsen women's already low access to productive resources for agricultural production, such as land, livestock and inputs. In Botswana, widowers tend to remarry to quickly find somebody to take over the functions of the deceased wife. Widows, however, seem to have more likelihood of remaining single, thus being left with care responsibilities for children, relying on the labor of few adult. Depending upon existing social networks, they may be able to rebuild their livelihoods, but are less likely to recover from the shock than a male-headed household. Although the government of Botswana has committed itself to eliminate all forms of discrimination against women, inequalities of assets and income in Botswana are still pronounced. While most countries have put in place policies and laws to allow women access to and use of land, FAO (2005) has observed that the mere existence of laws does not necessarily change social practices and customs.

In summary, decline in productivity of the agricultural sector and gender-related challenges in the context of HIV and AIDS are, inter alia,

- Rural-urban migration, leading to an ageing of rural areas, with many households headed by older women with few livelihood opportunities.
- Differences between women and men when it comes to ownership of land, cattle and other property
- Married women in rural are rarely able to buy or sell land in their own capacity, but are rather expected to produce consent from a husband or male relative. A similar consent from wives is not demanded.
- Evidence in Botswana and elsewhere in Africa indicate that women comprise the backbone of the agricultural workforce. They are involved in almost all agricultural operations of ploughing with animal traction. However, extension officers are predominately male, and extension services are geared more towards male than female clients;
- Demands on time for care giving activities by women and girls leave them less time for productive and other activities,
- Unemployment among young people create specific challenges for young women; leaving vulnerable to sexual exploitation and risky survival strategies due to limited employment opportunities. What about young men, what do we know?
- Despite the fact that agriculture is the mainstay of the majority of Botswana, the National AIDS policy does not treat the sector as a priority sector. The medical model predominates government 'multi-sectoral' interventions and approaches.
- Limited access to education, training, information and productive resources such as land, and water coupled with care responsibilities and time constraints inhibit some women from taking an active part in improving their skills and livelihoods.

4.4 CBNRM and HIV and AIDS

Ngamiland district is a home to a significant proportion of active CBNRM CBOs projects in the country. There are approximately 21 CBNRM CBOs in Ngamiland covering at least 63 villages and settlements (Figure 4.1). Additionally, Ngamiland CBNRM CBOs are among the high income generating institutions, and has a District CBNRM Forum that was started in 2000 with strong and all encompassing membership from government, CBNRM NGOs and CBOs, private sector and special interest groups. Ngamiland therefore it presents an ideal setting for assessing the relationship between CBNRM HIV/AIDS impacts.

NGAMILAND COMMUNITY BASED ORGANISATION

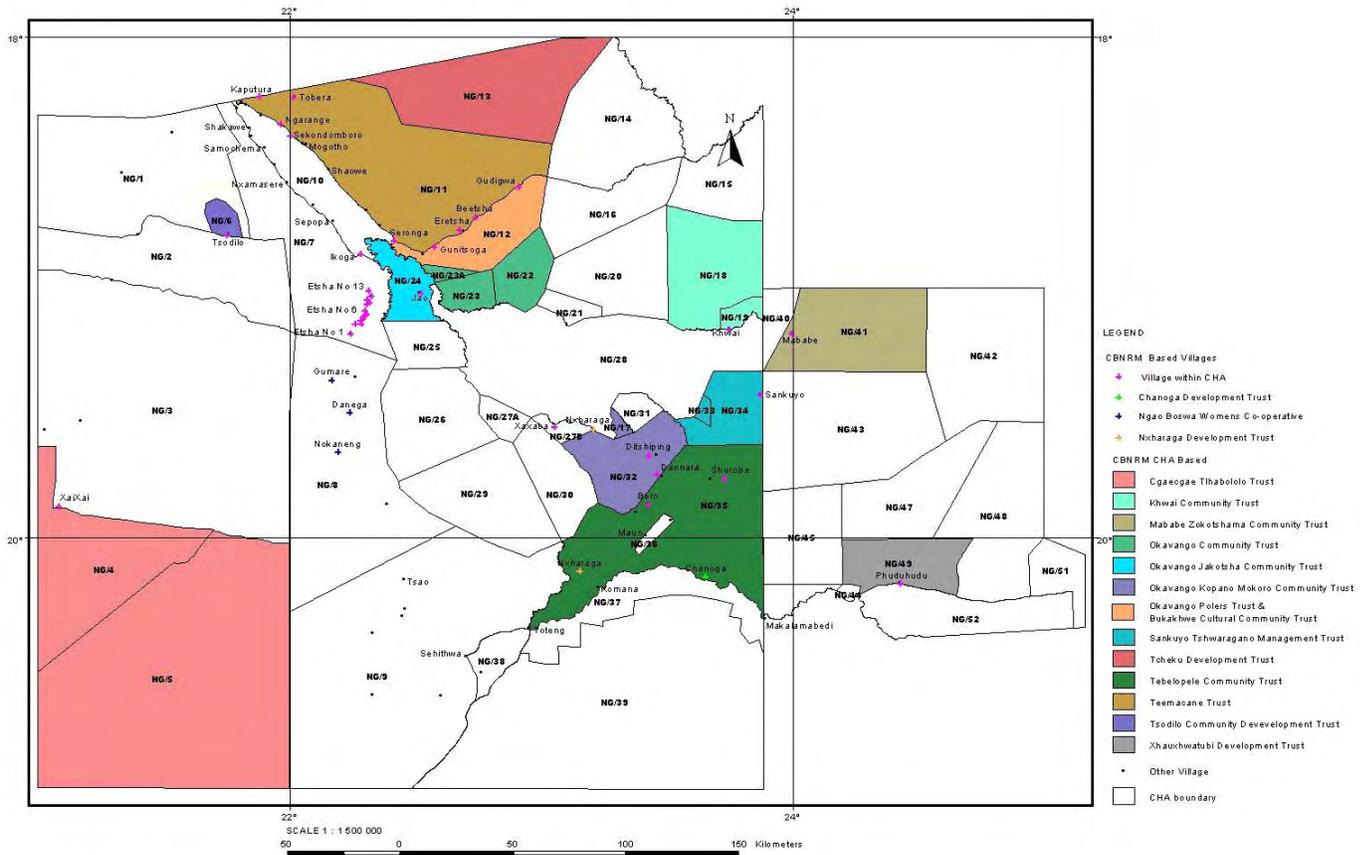


Figure 4. 1: CBNRM-CBOs in Ngamiland (Source HOORC GIS Lab)

As discussed in chapter 3, the prevalence and incidence of HIV in Ngamiland is increasing, and the districts is disadvantaged with regard to HIV/AIDS services. This section is based on work by Ngwenya, Potts and Thakadu's (2007) study of two CBNRM trust, the Okavango Community Trust (OCT), is a multi-village CBO established in March 1995 comprising of the villages of Seronga, Gunotsoga, Eretsha, Beetsha and Gudigwa (table 4.1) and their respective satellite settlements, and Mababe Zokotsama Community Development Trust was established in August 1998 as a single-village Trust of Mababe village (4.2).

Village	Population 2001 CSO	Ethnic composition	Health Facilities/HIV-AIDS Service Infrastructure	Educational Facilities
Seronga	1 641 (1402) ³	WaYei HaMbukushu BaKgalagadi Bugakhwe	1 Clinic with maternity HIV/AIDS routine rapid testing PMTCT and Isonized TB treatment, IEC material, Maternal/child health, Preventive work (as health post), Diagnosis and Treatment of common diseases, simple lab work, Case finding/follow-up with emphasis on TB	1 Primary School 1 Community Junior Secondary School
Gunutsoga	506 (50)	WaYei HaMbukushu BaKgalagadi	1 Health Post, 3 rooms and a toilet, Staff house, store room, community based worker at first contact, primary health care, case finding/follow-up, period visits by mobile health teams	1 Primary School
Eretsha	616	HaMbukushu WaYei	Mobile stop clinic, limited primary health care services, no fixed physical infrastructure	None
Beetsha	760 (669)	HaMbukushu Bugakhwe Bayei	1 Health Post (same as above)	1 Primary School
Gudigwa	732 (55)	Bugakhwe HaMbukushu	1 Health Post (same as above)	1 Primary School

Table 4. 1: the ethnic composition of the OCT villages and social services

Village	Population 2001 CSO	Ethnic composition	Health Facilities/HIV-AIDS Service Infrastructure	Educational and other facilities
Mababe	157	Basarwa	1 Health Post, 3 rooms and a toilet Staff house, store room, community based worker at first contact, primary health care, case finding/follow-up, period visits by mobile health teams	1 Primary School 1 Community hall and office complex

Table 4. 2: Population, ethnicity and social/health infrastructure in Mababe village

4.4.1 Impact of HIV/AIDS on access to and utilization of natural resources

Diverse sources of income in the study villages included cash employment, farming, fishing, hawking, tour guiding or mokoro (canoe) poling, crafts, basket weaving, beer sale, thatching, remittances and government assistance. Income from formal employment in the study villages constitutes about 70%, followed by farming (approximately 59%) and government social assistance (old age pension, food baskets for orphans, destitute persons, war veteran allowance and drought relief), 16% government assistance, Other important sources of income include remittances, fishing and beer brewing (13%).

³ (CSO 2002) - Population of associated localities

Access to and utilization of natural resources in Okavango Delta villages is important for both domestic and commercial purposes. Households use firewood for cooking and lighting, use poles and thatching grass for house construction and fencing their fields, harvest foods plants such as Berchemia discolor (Bird plum) (motsintsila), Grewia sp. (Brandy bush) (moretlwa) to supplement their diet and collect palm leaves for making baskets (see Table 4.3).

Veld product	% Use	% Don't use	% Not available in the area
Firewood	93.3	6.7	-
Poles	85	15	-
Thatching grass	84.0	16	-
Food plants	81.3	18.7	-
Reeds	50.7	25.3	24
Palm leaves	41.3	38.7	20
Medicinal plants	25.3	73.3	1.3
Papyrus	25.3	49.3	25.3

Table 4. 3: Access to and domestic utilization of veldt products

The four villages utilize a high proportion of food plants. A significant proportion of households in Gudigwa and Eretsha use natural plants for medicinal purposes (see figure 4.2). Table 4.4 Sale and non-sale of natural resources during period of distress

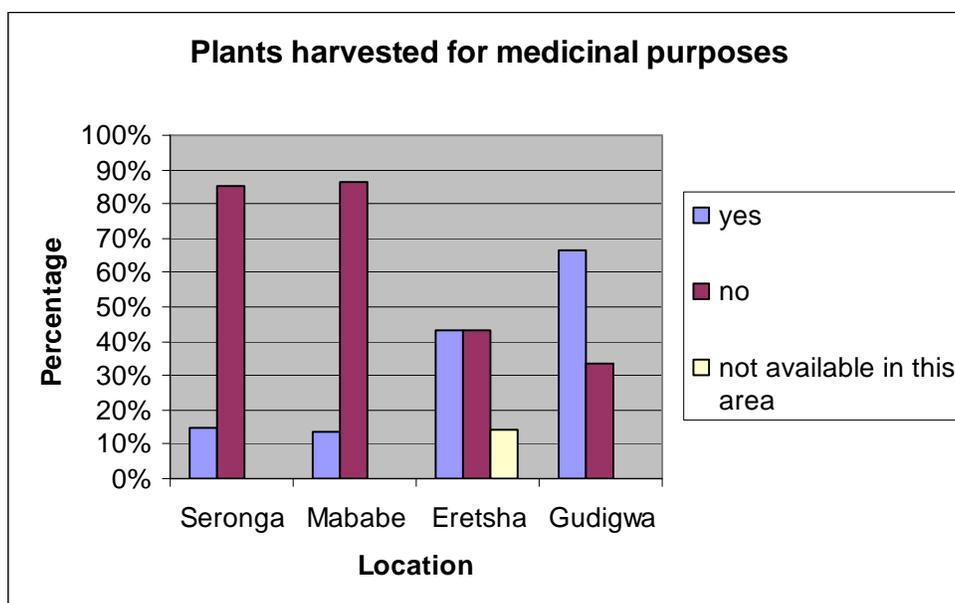


Figure 4. 2: Utilization of medicinal plants

Veldt product	During normal period			During illness episodes		
	% Sale	% Non Sale	Not available in the area	% Sale	% Non Sale	Not available in the area
Thatching grass	21.3	78.7	-	12	88	-
Food plants	13.3	86.7	-	9.3	90.7	-
Reeds	12.0	81.3	6.7	8	92	-
Poles	12.0	88.0	-	4	96	-
Palm leaves	10.7	89.3	-	4	96	-
Firewood	5.3	94.7	-	2.3	97.3	-
Papyrus	2.7	97.3	-	1.3	98.7	-
Medicinal plants	-	100	-	-	100	-

Table 4. 4: Veldt product utilization during normal and stressful episodes

4.4.2. NRM institution and HIV and AIDS

Botswana HIV and AIDS in the workplace related policies are comprehensive. These include Botswana National Policy on HIV and AIDS and Employment (2005) (Ministry of Labor and Home Affairs) whose goal is to provide overall guidance to employers including government and employees in taking responsibility for managing HIV/AIDS; Botswana Public Service Wellness Policy (2005) (Directorate of Public Service Management) whose goal is to promote equitably the wellness of public officers in all occupational setting in the public service through information, education and counselling, and active participation in the wellness programs by public service employees. The Public Service Code of Conduct on HIV/AIDS in the Workplace (Directorate of Public Service Management) articulates the rights, responsibilities and obligations of both the employer and employee in accordance with Botswana national AIDS policy. Interestingly, the Ministry of Minerals, Energy and Water Resources (2003) has a comprehensive HIV and AIDS policy whose objectives are as follows

- To provide care and support to ministry staff in view of the fact that HIV/AIDS issues are sensitive and personal,
- To avoid discrimination and prejudice among employees who are HIV positive,
- To provide IEC on HIV and AIDS to staff
- To mainstream HIV/AIDS activities into the internal and external domain of the Ministry
- To provide ministry management with consistent framework within which on to understand and confront the reality of AIDS in the workplace
- To maintain maximum stability and productivity in the workplace with due consideration to affected and infected staff

The government natural resources management (NRM) ministries such as Ministry of Wildlife, Environment and Tourism, Ministry of Agriculture and Ministry of Minerals, and Energy and Water Resources have workplace HIV and AIDS units modeled after the Ministry of Health which include the following:

- Establishing coordinating structures to facilitate the implementation of the workplace wellness program (setting up of wellness committees, training peer educators, identifying focal persons)
- Provision of wellness services for workers in a user friendly environment that promote access to prevention, care and treatment and support
- Capacity building and managing work related stress

The NACA, NSF Technical Report (2007) for instance, noted that in the Ministry of Lands and Housing, 92% of officers are reported to have tested for HIV, and male involvement is promoted through staff meetings and sports activities. Tsalaile's (2006) study of retail and wholesale companies in Maun found that employees were interested in knowing their HIV status. A survey in MMEWR (Butale, 2006) indicated that 79% of sampled employees had tested for HIV, the majority of whom were males, most likely to be industrial class cadre (as opposed to the permanent and pensionable – P & P).

From informal interviews with ministry based AIDS Coordinating Unit National Coordinators in Gaborone, notably Ministry of Agriculture, MMEWR and MEWT, it became apparent that internal domain responses are increasing access to Voluntary Counseling and Testing (VCT) as noted by the NSF Technical Report and Butale's survey report cited above. Also noted by both reports is that there has been a strategic shift from discreet HIV and AIDS interventions to holistic wellness approaches in which testing for HIV is conducted with a package of tests for a range of life threatening conditions including diabetes, high blood pressure and linking psychosocial support with determinants of high risk behavior.

Wellness is understood as the capacity for everyday living that enables individuals to perform work, pursue their social, economic, biological, intellectual, spiritual and mental goals, acquire skills and education, grow and satisfy personal and work aspirations. The MMEWR for instance, has twenty-five health and wellness teams spread out in its key department, Mines, Energy, Geological Survey, Water Affairs and Ministry Management as well as in outpost stations in the District.

The NSF Technical Report also noted that there was focus is on training peer educators and lay counselors although it is not clear to what extent they are used, and how their skill are updated and developed. Where the external domain or is link with resource users is concerned, it is often by way of fund-raising activities for local community projects such as donation of food, vegetables for the needy, provision of HIV related information. Butale's survey report shows that Maun and Gumare Water Affairs Health and Wellness Teams, like their counterparts, intend to focus on spiritual aspects, health and wellness talks, peer counseling and education and social welfare activities in their communities. The bottom line is that these Teams are too surprising that NRM institutions are not able to extend their support services externally to constituent CBNRM communities. Ngwenya, Potts and Thakadu (2007) findings were that

- CBNRM professionals in NRM institutions/NGOs tend to down play or even neglect the impact of the disease in their sector and assume that HIV and AIDS intervention is not within their mandate.
- As a result of lack of HIV and AIDS workplace policy and poor resource allocation to AIDS awareness, professionals in NRM institutions/NGOs servicing CBNRM CBOs and communities have limited knowledge of the general prevalence of the disease in their own backyard (workplace), let alone the impact of the disease amongst communities they work with directly. These professionals

- tend to 'pass the buck' to the public health sector when it comes to issues of prevention, mitigation, care and support.
- Voluntarism makes it difficult to collect disaggregated information on workplace, community and household prevalence of the disease and worker attrition by gender, age, household income, including data of emerging household types (orphan or elder headed households), intergenerational property transfers, distress migration, and alternative livelihood strategies.
 - CBNRM professionals do not regularly seek or exchange information with government health services or civil society organizations working in AIDS prevention and mitigation. Some CBNRM communities, such as Eretsha, are completely neglected by both government and non-government organizations.
 - CBNRM professionals do not monitor specific impacts of HIV and AIDS on CBNRM projects by documenting how the disease affects resource conservation.

Mullins (2001) cautioned that failure to recognize and mitigate against impacts of HIV/AIDS at organizational level was tantamount to professional negligence and resource misuse and that any organization doing so risks chances of ever achieving its objectives. The sub-section below give a case study of government/private sector partnership coordinated and implement through the HATAB Health Committee in Ngami sub-district. Prior to this initiative, in 2005, a 'one-off' HIV/AIDS component of the Every River has its People Project, engaged individuals and communities in a 'Road Show' which started in Angola through Namibia and ended in Botswana under the theme 'Everybody has a role – impacts of HIV/AIDS (ERP, 2006). Although there was lack of continuity to this initiative; the road show was the first of its kind and covered 14 villages in the three countries. Information was disseminated through drama, speeches, poetry, leaflets and posters. Most importantly, basin communities who have always been far from testing services, had facilities brought to them through arranged mobile health services) and up to 652 people were tested for HIV during the road show (ERP, 2006).

4.4.3 Government-cum-Delta Safari HIV outreach: private partnerships

The Hospitality and Association of Botswana (HATAB) Health Committee consists of representatives from Letsholathe Hospital, District Health Team (DHT), clinics in Maun and safari companies. Data for this section was collected from semi-structured interviews with key members of the Committee, gleaning Committee meeting minutes, participant observation and use of grey literature. Because of the nature of the remoteness of tourism inland Delta based camp, access to AIDS delivery services for these workers was problematic and, although there has not as yet a systematic study on the impact of AIDS on tourism, and conversely, or the impact of tourism on AIDS in Botswana, Magole's (2005) and Machoba's (2005) analysis suggest that the general scenario is that the most favored tourist destination in the country, for instance, Chobe district and Ngamiland East, tend to have a high HIV prevalence. Lack of empirical evidence notwithstanding, for the tour operators on the ground, it appears that when it became apparent that they as part of the larger private sector were not complementing government HIV and AIDS prevention effort, the need to be involved became paramount. The HATAB Health Committee was set up and through it, tour operators who are members committed themselves to flying -in and accommodating clinic based doctors to do health services outreach visits to the camps. Some safari companies have lay counselors provided and paid for by Ngami DMSAC who visit the camps on a monthly basis. Others companies have their own full-time nurse (OWS) or doctor (Desert and Delta). The majority of companies have

welfare officers (Orient Express for example) who are both contact persons and co-coordinators of outreach visits.

Five Maun based outreach clinics are Sedie, Boseja, Maun Clinic, Boyei and Thito. Shorobe clinic is also part of the Delta camp safari outreach structure. The HATAB Health Committee reasoned that, for the partnership with government to be effective, it had to set up coordinate a coordinating structure with clear lines of communication, reporting and accountability. Each clinic and each company has a coordinator cum contact person responsible for coordinating transport and scheduling of medical personnel (doctors/nurses) camp visits. Sedie clinic for instance, is responsible for providing outreach AIDS related services to eight tourist lodges, namely Kwetsani, Jacana, Tubu and Jao (owned by Ngamiland Adventure safari), Abu and Seba (owned by Elephant Back Safaris) Makatoo and Mokolwane owned by African Horseback Safaris (Table 4.5). All AIDS related outreach activities are reported to the District Health Team (DHT).

The outreach services reach a significant proportion of employees in the tourism industry who otherwise would have difficulty paying for flights to Maun either for check-up or medication refill. Orient Express has been part of the Delta Safari outreach program for 4 years. Orient Express runs 44 camps with 143 employees who receive monthly visits by either nurse, lay counselors or a doctor. These are at no extra cost for the safari company since they are being paid for either by the Council or the Ngami-DMSAC. OWS has approximately 700 employees. The company has a generic HIV in the workplace policy, has hired a full-time a nurse whose task is to provide primary health care, counseling (individual and group/couple), testing and STI screening. Test kits and condoms are procured through DAMSAC. OWS pays for the flight for workers to go for their appointments in Maun. They get three months supply of ARVs coordinated through HATAAB Committee. Visits are synchronized with the worker's leave days. Demand for service varies from 3 – 5 per day. In addition to primary prevention, patients should be given advice on diet and exercise or basic anatomy.

Of late, safari companies engaged services of a pastor and they are of the opinion that the intervention seem to have a very positive effect and employees appreciate these services. The pastor spends 2/3 days in each camp. Christian teachings seem to enable people to open up to talk about issues of sexuality. Support from the DAMSAC includes training of peer counselors, condom procurement and distribution.

Clinic Outreach	Lodges	Company/companies
Sedie	Kwetsani, Jacana, Tubu and Jao	Ngamiland Adventure
	Abu, Seba	Elephant Back safari
	Makatoo, Mokolwane	African Horseback Safaris
OWS Private	Vumbura, Kaporota, Duba, Mombo, Little Mombo, Xigera	Okavango Wilderness Safaris (OWS)
Boseja clinic	Stanley's Baines, Chiefs and Mombo	Sanctuary Lodges
Maun Clinic	Nxabega, Sandibe, Karana, Xudum	CC Africa Now & Beyond
	Pom Pom,	Gunns
	Chitabe	OWS
	Xudum, Kiri	Rann Safaris
	Kanana	Kerr & Downy

Boyei	Eagle Island (Xaxaba)	Orient Express
	Delta Camp, Odd Balls (Nxoga)	Okavango tours and Safaris
	Guns camp, Semetse	Gunns camp
Thito	Xugana, Camp Okavango	Desert and Delta
	Kwara and Little Kwara	Kwando safaris
	Shinde	Kerr Downy
	Little Vumbura	OWS
Shorobe	Camp Moremi	Desert and delta
	Xakanaka camp	Moremi safari
	Camp okuti	Kerr Downy
	Boat Station	Dan Rawson
	Kwai river Lodge	Orient express
	Mankwe, Mboma	Kgori safaris
	Santawana	Community

Table 4. 5: HIV Safari Outreach

Safari company employees are 'sequestered' in the Delta for three months before they can be given leave to join their families in their home villages. As one respondent put it, 'if people are sequestered for 3 months what do you expect them to do with their sexual energy. You have to be creative in your intervention and discuss issues of sexuality in ways that empowers people and for them to understand risks associated with the 'small house' phenomenon or being excited about having 'fresh meat in the camp' - this is just another code phrase for multiple and or concurrent partners.

The risks of contracting the HIV virus is perceived to be among co-worker relationships and government department workers passing through set-up camps, by BDF, Water Affairs and Wildlife. Government policy which does not transfer married couples to prevent them from starting new relationships is also perceived as fuelling HIV transmission. As one respondent put it, 'people not understand themselves; people think that if you do not have sex you get sick". Government campaigns on the other hand plays down the 'small house' phenomenon. Although there is need for empirical evidence, the perception currently is that outreach intervention has led to a dramatic drop in death rates and absenteeism. People are very open and disclose their status to the manager without fearing that they would lose their jobs. Those who did not disclose in the past suffered in silence and could not get medical attention until it was too late.

The advantage of high cost low volume tourism is that it caters for upscale clients who have no or limited contact with the community, take on a tourist package that has scheduled activities. The risk would increase with budget tourists who are likely to have greater contact with the local community. For the high-end tourists it is difficult to talk about HIV and AIDS, it feels like you are insulting their intelligence or wasting their time.

In summary, like any other program involving many stakeholders, there are logistical problems on the ground. But these are not insurmountable. The implication is that the Delta Safaris HIV outreach program, without committed partners and investment of human and financial resources, would not be feasible. The intervention also demonstrates ways in which government and the private sector can work together to counter the negative effects of social mobility by bringing services to the people.

4.5 Okavango Delta fishery and HIV and AIDS

Fish offers micronutrients, vitamins, minerals, and protein that have been shown to increase the efficacy of HIV/AIDS treatments (World Fish Centre, 2006). Fishing is a highly labour intensive occupation (Torrel et al, 2006) and therefore depends heavily on good health status of the labour force. The multiplier effect of the loss of productive labour and declining productivity due to HIV and AIDS may ultimately affect the supply of fish, fish products and household food security strategy (Allison and Seeley, 2004; Gordon, 2005).

According to MAAIF (2006), fish availability can be dramatically reduced as people become too weak to fish or eventually die with a consequent loss of indigenous knowledge and fishing skills. Therefore, HIV and AIDS can have a multiplier effect whereby productive pursuits such as fishing are severely curtailed with a resultant loss of rural employment and provision of food (Campbell and Townsley, 1996). Although ecosystem variability such as fluctuations in flood regimes is known to determine fish availability for subsistence in floodplain fishing communities, there is a provocative school of thought which suggests that HIV and AIDS is fast becoming a major factor in regulating fish availability to these communities (ID21, 2006). Although small scale fishing is the main source of livelihood for a significant proportion of populations in developing countries, the significance of fishing communities are rarely taken into account in national HIV and AIDS control programs and their socio-economic and environmental significance have largely been ignored (SFLP Bulletin, 2004). Fishing communities have particularly limited access to reproductive health services including HIV/AIDS prevention, care, and support. Poor health and poor sanitation makes people in fishing communities more vulnerable to illness.

Fishing communities in Africa have been described as 'hot-spots' for the spread of the HIV virus, not only because fishers are mobile, constantly moving between landing sites and water channels, but also because they live in fish camps away from family and societal sanctions (Baro, 2004; Forum SYD, 2005; Gordon, 2005; MAAIF, 2005). It has been observed that the HIV/AIDS prevalence rate among fishing communities in developing countries generally are five to ten times higher than the general population (<http://www.sflp.org/ftpl/others/>). Several case studies have shown that some African fishing communities (e.g. in the DRC, Kenya, Uganda, Zambia and Tanzania) have higher HIV prevalence rates than 'known risk groups' (e.g. truck drivers and commercial sex workers) (Allison and Seeley, 2006; Tanzarn, 2006; Tanzarn and Bishop-Sambrook, 2003; SFLP, 2004). In addition, hygiene and sanitation conditions in fishing camps are usually poor and thus contribute to people's vulnerability to infection (World Fish Centre, 2006).

McGoodwin (2001) argues that production relations and organization of fishing activities of small scale fishers in developing countries are very similar even though members have very distinct cultures. This being the case we can safely assume that fishing communities in Botswana as elsewhere are therefore vulnerable to HIV infection due to relative absence of a culture of saving money (World Fish Centre, 2006). As such, availability of cash from fish sales on a regular basis without tangible investment or savings facilities predispose fisher folk to 'conspicuous consumption' such as paying women for sex. The important question however, whether or not fishing communities per se have access to savings and credit from financial institutions in the first place. In the Okavango Delta, when compared to other districts in the eastern part of the country, savings and credit institutions in Ngamiland are few and far between. Commercial banks, for instance, are situated in Maun, the district capital, which is about 600 km or more away from most villages. Also, Botswana Savings Bank, operating

through Botswana Postal Services, has no branches in the majority of fishing communities. This scenario is less likely to encourage savings and credit competencies both at community and household levels. However, questions regarding the extent to which the absence of formal savings and credit institutions in Ngamiland is likely to fuel the transmission of HIV virus among fishing communities should remain open to empirical investigation such as that of Merten (2009). Rather than assume the existence of particular sexual relations within fishing communities, it is also important to make systematic investigation of incidents of transactional sexual relation in the context of a particular fishing community.

Ample research illustrates that HIV and AIDS disproportionately impacts on women worldwide due to the subordinate economic and social position of women in society. However, HIV prevalence rates among women working in fishing communities could be higher. In many countries, women play an important role in fishing livelihoods, such as processing and marketing activities (World Fish Centre, 2006). Also, different sexual relations are known to have developed around these activities which make members to be exposed to sexually transmitted diseases (SFLP Bulletin, 2004:9). In Botswana, especially in rural areas, women are more likely to be unemployed than men (CSO, 2004). Given these structural economic constraints, some women in fishing villages are likely to resort to risky behaviors such as having multiple partners, engaging in transaction or inter-generational sex, and sale and consumption of alcohol especially in landing sites. The situation is further compounded by gender and age inequalities which make women more vulnerable to sexually exploitative relations which places them at risk of contracting the HIV virus.

A systematic analysis of the impacts of AIDS on fisheries based livelihoods has hitherto received little attention (Allison and Seeley, 2004, 2006; Gordon, 2005). The ODMP conducted community consultation and feedback kgotla meetings to enable the teams to identify several sector related 'hot spots' (so called because of their sensitivity and demand for urgent policy/program intervention) before developing and implementing a comprehensive plan to manage OD resources in ways that support people's livelihoods in the area. The threats identified included, inter alia, threats to livelihoods by wildlife such elephants and lions, resource user conflicts, droughts, livestock diseases, poaching, destruction of crops by elephants, and chronic outbreak of wild fires (ODMP Report, 2004). The opportunity to identify human induced threats to fisheries livelihoods was again missed during the second round of kgotla meetings. In these meetings, discussion focused on conflicts between commercial and sport users, perceived declining fish stocks and government regulations (ODMP, 2005). Human induced disease threats to Okavango delta fishery were completely neglected. It is probable that HIV and AIDS related "hot spot" across villages in the Delta and information about this could be hidden in district level prevalence and incidence rate data. Lack of fishing sector specific information of HIV prevalence has been attributed to marginalization of small-scale fishing communities in public policy, and also lack of knowledge regarding the significant role played by small scale fisheries in reducing poverty (SFLP, <http://www.sflp.org/eng/003/fightaids.htm/>).

Ascertaining whether or not a household has HIV/AIDS infected person(s) or has lost someone due to the disease is difficult given the sensitivity of the information and social stigmatization. Generally, people are not willing to openly discuss HIV and AIDS (Stokes, 2003). In Zambia, when respondents were asked about HIV infected people, only 3% indicated the prevalence rate, in stark contrast to the nationally reported rate of over 20% (SADC-FANR, 2003). For these reasons, a household survey in Okavango Delta used the presence of continuously ill person/s (CIPs) over the past five years as proxy indicators of households most likely to be affected by HIV and AIDS. A CIP can be defined as any person declared by a medical doctor as terminally ill and has an incurable disease such as HIV/AIDS. Such a person may or may not be

bed-ridden, and is cared for at home either by family member/s, relatives, members of the community, friends, neighbors or church groups during periods of intense need or social distress (social crisis).

Ngwenya and Mosepele's (2007) analysis of primary data collected from a survey of 248 subsistence fishers' households in 22 villages found that about 53% percent of sampled households cared for continuously ill person/s in the last five years. The prevalence of CIPs varies across villages indicating that some households were more affected than others. At least twenty nine percent said the illness seriously impacted on fishing activities. Follow up informal interviews suggest that serious impacts included sale of family assets, depletion of savings, switching or abandoning fishing activities. Fish provides a significant proportion of food to CIP households. Approximately 55% of CIP households get their food from fish products. During food shortages, CIP households resorted to a hierarchy of strategies which included cutting down on meals or reducing meal portions, looking for paid work, gathering wild fruit, asking for food from relatives, selling livestock, and getting social assistance.

Of the 248 fisher households surveyed, 53% indicated that they had cared for continuously ill person/s in the last five years. The prevalence of CIP varies across villages indicates that some households were more affected than others. In some cases, all sampled households had a CIP such as Etsha 6, Sepopa and Samochima. Of the households, at least 29% said the illness seriously impacted on fishing activities, 9.4% moderately, 10.7% minimally while 51% said that the illness had no effect at all. Households in other villages indicated that having a CIP either minimally affected or did not in any way affect fishing activities. Part of the explanation given for the variation in effect was that some of the CIPs did not do any fishing prior to being ill or fished only minimally. Follow up informal interviews suggest that serious impacts included sale of family assets, depletion of savings, and switching or abandoning fishing activities. Some villages experienced more severe impacts on fishing activities than others. During food shortages, about 24% of households' increased fish catches as their first coping strategy.

In summary, this discussion points to an urgent need for policy interventions to highlight the impact and effect of HIV infection on fishing communities in the Okavango basin. Because HIV and AIDS is a major factor regulating fish availability to rural fishers, fisheries need to be streamlined into the national policy. Because some CIP fishers' households are likely to alternate between periods of engagement and non-engagement in fishing activities, measures ought to be taken to protect their income or consumption to prevent them from disengaging permanently from productive activities.

Chapter 5: HIV and AIDS Program interventions and Demographic Impacts Introduction: National Program Interventions

This chapter focuses on three key intervention AIDS programs in Botswana with specific reference to Ngamiland district. These are antiretroviral therapy (ART) roll-out, prevention of transmission from mother to child (PMTCT), Sexually Transmitted infections. These programs have key transboundary implication. With regard to ART, there are concerns over primary and secondary resistance to ARVs, mothers and access to Dry Blood Spot (DBS) of HIV children born HIV positive, changes in normative behaviors of long term survivors of ARVs and long term monitoring of virologic failures. With regard to PMTCT, it is poor male involvement in PMTCT. Pregnancy predisposes a woman to increased risk of exposure to infection. Another challenge has to do with pressure on women to bear children. More than 80% of HIV positive women and over 90% of women on HAART reported having more than one pregnancy. Also, pregnancy occurrences among discordant couples (one partner negative and the other positive) is a reflection of non or inconsistent condom use. STIs facilitate HIV transmission by increasing both infectious and HIV susceptibility. The expansion of STI surveillance system in border crossings and high transit sites is urgent. This also implies that condom distribution and social marketing campaign to prevention of new infections should be intensified.

Eligibility to ART is assumed to occur at a median of 3 years before AIDS death. The rate of progression from infection to AIDS death without treatment is 11 years. Other issues relate to ways in which AIDS related interventions to interactive dynamics of mortality, default, survival, prevalence and incidence. Simulations of these interactive scenarios are necessary for policy and program intervention. The last subsection in this chapter considers some likely scenarios in Botswana.

5.1.1 Key issues in ARV

ART lowers the probability of HIV transmission as it lowers the HIV concentration in the body, and hence renders recipients less infectious. Figures 5.1 below give four scenario, pre-AIDS stages, those with AIDS who are yet to receive ART, those on ART and those who have discontinued ART.

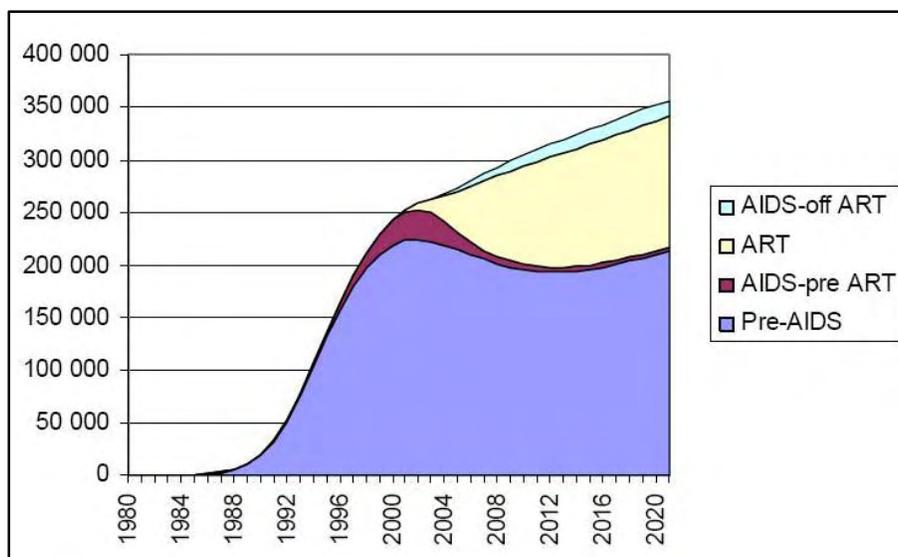


Figure 5. 1: Numbers infected, with AIDS and not on treatment, and on treatment

Although ART has reduced mortality, there is evidence to suggest transmission of drug resistance HIV strain. Primary resistance in Botswana and other countries in southern Africa, it has been found to be less than 5% (2nd generation, pp50). The Princess Marina Hospital's Infectious Disease Control (PH-IDCC) secondary resistance survey conducted in 2004 found virologic failure to be low, 3.5% (4, 811 patients), and in 2007 a review of 16 245 patients records who had been initiated on ARVs since 2002, also revealed that secondary rate resistance remains low, 3.6%. Today, for more than 20 ARV clinics, virologic failure still remains low at 3%. For highly mobile populations, drug resistance poses a major challenge that must be monitored nationally and across the borders.

It is estimated that in 2007, 19, 600 children are HIV positive. With no intervention to prevent mother-to child transmission, about 30% of children born to HIV positive mothers will be infected. The rate is reduced by about 20% with replacement feeding and even lower through the use of antiretroviral drugs. Child infection peaked in 1999 and declined sharply as adult prevalence declined and PMTCT program expanded. By 2007, the number of estimated annual new child infection has declined to 890 compared to 4, 600 in 1999. Some children progress from infection to death quickly while others progress slowly. The introduction of Dry Blood Spot (DBS) HIV Testing for Infants has helped increase the number of infants who are tested for HIV as early as six weeks instead of 18 months as before.

5.1.2 Key issues: Prevention of Transmission from Mother to Child (PMTCT)

In 1999, focus was given to prevention of mother to child transmission (PMTCT) of HIV from HIV positive mothers to their babies (vertical transmission) when ART was made available through MASA. PMTCT program has been available in all districts in the country since November 2001. The scaling up ART Therapy is available in approximately 32 sites and 166 clinics. Trends show that there has been a significant increase in the proportion of women attending ANC agreeing to test from 71% in 2004 to 80% in 2007. The Routine HIV Testing (RH)T, which uses lay counselors, was introduced in 2004 countrywide, uses rapid test kit. This has also contributed to uptake by pregnant women and reduced the burden on nurses and

midwives. In Ngamiland district, the current uptake is 89% and the goal is to increase it to 96% in 2009. This would be partly achieved by intensifying education on early registration for ANC and PMTCT, male participation in PMTCT, routine testing for babies born to HIV positive mothers (NWDC Annual Report, 2007/08).

For HIV positive mothers whose CD 4 count are over 200 and present no clinical signs of AIDS, prophylaxis (AZT) is given from 28 weeks of pregnancy through to delivery. These may stop treatment at delivery depending on test results. For those women with a CD 4 count below 200, the highly active antiretroviral treatment (HAART) is administered to slow down the progression of the virus and they stay on treatment after delivery. In 2004 the PMTCT uptake increased from 71% to 83%. (NACA, 2008) In general, there proportion of pregnant women testing HIV+ has remained steady and a major decrease in mother to child transmission from 20 – 40% to 7% in 2007 (The Mid-term Review of the Botswana National Strategic Framework for HIV/AIDS 2003/2009).

The main challenge country wide is male involvement in PMTCT is only in 2006 was 6% and has slightly improved in 2007 at 9%. Another challenge has been repeated pregnancies in HIV positive women. More than 80% of HIV positive women and over 90% of women on HAART reported having more than one pregnancy.

5.1.3 Key issues: Sexually Transmitted infections

The STI Control Program was established in 1989 and syndromic management protocol was introduced in public health system in 1992. This is a country wide program that provides treatment of STIs to patients free of charge. STI surveillance system has been established in 8 districts since 2007 and 3 service delivery in cross border and high transit sites in Kasane, Tlokweng and Serowe/Palapye. Further expansion is planned in five more districts.

In Ngamiland, compared to 2006, there were fewer STI cases in 2007 in different categories (Table 6.3) This situation could be attributed to the syndromic approach to STI treatment plus contact follow up. Some patients have difficulty convincing their partners to comply. There is also a problem of stigma associated with disclosure to partners, resulting in them not getting treatment. STI infection incidence in the district is 6.4% and the aim is to reduce it to 4% by March 2009, to improve and intensify partner notification and treatment, improve STI management and cervical cancer diagnosis. Improved treatment of STIs lowers the probability of HIV transmission. STIs enhance the risks of HIV transmission when present in HIV- or HIV + partner. Generally, it is estimated that fertility in Botswana is likely to be reduced by 30% due to HIV infection among 20 years and older. However, HIV positive women specifically have lower fertility rates than HIV negative women of the same age. This has been attributed to higher rates of miscarriage among HIV positive women, higher rates of secondary sterility due to history of sexually transmitted infections (STIs) (NACA, 2008).

ATTENDANCE FOR STI CARE								
SIGNS AND SYMPTOMS	FEMALE		MALE		TOTAL		%	
	2006	2007	2006	2007	2006	2007	2006	2007
Urethral Discharge	-	-	867	689	5842	4972	15	14
Vaginal Discharge	1883	1265	-	-	5842	4972	32	25
Genital Ulcer	241	177	219	230	5842	4972	8	8
Inguinal Bubo	0	0	0	0	5842	4972	0	0
Lower Abdominal Pains(PID)	641	678	-	-	5842	4972	11	14

Table 5. 1: Cases of Other STIs in Ngami 2006/2007

Source: NWDC , Health Department Annual Report 2006/2007

5.1.4 Demographic Impacts

Botswana’s demographic structure has also been impacted by the prevalence of HIV and AIDS. Nationally, death rates among the 25-29 age group almost doubled from 7.3 to 16 deaths per 1000 people. The rate tripled for the age group 30-34 showing recorded deaths from 8.5 to 23.6 deaths per 1000 (Central Statistics Office - CSO, 2004). As a result of the HIV/AIDS epidemic, there are adverse changes in key demographic indicators. Figure 5.2 depicts a modeled demographic pyramid (assuming no AIDS) show an expansive base and funnel top gradually narrowing at the base. However the recently released population Pyramid with AIDS infection based on estimated population in which the inner part of the pyramid shows the magnitude of the infection at each age and sex group. The pyramid bulges 30 - 44 with a prevalence range 40 – 50% (CSO, 2009).

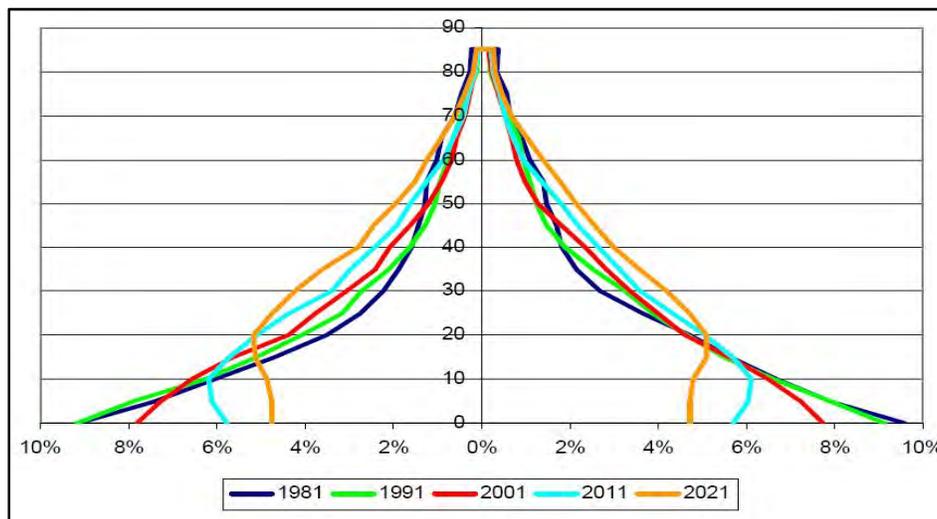


Figure 5. 2: Age sex-distribution of Botswana population 1981- 2021 – assuming no HIV and AIDS (Dorrington et al 2006 pp 54):

Kgathi et al. (2004) and Majelantle, Ngwenya and Nnyepi (2008) population pyramids shows that the 0-4 age group bar is shorter than that of children five years and above. Selected village sites of Ngarange, Shakawe, Mohembo West, Mohembo East and Samochima population pyramids, also reflect similar characteristics (Figures 5.3a – 5.3cc).

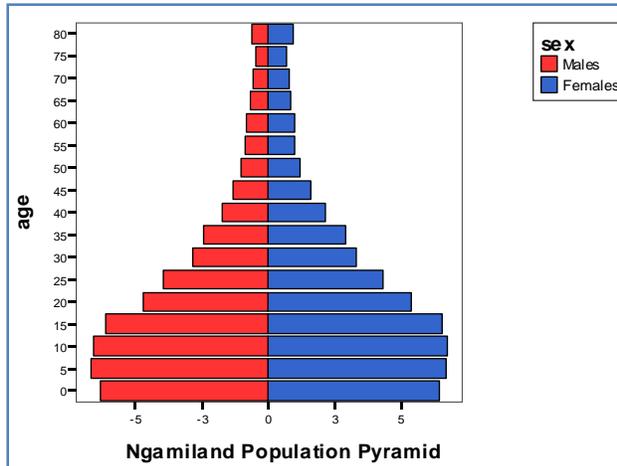


Figure 5.3a Ngamiland population pyramid (Source Majelantle, 2004)

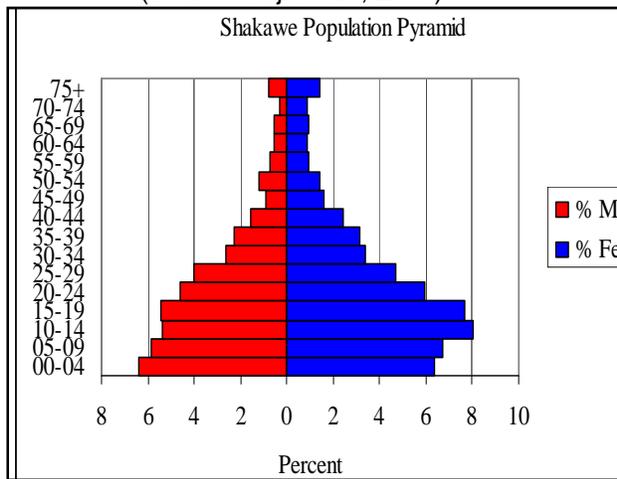


Figure 5.3b:Shakawe Population Pyramid (Source Majelantle, Ngwenya and Nnyepi (2008)

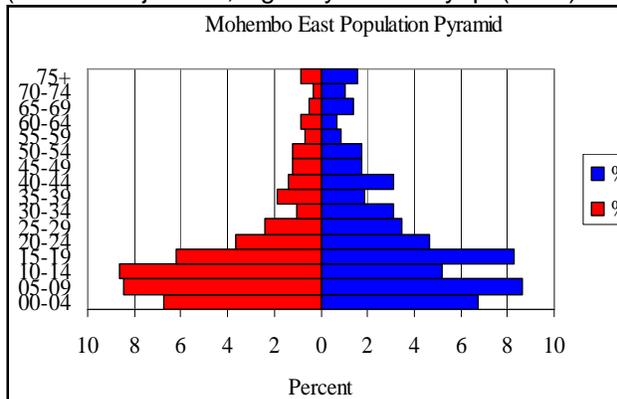


Figure 5.3c: Mohembo east Population Pyramid (Source Majelantle, Ngwenya and Nnyepi, 2008)

Figure 5. 3: A-C Population Pyramids

5.1.6 Modeled Scenarios of AIDS impacts and (non) interventions

Other issues relate to ways in which AIDS related interventions to interactive dynamics of mortality, default, survival, prevalence and incidence. This sub-section considers simulations of AIDS related scenarios with regard to the above factors. The rate of progression from infection to AIDS death without treatment is 11 years (NACA, 2008) Eligibility to ART is assumed to occur at a median of three years before AIDS death. Those who receive first- and second line ART experience extended survival. 85% survive the first year on ART and 95% survive each subsequent year (NACA, 2008). First year survival is lower than subsequent years since some people start ART too late and die before it can restore their immune system.

In Botswana, data shows that 91.3% of ART patients are known to be still alive, and after five years, 86% patients are still alive. A significant percent are lost through follow-up, that is their status is unknown and have probably died (NACA, 2008). A standard measure of adult mortality is the probability that a 15 year old does not survive to his or her 60th birthday. HIV reduces the population significantly below what it could have been without the disease. By 2021, the population is estimated to be 18% - 23% smaller, and the population growth would fall from an estimated 1.9% p. a without AIDS to between 0.8 – 1.1% with AIDS.

A model through which adults are expected to progress before dying of AIDS (in the absence of ART) was used by Dorrington et al. 2006) to forecast population by age cohort and 'with AIDS' scenario and permits the following interventions, improved treatment of STIs, Information and Education Campaigns (IEC) and social marketing, Voluntary Counseling and Testing (VCT, Prevention of Mother to Child Transmission (PMTCT), and Antiretroviral Therapy (ART). The key assumption being that from 2008, 90% of HIV+ persons eligible for treatment will use ART. The effects of ARVs are modeled by introducing 'people receiving treatment' and 'people who has started treatment and subsequently discontinue'. Three scenarios are modeled are, No AIDS, AIDS, no ART and AIDS with ART. One effect of not offering ART treatment would be to 'crowd out' non-AIDS deaths. New infection were expected to rise from 1981 and with new treatment expected to fall until 2006 and then increase again with the gradual increase in the population numbers (Dorrington et al 2006). Because ART reduces viral load, and could lead to some extent assumptions about changes in behavior. Prevalence is likely to be higher (15 – 49) on those on ART with longer survival due to assumed extended survival of those infected as a result of their better adherence to treatment protocol. Although the life-extending benefit of ART is shown in the initial stages with the reduction of deaths (from around 18 000 per annum in 2001 to around 15 000 in 2006, and 11 000 in 2008 – under a default with longer survival scenario), a gradual rise in the number of deaths is expected. Figure 5.4 show the estimated number of AIDS related death 1981 – 2021 under various scenarios (that is SO - No AIDS; S1 – Default; S1.1 Default with no ART, S1.2 Default with behavioral change and routine HIV Testing (RHT); S1.3 Default with longer survival on treatment)

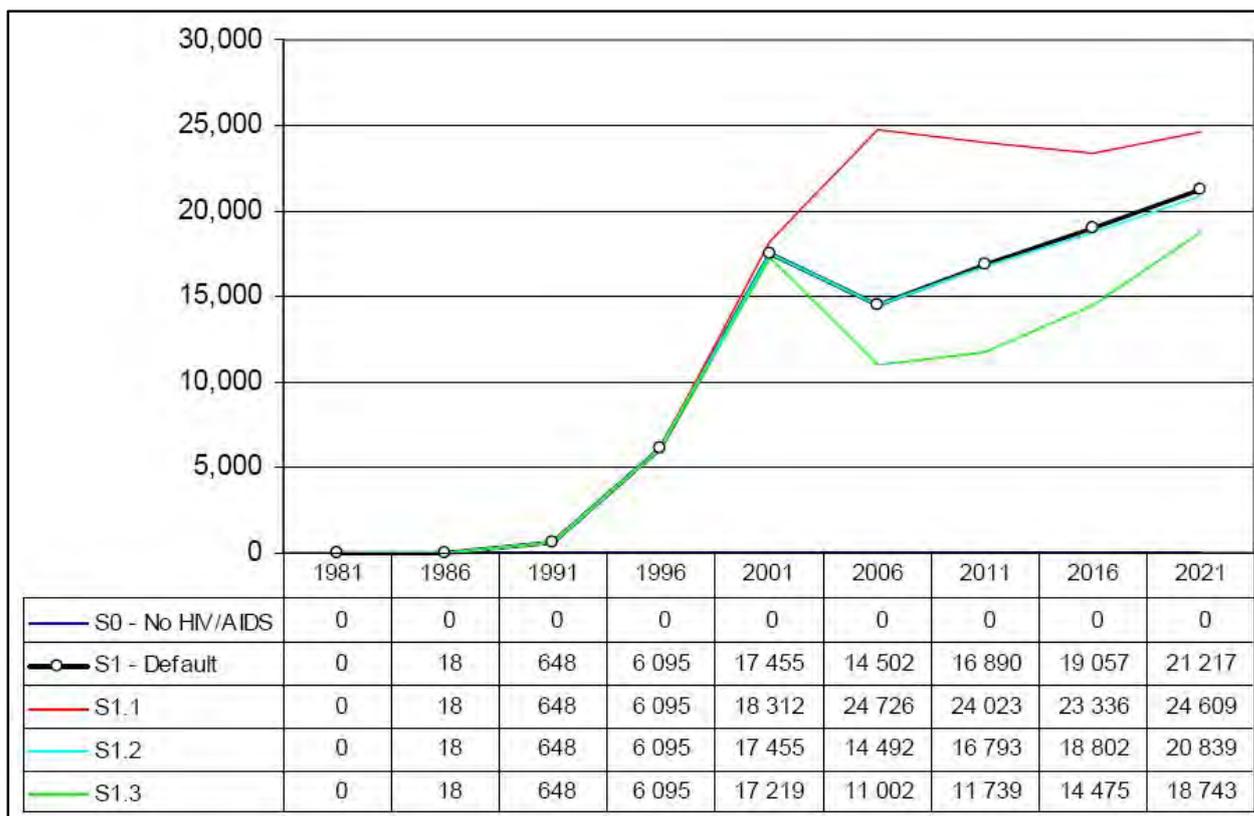


Figure 5. 4: Estimated number of AIDS related deaths, 1981- 2021, various scenarios (Source, Dorrington et al 2006, pp 62).

SO - No AIDS

S1 – Default

S1.1 Default with no ART

S1.2 Default with behavioral change and routine HIV Testing (RHT)

S1.3 Default with longer survival on treatment

Figure 5.5 shows various scenarios of projected age –sex distribution scenario of Botswana population allowing for the impact of HIV and AIDS. The impact of the epidemic concentrate on young adults (ages 30 and below) this is due to a dramatic impact of AIDS on male population aged 40 years and over and the female population aged 35 and over. Preliminary Results of the Botswana HIV and AIDS Impact Survey III (CSO, 2009: 7) show, at national level, prevalence rates plateaus around 40% in the age range 30 – 44 (with women the peaking is nearly earlier 50% for females within 30 – 34 while men peak 10 years later and lower at around 44%). Also, the preliminary results suggest that for both males and females, there appears to be a surge in the early 50s, and male prevalence is higher than that of females at 60 years and above. For Ngamiland wests, age range 25 – 49 and 31-49 respectively have a high prevalence rate compared the national average (Table 5.2).

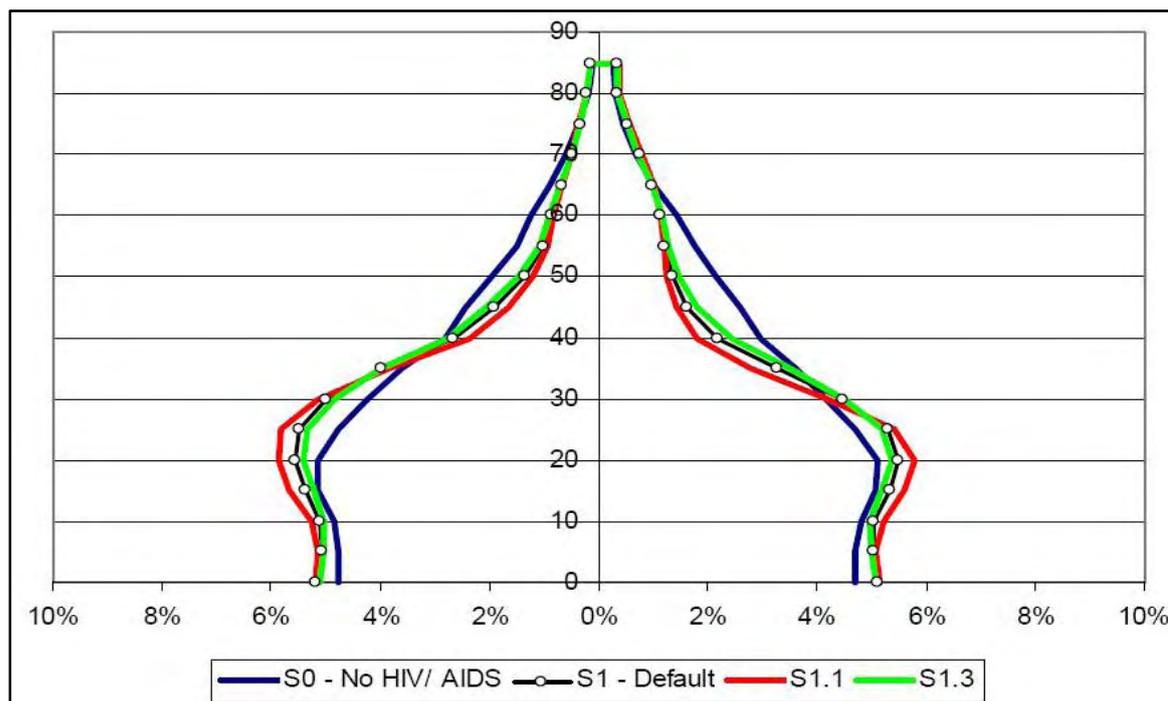


Figure 5. 5: Age-sex distribution of the Botswana population in 2021, various scenarios (Source Dorrington et al pp55)

- SO - No AIDS
- S1 – Default
- S1.1 Default with no ART
- S1.3 Default with longer survival on treatment

Table 5.2 Estimated HIV prevalence rate by district and target Age group

Prevalence rate by district and target Age group							
District	HIV prevalence by target group						
	15 - 24	19 - 24	15 -49	20 - 30	25 - 49	31 - 49	50 -64
Ngamiland East	8.4	10.4	27.1	23.4	34.9	38.2	20.7
Ngamiland West	9.1	10.5	26.3	22.6	43.0	44.9	17.5
National	8.0	11.0	25	20.7	34.7	38.2	22.2

Source: CSO, 2009.

In summary, AID interventions mentioned above have had differential impacts with regard to mortality and survival of Batswana. But these interventions also induce other dynamics which intersect with other variables such as age, gender, marital status and locality. It is worth noting that in Chapter 1, it was noted that Ngamiland west has a relatively high rate of poverty, that there are more women than men in the region and a relatively high proportion of women lead households, the table above also seem to give a not so good picture with regard to relatively high prevalence among 25 – 49 year old. This age group is still in its prime years of production and is likely to be mobile as well. This implies that at trans-boundary level, more attention should be given to the burden the disease imposes on this segment of the population as well as other factors such as drug resistance; multiple pregnancies of HIV positive women. Also, comparative scenarios of countries within the Okavango river basis

can be modeled. Various scenario can provide useful insights into future planning and national program formulation.

Summary and Conclusions

Livelihood/income diversification, adaptation to variability, multi-local residences and migration characterize human activities in the Okavango basin. Arable and livestock farming, formal employment, government social safety nets, remittances and fishing, constitute key sources of livelihood for a significant proportion of the Delta population. Although arable agriculture is primarily dryland or rain-fed and less dependent on drawing water from the Okavango River, it still remains the key food system. There is limited, if any, commercial irrigation based arable farming. Molapo farming (flood recession) along the Okavango River seasonal flood plains, although hailed by most farmers as the most productive food system, faces tenure rights and other legislative challenges. Other secondary food systems that are water related in the basin include fish, veldt products and leafy vegetables and scattered small scale horticultural/vegetable projects. Non related food sources include imported cereals and vegetables. A major collapse in arable farming and lack of policy/program attention in this sector in particular to enhancement of productivity of small-scale arable farmers, is likely to adversely impact on utilization of Okavango water resources in the long run. Recognizing the pivotal role of arable farming, the government of Botswana has initiated the Integrated Support Program for Arable Agriculture (ISPAA). There is ample evidence that variability of livelihood and or food systems of Okavango basin residents' speaks to local adaptations to variability in flood regimes/cycles. Key transboundary issues therefore are that, in order for the pristine status quo of water resources in the Okavango basin under high/low flood scenarios, much will depend very much on how, on the one hand, communities/ households adapt contemporaneously or will adapt over time. On the other hand, the effectiveness of local adaptation is determined by national policies/programs. Government interventions can either capacitate or incapacitate strategies depending on whether there is flexibility to address evolving impacts of flood variability on dynamic interconnectedness between water and non water livelihoods. The implementation capacity of ISPAA and other similar programs in the Basin should be enhanced and or program piloted in likely 'hotspot' as preventive/proactive trans-boundary initiative. The integrity of Okavango Delta water as a natural resources cannot be treated in isolation from other symbiotic natural resources based livelihoods/food system.

Gender, water resources and poverty dynamics in the Okavango basin indicate that men and women are constrained in different and often unequal ways as potential participants or beneficiaries' water resources. Whereas generally some natural resourced based livelihood activities in the are gender specific, others cut across age and gender. Under conditions of stress however, 'resource use often redefines traditional gender roles to include 'gendered switching' and commercialization.' For this scenario to happen, several variables come into play. These include, but are not limited to household structure, loosely indicated by type of headship, and asset profile (wealth and poverty levels). Unfortunately, headcount poverty rate in Ngamiland is very severe (40% and 50%) in Ngamiland east and Ngamiland west respectively. Furthermore, Ngamiland west has high proportion of women headed households with low levels of human capital development. These factors cannot be ignored and or be relegated to national governments. One direct water related resource that cuts across age and gender is fishing. To date, program planning (ODMP for instance) and government policy intervention (the Financial Assistance Policy FAP) and donor funded national projects (BIOKANGO), have been largely gender blind and tend to be biased towards so called commercial fishers and sport fishers. Lesser attention has been given to women fishers who primarily fish with traditional gears (such as fishing baskets). Studies from elsewhere indicated that women tend to benefits different from men in the fishing industry (Marketing and

processing). Building on work already done by the BLOKAVANGO Project, other entrepreneurial venture that include but not limited to aquaculture potential across the three countries should be ventured. A gender analysis framework is proposed that would include ways in which it intersects with dimensions of poverty (asset and subjective) and the feasibility of trans-boundary pro-poor, pro-growth small/medium program. The key issues being that assuming that gender roles at trans-boundary level cannot be assumed to be fixed. This assumption can result in intervention that would miss the dynamics of water and other interactive natural resource utilization, such as, consequently lead to inappropriate policies or programs in the Okavango Basin.

Although as a country, Botswana has comprehensive HIV and AIDS policies and reasonably resourced national programs intervention aimed at disease prevention, support and mitigation HIV Prevalence, incidence, trends and access is still remain a challenge. According to the recent 2008 Botswana AIDS Impact Survey III (BAIS III), national HIV prevalence rate stands at 17.6% (20.4% females and 14.2% males). The HIV incidence rate nationally is 2.9% (3.5% for females and 2.3% for males). Ngamiland west has a prevalence rate of 16-18.9% and Ngamiland East is the most hard hit with a prevalence rates of between 19 and 21.9%. The Ngamiland East district also has 'high incidence zone' of HIV infection (5.0% and above). Because antiretroviral therapy prolongs life, the numbers of infected is expected to increase over time in most districts as more people access antiretroviral therapy. New challenges include surging rates of new infections (4.76% in Ngamiland). Although death rates from HIV related factors should decline significantly, it is postulated that with successful ART roll out, the number of HIV + individuals is expected rise and there will be a gradual spread of the HIV virus across districts. Delivery of AIDS services faces some challenges regarding access. Some districts face more challenges than others due to a number of factors, some of which are policy related, others as a result of uneven regional development interventions especially those related to social development. Access to treatment is also critical. Approximately 36% of the districts population are > 60km from an ARV clinic. However, the picture is likely to change due to the fact that the National Development Plan 10 (NDP10) has provision for a primary hospital in Shakawe, upgrading primary hospital in Gumare and health posts in the Okavango sub-districts to clinic status. Whereas all these infrastructural and institutional developments are welcome and will greatly enhance the district's human capital, population growth centers and centers of commerce, create employment opportunities, the down side of it is that these changes are also likely to lead to increased risk factors of HIV transmission.

The link between HIV and AIDS and natural resource based livelihood has been neglected. Whereas the revised National Policy on HIV and AIDS (2006) has put some sectors in the fore-front, the role of natural resource based sectors such as agriculture; fisheries, water and CBNRM were not clearly defined in the National Policy on HIV/AIDS. Unfortunately, in Ngamiland, a significant proportion of the district population's livelihoods are derived from these. Case studies from three key natural sectors resources that are dependent on services of the Okavango Delta are used, namely, agriculture, fish and community based natural resource management (CBNRM) projects. The case studies suggest that the impact of AIDS on these sectors is verifiable, but in general, natural resource institutions (NRM) and HIV and AIDS have been inward looking with regard to addressing the problem, their program interventions have shifted away from hard realities of AIDS to soft targets around "wellness" in the workplace. This is in part because the link between HIV and environment has not been clearly articulated. A case study of a viable government/safari HIV outreach partnerships is discussed in the context of policy

and program partnerships in the basin that still focuses on the human crisis dimension of the pandemic.

Despite massive government resources and extra funding from African Comprehensive HIV/AIDS Partnerships (ACHAP), from which Ngami East benefit (and Chobe), Ngamiland west (Okavango) does not. Due to financial constraints, the AIDS Service infrastructure is likely to experience shortage of skilled staff and the inadequate availability of equipment, such as vehicles and laboratory equipment. More fundamentally, HIV is a human crisis. It is not easy therefore to link funding HIV interventions with natural resource management projects/programs. However, government/private partnerships transboundary project akin to the one spear headed by Kalahari Conservation Society (with Safari Operators) between Botswana, Angola and Namibia.

Evidence from the Botswana Sentinel Surveillance Report (2006) and the Botswana AIDS Impact Survey II (2004) and Botswana AIDS Impact Survey III (2009), Francistown – Kasane or the Francistown, or the Selebe - Pikwe trade routes, would be opening up another HIV transmission conveyer belt. The health needs of those people involved in cross-border trade, as well as those people who offer services to these people, such as sex workers. The clinic at the Kasungula weigh bridge is a step in the right direction, as is the fact that Kasane, a border post town, is receiving significant funding from ACHAP (ACHAP, 2006). The three countries may have to think about setting up border post health clinic that offer 24 hour services

Although there are numerous HIV and AIDS Program interventions, there are key ones whose challenges have transboundary implication. Focuses was given to three key intervention AIDS programs in Botswana. These are antiretroviral therapy (ART) roll-out, prevention of transmission from mother to child (PMTCT), Sexually Transmitted infections. With regard to ART, there are concerns over primary and secondary resistance to ARVs, mothers and access to Dry Blood Spot (DBS) of HIV children born HIV positive, changes in normative behaviors of long term survivors of ARVs and long term monitoring of virologic failures. With regard to PMTCT, it is poor male involvement in PMTCT. Pregnancy predisposes a woman to increased risk of exposure to infection. Another challenge has to do with pressure on women to bear children. More than 80% of HIV positive women and over 90% of women on HAART reported having more than one pregnancy. Also, pregnancy occurrences among discordant couples (one partner negative and the other positive) are a reflection of non or inconsistent condom use. STIs facilitate HIV transmission by increasing both infectious and HIV susceptibility. The expansion of STI surveillance system in border crossings and high transit sites is urgent. This also implies that condom distribution and social marketing campaign to prevention of new infections should be intensified. Other issues relate to ways in which AIDS related interventions to interactive dynamics of mortality, default, survival, prevalence and incidence. Transboundary simulations of HIV and AIDS intervention scenarios in relation to mortality, dynamics of extended survival on ART, demographic shifts, and prevalence and incidence, are important. All these factors have transboundary implications vulnerability to flood/climate variability for some social groups

Cited references

- Agarwal, B 2001, participatory exclusions, community forestry and gender: An analysis of south asia and a conceptual framework. *World development*: 29:1623-1648
- Agrawal, A., (2001). Common property and sustainable governance of resources. *World Development* 29 (10), 1649-1672.
- AIDS Brief. CBNRM Brief for Sectoral Planners and Managers. Development Alternatives, USAID. <http://www.frameweb.org/>
- Africa Biodiversity Collaborative Group. 2002. Securing Africa's Future: Biodiversity and Health and HIV/AIDS Workshop. Dar es Salaam.
- AIDS Brief, CBNRM. 2005. CBNRM Brief for Sectoral Planners and Managers. Development Alternatives, USAID. <http://www.frameweb.org/>
- Allison, E. H., and Seeley, J. A., 2004. HIV and AIDS among fisherfolk: a threat to 'responsible fisheries'? *Fish and Fisheries*, 5: 215 – 234.
- Allison E. H. and Seeley. J. A. 2006. HIV and AIDS among fisherfolk: What is at stake? Proceedings of the International Workshop, February 20 -21, Lusaka, Zambia
- Allison, E.H., Ellis, F., (2001). The Livelihoods approach and management of small-scale fisheries. *Marine Policy* 25, 377-388.
- Arntzen, Y 2005 Livelihoods, agriculture and biodiversity in the Okavango delta, Botswana. Report prepared for the PDF-B Stage of the GEF project; Building local capacity for the conservation and sustainable use of biodiversity in the Okavango Delta
- Applied Development Research Consultants (2001) A Report of the socio-ecological survey of the Okavango river Basin, HOORC Library, Maun
- Bishop-Sambrook, C. 2004. Addressing HIV/AIDS through agriculture and natural resource sector: A guide to Extension Workers. Socio-economic and Gender Analysis Program, FAO. Rome
- Baro, M., 2004. The dynamics of HIV/ AIDS in the fishing communities of Benin and Uganda. A synthesis Report. GTZ
- Bene C, Mindjimba, K, Belal, E, Jolley, T, Neiland, A 2003. Inland fisheries, tenure systems and livelihood diversification in Africa: the case of the Yaere Flood plains in Lake Chad Basin *African Studies* Volume 62, Issue 2, 2003, 187 – 212
- Bene, C., Neiland, A., Jolley, T., Ladu, B., Ovie, S., Sule, O., Baba, M., Belal, E., Mindjimba, K., Tiotsop, F., Dara, L., Zakara, A., Quensire, J., (2003). Inland fisheries, poverty and rural livelihoods in the Lake Chad Basin. *Journal of Asian and African studies*.
- Berkes, F.. 1977. Fishery resource use in a subarctic Indian Community. *Human Ecology* :5:289-307
- Buchy, M and Rai, B. 2008. Do women only approaches to NRM help women? The case of community forestry in Nepal In Elmhirst R., and Resurreccion (eds) Gender and Natural Resource Management: Livelihoods, Mobility and Interventions London, Earthscan pp127- 149
- Butale, B.M (2006) Directory of health and wellness teams AIDS Coordinating Unit, Ministry of Minerals, Energy and Water Resources, Gaborone
- Cassidy, L., (2001). Improving Women's Participation in Botswana. IUCN/SNV CBNRM Support Program, Occasional Paper No.5. <http://www.iucnbot.bw>
- Chant, Sylvia (2006) 'Re-thinking the "Feminisation of Poverty" in Relation to Aggregate Gender Indices', *Journal of Human Development*, 7:2, 201-20.
- Central Statistics Office 2004. Botswana AIDS Impact Survey (BAIS II). Ministry of Finance and Development Planning. Central Statistics Office. Gaborone

- Central Statistics Office 2009. STATS BRIEF: Preliminary Results: Botswana AIDS Impact Survey III, 2008.
- Ministry of Finance and Development Planning. Central Statistics Office. Gaborone
Central Statistics Office (2002). The 2001 Botswana Population and Housing Census. Gaborone,
Ministry of Finance and Development Planning
Central Statistics Office, (2008). Botswana Census-Based Poverty Map: District and Sub-district level Results . Ministry of Finance and Development, Gaborone, Botswana.
- COMPASS. Impacts of HIV/AIDS on Natural Resource Management in Malawi. Document 55. Blantyre, 2003
- Cornwall, A 2003. Whose voices? Whose choices? Reflections on gender and participatory development
World Development 31:1325 - 1342
- Cordell, J and McKean, M. A 1992. Sea and tenure in Bahia, Brazil. In Bromley D. W. (ed). Making the Commons Work – Theory, Practice and Policy. San Francisco: ICS Press
- Cooke, H K. 1978. The problem of drought in Botswana Proceedings of the Symposium on Drought in Botswana, National Museum , Gaborone. June 5th – 8th Clark University Press/Botswana Society, 7 - 19
- Dube, O.P and Sekhwela, M. B. M. (2008) Indigenous Knowledge, Institutions and Practices of Coping with variable climate in the Limpopo Basin of Botswana. In Leary, n., Burton, I., Adejun, J., Barros, V., Rodel, L. (eds). Climate Change and Adaptation. Earthscan London Pp71-89.
- Drimie, S., Gandure, S. 2005. The Impacts of HIV/AIDS on Rural Livelihoods in Southern Africa: An Inventory and Literature Review. FAO/UN Sub Regional Office of Southern and Eastern Africa. Harare.
- Eakin, H. 2005: Institutional change, climate risk and rural vulnerability: cases from central Mexico . *World Development* 33, 1923–1938 .
- Ellis, F. 2000. Rural Livelihoods and Diversity in Developing Countries. Oxford University Press. Oxford, UK.
- Elmhirst R., and Resurreccion , B. P.2008. Gender, environment and natural resource management:
New dimensions, new debates. In Elmhirst R., and Resurreccion (eds) Gender and Natural Resource Management: Livelihoods, Mobility and Interventions London, Earthscan pp3-17
- Elmhirst, R. 2008. Multi-local livelihoods, Natural resource management and gender in upland Indonesia,
In Elmhirst R., and Resurreccion (eds) Gender and Natural Resource Management: Livelihoods, Mobility and Interventions London, Earthscan pp 67-85.
- Elmhirst, R. 2002. Daughters and displacement: Migration dynamics in an Indonesian transmigrant area
Journal of development studies 38/5/138-166
- Dorrington, R.E., Moultrie, T.A., Daniel, T. (2006). The Demographic Impact of HIV/AIDS in Botswana:
Modeling the impact of HIV/AIDS in Botswana. Gaborone, UNDP/NACA.
- Every River Has its People Project, 2006. ERP Newsletter Vol 5/ Issue 24 /2006. Gaborone.
- Erskine, S. Red Ribbons and Green Issues: Exploring HIV/AIDS as an Environmental Concern. Health Economics
and HIV/AIDS Research Division (HEARD). University of KwaZulu-Natal,
<http://www.hivan.org.za/admin/documents/Red%20Ribbons%20and%20Green%20Issues.doc>

Farrington J, Slater, R and Holmes, R., 2004. The Search for synergies between social protection and Livelihood promotion: The Agriculture Case. Overseas Development Institute (ODI) Working paper 232. London
Financial Assistance Policy (FAP), 2000 Fourth evaluation, Botswana Collection, UB/HOORC Library, Maun.

Freira, J., Garcia-Allut A. Socio-economic and biological causes of management failures in European: the case of Galicia (NW Spain)). *Marine Policy* 2000; 24:375-384
Forum SYD, 2005. Forum SYD – Organizations Collaborating for Global Justice. Annual Report, Sweden

Freeman, P. H. CBNRM and AIDS in Bushbuckridge, Northern Province. South Africa. An Exploratory Geographic Analysis. South Africa, <http://www.poline.org/doc/1564/174389.html>

Geheb, K. Binns, T. 1997. Fishing farmers or Farming Fishers? The quest for household income and nutritional security on the Kenyan shores of Lake Victoria *African Affairs* :96:73-93
Gillespie and Kadiyala. 2005. HIV/AIDS and Food and Nutrition Security. *Food Policy Review* 7. Washington DC, International Food Policy Research Institute.

Gordon, A., 2005. HIV/ AIDS in the Fisheries Sector in Africa. WorldFish Centre, Cairo, Egypt.

Gwebu, T.D. (2003). Internal Migration in Botswana, 2001 Population and Housing Census Dissemination Seminar, 8th – 11 September, Gaborone, Botswana.

Wehbe, M., Eakin, H., Seiler, R., Vinocur, M., Avila, C and Marutto., C. 2006. Local perspectives on Adaptation to climate change: Lessons from Mexico and Argentina. AIACC working paper # 39. www.aiaccproject.org

Hitchcock, R K 1978. The Traditional Response to drought in Botswana. Proceedings of the symposium on Drought in Botswana, National Museum , Gaborone. June 5th – 8th Clark University Press/Botswana Society, 91 – 96

Hunter, L., & Twine, W. Adult Mortality, Natural Resources and Food Security: Evidence from the Agincourt field site in rural South Africa. Centre for African Ecology, University of Witwatersrand, South Africa, 2005

Johnson, T. Challenges and Responses to Impacts of HIV/AIDS on CBNRM in a Trans-boundary Context. South Africa. 2002.

Keulder, C 2006. Ships, trucks and clubs: The dynamics of HIV Risk Behavior in Walvis Bay, Namibia .

Proceedings of the International Workshop, February 20 -21, Lusaka, Zambia
Kgathi, D. L., Bendsen H., Blaikie., P., Mbaiwa, J., Ngwenya, B. N., Wilk, J 2004. Rural livelihoods, Indigenous Knowledge systems and the political economy of access to natural resources in the Okavango Delta, Botswana. HOORC Library, UB Maun campus.

Kgathi, DI, Kniveton, D, Ringrose, S, Turton, T, Vanderpost, C, Lundquist, Savenije, H, Seelely, M,

Mendelson, E, 2006. Rural Livelihoods, Indigenous Knowledge Systems and Political Economy of Access to Natural Resources

Kgathi, Donald L., Ngwenya, Barbara N. and Wilk, Julie ,2007.'Shocks and rural livelihoods in the Okavango Delta, Botswana', *Development Southern Africa*, 24:2, 289 – 308. DOI: 10.1080/03768350701327186

Kgathi, D.L., Mmopelwa, G., Mosepele, K., (2005). Natural Resources assessment in the Okavango Delta, Botswana: Case Studies of Some Key Resources. *Natural Resources Forum* 29, 70-81.

Leach, M. 1994. Rainforest relations Gender and resource use among the Mende of Gola. Sierra Leone. Edinburgh. University of Edinburgh press

- Lesetedi, N. G., (2003). Household Perspectives of Women and Men in Botswana, 2001 population and housing census dissemination, 8th – 11 September, Gaborone, Botswana.
- Mauambeta, D. D. C. HIV/AIDS Mainstreaming in Conservation: The Case of Wildlife and Environmental Society of Malawi.
http://www.rmpportal.net/library/hh_main/hh_hiv aids/HiVandConservation-Mainstreaming.pdf?searchterm=participatory%20planning.
- Magole, L., Ngwenya, B. N. and Butale, B. M. 2006. Does Institutional Capital Matter for Community Caregivers Central Statistics Office, Ministry of Finance and Development, Gaborone).
- Majelantle R.G, Ngwenya B. N, Nnyepi, M. S, Dintwa, K. F. A (2008) Socio-economic Survey of the Small-scale fisheries in Rural Livelihood Diversification in the Upper Panhandle Okavango Delta. Research Report SES/ F06/08, BIODIVERSITY Project, Fishery Sector, HOORC, UB Maun <http://www.orc.ub.bw/biodiversity>
- Mazwimavi, D and Mmopelwa, G 2006. Access to water in gazetted and ungazetted rural settlements in Ngamiland, Botswana. *Physics and Chemistry of the Earth* 31: 713 – 722.
- McGoodwin, J. R. 2001 FAO Technical Paper 401
<http://www.fao.org/docrep/004/y1290E/v1290e00.htm>
- Meinzen-Dick, R & M Z zwarteveen 1998, Gender participation in water management: Issues and illustrations from water users' associations in south asia, *Agriculture and human values* 15, 337-345
- Meinzen-Dick, R., Brown, L.R., Feldstein, H.S., Quisumbing, A.R., (1997). Gender, Property Rights, and Natural Resources. FCND discussion paper 29.
- Merten, S. and Haller, T., (2008). "We are Zambians- Don't tell us how to fish!" Institutional Change, Power Relations and Conflicts in the Kafue flats fisheries in Zambia. *Human Ecology* 36:699-715.
- Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), 2005. Uganda Strategy for Reducing the Impact of HIV and AIDS on Fishing Communities (summary document). Kampala, Republic of Uganda
- Ministry of Health (2007). Botswana ANC Second Generation HIV/AIDS Sentinel Surveillance Technical Report. Gaborone, Botswana.
- Mmopelwa, G. Ngwenya, B. N &. Sakwape, B. 2008. *The dynamics of fishing as a Natural Safety Net in the Okavango Delta, Botswana*. In Allam Ahmed (editor) Managing Science and Technology for a Sustainable Future, Book: the 6th International Conference, World Sustainable Development(WASD), Brighton, UK 27th – 29th August pp141 - 152.
www.worldsustainable.org
- Mochaba, M 2005.the impact of HIV/AIDS on the tourism sector in the Okavango Delta. Harry Oppenheimer Okavango Research Centre Library, University of Botswana, Maun
- M'Boussou, F. 2006. HIV/AIDS Response in fishing communities: the experience of the Republic of Congo Brazzaville. Proceedings of the International Workshop, February 20 -21, Lusaka, Zambia
- Mosepele, K. 2001. *Description of the Okavango delta fishery*. Technical Report to the Fisheries Section, Ministry of Agriculture, Gaborone, Botswana.
- Mosepele, K. 2003. Trends in Fisheries Development and Fish Utilization in the Okavango Delta. <<http://www.okavangochallenge.com/>>
- Mosepele, K; Ngwenya, B. N. and Bernard, T. 2006. Artisanal Fishing and Food Security in the Okavango Delta, Botswana. In Allam Ahmed (editor) *World Sustainable Development Outlook*. Pp 159- 168 Geneva Inderscience www.inderscience.com
- Mullins, D. 2001. Land Reform, Poverty Reduction and HIV/AIDS. Paper presented at the SARP Conference on Land Reform and Poverty Alleviation in Southern Africa. Pretoria.

- National AIDS Coordinating Agency, (2008). The National Response: HIV and AIDS Information Package, NACA, Gaborone.
- National AIDS Coordinating Agency, (2008). Progress report of the National Response to the UNGASS Declaration of Commitment on HIV/AIDS. Gaborone, Ministry of Sate President.
- National AIDS Coordinating Agency, (2006). The Economic Impact of HIV and AIDS in Botswana Report.
- National AIDS Coordinating Agency, (2008). HIV/AIDS in Botswana: Estimated trends and implications based on surveillance and modeling. NACA, Gaborone
- Ngwenya, B.N., Potts, F., and Thakadu, O.T. 2006 The Impact of HIV/AIDS on CBNRM in Botswana: The Case of Ngamiland, (edited by B. Schuster). IUCN CBNRM Support Program <http://www.iucnbot.bw>
- Ngwenya B. N. and Thakadu, O. T. 2007. HIV/AIDS Morbidity/mortality, Access to Social Support and Household Utilization of Natural Resources in Ngamiland, Botswana. In Tiezzi E, Marques, J. C and Brebbia, C. A and Jorgensen, S. E (eds) Ecosystemms & Sustainable Development Vol 6 WIT Press. pp <http://library.itpress.com/pages/PaperInfo.aspx?PaperID+18234>
- Ngwenya, B. N. Mosepele, K. 2007. HIV/AIDS, Artisanal, Fishing and Food Security in the Okavango Delta, Botswana. *Physics and Chemistry of the Earth* 32 (15 -18): 1339-1349. www.elsevier.com/locate/pce DOI 10.1016/j.pce.2007.07.032
- Ngwenya, B. N and Kgathi, D.L. 2006. Access to Water and HIV/AIDS: A Case Study of Home Based Care in Ngamiland. *Physics and Chemistry of the Earth* 31 (15-16) 669-680. <http://dx.doi.org/10.1016/j.pce.2006.08.041>
- NorthWest District Council District Health Team Health Department 2006/2007 Annual Report, Maun
- Oglethorpe, J., Gelman, N. HIV/AIDS and Conservation. Impacts and Ways to Reduce them. Fact Sheet for the Conservation Community. <http://www.framework.org/>
- Orindi, V., and Huggins, C., (2005). The Dynamic Relationship property rights, water Resource Management and Poverty in the Lake Victoria basin. International workshop on "African Water Laws: plural legislative Framework for rural water management in Africa" 26th – 28th January, Johannesburg, South Africa. Pp 33-1 – 33-9
- Ruhweza, A. Exploring the Relationship Between HIV/AIDS and Community Based Natural Resource Management (CBNRM). Uganda. 2001 http://www.gbf.ch/ab_received.asp?no=37&lg=EN&app=&now=2#2
- Leach, M., Mearns, R., Scoones, I., (1999). Environmental Entitlements: Dynamics and Institutions in Community-Based Natural Resources Management. *World Development* 27 (2), 225-247.
- Majelantle R. (2004) Ngamiland Demographic Indicators. Resource Paper for the WERRD Research project. HOORC-University of Botswana, Maun (Botswana).
- Merten, S and Haller, T., (2008). Property Rights, food security, and child growth: Dynamics of insecurity in the Kafue Flats of Zambia. *Food Policy* 33, 434-443.
- Tsalaile, G. 2006. HIV/AIDS in Workplace: A Survey of Selected Retail and Wholesale Sectors in Maun, HOORC Library, Research
- Terry, E. (1984). *A Survey of Basketmakers, Etsha Ngamiland, Botswana*. Botswanacraft Marketing Company, Etsha.
- Page, S. 2003. The impact of the HIV/AIDS on the ability of Malawian communities to manage their Natural Resources. COMPASS Document 55. Malawi.

- Prah, K.K., (1978). Some Sociological Aspects of Drought. In Proceedings of the symposium on drought in Botswana, (edited M T Hinchey) National Museum, Gaborone. June 5th – 8th Clark University Press/Botswana Society 87 -90
- Ruhweza, A. 2001. Exploring the Relationship Between HIV/AIDS and Community Based Natural Resource Management (CBNRM). Uganda.
http://www.gbf.ch/ab_received.asp?no=37&lg=EN&app=&now=2#2
- SADC-FANR Vulnerability Assessment Committee, 2003. Towards Identifying Impacts of HIV/AIDS on Food Insecurity in Southern Africa and Implications for Response. Findings from Malawi, Zambia and Zimbabwe. Harare, Zimbabwe.
- SADC, 2001. Protocol on Fisheries. Associated Press
- Sarch M. T, Allison E H. 2000. Fluctuating Fisheries in Africa's inland waters: well-adapted livelihoods, maladapted management. Proceedings on the 10th international conference of the Institute of Fisheries Economics and Trade. Corvallis, Oregon, July 9th-14th, 2000
<http://osu.orst.edu/dept/IIIFET/200/papers/sarch.pdf>
- Scoones, I, 1998. Rural livelihoods: a framework for analysis. IDS working paper 72. Brighton, United Kingdom: Institute of Social Studies, University of Sussex.
- Stringer, L.C., Dyer, J.C., Reed, M.S., Dougill, A.J., Twyman, C., Mkwambisi, D., (2009). Adaptations to climate Change, Drought and Desertification: Local insight to enhance policy in southern Africa. Environmental Science and Policy. Doi:10:1016/jenvsci.2009.04.002
- Soeftestad, L. 2001. The CBNRM Net Newsletter. Number 14. World Bank Common Property Resources Management Network.

The Okavango River Basin Transboundary Diagnostic Analysis Technical Reports

In 1994, the three riparian countries of the Okavango River Basin – Angola, Botswana and Namibia – agreed to plan for collaborative management of the natural resources of the Okavango, forming the Permanent Okavango River Basin Water Commission (OKACOM). In 2003, with funding from the Global Environment Facility, OKACOM launched the Environmental Protection and Sustainable Management of the Okavango River Basin (EPSMO) Project to coordinate development and to anticipate and address threats to the river and the associated communities and environment. Implemented by the United Nations Development Program and executed by the United Nations Food and Agriculture Organization, the project produced the

Transboundary Diagnostic Analysis to establish a base of available scientific evidence to guide future decision making. The study, created from inputs from multi-disciplinary teams in each country, with specialists in hydrology, hydraulics, channel form, water quality, vegetation, aquatic invertebrates, fish, birds, river-dependent terrestrial wildlife, resource economics and socio-cultural issues, was coordinated and managed by a group of specialists from the southern African region in 2008 and 2009.

The following specialist technical reports were produced as part of this process and form substantive background content for the Okavango River Basin Transboundary Diagnostic Analysis

Final Study Reports	Reports integrating findings from all country and background reports, and covering the entire basin.		
		Aylward, B.	<i>Economic Valuation of Basin Resources: Final Report to EPSMO Project of the UN Food & Agriculture Organization as an Input to the Okavango River Basin Transboundary Diagnostic Analysis</i>
		Barnes, J. et al.	<i>Okavango River Basin Transboundary Diagnostic Analysis: Socio-Economic Assessment Final Report</i>
		King, J.M. and Brown, C.A.	<i>Okavango River Basin Environmental Flow Assessment Project Initiation Report (Report No: 01/2009)</i>
		King, J.M. and Brown, C.A.	<i>Okavango River Basin Environmental Flow Assessment EFA Process Report (Report No: 02/2009)</i>
		King, J.M. and Brown, C.A.	<i>Okavango River Basin Environmental Flow Assessment Guidelines for Data Collection, Analysis and Scenario Creation (Report No: 03/2009)</i>
		Bethune, S. Mazvimavi, D. and Quintino, M.	<i>Okavango River Basin Environmental Flow Assessment Delineation Report (Report No: 04/2009)</i>
		Beuster, H.	<i>Okavango River Basin Environmental Flow Assessment Hydrology Report: Data And Models (Report No: 05/2009)</i>
		Beuster, H.	<i>Okavango River Basin Environmental Flow Assessment Scenario Report : Hydrology (Report No: 06/2009)</i>
		Jones, M.J.	<i>The Groundwater Hydrology of The Okavango Basin (FAO Internal Report, April 2010)</i>
		King, J.M. and Brown, C.A.	<i>Okavango River Basin Environmental Flow Assessment Scenario Report: Ecological and Social Predictions (Volume 1 of 4) (Report No. 07/2009)</i>
		King, J.M. and Brown, C.A.	<i>Okavango River Basin Environmental Flow Assessment Scenario Report: Ecological and Social Predictions (Volume 2 of 4: Indicator results) (Report No. 07/2009)</i>
		King, J.M. and Brown, C.A.	<i>Okavango River Basin Environmental Flow Assessment Scenario Report: Ecological and Social Predictions: Climate Change Scenarios (Volume 3 of 4) (Report No. 07/2009)</i>
		King, J., Brown, C.A., Joubert, A.R. and Barnes, J.	<i>Okavango River Basin Environmental Flow Assessment Scenario Report: Biophysical Predictions (Volume 4 of 4: Climate Change Indicator Results) (Report No: 07/2009)</i>
		King, J., Brown, C.A. and Barnes, J.	<i>Okavango River Basin Environmental Flow Assessment Project Final Report (Report No: 08/2009)</i>
		Malzbender, D.	<i>Environmental Protection And Sustainable Management Of The Okavango River Basin (EPSMO): Governance Review</i>
		Vanderpost, C. and Dhliwayo, M.	<i>Database and GIS design for an expanded Okavango Basin Information System (OBIS)</i>
		Veríssimo, Luis	<i>GIS Database for the Environment Protection and Sustainable Management of the Okavango River Basin Project</i>
		Wolski, P.	<i>Assessment of hydrological effects of climate change in the Okavango Basin</i>
Country Reports Biophysical Series	Angola	Andrade e Sousa, Helder André de	<i>Análise Diagnóstica Transfronteiriça da Bacia do Rio Okavango: Módulo do Caudal Ambiental: Relatório do Especialista: País: Angola: Disciplina: Sedimentologia &</i>

			Geomorfologia
		Gomes, Amândio	Análise Diagnóstica Transfronteiriça da Bacia do Rio Okavango: Módulo do Caudal Ambiental: Relatório do Especialista: País: Angola: Disciplina: Vegetação
		Gomes, Amândio	Análise Técnica, Biofísica e Socio-Económica do Lado Angolano da Bacia Hidrográfica do Rio Cubango: Relatório Final: Vegetação da Parte Angolana da Bacia Hidrográfica Do Rio Cubango
		Livramento, Filomena	Análise Diagnóstica Transfronteiriça da Bacia do Rio Okavango: Módulo do Caudal Ambiental: Relatório do Especialista: País: Angola: Disciplina: Macroinvertebrados
		Miguel, Gabriel Luís	Análise Técnica, Biofísica E Sócio-Económica do Lado Angolano da Bacia Hidrográfica do Rio Cubango: Subsídio Para o Conhecimento Hidrogeológico Relatório de Hidrogeologia
		Morais, Miguel	Análise Diagnóstica Transfronteiriça da Bacia do Análise Rio Cubango (Okavango): Módulo da Avaliação do Caudal Ambiental: Relatório do Especialista País: Angola Disciplina: Ictiofauna
		Morais, Miguel	Análise Técnica, Biofísica e Sócio-Económica do Lado Angolano da Bacia Hidrográfica do Rio Cubango: Relatório Final: Peixes e Pesca Fluvial da Bacia do Okavango em Angola
		Pereira, Maria João	Qualidade da Água, no Lado Angolano da Bacia Hidrográfica do Rio Cubango
		Santos, Carmen Ivelize Van-Dúnem S. N.	Análise Diagnóstica Transfronteiriça da Bacia do Rio Okavango: Módulo do Caudal Ambiental: Relatório de Especialidade: Angola: Vida Selvagem
		Santos, Carmen Ivelize Van-Dúnem S.N.	Análise Diagnóstica Transfronteiriça da Bacia do Rio Okavango: Módulo Avaliação do Caudal Ambiental: Relatório de Especialidade: Angola: Aves
	Botswana	Bonyongo, M.C.	Okavango River Basin Technical Diagnostic Analysis: Environmental Flow Module: Specialist Report: Country: Botswana: Discipline: Wildlife
		Hancock, P.	Okavango River Basin Technical Diagnostic Analysis: Environmental Flow Module : Specialist Report: Country: Botswana: Discipline: Birds
		Mosepele, K.	Okavango River Basin Technical Diagnostic Analysis: Environmental Flow Module: Specialist Report: Country: Botswana: Discipline: Fish
		Mosepele, B. and Dallas, Helen	Okavango River Basin Technical Diagnostic Analysis: Environmental Flow Module: Specialist Report: Country: Botswana: Discipline: Aquatic Macro Invertebrates
	Namibia	Collin Christian & Associates CC	Okavango River Basin: Transboundary Diagnostic Analysis Project: Environmental Flow Assessment Module: Geomorphology
		Curtis, B.A.	Okavango River Basin Technical Diagnostic Analysis: Environmental Flow Module: Specialist Report Country: Namibia Discipline: Vegetation
		Bethune, S.	Environmental Protection and Sustainable Management of the Okavango River Basin (EPSMO): Transboundary Diagnostic Analysis: Basin Ecosystems Report
		Nakanwe, S.N.	Okavango River Basin Technical Diagnostic Analysis: Environmental Flow Module: Specialist Report: Country: Namibia: Discipline: Aquatic Macro Invertebrates
		Paxton, M.	Okavango River Basin Transboundary Diagnostic Analysis: Environmental Flow Module: Specialist Report: Country: Namibia: Discipline: Birds (Avifauna)
		Roberts, K.	Okavango River Basin Technical Diagnostic Analysis: Environmental Flow Module: Specialist Report: Country: Namibia: Discipline: Wildlife
		Waal, B.V.	Okavango River Basin Technical Diagnostic Analysis: Environmental Flow Module: Specialist Report: Country: Namibia: Discipline: Fish Life
Country Reports Socioeconomic Series	Angola	Gomes, Joaquim Duarte	Análise Técnica dos Aspectos Relacionados com o Potencial de Irrigação no Lado Angolano da Bacia Hidrográfica do Rio Cubango: Relatório Final
		Mendelsohn, .J.	Land use in Kavango: Past, Present and Future
		Pereira, Maria João	Análise Diagnóstica Transfronteiriça da Bacia do Rio Okavango: Módulo do Caudal Ambiental: Relatório do Especialista: País: Angola: Disciplina: Qualidade da Água
		Saraiva, Rute et al.	Diagnóstico Transfronteiriço Bacia do Okavango: Análise Socioeconómica Angola

	Botswana	Chimbari, M. and Magole, Lapologang	Okavango River Basin Trans-Boundary Diagnostic Assessment (TDA): Botswana Component: Partial Report: Key Public Health Issues in the Okavango Basin, Botswana
		Magole, Lapologang	Transboundary Diagnostic Analysis of the Botswana Portion of the Okavango River Basin: Land Use Planning
		Magole, Lapologang	Transboundary Diagnostic Analysis (TDA) of the Botswana p Portion of the Okavango River Basin: Stakeholder Involvement in the ODMP and its Relevance to the TDA Process
		Masamba, W.R.	Transboundary Diagnostic Analysis of the Botswana Portion of the Okavango River Basin: Output 4: Water Supply and Sanitation
		Masamba, W.R.	Transboundary Diagnostic Analysis of the Botswana Portion of the Okavango River Basin: Irrigation Development
		Mbaiwa, J.E.	Transboundary Diagnostic Analysis of the Okavango River Basin: the Status of Tourism Development in the Okavango Delta: Botswana
		Mbaiwa, J.E. & Mmopelwa, G.	Assessing the Impact of Climate Change on Tourism Activities and their Economic Benefits in the Okavango Delta
		Mmopelwa, G.	Okavango River Basin Trans-boundary Diagnostic Assessment: Botswana Component: Output 5: Socio-Economic Profile
		Ngwenya, B.N.	Final Report: A Socio-Economic Profile of River Resources and HIV and AIDS in the Okavango Basin: Botswana
		Vanderpost, C.	Assessment of Existing Social Services and Projected Growth in the Context of the Transboundary Diagnostic Analysis of the Botswana Portion of the Okavango River Basin
	Namibia	Barnes, J and Wamunyima, D	Okavango River Basin Technical Diagnostic Analysis: Environmental Flow Module: Specialist Report: Country: Namibia: Discipline: Socio-economics
		Collin Christian & Associates CC	Technical Report on Hydro-electric Power Development in the Namibian Section of the Okavango River Basin
		Liebenberg, J.P.	Technical Report on Irrigation Development in the Namibia Section of the Okavango River Basin
		Ortmann, Cynthia L.	Okavango River Basin Technical Diagnostic Analysis: Environmental Flow Module : Specialist Report Country: Namibia: discipline: Water Quality
		Nashipili, Ndinomwaameni	Okavango River Basin Technical Diagnostic Analysis: Specialist Report: Country: Namibia: Discipline: Water Supply and Sanitation
		Paxton, C.	Transboundary Diagnostic Analysis: Specialist Report: Discipline: Water Quality Requirements For Human Health in the Okavango River Basin: Country: Namibia

*Environmental protection and sustainable management
of the Okavango River Basin*

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