

## Case Studies

### Environmental Management Workshop for USAID Staff: MEOs, CTOs, SO Team Leaders, PDOs

### USAID Environmental Procedures & Mainstreaming Environmental Considerations in Development Programs

### Africa Regional Course in Environmental Assessment and Environmentally Sound Design ■ Kasane, Botswana ■ 16- 20 May, 2005

#### Notes and cautions:

1. These case study notes are based on information that is sometimes conflicting or incomplete. Please bring corrections to the attention of the course facilitators and your group as soon as possible.
- 2. During the discussions with stakeholders, please avoid raising any expectations (or fears) that additional funding or development activities will be forthcoming in the project area**
3. These notes are NOT exhaustive. They are intended to be a starting point for field data collection and subsequent analysis by participants.
4. Participants will NOT be writing an environmental review of the case sites themselves. They will be using the information they gather to write a review of a PROPOSED PROJECT in a similar sector and in a similar physical and social environment.
5. Case studies are NOT audits. They are practice in observation and information-gathering for environmental review. Do not give critical judgments to stakeholders, site operators, or host organizations.

#### Sources and acknowledgements:

- Republic of Botswana, *Kasane-Kazangula Development Plan (2000-2024), Draft 2000*. Ministry of Local Government, Lands and Housing, Department of Town and Regional Planning, North West District Council, Chobe Land Board, prepared by Scott Wilson Kirkpatrick, 2000.
- Ecosurv (Pty) Ltd, *Chobe River Front Management Plan*, prepared for Chobe Wildlife Trust & LACOM with funding from USAID, October 2000.
- Department of Wildlife & National Parks, Botswana, *Management Plan for Chobe National Park (Incorporating the Chobe Riverfront Management Plan)*, 2001.
- Republic of Botswana, North West District Council, *Design and Construction Supervision Consultancy for the Kasane Landfill EH/02/99 Feasibility Report* from Burrow Binnie Integrated Engineering and Development Consultants, Gaborone, Botswana, July 2000 (Revised November 2000).
- For the Chobe Riverfront cumulative impact review case site prepared by Hayley Adamski, African Wildlife Foundation Researcher:



- Milton Khachana, District Tourism Officer. Interviewed 05/11/05.
- Agrippa Mbulawa- Deputy General Manager of Cresta Mowana Safari Lodge. Interviewed 05/12/05.
- Reggi, Go Wild Safaris Manager. Interviewed 05/09/05.
- Management Plan: Chobe National Park. Department of Wildlife and National Parks. July 2001.
- Chobe River Front Management Plan. Ecosurv (Pty) Ltd. October 2000.
- Water Affairs of Kasane. Interviewed 05/13/05.
- Mbathera Samakena, Environmental Health Officer. Interviewed 05/12/05.

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## ***General Background Information***

### **Regional Setting**

The Kasane-Kazangula Planning Area falls within the Chobe District of Botswana's Northern Planning Region of the North West District Council area (see Map 1). It is one of the smallest districts in Botswana, comprising 22,559 km<sup>2</sup> and situated in the north-eastern corner of the country at longitudes 24° to 26° East, and between latitude 17° 45' and 19° South. The District shares borders with Zimbabwe in the east and the Namibian Caprivi Strip in the north. Zambia is located to the north, across the Zambezi River. In the west the District borders the Ngamiland District, and in the south, the Ngamiland and Central Districts (Scott Wilson Kirkpatrick, 2000).

Kasane lies some 15km upstream of the confluences of the Chobe and Zambezi Rivers and apart from Lesoma, a few kilometers south of Kazangula. There are few significant settlements neighbouring the Planning Area. Pandamatenga is 100km to the south and the Chobe "Enclave," where much of the District population lives, is over 60km to the west beyond the National Park. Therefore, although Kasane-Kazangula is the administrative and commercial center of the District, it is fairly remote from the bulk of the District's population, and the District itself is considered to be fairly remote within Botswana (see Map 2).

Kasane, like other settlements designated as secondary centres by Botswana's National Settlement Policy, has a population that is substantially smaller than urban villages such as Maun and Mahalapye. Indeed, the population in 2000 was estimated to be 7,000, considered smaller than the 10,000-19,999 specified for secondary settlement under the National Settlement Policy.

The Kasane-Kazangula Planning Area includes State Land and Tribal Land, a traditional village, and a gazetted Township, whose authority is the North West District Council situated in Maun. The area has elements of traditional subsistence agriculture and urban formal sector employment. The land use and tenure requirements in such a diverse setting create special issues, and problems are exacerbated by the small size of the area and its unique natural resources, including the Chobe River and plentiful wildlife that frequent the area. Residents in Kasane are now largely engaged in the formal urban sector, however, many resident of Kazangula are still dependent on subsistence farming. Agriculture in Kazangula and urban expansion in Kasane often comes into direct conflict with animal movements and so-called "animal corridors". While the presence of extensive wildlife (elephant, lion, buffalo, etc.) in the Kasane-Kazangula Planning Area gives it a

unique advantage as a tourism gateway, the ensuing land use conflicts often adversely affect the poorest subsistence sector of the local economy (Scott Wilson Kirkpatrick, 2000).

The main infrastructure constraint to the physical development of the Kasane Township was identified as the water reticulation network. In particular, the servicing of plots on the plateau required the raising and relocation of the reticulation network. In Kazangula, the problem was seen not to be as severe, although the reported salinity of boreholes still led to local households drawing water directly from the Chobe River. Additional infrastructural challenges identified included the removal of solid waste, the use of Roads Department borrow pits (pits created by road material excavation) as waste dumps, the drainage network and the quality of roads, heavy vehicle traffic and the need for parking in the Kasane commercial area, and the need for a larger airport on the plateau to serve the local tourism industry (Scott Wilson Kirkpatrick, 2000).

**Social-economic Setting** [The excerpts in this section are drawn verbatim from Scott Wilson Kirkpatrick, 2000.]

The Chobe District, and the Kasane-Kazangula Planning Area in particular, have experienced high average annual population growth rates of 7-10% over the past decade. This has been due to the large numbers of individuals who have migrated to the region for social and economic reasons. The relatively well-developed local infrastructure, good housing, and employment possibilities in relation to the local tourism industry have all acted as strong “pull” factors to encourage migration to the area.

### Demographic Analysis

The total population of the North West District was recorded as being 108,660 in the 1991 Census and projected by the CSO to be 128,480 in 2000. According to the 1991 Census, approximately 52.2% of the population was female and 47.8% male. The contribution of the Chobe sub-district to this total was 14,626 (13%) in 1991 and projected to be 18,407 (14%) in 2000. Half of the population was between the ages of 15 and 64 years.

### Summary of Chobe Population Characteristics, 1991

| Population characteristic             | Figure |
|---------------------------------------|--------|
| Total population                      | 14,626 |
| Projected population 2000             | 18,407 |
| Projected population 2021             | 32,198 |
| Proportion to North West District     | 13%    |
| Proportion to Botswana                | 1%     |
| Density (persons / km <sup>2</sup> )  | 0.7    |
| Comparative density for Botswana      | 2.3    |
| No. of citizens                       | 14,127 |
| No. of non-citizens                   | 499    |
| Population growth rate                | 8%     |
| Proportion of males                   | 54%    |
| Proportion of females                 | 46%    |
| Proportion of persons aged 1-24 years | 59%    |
| Unemployment rate                     | 7%     |
| Dependency ratio                      | 0.5    |

|   |      |
|---|------|
| No. of households                                       | 3317 |
| Percentage of women headed households                   | 38%  |
| Percentage of women headed households in Botswana       | 47%  |
| Percentage of women headed households in rural Botswana | 52%  |
| Average household size                                  | 3.9  |
| Average size of female headed household                 | 4.5  |
| Average size of male headed household                   | 3.6  |

Source: Population and Household Census 1991

### **Population Growth**

The Central Statistical Office has undertaken a series of population projections for planning purposes. These projections are likely to be higher than the actual population in 2021, as they do not take the increased impact of HIV/AIDS into account.

The respective average annual population growth rates for Kasane and Kazangula are 6.5% and 5.2% per annum.

Approximately 67% of the Chobe District's population resided in villages within the district (1991 Census). During the same year approximately 36% of the Chobe District's population resided in the Kasane-Kazangula Planning Area. The projected contribution of the Planning Area to the total population of the Chobe District in 2000 increased to approximately 44%.

### **Fertility Rate**

The fertility rate for women aged 12 and over is 2.7, i.e. the mean number of children born to these women. These figures suggest that natural increase may not be a significant contributor to Kasane-Kazangula's future rate of growth. Instead the population growth may be more due to migration into the village and improved health care in the Planning Area. The latter factor results in a higher life expectancy, a lower infant mortality rate, and a decrease in death rate due to:

- immunisation (i.e. improved control of life threatening diseases)
- better management of diseases not controlled by immunisation
- better nutrition
- improved standard of health education, especially the education of women.

### **Migration Patterns**

Overall growth rates in Botswana were highest in urban districts at 6% per annum between 1981 and 1996, falling to a projected 4.15% per annum between 1996 and 2016. Urban districts appear to be the main destination of migrants from rural areas and semi-urban villages. Comparisons with the national average indicate that up to 40% of urban district growth is a result of migration.

The significant migration of people into Chobe between 1981 and 1991 is largely due to four factors:

- (a) the establishment of local and central government offices in Kasane
- (b) the role of Kasane as a rural service area

- (c) the economic activities of the tourist industry
- (d) more recently, the sudden decline in livestock farming as a key economic activity in the region as a result of CBPP. This would constitute a major push factor for people to seek employment in order to survive. These people will naturally migrate to centres of increasing economic activity and opportunity.

## HIV/AIDS

HIV/AIDS figures for Chobe are extremely high, with an adult HIV/AIDS prevalence rate of 37.6% in 1999. This high rate will have a significant impact on the economically active population. Premature deaths amongst the most productive sections of the population will dramatically decrease the numbers of skilled adults in the district, place pressures on the local health system and increase the number of HIV/AIDS orphans. An impact will also be felt on the demand for housing and infrastructure as the population growth rate declines.

The exponential increase in HIV/AIDS prevalence experienced in the planning area will inevitably lead to a decline in overall population growth rates. It can be reasonably predicted that, in the light of trends in areas of southern Africa where the pandemic has matured (Zambia, Uganda, South Africa), population growth rates may decline to 0% in the following five to seven years, if the disease remains unchecked.

## Local Economy and Employment

### Activity Rates

The proportion of the 1991 Kasane-Kazangula population classified as “economically active” was 2,510. This is equivalent to 66% of the population of those 12 years and over and 49% of the total population of the Kasane-Kazangula Planning Area. Of this economically active population 64% are males and 36% are females.

### Employment

The table below indicates the importance of formal employment in the Chobe District as opposed to the traditionally dominant subsistence sector. Some 89% of employed people are formally employed and only 5% are engaged in agricultural labour. Of the 38% of the total population that are registered as unemployed, a large proportion are either engaged in domestic labour (41%) or are students (39%).

**Table: Employment and Unemployment**

| Employment               | Male | Female | Total | %    |
|--------------------------|------|--------|-------|------|
| Employed                 | 3915 | 1473   | 5388  | 89%  |
| Self-employed            | 156  | 199    | 355   | 6%   |
| Work at lands            | 169  | 134    | 303   | 5%   |
| Total                    | 4240 | 1806   | 6046  | 100% |
| Proportion of employment | 70%  | 30%    | 100%  |      |
| Unemployed               |      |        |       |      |
| House work               | 144  | 1402   | 1546  | 41%  |

|                            |      |      |      |      |
|----------------------------|------|------|------|------|
| Student                    | 720  | 744  | 1464 | 39%  |
| Retired                    | 132  | 115  | 247  | 7%   |
| Seeking work               | 254  | 250  | 504  | 13%  |
| Total                      | 1250 | 2511 | 3761 | 100% |
| Proportion of unemployment | 33%  | 67%  | 100% |      |

Source: Population and Housing Census 1991

### **Employment Sectors**

The Chobe District is predominantly a tourist and an administrative area with closer economic ties with surrounding countries than with the national economy. This bias is reflected in the relative importance of these sectors in sectoral employment terms.

Substantial tourism growth and related investments in administrative infrastructure and housing have also made the construction sector a major contributor to the local economy of Kasane-Kazangula. Employment in these sectors has, however, tended to be cyclical and susceptible to external shocks, i.e. political instability in neighbouring countries with a subsequent impact on tourism and related development.

Commercial and, more especially, industrial enterprises remain extremely limited by the small size of the local economy and the few backward and forward linkages between local and national industries. A survey of local businesses carried out for the current Development Plan indicated that local business employment has only increased by 7.8% from the 1991 Census figure to 96 people. This stands in stark contrast to tourism-related employment and therefore appears to indicate that the current nature of tourist development does not encourage local economic diversification, endogenous investment, and out-sourcing to local entrepreneurs.

As with many rural areas in southern Africa, employment patterns are not diversified and Central and Local Government is a significant contributor to local employment. The location of Chobe District offices and government departments in Kasane explains the significant 23.5% employment contribution in the Kasane-Kazangula Planning Area.

### **Survival Strategies**

As a result of the difficult circumstances in which many families find themselves, various survival strategies are employed in order to obtain the basic necessities to live. Drought Relief Programmes have been introduced whereby small-scale infrastructure and building projects are undertaken by local community members. Kgotla offices have been erected by self-help groups, often consisting of women's groups, and an attempt is being made to rotate projects throughout the area in order to ensure a fair distribution of project income. Other projects such as staff housing, postal facilities, health facilities, and school kitchens are also being undertaken.

The payment rate is approximately P6.00 per day. These projects have been fairly successful, to the extent that the Department of Social and Community Development has recommended that these programmes be continued in the Kasane-Kazangula Planning Area. It has also been suggested that agriculture does not lift people out of poverty completely, but rather alleviates poverty. Drought Relief Programmes and other programmes are especially important considering the impact of CBPP on the local economy and the livelihoods of local inhabitants.

## Chobe River Frontage Management Plan

A Riverfront Management Plan has been being prepared for the Chobe River. The study addresses concerns that the eastern portion of the Chobe River, in particular, has experienced a significant increase in use, and may be overused. At present the study has identified options for the future management of the riverfront. For example:

- Retention as a high density tourism zone with no sub-zoning;
- Retention as a high density tourism zone with use of the river restricted to Kasane Lodge guests and Kasane tour operators according to the following sub-zoning:
  - Western third as an exclusive use zone for conducted drives from Kasane Lodges and Kasane based tour operators;
  - Remaining two thirds open for self drives and conducted game drives from lodges tour operators and HATAB sites.

Sub-options within both of these options include an increase in the existing infrastructure or the maintenance of the existing infrastructure. The aim of these proposals is to optimize the tourism returns from activities on the river to the Government of Botswana and the entrepreneurs in Kasane, but not at the expense of the wildlife, wilderness quality, aesthetics, or visitor satisfaction (Scott Wilson Kirkpatrick, 2000).

Official statistics indicate that Botswana has seen rapid growth in this main international tourism sector in recent years, with an 80% increase in international tourist arrivals between 1993 and 1997 (Scott Wilson Kirkpatrick, 2000). It is currently estimated that the tourism industry provides 4.5% of GDP. Growth is expected to continue, reflecting global tourism forecasts that predict higher than average growth rates in Africa, particularly southern Africa.

At present the tourism product is concentrated in the wildlife and wilderness assets of northern Botswana, namely the Chobe National Park, the Okavango Delta, and the Moremi Game Reserve (Scott Wilson Kirkpatrick, 2000). Tourism in these areas has reflected the national 'low volume – high value' tourism policy. However, it is noted that visitor numbers in certain parts of these areas are already approaching carrying capacity limits, determined by ecological, wildlife, and wilderness constraints (Scott Wilson Kirkpatrick, 2000).

The major tourist resource of the District is the Chobe National Park, which attracts some 18,000 to 21,000 visitors per year. The Park, approximately 11,000 km<sup>2</sup> in extent, has a number of public campsites and a hotel. Furthermore, tourists visiting the Chobe National Park now have a variety of tourism lodges and safari camps to choose from both within and adjacent to the Park. Tourist activities include organized game drives, safari tours, boat cruises, hunting safaris, sportfishing, and village tours.

It is estimated that approximately 1000 guests can be accommodated within Chobe District (Department of Tourism and the Chobe National Park Management Plan). EcoSurv (2000) have estimated that 972 guests could be accommodated within and surrounding the Chobe National Park riverfront area (area between the river and the Kasane-Ngoma road). Approximately 3.3% of these guests are accommodated in Namibia, 27% in Chobe National Park, 58% in Kasane-Kazangula, and 11.5% in Chobe West (Enclave) (EcoSurv, 2000).

## Key Issues

1. Kasane-Kazangula has experienced high rates of population growth, largely attributable to in-migration to the planning area due to the relatively high standards of local infrastructure provision, housing, and employment opportunities. This has placed strain on the existing infrastructure and led to housing shortages and increasing unemployment and poverty.
2. The projected population growth rates for the planning area until 2016 are in excess of 7% per annum. This high anticipated growth places increased stress on the existing urban infrastructure and underlines the need for job creation in the planning area. However, this high growth rate may be tempered by the impact of HIV/AIDS as Chobe District has a very high seroprevalence of 37.6%.
3. The population is nonetheless young, and thus reflects an increasing demand for education and health facilities as well as the creation of employment opportunities.
4. Household formation is proceeding in the study area at a rate that exceeds the population growth rate. This is indicative of the decline in household size, the extent of one and two person families associated with civil servants and migrants to the area. The implication of this is an increase in the demand for housing units.
5. The key issues facing the Kasane-Kazangula Planning Area's local economy relate essentially to the need to diversify it from a reliance on agriculture and public sector employment to a more sustainable economic growth path. While tourism plays an important role in this regard, this sector cannot absorb all of the unemployment or underemployment in the area. Secondary tourism activities and, more especially, commerce and small businesses are essential to solving the area's economic challenges.

## **Group Case Site Review: Chobe Riverfront Lodge Development: Cumulative Impact Assessment**

*Prepared by Hayley Adamski- African Wildlife Foundation Researcher*

### **Review of Existing Site- Cresta Mowana Safari Lodge**



Mowana Lodge is located in the Kasane region, which includes the Chobe National Park and the Chobe Riverfront. There are approximately 5,000 residents in Kasane with an influx of approximately 144,000 tourists annually. Tourists receive accommodations at one of the 18 lodges that have been established in Kasane, many within the last 20 years. Approximately 5 of the 18 lodges are located on the Chobe Riverfront, while most of the surrounding plots on the riverfront and throughout Kasane have been sold with the prospective of building tourist facilities (Khachana, 5/11/05). The Chobe River, which is 1,700 km long, flows from the Zambezi River (Reggi, 5/9/05). Since Kasane is located next to the Chobe River and near the entrance gates to the Chobe National Park, this small town is ideal for many tourists.

According to the Department of Wildlife and National Parks, the Chobe National Park consists of approximately 11,000 km<sup>2</sup> divided into nine zones. The riverfront zone consists of 407 km<sup>2</sup> and has the highest tourist density (Management Plan: Chobe National Park, 2001).

Cresta Mowana Safari Lodge was established in 1993 (a fire required reconstruction after its initial opening in 1992). Mowana is the largest land owner of the 18 lodges in Kasane, with approximately 100 hectares. The lodge has 111 rooms and can hold 222 guests. Mowana has a staff of 118 employees. The annual occupancy rate is approximately 31%, equivalent to 22,000 guests per year. All of the lodge's water comes from the local water treatment plant at Water Affairs, except for the water used in the gardens and golf course, which is pumped directly from the Chobe River (Mbulawa, 05/12/05). Similar to the other lodges in Kasane, Mowana pipes its wastewater, including grey water, to a municipal holding tank which carries the waste to the sewage treatment plant.

### **General Environmental Issues**

**Waste management** - The materials used in lodge construction may be harmful to place directly in the municipal dump (e.g., some materials, such as paints or lacquers, may have characteristics hazardous to human and/or ecological health). One must also be aware of the implications of the presence of the construction workers and their waste. After construction, the waste produced by the lodges increases. Proper disposal is hampered by a lack of dependable pickup by District Council



**District Council pickup postponed because of truck breakdown.**

trucks. The region's dump and sewage treatment plant is used by the lodges as well as the permanent residents of the Kasane region. Issues of concern include the lack of effective management of these sites which creates disease and safety concerns for both Kasane residents and wildlife populations.

**Water Utilization** - Water for the entire town is extracted from the Chobe River. According to their consumption patterns, tourists have little concern for their water usage; whereas, residents utilize a much smaller portion of the region's water. The main issue of concern is how much of an increase in tourism and water consumption is sustainable while ensuring that residents' consumption requirements are met and adequate Chobe River flows are maintained.

## Proposed Assignment

Participants will prepare an Initial Environmental Examination outline for a proposed new lodge built along the Chobe Riverfront to the east of Mowana Lodge. The participants should assess impacts of construction, waste management, water utilization, and tourism as well as overall environmental impact to the Chobe Riverfront and the river. The participants should also attempt to determine indirect impacts such as the amount of solid waste deposited to the city of Kasane's open dump site and the quantity of human waste being pumped to Kasane's sewage treatment ponds. Participants should identify the major activities and significance of potential impacts (direct and indirect) associated with the design, construction, operation and maintenance of the new lodge, and the overall contribution to the cumulative impact of all lodges on the riverfront. The assessment should include what type of waste the lodge produces and how the lodge will dispose of the waste. The other crucial aspect to assess is where the lodge will obtain its water and how much water will be required for the guests, laundry and overall maintenance of the hypothetical lodge. Specifically also consider impacts of boat and overland vehicle wildlife tours, both on wildlife populations and habitat as well as on river water and land resources, if any. An effort should be made to classify the impacts using the Reg. 216 process (e.g., Leopold matrix if possible), to indicate tentative threshold decisions and to provide an outline of appropriate mitigation and monitoring step that should be part of an *Environmental Management Plan*.

## Fact Sheet

### Statistics

- 18 lodges in Kasane, 2 lodges are located within the Chobe National Park.
- Combined, all of the lodges in the Kasane region can house over 1,000 guests
- Approximately 5,000 residents in Kasane
- Presently, there are 85 safari trucks operating in the area and 50 boats (Khachana, 5/11/05; Management Plan: Chobe National Park, 2001).
- The Department of Tourism of Kasane has licensed more than 70 safari companies; however, only 21 are



**Adding additional wildlife tour boats to the Chobe River near Kasane could have detrimental effects on both wildlife and tourism aesthetics as Limits of Acceptable Change are exceeded.**



currently operational (Khachana, 5/11/05).

### ***Tourism Policies of Botswana***

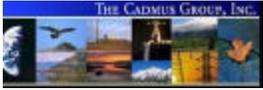
- The Tourism Act of 1992 was the first official policy on tourism in Botswana, issued by the Botswana's government. Prior to the Act, many lodges had already established themselves in the Kasane area, acting as they saw fit (Khachana, 5/11/05).
- 'High cost, low volume' policy is in place for all of Botswana. Under this policy tourism infrastructure in Botswana is more expensive, requiring a wealthy tourist and limiting the number of tourists to maintain the ecological integrity of the resource base. However, the policy also encourages the development of local tourism entrepreneurs. How can this policy be implemented and regulated? Who determines when the area is over its carrying capacity?
- Land for lodges is acquired by applying to the Ministry of Environment, Wildlife and Tourism because Kasane is a part of Chobe National Park and therefore falls under state land, as opposed to tribal or freehold land. If the proposed lodge falls under the planning zone, it must have approval from the Kasane-Kazangula Planning Committee. The lodge must apply for a tourism license if it falls into the planned areas (as most of Kasane does), and at this point in the process it is "assumed that an environmental impact assessment has been completed". Currently, most empty plots in Kasane are allocated to lodges whose land has already been approved by the board (Khachana, 5/11/05).

### ***Water***

Water Affairs distributes all of Kasane's and surrounding areas water, which is derived from the Chobe River. In February 2005, 69,773 cubic meters was extracted from the Chobe River by Water Affairs and 65,170 cubic meters were utilized by the Kasane region. In March of 2005, 82,038 cubic meters was extracted from the Chobe River and 78,570 cubic meters were utilized. After extraction, the water is chemically treated with chlorine (i.e., sodium hypochlorite) at the water treatment plant on the river front. Most of the lodges use water generated from the Chobe River for irrigated their lawns and gardens, except for the lodges inside of the park which rely on underground water (Water Affairs of Kasane, 05/13/05)

### ***Waste Management***

All lodges are required to connect to the municipal sewage system, except for the lodges inside Chobe National Park and Toro Lodge which have their own septic tanks. These lodges transport their own sewage to the sewage ponds (Khachana, 5/11/05). The pipes carrying the sewage from Kasane town and the lodges converge at a holding tank in the centre of town, near Chobe Marina Lodge, where the waste water then flows by pipe to the sewage ponds on the outskirts of Kasane (Samakena, 05/12/05). Plans to open a landfill are underway in hopes of helping the environment but mostly to lessen the eye-sore of how the current dump presents itself. The Department of Tourism of Kasane believes the environmental affects from the current dump are minimal and once the current rubbish is cleared and taken to the new landfill, the land will be able to be rehabilitated. The baboons, Marabou Storks and elephants that graze through the current dump are scavenging for the waste fruit deposited from the nearby Chobe Farms.



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## **TEAM 1:**

### ***Solid Waste Disposal – New Kasane-Kazangula Landfill Development***

During the site visit Team 1 will focus attention on the current impacts associated with Kasane dumpsite, a brief review of proposed alternative sites and designs for reducing adverse solid waste impacts and field discussion of possible mitigation measures.

#### **Background: The existing Kasane dumpsite**



Solid waste disposal in Chobe is managed by the Department of Health of the North West District Council. According to the Chobe District Settlement Strategy (2000) solid waste is collected twice a week in the major villages, e.g., Kasane and Kazangula and once a month elsewhere. However, in the smaller villages, no waste management systems are in place, and indiscriminate dumping occurs, often in old borrow pits. Despite these dumping practices, most of the collected solid waste is disposed of at the council dumpsite in Kasane. The total proposed catchment area for Kasane - Kazangula wastes covers a population of about 14100 people (Chobe District Settlement Strategy, 2000). This dumpsite is located approximately 4 km due east of Kasane on the right side of the Kasane-Kazangula highway proceeding toward Kazangula. The site uses a portion of a road

construction borrow pit that covers an area of approximately 16 hectares. The current disposal activities are in the southern portion of the pit, covering an area of about 3 ha. The site is unguarded. Perimeter fencing has been vandalized and trampled by wildlife to such a degree that it serves no useful purpose. None of the waste has been compacted, sorted or covered. Infrastructure is in a dilapidated state, and waste is dumped randomly even beyond the site's boundary.

#### **General environmental issues**

##### **Sources of direct adverse impacts. The team should consider the following:**

- Residential and commercial solid waste is collected by the municipalities and disposed of on-site. There has been no effort to extract cans and plastic bottles from the waste stream at the source, e.g., from individual households, commercial establishments or lodges. Similarly organics are not collected separately. The direct adverse impacts include the attraction of potential disease vectors to the site, including, flies, roaches and other insects, rats,

mongooses, birds (e.g., Marabou stork and crows), baboons and monkeys. In addition, the site is unfenced and lies in a “wildlife corridor”. Because this is an open dump, there are also adverse impacts associated with odor, smoke and natural aesthetics since the site is extensive and easily visible from the Airport to Kazangula Road. The team should also attempt to identify both wet and dry season impacts.

- Sources of indirect adverse impacts.** The site is somewhat removed from the nearby residential Plateau development. However, the proximity of Plateau homes and Chobe Farms to the dump site may be placing residents of the area at risk of disease transmission from the various vectors listed above. The dump also may have health and safety hazards for pickers and children. Tourist impressions of Kasane may also be affected, decreasing their satisfaction level with game viewing safaris in the area. The dump site also poses a health and safety threat to wildlife which frequents the area. The team should observe the site for evidence of wildlife and vector presence and prepare a list of the species considered to frequent the site. If possible, the Team should interview other individuals on site who may be familiar with the range of species and other direct or indirect adverse impacts. Review the



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**Cans are a significant component of the Kasane open dump site.**

excerpts from background documents (Burrow Binnie, 2000) to determine what effect the dumpsite may be having on groundwater and nearby vegetation.

- Public perception:** Through a public participation process, four prime issues were identified related to existing solid waste practices and the Kasane dumpsite: 1) illegal dumping is a problem throughout the Kasane Kazangula Planning Area (KKPA), 2) the waste collection system needs to be improved; 3) the existing dumpsite is unsightly; 4) a problem exists with wildlife scavenging through the rubbish.

Suggestions aimed at improving the situation included intensified environmental health education, a partnership between Council and the community with respect to collection of waste; the contracting of a private waste collection company, and increasing Council resources.

**Assignment:**

Team 1 will observe two potential sites for a new landfill, the existing open dump site, and a second site beyond the existing sewage treatment ponds. This second potential site on the western slope of Nyungwe valley near (approximately 200 m to 500 m) Kasane’s existing sewage ponds. It is approximately 1 km due south of the existing waste site. The team should consult the excerpts from the Landfill Feasibility Report (Burrow Binnie, 2000). This report examined a total of 6 alternative sites. The proposed new landfill is planned for a 20 year life, serving an ultimate population of 34,769, containing 155,767 tons.

Assuming a maximum height of 10 meters for the landfill, with 1:3 side slopes, the area required to accommodate the waste is approximately 5 hectares. For site selection and planning purposes it is recommended that an area of approximately 10 ha be considered (Burrow Binnie, 2000).

- Obtain basic environmental and social information regarding (1) the immediate physical and social environment of both proposed sites.
- Briefly try to identify the activities associated with design, construction, operation and abandonment (decommissioning) at both sites and those with the most significant potential adverse impacts. If possible use a Leopold matrix process for this purpose.
- Provide tentative Reg. 216 classification(s) and threshold decisions for the impacts associated with the activities for the preferred alternative(s).

Develop a mitigation and monitoring plan (Environmental Management Plan) outline for the two proposed landfill sites, including 1) design options to reduce, minimize or prevent adverse impacts, and 2) mitigation strategies for operation and eventual abandonment of the landfill.

**Facilitators:**

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## **TEAM 2:**

### **Kasane Sewage Treatment**

During the site visit Team 2 will focus attention on 1) the current impacts associated with Kasane sewage treatment ponds; 2) a brief review of proposed alternative sites and designs for reducing adverse environmental, social and health impacts from the ponds; and 3) field discussions of possible mitigation measures.

#### **Background: Environmental conditions**

The current site lies due east of the Kasane town dump and on the west side of Chobe Farms, in Nyungwe Valley. It is accessible over a dirt road less than kilometre from the main Kasane-Kazangula highway leading from the airport to Kazangula. The site consists of a number of holding ponds. The first series of ponds are designed to receive sewage pumped and trucked from commercial, government and residential septic tanks. These ponds appear to be lined. Additional ponds, some lined, some not are receiving pumped sewage from the larger establishments in Kasane town, including the lodges. All the ponds drain to a larger artificial pond which is frequented by variety of wildlife as a watering point. The discharge from this highly eutrophic/nutrient-rich pond forms a stream which flows through Chobe Farms, which is both a producer of vegetables and dairy products. The farm uses this water to irrigate their crops. Flow depends on seasonal conditions. During the last rainy season the flow increased to such an extent that it reached



**Effluent from this pond creates a stream that runs through Chobe Farms and is used to irrigate crops.**



**An unlined sewage pond at the Kasane site.**

Chobe River. According to the Chobe Farms General Manager, however, a flood event of this magnitude is a rare event in Kasane, and the water coming from the larger pond is already devoid of pathogens.

The site once was guarded and fenced, but the guard house has fallen into disrepair as has the accompanying latrine. The site was also fenced with heavy wire construction, but has been torn and trampled by elephants in search of water and rendered ineffective at keeping wild animals and people away from the ponds.

#### **Sources of direct adverse impacts. The team should consider the following:**

- The strong odor from the ponds is immediately discernable on arrival at the site. In addition there is evidence that the site attracts a significant wildlife population, including elephant, various species of antelope, buffalo and even lion. Abundant bird life is attracted to both the

primary ponds and the larger animal watering point. The direct adverse impacts include the attraction of potential disease vectors to the site (including, flies, and other insects, etc.) and the draw for both wildlife and birds. The water consumed by the wildlife is more than likely to have very high concentrations of nitrate and phosphate, perhaps nearing toxic levels. There appears to be little evidence of macrobiotic aquatic life in the ponds, other than high microalgal concentrations. Like the Kasane dumpsite, the sewage ponds appear to lie in a “wildlife corridor”. The team should attempt to identify both wet and dry season impacts.

- **Sources of indirect adverse impacts.** The site’s proximity to Chobe Farms and the fact that the outfall from the ponds is passing through the farm may be creating a health risk for the farm workers and residents, both from the outflow (i.e., microbial pathogens) and from disease vectors, especially flies, rodents and birds. Surface water runoff from the ponds may be being contaminated during heavy rains. During flood periods the flow may even reach the Chobe River. In addition the ponds may be creating a subsurface pollution plume that may be contaminating groundwater, depending on soil porosity and if any liners are damaged. Birds and wildlife may have shortened life spans associated with drinking from the ponds. If possible, the Team should interview other individuals on site who may be familiar with the range of species and other direct or indirect adverse impacts.

### **Assignment: Proposed expanded sewage ponds (doubled size by 2010).**

Team 2 will consider the activities and potential impacts associated with a proposed expansion of the current number of sewage treatment ponds at the existing site. The team should attempt to obtain.

- Additional basic environmental and social information regarding (1) the immediate physical and social environment of the proposed site.
- Briefly try to identify the activities associated with design, construction, operation and abandonment (decommissioning) for the proposed expansion. If possible, use a Leopold matrix process for this purpose.
- Identify potential adverse impacts and their level of significance. Provide tentative Reg. 216 classification(s) and threshold decisions for the impacts associated with the activities for the preferred alternative(s).

Develop a mitigation and monitoring plan (Environmental Management Plan) outline for the 1) expansion of the ponds, including design options to reduce, minimize or prevent adverse impacts, and 2) mitigation strategies for current operation and potential future abandonment of the treatment ponds.

### **Facilitators:**

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### **TEAM 3:**

## **Chobe District Department of Environmental Health Vector Control Program and Chobe Farms Pesticide Storage and Use**

During the site visit Team 3 will focus attention on the current impacts associated with the Chobe District Department of Environmental Health Vector Control Program storage and application of vector control pesticides. In addition, Team 3 will examine pesticide storage and application issues associated with Chobe Farms, a vegetable farm and dairy located about 4.5 km east of Kasane on the main Kasane-Kazangula highway. The team will conduct a brief assessment of activities associated with Department of Environmental Health's vector control program and Chobe Farms pesticide use, including potential adverse environmental and health impacts. Methods include a field review of proposed mitigation measures for existing pesticide storage and application, as well as a field discussion of how the Department of Environmental Health might best plan for an expanded vector control initiative, with associated mitigation and monitoring measures.

### **Background:**

#### **Site 1: The existing Department of Environmental Health Vector Control Program: Environmental conditions**



**The vector control storeroom.**

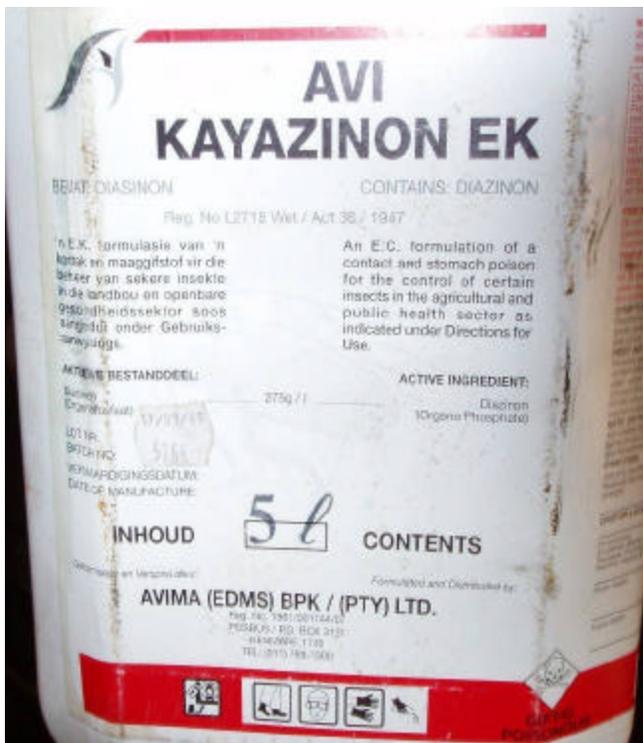
The Department of Environmental Health's Vector Control Storage facility is located in downtown Kasane, close to the Audi Centre and AWF offices. It consists of a small storeroom where the chemicals and equipment for the vector control program are stored. Keys to the storage room are held by a private security company. The storeroom is small and crowded with pesticides and vector control equipment (including sprayers, drums, generators and mattresses) which the specialists take with them into remote areas.

#### **The baseline. The team should consider the following:**

1. What is the baseline situation?
2. How long have the Department of Environmental Health had a vector control program?
3. How is it paid for?
4. What is the average amount of time, an employee works as a vector control specialist?
5. What chemicals are being used? What are the human and environment risks of these pesticides? Are they appropriate and safe for their intended use? From where are they procured?
6. What are the primary activities currently associated with vector control?

**Sources of direct adverse impacts. The team should consider the following:**

1. How are the pesticides applied? Are they being applied correctly? How are the pesticides stored? Are they being stored safely, any temperature or humidity issues?



2. Are there risks associated with having the specialists' field equipment and bedding in the same room as the pesticides?
3. Where is the field equipment stored? Is it ever washed? What protective equipment is used? Wash water disposal issues?
4. Have any of the specialists complained of health problems?
5. Prioritize. Which of these considerations may have the most significant impacts?

**Sources of indirect adverse impacts. The team should consider the following:**

1. Have any customers complained of health problems? Families? Children?
2. How might these complaints best be mitigated at low cost? At delivery, storage, application, with training?

**This insecticide is being used to kill bats in the District.**

Are financial systems in place to ensure that funds are used effectively for their intended purpose?

**Site 2: Chobe Farms Pesticide Stores**

1. What is the baseline situation?
2. How long has Chobe Farms had the storage facility?
3. What pesticides or other chemicals are being used? What are the human and environment risks of these pesticides? From where are they procured? Are they appropriate and safe for the intended use? Are they being stored safely? How are they applied? Are they being applied correctly?
4. What protective equipment is used? Where is stored? Is it ever washed? What budget, if any, is provided to repair or replace damaged protective equipment?
5. Which employees apply the pesticides? How are they trained?
6. Have any of the employees complained of health problems?
7. Might pesticides residues on produce be a problem?
8. What are the primary activities currently associated with pesticide storage and application. Which of these may have the most significant impacts?
9. How might these best be mitigated at low cost? Delivery, storage, training, application?
10. Is IPM being incorporated? Would this be possible? How?
11. Does the farm have a pesticide safe use action plan?

**Proposed new vector control storage facility and program:**

1. What alternatives might be considered for an expanded Department of Environmental Health program to double the delivery of the current vector control services? Is a new facility needed? A new design and location? A new system for guarding the storeroom?
2. What are the activities associated with development of an expanded vector control program, during design, construction, operation, and potential decommissioning of the existing facility? Which of these activities have the most significant impacts?
3. What are the potential direct impacts of the program on the control specialists?
4. What are potential impacts, direct or indirect on customers, residents, children? To prioritize,



**Bedding and diesel generators for vector control officers site visits.**

which of these impacts are most significant? How would these risks be best mitigated at least cost, for example:

- a. How can health and safety risks be minimized for the specialists?
- b. How can risks be minimized to customers, residents, children, workers?
- c. Are there IPM alternatives that should be pursued?
- d. What should the pesticide safe use action plan look like? Who will pay for this more comprehensive and systematic program for vector control and management? Would they be willing to pay? How would you find out?
- e. Are financial systems in place to ensure that the vector control funds would be used effectively for their intended purpose?
- f. How might customers be sensitized about the need to pay?

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