## *EXECUTIVE SUMMARY*

### *1.0 INTRODUCTION*

*This study was an evaluation of the impact of invasive weeds on important migratory waterbird sites. In particular, the study focused on how invasive aquatic weeds affect the sites and how the use of the sites as a waterbird habitat area has been addressed and impacted by the rehabilitation activities. This followed a request by AEWA to IUCN-ELC to undertake these studies regionally on the degradation of wetlands in Africa that are of importance to migratory waterbirds, through their degradation by invasive aquatic weeds. The impacts of aquatic invasive weeds on migratory waterbirds have been noted to occur either through the direct removal or alteration of their habitats or by effects on the food chain. This can completely change the ecological character of these wetlands.*

*The report discusses the findings of the evaluation of the impact of invasive weeds on important migratory waterbird sites and their rehabilitation in Kafue Flats, Zambia. The data gathering was carried out in October and November 2002, and in March 2003. This was done through field visits, literature reviews and interviews with stakeholders. The study specific objectives were:*

a) *To contribute to the documentation of recent experiences in the restoration of waterbird habitats, where those habitats have been degraded by alien invasive weeds.*
b) *To provide a detailed case study of rehabilitation of wetlands of the Kafue Flats, Zambia, with regard to the manner in which the use of the site as waterbird habitat has been impacted and addressed by these rehabilitation activities.*
c) *To increase knowledge and awareness of the invasive aquatic weed impact on the migratory waterbird habitats among major local and national stakeholders in Zambia.*

*This report represents the last part of the three-part study. It comprises a review of documentation available relating to the study and implementation of AEWA in the selected sites in Zambia. It also provides a detailed account on issues of conservation and the impact of rehabilitation on the Kafue Flats wetland.*

*Publications on aspects of Kafue Basin at large are numerous, but this is the first report to bring out concerns on the conservation of the Kafue Flats wetland as a special habitat for aquatic birds. Findings in this study are expected to be of considerable significance to the implementation of the AEWA and Ramsar Convention. The report is divided in to five chapters, focusing mainly on:*

- *Conservation and socio-economic issues;*
- *Pollution and eutrophication;*
- *Invasive weeds and their impact;*
- *Invasive weeds and their impact on migratory birds;*
- *Implications of weed control and rehabilitation on birds;*
- *Weed control measures and evaluation;*
- *Recommendations for future action.*

*Because of limited resources and time, much of the ground was not covered, especially Area C. However, fairly detailed studies were carried out in areas A and B between Kafue Bridge and Lochinvar National Park.*

### *2.0 DESCRIPTION OF THE STUDY SITES*

*Kafue Flats wetland is located in Southern Zambia and is among the most important wetlands in the country. It has a total area of approximately 6,500 km², consisting of flood plains, swamps and shallow lakes. The wetland is significant for its abundant bird life, fisheries, wildlife, agriculture, water resources and tourism. Six vegetation zones constitute the habitat types: Levees and lagoons, flood plain grasslands, water meadows, termitaria grasslands and woodlands. At least*

*127 mammalian species have been recorded in the area but most important for commercial purposes are the Kafue Lechwe (Kobus leche kafuensis) and Zebra (Equus buchelli). In general, records show 69 known species of reptiles, 27 species of amphibians and 77 species of fishes. Very little is known about invertebrates.*

*Bird life is represented by nearly 428 species, of which 125 species are predominantly wetland species, and about 52 are migratory species. Migratory species include White stork (Ciconia ciconia), Abdim's stork (C. abdimii) and Sand Pipers, Plovers, Terns, swifts, and Swallows. Although the wetland has some limited protection through Lochinvar and Blue Lagoon National Parks, and three Game Management Areas, it is severely threatened. Major environmental issues affecting the Kafue Flats are:*

- *Water regulation and lack of normal flooding due to dam developments;*
- *Over-exploitation of wildlife and fisheries;*
- *Agricultural development;*
- *Increasing human population;*
- *Pollution and proliferation of invasive weeds, mainly Water Hyacinth (Eichhornia crassipes, Mimosa pigra, and Salvania molesta).*

## *3.0 STUDY METHODS*

*The methods of study were through literature review, interviews of stakeholders, and field visits. Three populations were sampled through questionnaires on socio-economics and on assessing people's understanding of ecological issues.*

## *4.0 RESULTS AND DISCUSSIONS*

### *4.1 Socio-economic Issues*

*The human population estimated at 1,211,319 composed of Tonga and Ila people in the Kafue Flats is the largest compared to the entire Kafue Basin. It is also growing at a faster rate (3.2% per annum) than the national rate (3.0% per annum) due to high birth rates and immigration of outsiders as fishermen and labourers from other tribes (Lozi, Luuvale and Bemba). The settlement pattern in the flood plain particularly in the fishing camps is temporal (38%) characterized by lack of tenure or no permanent land rights. About 62% have permanent residence. Most of the population has been in the area for the last 10 years (67%), while 25% has been in the area for over 20 years. The population's main source of income is fishing (40%), while agriculture (24%) and trading (20%) are ratified low. Surprisingly, livestock production accounts only for 10%.*

*The large and increasing population coupled with lack of tenure of fishing population entails abuse and pressure on wetland resources. Pressure on resources in the Flats is also being exacerbated by poverty and the low level of development in the area. This is symbolized by poor or limited access to adequate social and physical infrastructure, limited access to electricity and clean water supply and good sanitation, occurrence of floods and drought affecting crop production, and limited land for agriculture. Although infrastructure investments in hydro-power generation in the area are substantial, the majority of the communities depend on trees for their energy needs. This has some implications on deforestation, run-off rates and land degradation.*

*Land use activities that take place in the Flats have implications on the conservation of this area. The Tonga and Ila keep large herds of cattle mainly for social power and a source of wealth other than as a source of energy, income or meat protein. The cattle, which are grazed on the flood plain in a transhumance manner together with wildlife, are causing overgrazing of the rangeland, especially since the grazing area has been reduced by changes in flooding regime. Overgrazing is evidenced by the extensive growth of Dicrostachys cinerea, an indicator weed species in Lochnivar National Park where cattle and wildlife are grazed.*

*The Kafue Flats are important for agriculture. Maize is the main source of carbohydrates and forms the area's primary source of income. However, due to the generally acidic soils on the flood plain periphery, maize growing is dependent on clearing of woodlands for new fields, fertilizers and agro-chemical usage. With high concentration and increasing human population on the flood plain periphery/plateau, maize growing has implications on deforestation, soil erosion, and run-off on the periphery; sediment transport, nitrogen and phosphorous transport into the flood plain. Commercial agriculture, particularly irrigated sugar cane growing at Nakambala in Mazabuka on the other hand, depends on high water demand and abstraction. Cultivation of large tracts of land for maize and sugar cane in the wetland disturbs the natural grassland system, and thus reduces the ability of the wetland to perform filtering functional value. Apart from commercially produced sugar and maize, the major crop grown in the Kafue Flats is ground nuts although cassava and sweet potatoes are also important.*

*Most major issues as perceived by the people sampled are poor accessibility (34%), poor health facilities (31) lack of schools (31) and poor access to water (30%). Other items listed as serious social issues include lack of floods and lack of land.*

*Hunting of game is another important activity in the area, a source of meat protein and income. Although legalized, the illegal form of harvesting of game animals still exists. Due to cultural factors difficulties and cost of obtaining licenses, increasing poor economic conditions, food insecurity and weak wildlife management and monitoring systems, poaching is responsible for the drastic reduction of animal numbers, particularly lechwe, in the area. Poaching was being done by outsiders from urban areas (legal hungers), the local people (fishermen) and those living in the periphery of the Flats.*

*Forestry resources are important in the rural economy of the area. Trees on the periphery of the Flats are cut for the construction of buildings, timber production, charcoal production, firewood and cultivation. Other uses include collection of wild fruits, mushrooms, and caterpillars, despite this importance, increase in pressure as a result of the above uses and in combination with tree cutting for agriculture on the Periphery of Flats was causing deforestation.*

*Bush fires are a common occurrence in the study area. However, most of these take place in the late dry season in the woodland area, which are important habitats for kudu, buffalo, duiker, klipspringer and grysbok, and caused by surrounding communities. Due to poor management capacity, fires are an important management problem in the Lochnivar Park.*

### *4.2 Invasive weeds and their impact*

*At least 11 plants have been recorded as weed plants, but most invasive plants are the Water Hyacinth and Salvinia molesta. Cerafophyllum dermesum, Ludwigia stolonifera, Typha sp Phragmites sp. Ultrialaria sp are also important.*

*The most invasive non-aquatic weed plant is Mimosa pigra which is rapidly expanding in Lochinvar National Park. Dichrostachys cinerea and Ambrosia maritima are also becoming a threat to the wildlife habitat. Information based on literature review indicates that weeds can be a considerable nuisance to economies, especially posing a threat to installations such as hydropower generation, bridges, pump stations, and a serious impediment to waterways. Aquatic weeds interfere with various other water uses including water abstraction, fishing and transportation. Aquatic weeds are also known to change the hydrobiology of an aquatic system, and based on these observations, it was very evident that weeds (Water Hyacinth, and Mimosa pigra) have a serious impact on bird habitats causing an alteration of the habitat and loss of biodiversity, as well as loss of land value and breeding functions of birds. Detailed studies are never the less needed on this issue.*

### *4.3 Impact of aquatic weeds on waterbird ecology*

*Whereas the status of most birds remains unknown, at least 52 species are migratory species including the White stork, Abdim's stork, Open-bill Stork, and some species of Plovers, Spoon*

*Bill, Terms, Swifts and Swallows. Although no detailed studies were done on birds' distribution, breeding and feeding habits, nevertheless, the present survey revealed that the major distribution of birds is concentrated in the Chunga lagoon, Malema stream, Kaindo area and westwards to the Namalyo area. Concentrations of birds in the northern part of the Kafue Flats occur along the Luwato lagoon, Namunyona lagoon and the area near Muwezwa. While the exact impact of weeds on birds needs to be studied for the most part, possible impacts include: loss of nesting sites, loss of feeding sites, loss of cover exposure to predation and failure to mate. It is obvious that both Water Hyacinth and Mimosa pigra are potential threats to birds. However, future studies are needed in this area.*

***4.4 Site rehabilitation and weed control site rehabilitation of the Kafue Flats.*** *This was mainly considered at two levels:*

*a) Prescribed flooding to mimic natural flooding for the restoration of the flood plain. This has not been possible to achieve.*

*b) Weed control by removing Water Hyacinth from the area, and this was done mainly to protect installations for power generation, bridges and pump stations, and it was confined to the area between Mazabuka and the Kafue Gorge.*

*Weed control in Kafue Flats has been limited to mechanical control methods (using various simple tools to remove the plant) and biological control methods. Four biological control agents were introduced between 1995 and 1998 for control of Water Hyacinth in Kafue Flats between Kafue Gorge and Nakambala in Mazabuka. The bioagents were:*

- *Mottled Water Hyacinth Weevil (Neochetina eitchorniae);*
- *Chevroned Water Hyacinth Weevil (Neochetina Bruchi Hustache;*
- *Water Hyacinth Leaf-sucking Mirrid Bug (Eccritotasus catarinensis).*

*The absence of monitoring and evaluation of the effect of these agents made it difficult to determine their success. It is not clear whether the reduction of the weed in the Kafue Flats below Mazabuka can be attributed to the bioagents.*

*Although detailed investigations were not possible in this survey, the impact of weed control on waterbirds was considered at several levels:*

- *A change in or removal of vegetation as a result of weed treatment (mechanical or chemical) may alter the bird habitat;*
- *Human disturbance associated with weed treatment can cause displacement of waterbirds;*
- *Direct impact and contact with treated vegetation or direct contact with herbicide;*
- *Feeding on chemical contaminated organisms may cause cumulative effects in birds.*

*No measures have ever been put in place to control Momosa pigra, although the weed is growing very rapidly. The remaining weeds are not yet a threat in Kafue Flats.*

***5.0 Conclusions and Recommendations***

*This report has examined various issues affecting waterbirds in the Kafue Flats, and this has been done under the request of AEWA. The study has demonstrated that currently the area remains very important for conservation of birds, despite various conflicts between conservation and human activities. The impact of weeds on aquatic birds in Kafue Flats remains speculative at present and needs detailed studies on this matter. The impact of rehabilitation activities are not fully assessed, however, it is quite clear that any disturbance to the habitat will naturally affect organisms. Specific recommendations from this study are:*

a. *Socio-economic issues*

*The management of wetlands would need the incorporation of socio-economic issues particularly those that affect people's livelihoods. Reviews and the social survey in this study have shown considerable need to address people's needs if the conservation is to succeed. Clearly, the rapidly growing population and increasing poverty could have a serious impact on the Kafue Flats. It is important that special attention is given to the pattern of settlements as opposed to birds' major habitats.*

b. *Weed management and monitoring of weed control practices are essential in Kafue Flats. The current study has shown that very little has been done to understand the impact of weeds on ecology of birds. Essentially, the management of weeds in Kafue Flats has only concentrated on Water Hyacinth, indicating that this has focused on a single issue. It would be advisable that the Kafue Flats could be managed as a single system. Among the weeds requiring considerable attention is the Mimosa pigra which is expanding at a rapid rate, and which is very difficult to eradicate. Unless the spread of the weed is halted, much of the waterbird habitat in Lochinvar National Park will be lost.*

c. *Research and monitoring*

*The study has revealed that much work has to be done in Kafue Flats. By the time of writing, there had not been any monitoring system in place to monitor activities in the area. Both weed eradication activities and water regulation have no monitoring plan on either the performance of the restoration process and the impact of restoration on other components of the ecosystem. It is recommended that a project is conceived which will ensure monitoring and evaluation of a) implementation of weed control b) impact on birds, particularly the bird habitat c) behaviour of migratory bird species e) water quality and socio-economic studies.*

d. *Community involvement and public awareness*

*Whereas this item has not been fully discussed, from the reviews and discussions with people, it is clear that effective future activities will need full participation of all stakeholders, and in particular local communities. Results of the present studies have revealed that current activities in weed control have not considered local people. For the most part, local involvement has been confined to CBNRM, and through Partners for Wetlands Programme. It is the view of this study that weed management and conservation of waterbirds will require not only the general participation, but also public awareness.*

e. *Legal and institutional framework*

*The study has shown that though adequate legal framework is available for the conservation of waterbirds, it is important that various pieces of legislation are harmonized together with the need to integrate this with various conventions. Nevertheless, at present, implementation of the AEWA agreement in Kafue Flats is possible without any need for other legislation.*

f. *Donor support for future work*

*It is the general understanding of this report that donor assistance in Kafue Flats has been largely uncoordinated. This has been the case because of the sectoral nature activities in the area. Secondly, projects have been started, implemented and terminated, even when they are good and useful projects. For the most part, much of the donor funds have been on developmental projects, mainly in hydropower development and irrigated agriculture. Conservation projects have been limited. Based on the findings in this study, it is essential that future donor assistance should include a large component of*

*conservation and community development. Successful conservation will depend on how well socio-economic and wetlands habitat issues are addressed.*

***ACKNOWLEDGEMENTS***

The consultancy wishes to commend IUCN and the sponsors for carrying out this study. It is the hope of the consultancy that this study will mark the beginning of comprehensive research, inventories and ecological assessments on birds and other wetland species in Zambia.

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**LIST OF ACRONYMS**

| | |
|---|---|
| **ADMADE** | Administrative Management Design |
| **AEWA** | African-Eurasian Migratory Waterbird Agreement |
| **BOD** | Biological Oxygen Demand |
| **CBD** | Convention on Biological Diversity |
| **CBNRM** | Community Based Natural Resource Management |
| **CITES** | Convention on International Trade in Endangered Species |
| **CMS** | Convention on Migratory Species of Wild Animals |
| **COD** | Chemical Oxygen Demand |
| **ECZ** | Environmental Council of Zambia |
| **ESP** | Environmental Support Programme |
| **GMA** | Game Management Area |
| **GRZ** | Government of the Republic of Zambia |
| **HQs** | Head Quarters |
| **ITCZ** | Intertropical Convergence Zone |
| **IUCN** | International Union for the Conservation of Nature |
| **IWRMS** | Integrated Water Resource Management Strategy |
| **KAFGEN** | Kafue Generation |
| **LIRDP** | Luangwa Integrated Resource Development Programme |
| **MENR** | Ministry of Environment and Natural Resources |
| **MTENR** | Ministry of Tourism, Environment and Natural Resources |
| **NAP** | National Action Plan |
| **NCSR** | National Commission for scientific Research |
| **NCZ** | Nitrogen Chemicals of Zambia |
| **NEAP** | National Environment Action Plan |
| **NGO** | Non Governmental Organization |
| **NPWS** | National Parks and Wildlife Services |
| **PFAP** | Provincial Forest Action Plan |
| **TDS** | Total Dissolved Substances |
| **ToRs** | Terms of Reference |
| **TSS** | Total suspended Solids |
| **UNDP** | United Nations Development Programme |
| **UNDP-GEF** | United Nations Development Programme – Global Environmental Facility |
| **UNFAO** | United Nations Food and Agricultural Organization |
| **WRAP** | Water Resources Action Plan |
| **WWF** | World Wide Fund for Nature |
| **ZAWA** | Zambia Wildlife Authority |
| **ZESCO** | Zambia Electricity Supply Corporation |
| **ZFAP** | Zambia Forestry Action Plan |

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