Human-wildlife conflicts in the Okavango Delta, Botswana: What are sustainable management options?

Joseph E Mbaiwa[1]

Abstract

Human-wildlife conflicts (HWCs) threaten natural resource sustainability and livelihoods in Botswana. Using the notions of sustainability, human wildlife conflict and conflict resolution, this paper analyses causes, consequences and management options of HWCs in the Okavango Delta (OD), Botswana. Primary and secondary data sources were used in the study. The results of the study show that there are primary (underlying) and proximate factors that cause HWCs in the OD. The main causes of HWC include crop damage caused by wild animals such as elephants, kudus and hippos. Livestock predation caused by lions, hyenas, wild dogs, cheetahs and crocodiles are some of the cause of HWC in the delta. Proximate factors of HWC include increased human and wildlife population (e.g. elephants), policy and institutional failures, livestock diseases and veterinary fences. These result in insecure livelihoods, and negative local attitudes towards wildlife conservation. Policy and institutional barriers increase HWC in the OD. This is reflected by the fact that government policy tends to favour wildlife-based tourism over agro-pastoralism in the OD. The result has been an increase in HWCs and poverty in the wetland. In addition, institutional policies on land use are not harmonized and are top-down to development planning and in the implementation of development programmes. In conclusion, land zonation for land uses and compensation for crop damage and livestock predation are potential options for sustainability and HWC resolution.

Keywords: Human-wildlife conflicts; sustainability; livestock predation; crop damage; Okavango Delta

[1] Professor & Director, Okavango Research Institute, University of Botswana. Email: jmbaiwa@ub.ac.bw

Introduction

Human-wildlife conflicts (HWCs) are a concern for Botswana, Africa and the world at large (Brooks et al 2010). HWCs are common in areas where there is human-wildlife interaction, especially in those areas where human settlements are located near protected areas and game reserves. Crop-raiding by wild animals is the major problem for farmers (Hedges and Gunaryadi, 2008; Graham et al., 2009; Kikoti et al 2010; Olsson, 2014). Human-elephant conflict occurs more often at the end of the rainy season when crops are ripening and the elephants raid the crops at night (Jackson et al., 2008; Graham et al., 2009). HWCs also involve competition for grazing land between wildlife and livestock, and the killing of livestock and people by predators (Gadd, 2005; Hedges and Gunaryadi, 2008, Barua et al, 2013; Olsson, 2014). In Africa, large herbivores and carnivores are the source of most HWCs (Lamarque et al 2009). For example, elephants destroy homes, grain stores and water facilities. The damage caused by wildlife has led communities living in wildlife areas in Africa to view wildlife as a problematic government property (WWF SARPO, 2005). These perceptions contribute to HWCs in Africa, including in Botswana (Darkoh and Mbaiwa, 2009). HWCs in Africa threaten rural livelihoods, food security and often cause conflict between wildlife managers and local communities.

In Botswana, HWCs are concentrated in the northern part of the country, especially in the Okavango Delta (OD), Boteti and Chobe Districts (Darkoh and Mbaiwa, 2009). HWCs in the OD may be an indication that the area has experienced an increased population and influx of different land users in the last few decades. In addition, state actions, policies and institutional failures may give rise to HWCs if the government prioritises certain land use activities over others. That is, policy and institutional failures can hinder the implementation of appropriate strategies for the management of natural resources, and worsen conflict between wildlife and humans. These issues have not been adequately analysed in the OD, so this paper addresses some of these issues. The paper analyses causes and consequences of HWCs in the OD, Botswana. The paper further identifies sustainable options for the management of these conflicts. The paper is informed by the notions of environmental change, sustainable development, human wildlife conflict and conflict resolution.

Sustainability and human-wildlife conflicts

The notion of sustainability, sustainable development and conflict resolution are used in this paper because sustainability in wildlife-tourism is critical. Wildlife-tourism destinations like the OD are also sites and home to the poor rural and subsistence communities who rely on environmental resources such as land (for agro-pastoralism) to sustain their livelihoods. Sustainability is achieved the use of natural resources becomes sustainable when meeting the needs of the present generation does not compromise the needs of future generations (WCED 1987). These sustainable development ideals were adopted at the Rio World Summit in 1992 and are meant to maintain a balance between the caring for the environment and achieving economic development (WCED, 1987). However, sustainability or sustainable development has been criticised by several scholars (Redclift 1987, Lele 1991; Warren 1996). The critics of sustainability argue that its goals are ambiguous and unachievable. Despite these criticisms, governments around the world have come to accept that any form of development cannot be achieved unless policies, strategies and their implementation are consistent with the goals of sustainable development (WCED, 1987). This acceptance by governments is

illustrated by the 1992 *Rio Summit* which resulted in many governments around world adopting sustainable development principles in their respective economic agendas.

If unresolved, HWCs may result in environmental change and resource degradation in the OD. Natural resource use competition and conflicts arise when different interest groups use resources differently within the same natural eco-system like the OD. Where property is communally or government owned and treated as a free resource, competition will inevitably lead to overuse of resources with little regard for the consequences (Darkoh and Mbaiwa, 2014). The shortage of natural resources desired by different interest groups leads to competition, conflict, land degradation and poverty (Darkoh and Mbaiwa, 2009). In addition, if state actions, policies and strategies are designed without the consideration of sustainable development ideals, they may give rise to competition and conflicts over natural resources. Thus, lack of appropriate natural resource use management strategies may result in dissatisfaction and competition, and this may worsen conflict and the non-sustainability of resource utilisation (Darkoh and Mbaiwa, 2009). The emergence of the wildlife-based tourism pitted against subsistence and poor agro-pastoralism and the rise of HWCs in the OD is the focus of this paper.

Misunderstandings and conflicts over natural resources can be resolved when the underlying sources of tension between parties are removed (Buckels and Rusnak, 1999). A "win-win" scenario between interest groups and stakeholders in a geographical area characterised by conflicts is essential as a conflict resolution mechanism. A win-win situation is, however, not always the case as some stakeholders may choose not to collaborate or make any concessions. Redpath et al (2013) argue that conflict management requires all stakeholders to recognize problems as shared ones, and engage with clear goals, a transparent evidence base, and an awareness of trade-offs. This suggests that decision makers and stakeholders in the OD should focus on a "win-win" scenario in conflict resolution. This approach can be used to resolve HWCs and promote sustainable ecosystem management and biodiversity conservation in the OD.

The research site

This research was carried out in the Okavango Delta, located in north-western Botswana (Fig. 1). The OD is a vast swamp and floodplain area covering about 16,000 square kilometres, half of which is permanently flooded (Tlou, 1985). It is home to a wide variety of flora and fauna which include insects, birds, reptiles, fish and countless micro-organisms.

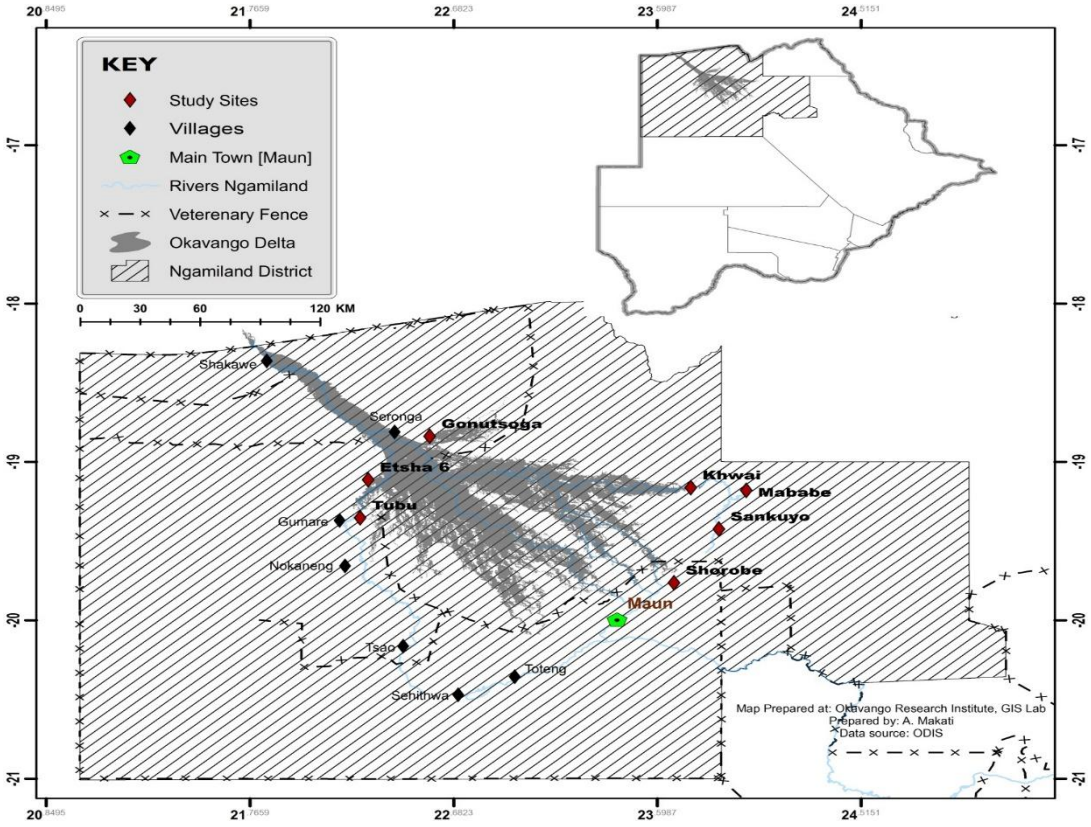

Fig 1: Map of study site – Okavango Delta

The rich wildlife diversity and scenic beauty of the OD supports a growing wildlife-based tourism industry (Mbaiwa and Stronza, 2010). The OD also supports a growing human population in the region. The region has a multi-ethnic population of about 154,712 (CSO, 2011) over three-quarters of which directly or indirectly depends on natural resources found in the OD. The livelihoods of the local people include fishing, crop and livestock farming, hunting and gathering. The existence of wildlife resources and agro-pastoralists in the OD makes the site suitable for a study of HWCs. In order to narrow down the research, seven villages within the OD were selected for household interviews. These are Shorobe, Tubu, Etsha 6, Gunitsoga, Khwai, Mababe, and Sankoyo. These villages are located in different parts of the OD.

Research design and methodology

A descriptive cross-sectional research design was adopted in this study. The cross sectional approach was adopted because this research was a once off survey. Cross-sectional studies are usually conducted to estimate the prevalence of an outcome of interest for given population (Ary et al., 2013).

This paper used data collected from both published and unpublished literature on HWC in the OD and Botswana. The paper specifically made use of two main research studies carried out in 1999 and 2005. All the villages, namely: Sankoyo, Khwai and Mababe (for 1999 survey) and Shorobe, Tubu, Etsha 6 and Gunitsoga for 2005 survey) were purposively sampled. At a household level, random sampling was carried out in each village. A sample of 120 households was made from the four villages in the 2005. This study was meant to verify,

update and add information base data extracted from the 1999 study. The 1999 study sampled a total of 90 households. In these two studies, purposive sampling was done on institutional settings since decision-makers often hold a post of responsibility in their respective organisations. Institutional actors and decision makers included government officials in the livestock and crop industry, wildlife managers, traditional leadership in sampled villages, and tourism operators.

The two studies used the questionnaire with closed and opened-ended questions administered to all stakeholders. Closed questions allowed the generation of data that were quantifiable. Closed questions, however, did not allow respondents to express themselves. It is for this reason that open-ended questions were used. Special questionnaires were given to key informants and different land users. The interviews with key informants were in the form of dialogue to allow respondents to explain everything in their own words. The interviews with key informants therefore provided more insights than questionnaires. The data collected from both institutional actors and households included existing and potential HWCs in the area, especially those related to agro-pastoralism, causes of HWCs in respective villages, crop damage by wildlife and livestock predation, results of HWC and suggestions on potential solutions to the conflicts.

Data were also collected in 2014, using informal interviews with key informants such as traditional leaders in the study villages (n=7) government (n=5) and tourism operators (n=4) to update previous studies and to capture current causes, consequences and mitigation measures of HWC in the OD. The updating of data also involved the use of current secondary data from the Department of Wildlife and National Parks (DWNP) including the species or wild animals responsible for causing HWCs, the extent of crop damage caused by wildlife, the number of livestock killed by predators and the number of human beings killed by wildlife. Data from DWNP involved the use of current annual reports on problem animal control and informal interviews with officers. Materials which formed secondary data sources include government policy documents, reports, maps, books and audio-visual information on HWC from libraries at University of Botswana, the DWNP and Department of Tourism in Gaborone and Maun.

Finally, a thematic approach was used to analyze the HWC data. Informal interview data from open ended questions with decision makers and stakeholders was sub-divided into themes and patterns for analysis. Thematic analysis involved reducing HWC data and summarizing it into themes and patterns. Themes formed centered around existing and potential HWCs, causes of HWCs, crop damage by wildlife and livestock predation, results of HWC and conflict resolution. Finally, quantitative data collected from secondary sources was presented in the form of tables, charts and diagrams.

Results

Primary causes of HWC in the Okavango Delta

Livestock Predation

Livestock predation was found to be one of the main causes of HWC where agro-pastoralists clash with wildlife managers and Government. The results of this study indicate that a total of 65.8% of the households interviewed in the 2005 study at Tubu, Etsha 6, Shorobe and Gunitsoga owned livestock as their main source of income (Table 1). Livestock owned by

these rural communities include cattle, sheep, goats, donkeys, mules and horses. These households reported that predators moved freely between Moremi Game Reserve and the nearby concession areas kept for livestock grazing and prey on livestock.

Table 1: Livestock ownership in OD

Response	Frequency	Percentage
Own Livestock	79	65.8
Have no Livestock	41	34.2
Total	120	100.0

Seventy-three percent (73%) of the subsistence farmers in households at Shorobe, Tabu, Gunitsoga and Etsha 6 villages reported livestock predation by carnivores in a two-year period (Table 2). Only 26.7% of the households did not experience livestock predation in the study villages.

Table 2: Livestock predation in the study villages (n=86)

Village	Number of households which experienced livestock predation	Number of household which did not experience livestock predation
Etsha 6	6 (50.0%)	6 (50.0%)
Gunitsoga	22 (78.6%)	6 (21.4%)
Tubu	16 (66.7%)	8 (33.3%)
Shorobe	19 (86.4%)	3 (13.3%)
Totals	**63 (73.3%)**	**23 (26.7%)**

Informal interviews with livestock farmers at Shorobe, Tabu, Gunitsoga and Etsha 6 further indicate that predation was caused by cheetahs, hyenas, lions, leopards, jackals, pythons and wild dogs. This information was confirmed by data from the Department of Wildlife and National (DWNP) Annual Reports indicating that cases of predation were attributed to lions, leopards, crocodile and hyenas. According to these reports, lions were the main killers of livestock in the OD. For example, in the study area, between 2000 and 2004, a total of 3,704 livestock animals were killed by lions alone (Table 3).

Table 3: Number of livestock killed by four key predators, 2000-2004

Species	2000	2001	2002	2003	2004	Totals
Lion	401	554	1161	688	900	3704
Leopard	151	334	271	223	172	1151
Crocodile	25	15	50	50	49	189
Hyena	31	3	26	11	29	100
Totals	608	906	1508	972	1150	5144

Source: DWNP (2009)

Predators in the OD largely prey mainly on cattle. For example, of the 3704 livestock killed between 2000 and 2004 by lions in the OD, 1,285 were cattle (Table 4). Pastoralists noted that lions move into livestock areas to prey on cattle kept in a kraal at night. Respondents indicated that their only defence against lions was to keep cattle in kraals at night and scaring lions by hitting tins and drums and creating noise. Lion predation cases between 2000 and 2004 were 3704; however, they dropped to 1392 cases in the period between 2010 and 2013 (Table 4). This represents a drop of 62.4% in lion predation cases. Although there was a decline in predation caused by lions, cases of predation by lions remain higher than those caused by hyenas, wild dogs, cheetahs, crocodiles and leopards.

Table 4: Livestock predation in the OD 2010- 2013

Year	**Lion**	**Crocodile**	**Wild dog**	**Hippo**	**Leopard**	**Cheetah**	**Total**
2010	330	9	203	33	136	18	721
2011	251	51	157	17	131	2	609
2012	345	22	231	17	147	7	779
2013	466	36	288	19	207	9	1025
Totals	**1392**	**118**	**879**	**86**	**621**	**36**	**3132**

Source: DWNP (2015)

Although the Government of Botswana has attempted to separate livestock areas and wildlife areas through the establishment of veterinary fences, the study respondents reported that some of the predators dug under the fences to kill livestock in grazing areas. Gusset al (2009) confirms this by stating that lion, leopard, cheetah, caracal, spotted hyaena, wild dog, and black-backed jackal commonly pass through the veterinary cordon fence in northern Botswana. Results on livestock predation in the OD confirm that predators, especially cats cause most of HWCs in Africa (e.g. Lamarque et al 2009; Anthony and Wasambo 2009; Anthony et al 2010).

Conflicts due to crop damage

Results of this study indicate that crop damage by wildlife is one of the main causes of HWC in the OD. A total of 86% of crop-farmers at Shorobe, Tabu, Gunitsoga and Etsha 6 indicated that in the last two years, they ploughed their crop fields while 14% did not plough in that season due to fears of crop damage. Results further indicate that 67% of the farmers who ploughed during this period had their crops damaged by wild animals (Table 5).

Table 5: Crop damage by wildlife (n= 103)

Responses	**Frequency**	**Percentage (%)**
Crops were Damaged by Wildlife	69	67.0
Crops were not Damaged by Wildlife	34	33.0
Totals	103	100.0

Source: Darkoh and Mbaiwa (2005)

Results from informal interviews with crop farmers and secondary data sources show that crop damage in the OD is mostly caused by elephants. For example, data from annual report of the DWNP indicate that elephants accounted for 1,377 crop damage cases reported between 2000 and 2004. This represents 94.3% of all the crop damage cases in that period

(Table 6). Between 2010 and 2013, the DWNP annual reports of 2015 showed that 1805 crop damage cases were documented as having been caused elephants, kudu and hippo.

Table 6: Number of cases of crop damage reported, 2000-2004

Animal Caused	2000	2001	2002	2003	2004	Totals
Elephant	204	167	375	422	209	1,377
Hippo	11	15	17	21	11	75
kudu	0	0	2	5	0	9
Totals	215	182	394	448	220	1461

Source: Darkoh and Mbaiwa (2005)

To illustrate the damage caused by elephants, a household representative at Gudigwa Village cynically retorted, "*we plough but elephants do the harvesting*" when referring to the damage by elephants in Gudigwa village. These results indicate that elephants cause crop damage in the OD and this has led to HWC between crop farmers and wildlife managers or the government. The elephant population has rapidly increased in Botswana in the last 10 years. The elephant population in Botswana increased from 120,000 in 1995 (DWNP, 1995) to 230, 176 in 2012 (DWNP, 2012). In the OD, elephants increased from 79,000 in 2005 (DWNP, 2005) to 126, 474 in 2012 (DWNP, 2012). This has resulted in elephant herds moving outside the OD into agro-pastoralist areas and destroying crops.

Proximate causes of HWCs in the OD

Increased human population (human sprawl)

There has been an increase in infrastructure development and human population in the OD in recent decades. Van der Post (2004:65) notes that there has been a proliferation of rural settlements and infrastructure development in the OD in recent decades. The human population of the OD grew from 41,820 people in 1964 to 154,712 people in 2001 (CSO, 2011). Van der Post (2004:65) notes that the region's growth rate is the highest in the country. The increase in rural population is shown by the growth in the number of small settlements in the OD from 312 in 1981 to 507 in 2001, an increase of 63% (Van der Post, 2004). Human activities such as roads and villages have expanded into the OD in the last two decades. This has led to an increase in boreholes sunk for watering increased numbers of livestock and deforestation for arable land (Darkoh and Mbaiwa, 2014). When wildlife and human populations compete for land and other resources, HWCs emerge. Informal interviews with agro-pastoralists and decision makers showed that the growth of human populations and demand for more land, water and other natural resources cause HWCs in the OD. This shows that an increased human population means an expansion of economic and demographic pressures on resources in wildlife areas.

The increased human population in the OD and threats caused by human activities explain why the wildlife and tourism sectors are not comfortable with increased human settlements. These sectors are not comfortable because the expansion of humans into the OD means an increased threat to wildlife areas which are used for tourism. Agro-pastoralism conflicts with the wildlife-based tourism industry, so tourism operators have called for the relocation of some of the settlements from the OD. Informal interviews with tourism operators at Khwai indicate that they prefer Khwai village to relocate from its current

location to Mababe or Sankoyo areas to give way to wildlife-based tourism. This shows that the rapid expansion of tourism facilities, the upsurge of urbanisation and the proliferation of human settlements in the OD area add to the competition and HWCs.

Increased animal population

The increased livestock in a wildlife area such as the OD was found to be one of the main causes of HWCs in the wetland. The cattle population in the OD increased from zero in 1999 to 422,365 in 2012. In 1995, there was an outbreak of the Cattle Lung Disease which led to the culling of the entire cattle population in the Okavango region. However, in 1999, there was a restocking of cattle. Since then there has been an increase in the cattle population in the region.

In addition to the cattle population in the OD region, small stock populations have been on the increase. Small stock in the OD is often not affected by diseases which can cause significant changes in their numbers. Small stock, especially goats, is considered the third most important component of the rural household economy in the Okavango region (Fidzani et al, 1999). Bendsen and Meyer (2002) indicate that the total number of goats has tripled between1968 and1998. Bendsen and Meyer note that in 1998, there were 185,711 goats and 24,525 sheep that grazed in communal areas of the region. In the 1980s, about 50% of the households raised goats in the Okavango area; this number increased to 57% by 1998 (Bendsen and Meyer, 2002). This shows an increase of seven percent in households that rear goats. In 2012, there were 124,838 sheep and goats in the OD (DWNP, 2012). Goats in the OD are often killed by predators and therefore become a source of HWCs as subsistence farmers and wildlife managers often clash over livestock predation. The increase in livestock numbers in the OD has resulted in livestock grazing areas expanding into wildlife areas. This causes conflicts between wildlife managers and livestock farmers as more domestic animals are lost to predators.

Policy and institutional failures

Policy and institutional failures cause HWC in the OD. Gupta (2013) argues that understanding the roots of HWC in Botswana requires an examination of the historical process and genealogy of conservation policies in the country. Gupta argues that HWCs in Botswana emerged due to conservation policies in the colonial era which ignored local community interests. Results in her study indicate that land and natural resource use policy and institutional framework in the OD lacks harmonisation, appropriateness and local community support hence the prevalence of HWCs. Agro-pastoralism and wildlife-tourism policy and institutional framework in Botswana are mostly top-down in formulation and implementation. For example, the rapid growth of the wildlife-based tourism industry since the 1990s is a result of the adoption of the Wildlife Conservation Policy of 1986 and the Tourism Policy in 1990. The adoption of the Wildlife Conservation Policy and the Tourism Policy resulted in the demarcation of land in the OD into tourism concession areas. This was carried out without adequate consultation with rural communities that live in these areas. In addition, the classic example of the top-down government approach is the periodic extensions of Moremi Game Reserve (MGR) into land belonging to the people of Shorobe, Sankuyo and Mababe which is done without their consent; the latest such extension was in 1989. The expansion of MGR into communal grazing land meant a reduction of grazing land for

communities and, this brought wildlife closer to human settlements and farming areas. Predators like lions, leopards and cheetah had easier access to livestock. Similarly, herbivores such as elephants, hippos and antelopes destroyed crops belonging to local communities. Interviews with the people in Khwai, Sankoyo and Mababe revealed that the extension of MGR boundary into their crop and livestock land was done without consultation. This is an indication that the government prioritised wildlife-based tourism over their livelihood activities such as crop and livestock farming. The people of Khwai argued that their removal from Xakanaxa inside MGR to their current location outside the reserve demonstrates that the government policy favours wildlife-based tourism over their livelihoods. This has exacerbated the HWC and hostility between local people on the one hand, and the wildlife-based tourism industry and the government on the other.

An analysis of the institutional arrangement in the OD suggests that there is lack harmonisation and agreement among land use agencies. Informal interviews with different government officials indicated that Sankoyo, Mababe and Khwai are situated in areas with vast wildlife species which also happen to be prime tourism areas. Crop production and livestock farming are promoted by the Ministry of Agriculture and Food Security. At the same time, the Ministry of Environment Tourism and Wildlife promotes international tourism in this area. The lack of harmonisation of government institutions (for example, departments and ministries) has resulted in these agencies adopting and implementing land use policies which are in conflict with one another. This often results in conflicts among stakeholders when these policies are implemented. For example, the decision in 1995/6, of the Department of Veterinary Services to erect veterinary fences in the OD in order to control the spread of the Cattle Lung Disease without the consultation of sister departments such as those of arable agriculture, wildlife, tourism and local governments and the local people themselves. The result was that there were numerous conflicts, with livestock farmers complaining about having lost some of their grazing and arable land, leading to new restrictions on cattle movements.

Institutional and policy failures in the OD have also been demonstrated by the land use plans which are not harmonised; consequently, conflict develops during the implementation of these plans (Darkoh and Mbaiwa 2014). Although attempts have been made in the past to integrate land use plans through the 1991 Ngamiland Land Use and Development Plan, these have not resolved the current HWCs and related conflicts in the Delta. In fact, this Plan has never been implemented as it lacks support from government, land use planners, the local communities and other stakeholders. Consultation with stakeholders was inadequate, especially with the local communities who are affected by the plan. In 2008, a new integrated land use plan known as the Okavango Delta Management Plan (ODMP) was formulated for the Okavango Delta (DEA, 2008).

The ODMP mid-term review of 2012 noted that the ODMP had suffered from lack of implementation by government (Plantec Africa, GISPlan and Fameventures 2012). As a result, land use conflicts between various land users continued to be a challenge. For example, the most significant land use conflicts have been those among wildlife, livestock, arable land, tourism, natural resource conservation, and scattered settlement expansions, as well as between subsistence use (gathering of veld products, fishing and hunting wildlife) and the need for conservation and sustainable resource utilisation (Darkoh and Mbaiwa, 2014). Wildlife-based tourism is given priority by the government in that certain parts of the OD

such as areas within the Buffalo Fence have been reserved for tourism development to the exclusion of other land uses.

Livestock diseases, veterinary fences and HWCs

Foot-and-Mouth (FMD) disease is also one of the causes of HWCs in the OD. Buffaloes are carriers of FMD in the OD. For example, 40% of buffalo in FMD prevalent areas of Botswana are carriers of the disease (Brooks et al, 2010). The OD has the largest buffalo population and is susceptible to FMD outbreaks. Livestock farmers at Shorobe, Tabu, Gunitsoga and Etsha 6 reported that buffaloes usually mix with their livestock and in the process transmit FMD to the livestock, which often results in the Botswana Government killing all infected animals or those which are reported to have been in contact with buffaloes. Livestock farmers in these villages reported that this approach to managing FMD has become a source of conflict between livestock farmers on the one hand, and wildlife management and the Botswana Government on the other. The response by the government to manage this challenge is the erection of veterinary fences in the OD to protect livestock and the beef industry from being destroyed by the FMD disease. Veterinary fences thus divide the OD into disease control areas where livestock movements are restricted.

Veterinary fences in the OD were reported by farmers to be reducing their grazing areas and blocking access to livestock watering points. This concern was raised by the Etsha 6 community over the erection of the Ikoga Fence, the Tubu and Shorobe over the Southern Buffalo Fence and the Gunotsega community over the Northern Buffalo Fence. Elephants also break the veterinary fence, which results in cattle crossing into buffalo areas. When this happens, all the cattle that crossed into buffalo areas are killed by the Department of Veterinary Sciences (DVS) purportedly to control FMD. This approach is opposed by subsistence farmers who lose their livestock with little compensation. In 1995, DVS killed all the 320,000 cattle in the OD to stop the spread of the Cattle Lung disease. This decision was taken without adequate consultation with or the consent of the farmers, so conflicts arose between the government and livestock farmers especially those who cattle were culled (Darkoh and Mbaiwa, 2009). The killing of livestock to control livestock diseases, livestock predation and crop damage do not only lead to conflict between the government and local communities in the OD, but also results in food insecurity and poverty.

Discussion and conclusion

Wildlife is an important resource for economic and social development in the OD. However, some wild animals cause damage to people, their property (especially their livestock) and infrastructure (Sifuna, 2010). The damage caused by wildlife leads to rural communities having negative attitudes towards wildlife conservation (Gusset et al, 2009; Sifuna 2010; Mbaiwa and Stronza 2011). Livestock predation sometimes leads to retaliatory attacks on the predatory animals through poisoning, shooting or ensnaring the animals with traps or manholes (Sifuna, 2005; 2010). The poisoning of livestock carcases to kill predators has led to the death of vultures and other non-predatory wildlife in the OD (Darkoh and Mbaiwa, 2014). This shows that livestock owners may resort to the illegal killing of predators to safeguard their livelihoods when they are not satisfied with the government's response to their problems (Gusset et al (2009).

The OD attracts different land users and stakeholders wanting to use resources found in the wetland. These stakeholders have different land use interests, hence competition and conflicts among them. A growing human population and the expansion of agro-pastoralism into wildlife-based tourism areas cause conflicts between the agro-pastoralists and wildlife-tourism sectors in the OD. HWCs have had a direct impact on food security and sustainable livelihoods in the OD. Government compensation for livestock predation and crop damage is low and unacceptable to agro-pastoralists, and this exacerbates HWCs in the area. Policy and institutional failure, particularly the government approach which seems to favour wildlife-based tourism in the OD at the expense of farmers has increased HWCs in the area. Government policy is not harmonized and this has worsened conflicts. For example, the Ministry of Agriculture provides seeds and livestock to subsistence farmers to eradicate poverty; this is in conflict with the Ministry of Wildlife as it amounts to promoting agriculture in a wildlife area and directly causing HWC.

To mitigate HWCs and achieve sustainability in the OD, there is need to address land use planning in the wetland. According to Brooks et al (2010), land use planning can successfully mitigate HWCs in the long-term in Botswana. Agro-pastoralists need to be part of the decision-making on issues of land use planning in the OD. Previous land use management policies and plans were top-down in design and implementation. These plans lacked local people's support and did not reduce in any significant way HWCs. Land management planning should make people central to the development by encouraging beneficiary community involvement in interventions that affect their lives. The OD Management Plan (ODMP) was adopted to manage HWCs and ensure stakeholder involvement in decision making in the OD, but it has not been implemented due to lack of resources and political will (Plantec Africa et al 2012). The involvement of all stakeholders, particularly local communities in land use management, even in the wildlife-based tourism industry, is an important aspect of sustainable development. It can reduce resource competition and HWCs and improve rural livelihoods and achieve sustainability in the OD.

References

Anthony, B.P.; Scott, P. and Antypas, A. (2010). Sitting on the fence? Policies and practices in managing human wildlife conflict in Limpopo Province, South Africa. *Conservation and Society*, 8(3), 225-240.

Ary, D., Jacobs, L., Sorensen, C., and Walker, D. (2013). Introduction to research in education: Cengage Learning.

Barua, M., Bhagwat, SA., and Jadhav, S. (2013). The hidden dimensions of human–wildlife conflict: Health impacts, opportunity and transaction costs. *Biological Conservation*, 157, 309-316.

Bendsen, H., and Meyer, T. (2002). The dynamics of the land use systems in Ngamiland and changing livelihood options and strategies. In Bernard et al (eds) , *Environmental monitoring of tropical and Sub tropical wetlands*. 278-304. Proceedings of a Conference Maun, Botswana. December 4-8, 2002, HOORC, Maun.

Brooks, B. Maude, D., Meyer, T., McCulloch, G., and Arntzen, J. (2010). Wildlife resources and human wildlife conflict. In *Makgadikgadi framework management plan.* Volume 2 Gaborone: Centre for Applied Research and Department of Environmental Affairs Technical Reports.

Brooks, C. (2005). *Foraging behaviour of Burchell's zebra*. Ph.D. Thesis. University of Bristol, UK.

Buckles, D. and Rusnak, G. (1999). Conflict and collaboration in natural resource management. In D. Buckles, (ed). *Cultivating peace: Conflict and collaboration in natural resource management*. 1-10.Washington DC: International Development Research Centre, World Bank Institute.

Central Statistic Office (CSO). (2011). *Population and housing census of 2011*. Gaborone:Ministry of Finance and Development Planning.

Darkoh, MBK. and Mbaiwa, J. E. (2009). Land use and resource conflicts in the OD, Botswana. *African Journal of Ecology*, 47, 161-165.

Dunham, KM., Ghiurghi, A., Cumbi, R. and Urbano, F. (2010). Human–wildlife conflict in Mozambique: A national perspective, with emphasis on wildlife attacks on humans. *Oryx*, 44(2), 185.

DWNP. (1995, 2005, 2012, 2014, 2015). *Department of Wildlife and National Parks Annual Report*. Gaborone: Government Printer.

DWNP. (2012). *Aerial Census of Animals in Botswana: Dry Season 2012*. Gaborone: Government Printer,

Fidzani, B., Mlenga, W. S., Atlhopheng, M. and Shatera, M. M. (1999). *Socio-economic effects of CBPP in Ngamiland*. Ministry of Agriculture: Division of Agricultural Planning and Statistics.

Gadd, ME. (2005). Conservation outside of parks: Attitudes of local people in Laikipia, Kenya. *Environmental Conservation*, 32(1), 50-63.

Gupta, C. (2013). A genealogy of conservation in Botswana. *Pula: Botswana Journal of African Studies*, 27(1), 45-67.

Gusset, M., Swarner, MJ., Mponwane, J., Keletile, K. and McNutt, J. W. (2009). Human–wildlife conflict in northern Botswana: Livestock predation by endangered African wild dog *Lycaon pictus* and other carnivores. *Oryx*, 43(1), 67–72.

Graham, M. D., Douglas-Hamilton, I., Adams, W. M. and Lee, PC. (2009).The movement of African elephants in a human-dominated land-use mosaic. *Animal Conservation*, 12(5), 445-455.

Hedges, S. and Gunaryadi, D. (2010). Reducing human–elephant conflict: Do chillies help deter elephants from entering crop fields? *Oryx*, 44(1), 139-146.

Jackson, T. P., Mosojane, S., Ferreira, SM. and van Aarde, R. J. (2008). Solutions for elephant *Loxodonta Africana* crop raiding in northern Botswana: Moving away from symptomatic approaches. *Oryx*, 42(01), 83-91.

Kikoti, AP., Griffin, CR. and Pamphil, L. (2010). Elephant use and conflict leads to Tanzania's first wildlife conservation corridor. *Pachyderm*, (48), 57-66.

Kgathi, D.L., Sekhwela, M. B. M. and Hamandawana, H. (2003). Sustainability of commercial agriculture in the Chobe District, Botswana. *South African Geographical Journal*, 85(1),18-25.

Lamarque, F., Anderson, J., Fergusson, R., Lagrange, M., Osei-Owusu, Y. and Bakker, L. (2009). *Human-wildlife conflict in Africa: Causes, consequences and management strategies*. Food and Agriculture Organization, United Nations, Unpublished Report, Rome, Italy.

Lele, S. (1991). Sustainable development: A critical review. *World Development*, 19 (6):607-621.

Mbaiwa, J.E. and Stronza, A.L. (2011). Changes in residents' attitudes towards tourism development and conservation in the Okavango Delta, Botswana. *Journal of Environmental Management*, 92(8), 1950-1959.

Olsson, E. (2014). Human-elephant conflicts: A qualitative case study of farmers' attitudes towards elephants in Babati, Tanzani*a*. Unpublished Bachelor's Thesis, School of Natural Sciences, Technology and Environmental Studies, Södertörn University, Stockholm, Sweden.

Plantec Africa, GISPlan and Fameventures. (2012). *Mid-term review and gap analysis of the OD Management Plan*: *Scoping and gap analysis report*. Gaborone: Botswana Tourism Organisation

Redclift, M. R. (1987). *Sustainable development: Exploring the contradictions*. Methuen, London.

Redpath, S. M., Young, J., Evely, A., Adams, W. M., Sutherland, W. J. and Whitehouse, A., (2013). Understanding and managing conservation conflicts. *Trends in Ecology and Evolution*, 28 (2),100-109.

Tlou, T. (1985). *History of Ngamiland: 1750 – 1906: The formation of an African state*. Gaborone: Macmillan Publishing Company.

Van der Post, CHM. (2004). Human sprawl and the African wilderness of the Okavango Journal South African. *Geographical Journal*, 86 (2), 122-130.

Warren, A. (1996). Comments on indigenous and scientific knowledge: Some critical comments. *Indigenous Knowledge and Development Monitor*, 4(1), 13-14.

World Commission on Environment and Development (WCED). (1987). *Our common future*. London: Oxford University Press.

WWF SARPO. (2005). *Human wildlife conflict manual*. Harare, Zimbabwe: WWF Southern African Regional Programme Office (SARPO).