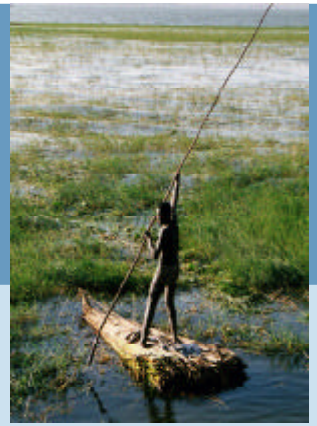

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Wetlands of Ethiopia

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BLUE SERIES

Wetlands of Ethiopia

Proceedings of a seminar on the resources and status of in Ethiopia's wetlands

Yilma D. Abebe and Kim Geheb(Editors)

IUCN

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IUCN - The World Conservation Union

IUCN - The World Conservation Union was founded in 1948 and brings together 79 states, 112 government agencies, 760 NGOs, 37 affiliates, and some 10,000 scientists and experts from 141 countries in a unique worldwide partnership. Its mission is to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable. Within the framework of global conventions IUCN has helped over 75 countries to prepare and implement national conservation and biodiversity strategies. IUCN has approximately 1000 staff, most of whom are located in its 42 regional and country offices while 100 work at its headquarters in Gland, Switzerland.

IUCN Wetlands and Water Resources Programme

The IUCN Wetlands and Water Resources Programme coordinates and reinforces activities of the Union concerned with the management of wetland and water ecosystems. The Programme focuses upon the conservation of ecological and hydrological processes, in particular by developing, testing, and promoting means of sustainable utilisation of wetlands. It does so in collaboration with IUCN members and partners, in particular those other international institutions with a specific wetland mandate, especially the Ramsar Convention Bureau, and the International Waterfowl and Wetlands Research Bureau (IWRB).

The core of the Programme is a series of field projects which develop the methodologies for wetland management, in particular in the countries of the developing world where wetlands are used intensively by local communities which depend upon these for their well-being. Related strategic and policy initiatives draw upon the results of these projects and present their conclusions in a form useful for government decision makers and planners.

The activities of the Programme are designed on the basis of the concerns and information provided by IUCN members. To facilitate this, the Programme works through IUCN's regional offices. The Programme also works closely with the major development assistance agencies to ensure that conservation considerations are adequately addressed in their projects.

The Wetlands and Water Resources Programme receives generous financial support from the World Wide Fund For Nature (WWF), the Swiss Directorate of Development Cooperation and Humanitarian Aid (DDA), the Finnish International Development Agency (FINNIDA) and the Government of the Netherlands. Project support has been received from the Swedish International Development Authority (SIDA), Norwegian Agency for Development Cooperation (NORAD), United States Agency for International Development (USAID), the Ford Foundation and a number of IUCN members including the Finnish Association for Nature Conservation (FANC), Institut Francais pour Le Developpement en Cooperation (ORSTOM), the Royal Society for the Protection of Birds (RSPB), the United States National Park Service (USNPS) and the World Wide Fund For Nature (WWF). It is coordinated from the IUCN Headquarters in Switzerland, with regional coordinators in Central America, South America, Brazil, West, East and Southern Africa, and Asia.

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Wetlands of Ethiopia: an introduction

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An introduction to wetlands

Wetlands are ecosystems or units of the landscape that are found on the interface between land and water. While water is a major factor of wetland definition (Ramsar Convention Bureau, 1997), soils, vegetation and animal life also contribute to their unique characteristics (Koetze, 1996; Howard, 1995; Roggeri, 1995). As a result, it has proved difficult to define wetlands, and over 50 definitions exist. That used by the Ramsar Convention (1997: 2) is as follows:

> "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters".

This definition provides significant latitude – wetlands, as a result, come in a whole host of forms and types. The Ramsar Convention recognises five major wetland systems (Ramsar Convention Bureau, 1997), while others identify up to seven main groupings (Dugan, 1990). The major Ramsar groupings are:

- marine (coastal wetlands);
- estuarine (deltas, tidal marshes, and mangroves);
- lacustrine (lakes and associated wetlands);
- riverine (rivers, streams and associated wetlands);
- palustrine (marshes, swamps and bogs).

These forms are further divided into more than 30 sub-divisions classifying them according to physical, chemical or biological characteristics.

Wetlands are distributed all over the globe and are estimated to cover about 6% of the earth's surface (Maltby, 1986) – some 5.7 million km^2 (WCMC, 1992). Although Africa is best known for its savannahs and hot deserts, 1% of its surface area (345,000 km^2) is covered by wetlands (Finlayson and Moser, 1991). These ecosystems range from the Senegal River and the Inner Niger Deltas in the West, to the Sudd Floodplains and the Ethiopian Wetlands in the East. Southwards, important wetlands include the Zaire Basin Swamps, the Okavango Inland Delta, the Kafue Flats, the African Great Lakes and the extensive Malagarasi-Moyovosi Wetlands in Tanzania. Wetland characteristics will also vary with altitude, with high ground wetlands, such as those found in the Ethiopian and Kenyan mountain systems, complementing lowland types found in the semi-desert.

Wetlands have played a noticeable role in the growth of human civilisations and cultural development. This is true globally, where major pre-historic civilisations, including those on the Nile, Euphrates and Tigris, have emerged and developed (Finlayson and Moser, 1991). It is noteworthy that the Great Rift Valley of Africa has yielded fossil evidence of some of the world's earliest hominids. This is especially true in the Ethiopian Rift. Fossil remains from Hadar in the Afar depression, and at Omo in Southern Ethiopia, suggest that in order for humans to have lived here, the Ethiopian Rift must at one time have been better watered than it is presently. The Rift's ever changing geology, which was marked by the slow sedimentation of rivers and changes in drainage and faulting, created ideal conditions for the rise and later development of the hominids (Smith, 1995).

The importance of wetlands

Only 2.6% of the world's water is fresh (Illueca and Rast, 1996). The remainder is found in the oceans and brackish waters. Only a fraction of the world's fresh water is available for consumption because so much of it is locked up in polar icecaps and glaciers (Illueca and Rast, 1996).

Freshwater resources are a finite, but global consumption rates are known to increase 2-3% every year (Illueca and Rast, 1996). Africa uses only 4% of its renewable freshwater resources because of the uneven distribution of water resources over the continent (UNEP, 2000). At the same time, access to water is affected by its quality – much of Africa's water may be unsuitable for consumption by its people. These regional patterns are also evident in Ethiopia, where water resources are unevenly distributed and only a quarter of its population has access to safe water and sanitation.

Wetlands are the main custodians of these valuable water resources. They act as 'banks' from where water may be drawn, and groundwater replenished. Dugan (1990) explains that wetland values are best understood in terms of their intrinsic conditions (biological, chemical and physical), which allow them to carry out their distinctive functions and generate products. Their functions comprise those natural processes that sustain economic activities and fortify ecological integrity. Examples are groundwater discharge and recharge, flood control, shoreline stabilisation and nutrient retention. Besides water being the most basic product that a wetland can provide, food, fuel wood, wildlife, fisheries, forage and agricultural resources are additional wetland products. Wetland attributes are closely intermeshed with the ethical and aesthetic values that human beings attach to them (Roggeri, 1995).

Wetlands are the most productive ecosystems in the world, by far outstripping some of the alternative uses to which they are subjected. The annual primary production of herbaceous swamps, for example, is impressive. Papyrus in tropical Africa can produce up to 143 tonnes per hectare, while production rates for *Typha* range from 30 to 70 tonnes per hectare. Conversely, highly productive crops such as sugar cane and maize produce just 63 tonnes and 60 tonnes per hectare respectively (Finlayson and Moser, 1991).

Threats to wetlands

While wetlands may be the most productive of ecosystems on earth, they are also the most threatened. Wetland destruction and alteration has been and is still seen as an advanced mode of development, even at the government level. Wetlands and their value remain little understood and their loss is increasingly becoming an environmental disaster. While rates of wetland loss are documented for the developed world, the limited study of these ecosystems in countries like Ethiopia leaves us with little to say. Wetland loss is evident wherever major developments like dams, irrigation schemes and conversion projects are present in the developing world. While most of the threats that wetlands face result from their misuse, many are also related to unsustainable resource extraction. Another important reason for their vulnerability is the fact that they are dynamic systems undergoing continual change (Barbier *et al*., 1996). As a result, many wetlands are temporary features that disappear, reappear and re-create themselves over time (Barbier *et al*. 1996).

Humans usually and very dramatically accelerate natural processes often unintentionally but usually in the course of activities like agriculture, industry and urban development. These activities can involve anything from drainage and diverting water, to dredging and loading water sources with toxic chemicals. Perhaps the most destructive of all activities is mining (Williams, 1990) which permanently destroys the substrate and prevents the natural restoration of a site. Wetlands whose biotic balance has been disturbed can often recover.

Dugan (1990) claims that 65% of wetland disturbances are of human origin, while the remainder have natural origins. Out of these, 73% of disturbances are thought to result from direct human actions, while the remaining 27% are believed to come from indirect sources (Table 1).

Table 1. Causes of Wetland loss (after Dugan, 1990)

Human Actions		**Natural Causes**
Direct	**Indirect**	
Drainage	Sediment diversion	Subsidence
Dredging	Hydrological alterations	Sea-level rise
Filling	Subsidence	Drought
Conversion		Hurricanes and storms
Construction		Erosion
Discharge		Biotic effects
Mining		
Abstraction		

The results of wetland loss are far-reaching and disastrous. Humans and other life close to wetlands, and who depend upon them, are the first to feel the impact of wetland loss. Dam construction can significantly impact the lives of people living downstream, as

waters are regulated. Animal and plant life dependent on a dammed river's annual floods may be exterminated or become endangered. Dams affect flooding cycles, water chemistry, sediment behaviour and fish migrations (Maltby, 1986). All too often, wetland functions, including flood protection, nutrient retention, erosion control or sediment retention, will be compromised by well-meant development interventions.

Once a wetland has been destroyed, the services it previously provided now have to be paid for by tax payers (Dugan, 1990). Examples of wetland services artificially performed by human interventions are water purification and erosion control schemes (Dugan, 1990). While industrialised countries can probably pay for most of these services from tax incomes, this is not so in developing countries, where wetland destruction can have a very serious impact on the livelihoods of the rural poor.

The wise use of wetlands

At its meeting in Regina, Canada in June 1987, the Ramsar Convention defined 'wise use' as follows: "the wise use of wetlands is their sustainable utilisation for the benefit of mankind in a way compatible with the maintenance of the natural properties of the ecosystem" (Davis, 1993). The term 'wise use' encapsulates the need to safeguard the integrity of wetlands while at the same time providing sustenance to the natural and human communities around them. This position was clarified at the first meeting of the Ramsar contracting parties in Cagliari, Italy, when it was emphasised that the "wise use of wetlands involves the maintenance of their ecological character as a basis not only for nature conservation, but for sustainable development" (Davis, 1993).

It goes without saying that the wise use of wetlands is impractical if the people who make use of them are not involved in one way or another. The involvement of such people and a knowledge of their values is the basis for the implementation of wise use strategies. If many of the causes of wetland degradation and loss are of socio-economic origin, then social and economic factors need to form the crux of wise use programmes. In particular, indigenous populations should be the beneficiaries of the improved management of wetland sites (Davis, 1993). The wise use of wetlands is a complex concept to implement and requires the support of national programmes addressing several factors including information, policy, research, awareness, management and institution building (Dugan, 1990).

Ethiopia and its wetlands

Ethiopia is a country in North-Eastern Africa lying between 8º 00' N and 38º 00' E. Its area covers an estimated 1,127,000 km^2 of which some 7,444 km^2 is covered by water. Ethiopia has 5,311 km of frontiers that it shares with Djibouti, Eritrea, Kenya, Somalia and Sudan.

Ethiopia's ecological diversity and climatic variation is to a large extent explained by its highly variable topography. Altitudes range from 125 m below sea level in the Dallol Depression, to 4,620 m above sea level at Ras Dashen. These altitudinal extremes mean that Ethiopia is a country of enormous habitat diversity, which is also influenced by the country's climate. The tropical monsoon rainfall pattern is influenced by moisture-laden

winds from the Atlantic and the Indian Ocean and also by the Inter-tropical Convergence Zone and variations in altitude variation.

With the exception of coastal and marine-related wetlands and extensive swamp-forest complexes, all forms of wetlands are represented in Ethiopia. These include alpine formations, riverine, lacustrine, palustrine and floodplain wetlands. Floodplains are found both in Ethiopia's highlands and lowlands, although they are most common in the North-Western and Western Highlands, Rift Valley and Eastern Highlands. Hillman and Abebe (1993) estimate that wetlands cover 1.14% of the total landmass of the country, while forests cover approximately 2%. Rivers from the Ethiopian Highlands annually produce in excess of 110 billion m^3 of water, of which 74% flows into rivers draining into Sudan, Egypt, Kenya and Somalia.

In a country like Ethiopia, a wise use wetland programme would need a responsible agency to co-ordinate national action. Because wetlands fall within the ambit of a crosscutting issue like environmental protection, both public and private institutions would need to contribute their expertise and work together. The development of a management plan for Ethiopia's wetlands will need basic studies, including awareness, surveys and inventories, which should be part and parcel of a wetland development programme (Davis, 1993; Ramsar, 1997).

Some of the institutions that could take the lead in the development of a wise use wetlands management plan for Ethiopia have already been involved in wetlands-related work for some time. These are:

- the Ethiopian Wildlife Conservation Organisation (EWCO): wetland distribution, preliminary mapping and gathering information, protected area management;
- Ethiopian Wildlife and Natural History Society (EWNHS): wetland birds, identification of wetland Important Bird Areas (IBAs) and promoting the research and management of threatened species;
- Ethiopian Wetlands Research Project (EWRP): indigenous knowledge, sustainable management, socio-economic processes, equity/gender, and cultural values;
- Environmental Protection Authority (EPA): environmental policy, conservation strategies and Environmental Impact Assessment (EIA) procedures;
- Institute for Biodiversity Conservation Research (IBCR): biodiversity conservation in Ethiopian Rift Valley Lakes;
- Addis Ababa University: amongst others, limnological studies, wetland biodiversity and social studies.

An over-view of wetlands work in Ethiopia

It was with the kind and generous support of the Royal Netherlands Embassy in Addis Ababa that the first ever meeting on the wetlands of Ethiopia was possible. The meeting brought together major stakeholders from the country's wetland conservation arena to discuss and look at wetland issues more closely than they have been considered in the past. The meeting's final resolution aimed to create a core team comprising various institutions to look at wetland conservation and management. The papers presented in this volume look at wetlands from various angles.

The first paper, by Leykun Abunie, sets out to try and classify Ethiopia's wetlands. He starts by grouping them broadly into four biomes. At a far more localised level, Abunie goes on to group Ethiopian wetlands by habitat, physical and biological characteristics, yielding ten different groups. Like many of the other papers in this volume, Abunie identifies the main threats facing wetlands as relating to their drainage and to human activities in their catchment areas.

Lemlem Sissay's paper concerns the value of wetlands, and considers Ethiopia's Rift Valley lakes. She argues that they are of extremely high value in terms of the wetland functions that they provide, the biodiversity that they support and the economic values that they generate. She then identifies a series of threats to these valuable resources as high population pressure, wood harvesting and other excessive natural resource exploitation in wetland drainage basins.

Mengistu Wondefrash's paper builds upon the introduction to wetlands presented here. He argues that in Ethiopia, there is a lack of awareness of the wetland 'concept', too few resources to provoke wetlands conservation, a derth of tools or documents to ensure the formulation of an adequate national wetlands policy, few focal groups – in the government or otherwise – through which wetland issues may be channelled and, finally, a lack of a sense of responsibility for the protection and wise use of wetlands. Wondefrash summarises what he sees as the major threats facing wetlands as demographic pressures, development pressures, pollution, mis-management and weed infestation.

The vital importance of wetlands as ecological reserves is also considered in Wondefrash's paper when he summarises the role that they play in the conservation of bird life. Hence, many wetlands conservation initiatives will concentrate their efforts on the preservation of birds, not least as valuable indicators of biodiversity and ecosystem health. He points out that migratory waterfowl often use a multitude of wetlands as they travel to and from their migratory destinations, necessitating that wetland conservation approaches need to be international in scope and organisation. Wondefrash then goes on to discuss Ethiopia's Important Bird Areas (IBAs) and demonstrates the critical importance of these habitats in the protection and conservation of many of Ethiopia's most threatened bird species.

Wondefrash concludes with a series of management recommendations that include the raising of public awareness, the need for national advocacy roles, a conservation action plan, research and monitoring at selected wetlands and the need to develop a focal institution for wetlands. Amongst these, he calls for participatory approaches in the management and monitoring of wetlands, pointing out how necessary this is in the light of Ethiopia's enormous and growing human population.

Afework Hailu's paper is the first of three to discuss the output of the Ethiopian Wetlands Research Programme (EWRP). The study was based in Illubabor in southwest Ethiopia, and concentrated on eight 'core' wetlands. A multi-disciplinary approach was employed to not only consider the physical parameters of these swamps, but also to examine the characteristics and use values of the swamps to surrounding human populations. As can be expected, the physical work on these swamps was to determine that substantial changes occur when they are drained or heavily exploited. Importantly, Hailu claims that amongst the surrounding populations there is evidence of traditional

natural resource management institutions that can be brought to bear in the community-based management of these resources.

Zerihun Woldu and Kumlachew Yeshitela's paper is the second to be derived from the EWRP output, and focuses on the vegetation composition of the core wetlands, how this changes over time and what happens to vegetation when the swamps are drained or heavily exploited. Woldu and Yeshitela find that wetland plants are distributed across time and space. Dominant plant species come and go with the seasons, and spatial differences are attributed to different types and intensities of human exploitation. They summarise the various species types collected from the wetlands and compare their presence and absence at the eight sites at different times of the year. They argue that there is a 'terminal phase' in the exploitation of wetland plants from which they will not recover if it is reached. They suggest that such a phase may be achieved if grazing, cultivation and grazing are practised continuously.

In the third EWRP paper, Adrian Wood draws on data collected under this project and from experiences derived from developments on the lower Awash River, to argue that making use of wetland resources may be restricted by access rules which depend on local level political processes or by household resource constraints. In addition, he suggests, when wetlands are altered or transformed in some way, the benefits they previously generated may be destroyed and this can be particularly damaging to the interests of the poor and women. Hence, social equity can be worsened by wetland development and transformation. Wood recommends that a use regime needs to be developed which ensures that the fullest range of benefits are produced from wetlands for the local community in a sustainable way and within a framework which also maintains the wetland's ecological functions indefinitely. Management needs to ensure equitable access to wetland-produced benefits. This requires agreement amongst all wetland stakeholders over the uses to which a wetland can be put and how it should be managed.

Zerihun Desta's paper looks at three interconnected wetlands – Lake Awassa, which is connected to the Shallo Swamp via the Tikur Wuha River. The swamp is located close to Awassa Town, from where it receives the effluent of a textile factory. Using this as an empirical basis for his discussion, Desta describes how wetlands may be polluted to such an extent that their ecological functions collapse, sending out reverberations into the human and natural communities that rely upon them. He suggests that one way around this problem is to ensure that wetlands have 'efficient' property rights, so that the costs of pollution may be borne by polluters.

Messele Fisseha's paper is the first of two in this volume to consider wetlands-related policy in Ethiopia. Fisseha points out the importance of Ethiopia's water resources against a background of the country's often critical water problems. The place of wetlands in the nation's hydrological cycle, he argues, is sufficiently important that a national wetlands policy is merited. At present, however, wetlands are only addressed as components of other national water or environmental policies. He provides case studies from a number of Ethiopian wetlands to demonstrate the variety of management problems that they face, strengthening his call for a self-standing wetlands policy. He concludes by recommending that the management of wetlands should be based on monitoring, research and planning; that wetlands require a co-ordinated management

approach based on Memoranda of Understanding (MOUs) between interested and relevant national and regional government ministries; and finally, that Environmental Impact Assessments (EIAs) should be undertaken before any development occurs in wetlands.

Dessalegne Mesfin also reviews Ethiopia's wetlands-related policies. In contrast to Fisseha, he suggests that present policies and legislation sufficiently address wetlands issues and problems. More site-specific legislation and regulation could be developed at the regional level. In order for this to occur, he argues, certain data will be needed. In particular, those data that can demonstrate the benefits of wetlands on the one hand, and the cost of wetland destruction on the other. He implies that this data need arises, in part, to counter the perception of wetlands as wastelands. In addition, he says, the implementation of a wetland policy is compounded by more pressing food security policies that may seek to reclaim wetlands for agricultural purposes.

Certainly, one possible way to review the status of Ethiopia's wetlands and to pre-empt the serious repercussions of wetland disturbance, would be through the use of Environmental Impact Assessment (EIAs). Berhanu Tekaligne's paper argues that many of the problems that Ethiopia's wetlands face today are derived from the fact that no adequate EIA was carried out prior to development. Such development may directly involve the wetland (through, for example, its drainage and filling), or be indirect, and associated with development upstream from the wetland (for example, urban or industrial development, and associated sewage and waste discharge into streams and rivers). EIA, Tekaligne suggests, would enable development planners to better anticipate and assess the impact of their activities on wetlands and resources well in advance of project implementation. He then presents an outline of the steps through which a wetland EIA might pass.

Reint Bakema and Paul Mafabi's paper is not from Ethiopia at all, but from Uganda, where the National Wetlands Programme has worked for ten years developing awareness, policy and related legal instruments with which to protect the extensive wetlands resources of that country. The paper provides an intriguing insight into how a wetlands policy and attendant legislation might be developed. Drawing on this practical experience, Bakema and Mafabi suggest that the development of a wetlands process needs to go through six steps:

1. create an awareness and appreciation of wetland functions and values at all levels in society;
2. develop a knowledge and understanding of wetland stocks and the ecological and hydrological processes of wetlands;
3. develop a knowledge and understanding of the socio-economic uses of wetlands
4. develop a wetlands policy, legislation and wise use criteria, and incorporate or harmonise wetland issues in other laws and policies;
5. develop an institutional framework and capacity for wetland management in the government and civil society;
6. develop best practices for sustainable resource use and wetland system management.

Figure 1: Map of Ethiopia showing the regions and positions of neighbouring countries

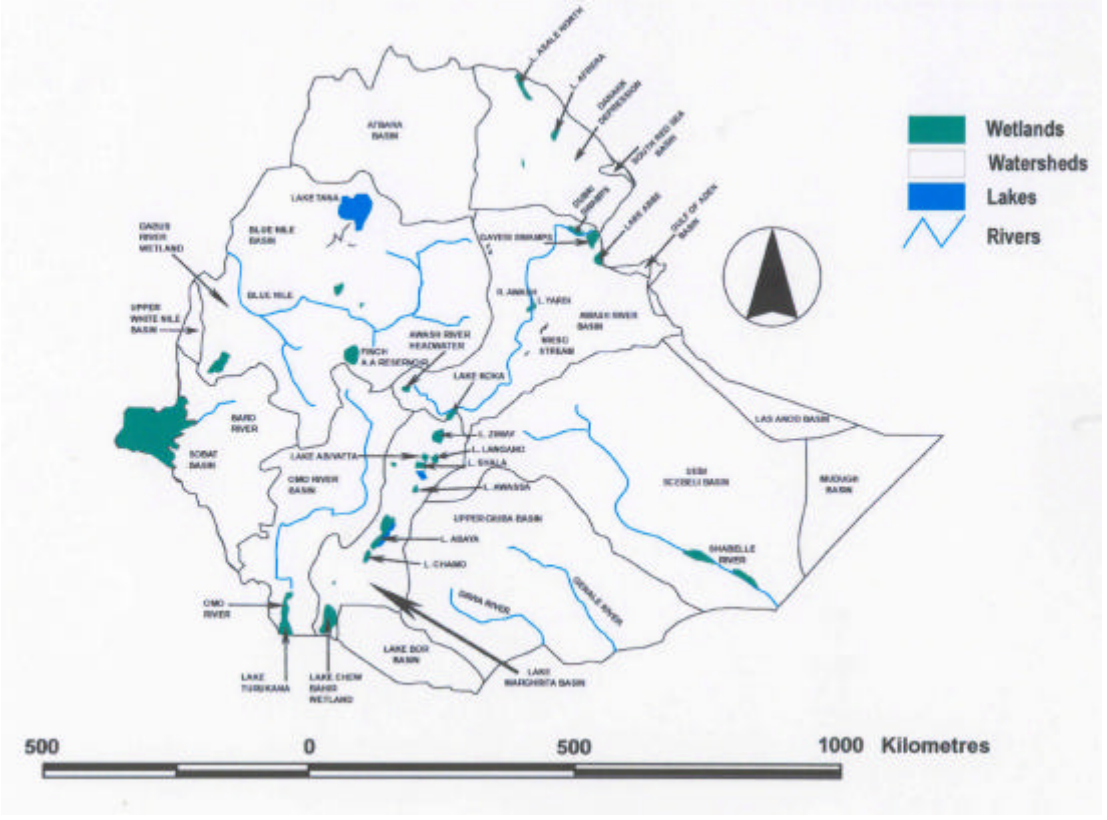

Figure 2: Map of Ethiopia showing lakes, rivers and wetlands

In their paper, each of these is carefully considered and discussed, generating an important compendium of knowledge and experience that Ethiopia may itself wish to follow in the development of wetlands-relevant national policy and legislation.

References

Barbier, E. B., M. C. Acreman, D. Knowler. 1996. *Economic Valuation of Wetlands: A guide for policy makers and planners*. Ramsar Convention Bureau, Gland, Switzerland 127pp.

Davis, T. J. (ed.). 1993. *Towards the Wise Use of Wetlands*. Wise Use Project, Ramsar Convention Bureau, Gland, Switzerland 180pp.

Dugan, P. J. (ed.). 1990. *Wetland Conservation*: *A Review of Current Issues and Required Action*. IUCN, Gland, Switzerland 94pp.

Finlayson M. and M. Moser (eds.). 1991. *Wetlands*. International Waterfowl and Wetlands Research Bureau. Facts on File Ltd. Oxford, UK 224pp.

Hillman J. C. and D. A. Abebe 1993. Wetlands of Ethiopia. In: *Ethiopia: Compendium of Wildlife Conservation Information* (ed. J. C. Hillman). NYZS - The Wildlife Conservation Society International, New York Zoological Park, Bronx, NY and Ethiopian Wildlife Conservation Organisation, Addis Ababa, 2 Vol.s 786 pp.

Illueca J. and W. Rast. 1996. Freshwater Resources: precious, finite and irreplaceable. *Our Planet* 8 (3): 19-21.

Howard, G. 1995. Freshwater Wetland Plants in East Africa. *Swara*. 18 (1): 18 - 21.

Koetze, D. 1996. *How wet is a Wetland? An introduction to understanding wetland hydrology, soils and landforms.* Wetland Use Booklet 2. Share-Net. Wildlife and Environment Society of South Africa. 24pp.

Maltby, E. 1986. *Waterlogged Wealth: Why waste the world's wet places?* International Institute for Environment and Development and Earthscan, London 200pp.

Ramsar Convention Bureau, 1997. *The Ramsar Convention Manual: A Guide to the Convention on Wetlands* (Ramsar, Iran, 1971), 2nd ed. Ramsar Convention. RCB, The Gland 170pp.

Roggeri, H. 1995. *Tropical Freshwater Wetlands: A Guide to Current Knowledge and Sustainable Management*. Developments in Hydrobiology 112. Kluwer Academic Publishers, Dordrecht 363pp.

Smith, A. 1995. *The Great Rift Valley: Africa's Changing Valley*. BBC Books, London 364pp.

UNEP 2000. *Global Environment Outlook*. Earthscan Publications Ltd., London 432pp.

WCMC (World Conservation Monitoring Centre). 1992. *Global Biodiversity: Status of the Earth's Living Resources.* Chapman and Hall, London, 585pp.

Williams, M. (ed) 1990. *Wetlands: A Threatened Landscape*. UK, Institute of British Geographers, Oxford. 419pp.

The distribution and status of Ethiopian wetlands: an overview

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Introduction

Ethiopia, with its different geological formations and climatic conditions, is endowed with considerable water resources and wetland ecosystems, including twelve river basins, eight major lakes, many swamps, floodplains and man-made reservoirs. According to EFAP (1989), 110 billion cubic meters of water runs off annually from the above sources. Major river and lake systems, together with their associated wetlands, are fundamental parts of life interwoven into the structure and welfare of societies and natural ecosystems. Wetlands are productive ecosystems that can play an important role in socio-economic development if they are effectively utilised on a sustainable basis.

The extent to which water and wetland resources can potentially contribute to Ethiopia's development has barely been assessed. Ethiopian wetlands are currently being lost or altered by unregulated over-utilisation, including water diversion for agricultural intensification, urbanisation, dam construction, pollution and other anthropogenic interventions.

Water resource and wetland development need environmentally sound planning systems and to make room for long-term ecological productivity and the welfare of local communities. It is therefore crucial to develop strategies for national wetland programmes so that wetland values can be accrued. Amongst many other benefits, these values include ecological and hydrological functions as well as the goods and services wetlands provide to human beings.

This paper reviews the main types of wetlands in Ethiopia and their values and examines the major reasons for their losses. It concludes with suggested options for their effective management.

Wetlands in Ethiopia are defined as land covered by shallow water encompassing lakes, rivers, swamps, floodplains, ponds, aquifers and dams. This paper only addresses the country's 'minor' wetlands whose ecological and hydrological functions are not often recognised as productive. These are mainly swamps, marshlands and floodplains, which are being converted and altered at an alarming rate into what many people consider better alternative uses. This paper also emphasises lowlands that are covered by shallow waters, which include swamps and floodplains. Floodplains differ from swamps in that they are seasonally submerged as a result of riverine, lacustrine or other flooding.

The Ethiopian wetland resource base: major characteristics and distribution

The classification of Ethiopian wetlands

Tesfaye (1990) listed 58 major lakes and marshes in Ethiopia (including Eritrea) Hillman (1993) listed a total of 77 wetlands in Ethiopia and Eritrea, together with locations. He estimated that Ethiopian wetlands covered an area of 13,699 km^2 or 1.14% of the country's land surface. Appendix 1 to this volume provides a list of Ethiopian wetlands and their locations. At the macro level, wetlands may be classified according to biomes. At the local, and more specific level, wetlands may be grouped according to their habitat type, physical and biological characteristics.

The classification of Ethiopian wetlands by biome

Ethiopian wetlands can be grouped into four major categories based on ecological zones, hydrological functions, geomorphologic formations and climatic conditions. These categories interlink to form four major biomes, which also describe climatic conditions in Ethiopia. These biomes are the Afro-tropical Highlands, the Somali-Masai, the Sudan-Guinea and the Sahelian Transition Zone groups (Tilahun *et al.*, 1996).

Group I – the Afro-tropical wetland system

The Afro-Tropical Highlands are composed of the Central, Western and Eastern Highlands of Ethiopia that serve as the prime water catchments and sources of its major rivers. The average annual rainfall is more than 2,000 mm. Rains are bimodal, with the long rains extending from June to September and short rains between February and May (Tilahun *et al*, 1996). These areas include most of Ethiopia's alpine and fresh water wetland ecosystems. The wetlands in this biome include Lakes Tana, Hayk, Ashange, Wonchi and, in the Western Highlands, Gojjeb and Ghibe. Floodplains associated with the biome's lakes and rivers are the Fogera and Dembia on the shores of Lake Tana. Some of the important wetlands of the Central Highlands are the Chomoga-Yeda floodplains around Debre Markos, and the Borkena and Dillu swamps in the Upper Awash Basin. The numerous alpine lakes of the Bale Mountains and the swamps of Arsi and Alemaya are important wetlands in the Eastern Highlands.

Group II - Somali-Masai wetland system

This biome also exists, in large measure, due to the formation of the Great Rift Valley. Its wetlands include the southern group of the Great Rift Valley Lakes and the northern group of the Awash Basin together with their associated swamps and marshlands. The water-divide of these two wetland complexes is near Meki town. The Awash Basin wetland complex is to the north of the water divide and includes the wetlands of Bishoftu, the Kesem-Meteka complex and Lake Abe complex. The southern group comprises three separate and closed drainage systems. The first system comprises lakes Langano, Abijatta and Shalla. The second drainage system comprises Lake Awassa and Chelekleka, while the third comprises the rivers Abaya, Chamo and Chew Bahir together with their associated floodplains. The rainfall distribution under this biome is

bimodal, with peaks between September and November, and March and May (Tilahun *et al.*, 1996).

Group III – Sudano-Guinean wetland system

The Sudano-Guinean Wetland System is found in the Western lowlands of Ethiopia. The wetlands in this group stretch from the Turkana delta in the south-west of Ethiopia, north along the Ethio-Sudanese border, the Baro-Akobo floodplains in Gambella Region, the Dabus and Beles floodplains in the Benshangul-Gumuz Region and the Metema and Tekeze floodplains in Amhara and Tigray Regions. Rainfall is unimodal, from March to September (Tilahun *et al*, 1996).

Group IV – Sahelian transitional wetland system

The Sahelian Transitional Zone Biome is that found in the extreme north-eastern part of Ethiopia. This area is the hottest and driest part of the country and is where the Dallol depression is located – at its lowest point, Dallol is 116m below sea level, (Tilahun *et al*., 1996). The area comprises semi-desert steppe, and the evapo-transpiration exceeds mean annual precipitation by over ten times (Messele Fisseha, pers. comm.). The biome contains a number of fresh and saline wetlands, including Lakes Afambo, Afdera, Gamari and Asali. The water volume of these lakes is dependent on the rainfall from the highlands during the wet season. In the dry season, most of the water in these wetlands evaporates leaving large salt pans behind. Rainfall is unimodal and unreliable, with a small amount received mainly between November and February (Tilahun *et al.*, 1996).

Classification of Ethiopian wetlands by habitat, physical and biological characteristics

Based on habitat type and basic physical and biological characteristics, wetlands may be grouped into 30 categories and nine man-made ones (Dugan, 1990). Using the Directory of African Wetlands as a basis, Ethiopian wetlands are classified into ten major groups, lakes being included (Hughs and Hughs, 1992). This classification is based mainly on river and lake drainage systems. The classification is not complete and will need revision. Because they are so numerous, not all Ethiopian wetlands are listed. The classification scheme is, however, able to show the diversity of wetland types in the country. It is not able to cope with the many different forms of wetland e.g. alkaline, fresh or seasonal. It includes those wetlands previously excluded by Hughs and Hughs (1992), but excludes tidal and coastal wetlands because Ethiopia has no access to the sea.

The Lake Tana and associated wetlands
- Lake Tana
- Fogera floodplains
- Dembia floodplains

The Ashenge and Hayk Lakes
Wetlands of the Bale Mountains
- Numerous alpine lakes including Garba Guracha
- Swamps and floodplains

Wetlands of the Western Highlands
- Keffa Zone - Ghibe and Gojeb
- Illubabor Zone

Lakes of Bishoftu
- Crater Lakes - Hora, Bishoftu Guda and Zukala
- Green, Babogaya, Bishoftu Lakes, etc.

Lakes and the associated wetlands of the SW Rift Valley
- Lakes Ziway, Langano, Abjiyata, Shalla
- Lakes Awassa and Chelekleka
- Lakes Abaya, Chamo, Chew Bahir
- Lake Turkana

Lakes and Swamps of the Awash River System
- The upper Awash Valley- Dillu Meda, Aba Samuel
- The Lake Beda Sector
- The Gewane Lakes/Swamp Complex
- The Dubti, Afambo and Gemari Lakes/Swamp complex
- Lake Abe and delta

Lakes of the Afar Depression
- Lake Afrera
- Lake Asale
- Dallol Depression

Western River floodplains
- Alwero, Baro, Akobo, Gilo
- Chomen, Fincha Swamps
- Dabus Swamp
- Beles floodplain

Artificial Impoundments and Micro Dams
- Koka, Fincha, Melka-Wakana and other hydropwer dams
- Municipal and other reservoirs like dams, aquifers, and wells

Threats and causes of wetland loss in Ethiopia

Ethiopia is often referred to as the water tower of Africa mainly because of its wide variety of landforms and climatic conditions, creating an extensive wetland system throughout the country. General wetland ecosystem values range from tangible subsistence uses and direct benefits to intangible goods and services and the fulfilment of human needs (Dugan, 1990).

The indirect uses of wetlands are their hydrological and ecological functions, which support various economic activities, life support systems and human welfare. This includes ground water recharge, flood control, nutrient cycling, erosion control and sediment traps, climate regulation, habitats for migratory wildlife and pest control (Dugan, 1990). As such, wetlands produce an ecological equilibrium in the environment by maintaining the integrity of life support systems for sustainable socio-economic development. Yet, many wetland ecosystems – particularly floodplains and swamps -

are regarded as wastelands and continue to be depleted at an alarming rate throughout Ethiopia. Moreover, national economic policies that prioritise crop production, severely affects sensitive ecosystems including wetlands through extensive land development schemes that have no concern for environmental costs.

The causes of wetland degradation include the conversion of wetlands for intensive irrigation agriculture, the expansion of human settlement, industrial pollution, pesticides and fertilisers and water diversion for drainage and the construction of dams. Wetland conversion often results in water depletion, the displacement of populations, the destruction of traditional production systems, habitat degradation, salinisation, increases of waterborne diseases and other adverse ecological impacts (WCED, 1987).

The construction of dams and mechanised irrigated agricultural activities in particular have emerged as controversial development issues in recent years. Proponents of such development, such as the government, private developers and financing institutions such as the World Bank, have faced increasingly bitter opposition from NGO's, affected people and environmentalists (Timberlake, 1985). This is particularly severe in developing countries like Ethiopia where the lowlands already suffer from water stress and drought. The desire to turn a quick profit and failure to use integrated planning strategies with no concern for ecological and social values, have already had a harmful impact on Ethiopia. For example, siltation problems in the Legedadi and Gefersa water supply project and hydropower generation projects in Koka and Melka-Wakana impair the proper functioning of dams and reservoirs. The Borkena dam, built for irrigation development, broke due to sediment load. Given the increasing severity and scale of threats, it is crucial that any water development related to wetland ecosystems use appropriate strategies and plan with a vision for the environment.

Conclusions and recommendations

The underlying causes of wetland loss are that they are assumed to be less important than other priorities or tend to be regarded as free goods. This is due to the absence of a proper guiding policy and an accountable institution for addressing problems associated to wetland degradation. The lack of any strategic planning and capacity for wetland management programmes and sustainable uses are other impediments. Thus, the priority actions and challenges to overcome this prevailing state of affairs are:

– An appropriate institution should be created with a mandate to implement policies, provide alternatives to actions that cause wetland degradation and to formulate modalities for a national wetland management programme. This would provide an understanding of wetland values and problems, as well as filling gaps to support the protection and wise use of wetland ecosystems in the country.

– Begin a national wetland inventory and build a wetland information database. This would ensure a full understanding of wetland values, socio-economic importance and provide answers for future management action.

– Environmental Impact Assessments should be carried out when any development intervention is planned. Critical wetland ecosystems should be identified, their ecological and hydrological functions evaluated, and any impact assessed.

– Integrated wetland ecosystem planning should be a requirement to enhance the values of wetlands in ecological and socio-economic development.

– To gain technical support and development assistance, the country must ratify international wetland agreements. Wetlands are a shared resource that have global importance and require support from international communities for sustainable management. Hence, there is a need to ratify international wetland conventions for cooperation and as a means of gaining material and technical assistance.

References

EFAP (Ethiopian Forestry Action Programme), 1989. *The Challenges for Development*. EFAP, Addis Ababa, Ethiopia. Vol. II

Hillman, J. C. (ed.) 1993. Ethiopia: Compendium of Wildlife Conservation Information. NYZS - The Wildlife Conservation Society, International, New York Zoological Park, Bronx, NY and Ethiopian Wildlife Conservation Organisation, Addis Ababa, 2 Vol.s, 786 pp.

Dugan, P. J. (ed). 1990. *Wetland Conservation*: *A Review of Current Issues and Required Action*. IUCN, Gland, Switzerland 94pp.

Hughes, R. H. and J. S Hughes. 1992. *A Directory of African Wetlands.* IUCN, Gland, Switzerland and Cambridge, UK/UNEP, Nairobi, Kenya/WCMC, Cambridge, UK. 820pp.

Tesfaye, H. 1990. *The Conservation Status of Wetlands and Waterfowl in Ethiopia*. Paper Presented to IWRP Workshop. 3 - 12 March, 1990, Uganda. 18pp.

Tilahun, S., S. Edwards, and B. G. E. Tewolde (eds.). 1996. *Important Bird Areas of Ethiopia: A First Inventory.* Ethiopian Wildlife and Natural History Society, Addis Ababa. 300pp.

Timberlake, L. 1985. *Africa in Crisis: The Causes, the Cures of the Environmental Bankruptcy*. Earthscan. London 218pp.

WCED (World Commission of Environment and Development), 1987. *Our Common Future*. WCED. Oxford University Press. New York, U.S.A. 398pp.

Biodiversity potentials and threats to the southern Rift Valley lakes of Ethiopia

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Introduction

The Ethiopian Rift Valley runs the whole length of the country from neighbouring Eritrea in the northeast to Lake Turkana in the southwest, bordering Kenya. The Ethiopian Rift Valley Lakes Basin (RVLB) is one of the twelve Ethiopian river basin ecosystems which share a common geological structure, history and similar biological resources.

Within the RVLB, there are eight principal lakes: Ziway, Abijatta, Langano, Shalla, Awassa, Abaya, Chamo and Chew Bahir, which drain an area of about 52,000 km^2. Four of these lakes - Ziway, Abijatta, Langano and Shalla - cover a hydrologically closed drainage area of about 14,640 km^2. The two southern lakes of Abaya and Chamo are the largest and, relatively, the shallowest. The Rift Valley Lakes are very important in terms of biological resources. Their ecosystems support both aquatic and terrestrial biodiversity, such as migratory birds, wildlife, fishery resources and aquatic and terrestrial vegetation. These ecosystems serve as wintering grounds and maintenance stations for a large number of terrestrial and aquatic birds.

The mountain ranges on both sides of the Rift Valley have serious environmental problems, the impact of which accelerates the loss of biodiversity in the lakes. These problems are the result of a combination of social, economic and climatic factors, which have increased pressure on the natural resources of the Rift Valley Lakes (RVLs) and wetlands. This has caused the degradation of watersheds, increased soil erosion, decreased water quality and caused immeasurable loss to biological diversity.

In view of this, the Institute of Biodiversity Conservation and Research in collaboration with relevant stakeholders, is in the process of developing a project on the conservation and sustainable use of biodiversity in Ethiopia's RVLs. This paper is based on the information collected for the problem analysis and synthesis components of this project. It explores the values of the lakes in Ethiopia's southern Rift Valley area, and finds that these are considerable. It then proceeds to consider the threats posed to these lakes and the values that they represent.

Values of biological resources

Direct and indirect values

Wetlands have direct values that include both production and consumption goods. These are the raw materials and physical products that are used directly for production, consumption and sale including those providing energy, shelter, food, agricultural production, water supply, transportation and recreation.

The Rift Valley's ecosystems provide ecological functions which maintain and protect nature and human systems through services such as the maintenance of water quality, flow and storage, flood control, sand storm protection, nutrient retention and micro-climate stabilisation, along with the production and consumption activities that they support.

Optional values associated with the lakes are primarily those that maintain the pool of wetland species and genetic resources for future possible uses such as leisure, commercial, industrial, agricultural, pharmaceutical applications and water-based developments, some of which may not be known at present. Other import values are existence values, which have merits regardless of the possibility of current or future use possibilities, such as cultural, aesthetic or heritage bequest significance. All of these benefits have value because they contribute to economic activity and enhance human welfare.

Some of the important ecological values of the Ethiopian rift are to be derived from its large variety of habitats. Lakes of various sizes and of fresh and alkaline waters are home to a large diversity of animal species, especially birds. Thirty-five fish species have been described from the above-mentioned lakes and the Omo River. Ninety-four mammal species are recorded from the Ethiopian Rift system, of which six are endemic (Tesfaye, 1990).

The whole Rift Valley ecosystem, including its wetland drainage system and the uplands, is regarded as a rich strategic site for a wide variety of resident and migratory avifauna populations (Hillman, 1993). In contrast, the overall ecosystem lies in a region of rainfall deficiency, with evapo-transpiration higher than the mean annual rainfall, making the area susceptible to drought and ecological degradation (EMA, 1985).

Aquatic biodiversity values

Less is probably known about the diversity level and ecosystem values of phytoplankton and aquatic invertebrates than of fish. As primary producers in the food web, phytoplankton are important as sources of energy and food for other trophic levels, and thus their loss entails changes to aquatic food webs. Some phytoplankton, such as *Arthrospira fusiformis*, have gained recognition because of their high content of unique and novel biomolecules. Other phytoplankton is toxic to fish, other aquatic animals and even to terrestrial wildlife.

Algae are involved in the improvement of air and water quality through their photosynthetic activity and uptake of undesirable nutrients. The few intensive studies done in Ethiopia report 206 phytoplankton species collected from ten lakes in the Rift Valley. About ten species recently collected from these lakes are new to science (Elizabeth and Willen, 1996). Clearly, more studies are needed to exhaustively list the phytoplankton species of Ethiopia's lakes.

Invertebrates are important biological control agents of some disease vectors. The copepod mesocyclops, for example, is an effective predator of malaria-causing mosquitoes. Certain aquatic beetles can clear the alien invasive aquatic weed, water hyacinth (*Eichhornia crassipes*). Many invertebrates have educational, scientific and biotechnological values because they are good models with which to understand biological systems (such as DNA/chromosome functions, embryogenesis) and are used in sewage treatment plants, fermentation processes and in the production of useful bio-molecules.

Benthic invertebrates, such as oligochaetes and chironomids, serve as useful bio-indicators of environmental perturbations and ecosystem health. They have been used as bioassay organisms to monitor pollution levels in waters, and bio-geographical studies have used them as paleo-indicators of past climatic change.

From limited and fragmented reports, it is known that more than 110 invertebrate species new to science have recently been described in Ethiopia. There is a pressing need, however, to continue the inventory and cataloguing of invertebrates on a more systematic and wider scale in order to have a better understanding of the aquatic invertebrate biodiversity status of the country.

Fish species values

Over 35 fish species have been described from the Rift Valley Lakes (RVLs) and the Lower Omo River Basin. The fish fauna is more diverse in the Southern RVLs of Abaya and Chamo and in the Lower Omo River basin. The need to study and carry out inventories of fish taxa is acute since new species still appear in sporadic surveys.

The fisheries of the RVLs support over 3,000 families in commercial and subsistence fishing activities and many more in processing, distribution and marketing centres. Additional incomes are obtained through the production, supply and repair of fishing gear, boats and engines. In the Oromia Region, 19 fisher's cooperatives with more than 1,700 members have been registered from Lakes Langano, Ziway, Koka and Basaka.

In the Southern Nations, Nationalities and Peoples (SNNP), Region, about 550 fishermen are engaged in full-time fishing activities on Lakes Awassa, Chamo and Abaya. Over 60% of Ethiopia's fish supply originates from the RVLs. The uneven exploitation of the lakes, however, has meant that some lakes are almost over-fished (Lakes Chamo, Awassa and Ziway) and others under-exploited.

Sport fishing for Nile perch is an important activity on Lakes Chamo and Abaya. In general however, people are engaged in fishing for its food value. The actual landings from the Oromia lakes is around 60 - 70% of total national production.

The waters of Lake Turkana, which span the Ethiopian – Kenyan border, have high fish species diversity. Many of these migrate up the Omo River to spawn. Few studies have

been carried out on the diversity level and the ecological status of this trans-boundary aquatic resource (see, however, Kolding, 1989).

Birdlife

A total of 538 species of birds - more than 65% of the country's total – are recorded from the RVL's ecosystem. Of the 29 Ethio-Eritrean endemic bird species, eight are endemic to the Ethiopian Rift Valley. Because of its geographical position, the Ethiopian RVLs serve as a wintering and maintenance station for a large number of terrestrial and aquatic birds, including Southern African, Sub-Saharan and Palearctic species.

According to a relative abundance classification system, there are 201 species of birds in the Ethiopian Rift Valley that are common (60 - 100% chance of being seen), 241 species that are frequent (10 - 59% chance of being seen) and 96 species that are rare (0 - 9% chance of being seen).

Some RVLs, such as Lake Abijatta, have plenty of birdlife. The latter lake had 230,000 Lesser flamingos and 150,000 Yellow wagtails during a count conducted in 1992/93 (Hillman, 1998). Northern Palearctic visitors such as stilts, ruffs and various ducks also use this lake as a staging and wintering ground. The lake has been proposed as an international wetland national park (EWCO, 1989) and is a protected bird sanctuary. Many bird species make their home on the plains and watersheds of the RV region, including the endemic Nechsar nightjar, the Star-spotted nightjar and the White- tailed bush lark. There are also a number of threatened species such as the Lesser kestrel, Pallid harrier and Lesser flamingo.

Other wildlife

The Ethiopian Rift Valley (RV) has 94 mammal species or 40% of the country's total of 277 species. Among the 94 species, 50% are smaller mammals consisting of bats, insectivores and rodents. Six of the country's 31 endemic mammals occur in the RV, as do half of Ethiopia's hares and predators. The RV ecosystem has several conservation areas, including sanctuaries, controlled hunting areas, national parks and game reserves.

There is ample potential for wildlife ranching in the RV because wild animals require less husbandry and utilise range lands better than domestic livestock. The areas surrounding the RV lakes are ideal ranching sites with their park-like acacia woodland. Livestock farms in the RV could be supplemented with game-ranching using grazers and browsers without affecting domestic animals. Wildlife products could include meat, fur, household goods, cultural relics, ceremonial dresses, medical paraphernalia, trophy hunting and tribal prestige markings.

Some of the RV's species, such as Swayne's hartebeest and Grevy's zebra, are threatened, while very little is known about Scott's Hairy Bat, the shrew *Crocidura phaeura*, Mahomet's mouse, the Ethiopian grass rat and Harrington's scrub rat.

In general, the terrestrial mammals of the Ethiopian RV are a precious biodiversity resource whose ecological and scientific significance has not been evaluated fully. There is an urgent need for understanding and conserving this important biodiversity before human activities damage it irrevocably.

Threats

Degradation of catchment areas

The water catchment areas of the Rift Valley Lakes Basin (RVLB) range from an altitude of more than 3000 m asl on the eastern and western rift valley floor, to the 500 m asl in the southern low lands. The causes of the basin's degradation are generally the same for all of Ethiopia's catchments. The major ones are deforestation mainly for agricultural purposes, encroachment and settlement as a result of population pressure and the need for grazing land, over-grazing as a consequence of overstocking and soil erosion and land degradation. The stocking rate of livestock is 4.62 to 68.2 Tropical Livestock Units (TLU) per hectare in the Abijatta-Shalla lake basin, which is 3 to 27 times the carrying capacity of most of Ethiopia, the average for which is 2 TLU per hectare.

Concomitantly, the hilly nature of the land and the erodibility of volcanic soil also contribute greatly to land degradation in the RVLB. Soil fertility loss and cropland abandonment may well then result. This kind of land degradation has occurred in Ziway Dugda *woreda*[1] to the south of Lake Ziway, in the Upper Woito-Segen basin, the eastern uplands of Lake Abaya, West Abaya and Chamo.

Demographic pressure

High population pressure and urbanisation in developing countries increases the demand for land, encourages deforestation, increases pollution and promotes the trade of species in danger of extinction. Just over 900,000 people live in the six *woredas*[2] around Lakes Ziway, Langano, Shalla and Abijatta). Approximately 781,000 of these people are located in rural areas, where there are 1.5 to 4.4 people per hectare of agricultural land. There are an estimated 6 million people in the Abaya, Chamo, Awassa and Chew-Bahir catchments, yielding an average population density of more than 160 people/km^2.

High population densities within the catchments of the Ethiopian Rift Valley Lakes have been associated with a series of deleterious trends, in particular those arising from the clearance of vegetation for grazing and agriculture, resulting erosion and downstream nutrient and silt loading. Other problems are as follows:

– improper farming methods and poor tillage systems, which contribute towards the erosion of steep cultivated land;

– fish-kills, algal blooms and the associated death of wildlife in Lakes Chamo (Amha and Wood, 1982) and Abijatta (Kassahun, 1982) are in part attributed to human activities within the RVLB;

– urbanisation and human settlement are amongst the most serious of problems in the RVLB. The fast-growing cities of Ziway, Awassa and Arbaminch are all close to the Rift Valley Lakes. Associated industrial development is also problematic. The

[1] A *woreda* is an Ethiopian administrative unit equivalent to a district.

[2] These are Munesa, Arsi-Neggellee, Adami Tullu, Bora Dugda, Ziway Dugda and Siraro

extraction of soda ash from Lake Abijatta, for example, involves the evaporation of 900,000 m^3 of water a year from the lake;

– farming along the lakes' shores not only disturbs shore ecology but also exacerbates siltation and increases the turbidity of the bank. Resultant sedimentation tends to be more pronounced in the littoral than in the pelagic zones of lakes, affecting aquatic life at the shore.

Deforestation

Small pockets of natural forest remain on the south-east shore of Lake Langano, the eastern catchment of Lake Awassa, in Nech-Sar National Park and the intermediate uplands of Wonago and Yirga Chefe. These are, however, under continual threat from deforestation due to population growth and the associated expansion of farming, increasing demand for fuel, construction wood and charcoal. Charcoal production is becoming a serious cause for concern in the Sub-Rift Valley System of Ziway, Langano, Abijatta and Shalla.

Overfishing and destructive fishing

Overfishing may result in the loss of some fish species and their replacement by others. This effect cascades throughout the trophic food web and ends in structural ecosystem changes, which are sometimes difficult to detect unless monitored on a continual basis. On Lake Chamo, the '*gancho*' net has caused the rapid depletion of Nile perch stocks. Some 70% of the fish landed from the Rift Valley Lakes comes from Lake Ziway alone, suggesting excessive fishing pressure. Tilapia stocks in Lake Awassa are also thought to be over-fished.

Amongst the destructive fishing techniques employed on these lakes are the use of herbicides, fishing in reed belts, chase and trap fishing and shore beach-seining. These activities deplete juvenile stocks and destroy nursery grounds. The immediate and long-term effects of over-fishing and destructive fishing on biodiversity resources have not been properly assessed.

Common threats to all lakes

– institutions for the management and proper use of fisheries are weak, as is law enforcement for resource and protected area conservation;
– lack of awareness, information and research on wetlands;
– poverty, the lack of livelihood alternatives for farmers, poor agricultural technology and productivity;
– dependence of local communities on wood fuel for energy;
– the delicate arid and semi-arid environment surrounding the lakes, associated low and erratic rainfall and the threat of high human population pressure;
– illegal settlement in parks and conservation areas;
– livestock pressure on conservation areas.

References

Amha, B. and R. B. Wood, 1982. Limnological aspects of an algal bloom on Lake Chamo in Gamo Goffa Administrative Region of Ethiopia. *Ethiopia. J. Sci*. 5 (1): 1 - 19.

Elizabeth, K. and E. Willen. 1996. Phytoplankton composition and diversity in salinity-alkalinity series of Lakes in the Ethiopian Rift Valley. *Hydrobiologia* 80 (1996): 1-8.

EMA (Ethiopian Mapping Authority). 1985. *Ethiopia Map at 1:2,000,000 scale showing major geographic features*. Addis Ababa, Ethiopia.

EWCO (Ethiopian Wildlife Conservation Organisation) 1989. *Agro-Ecological Zonation Study*. EWCO, Addis Ababa, Ethiopia.

Hillman, J. C. 1998. *Abijatta-Shalla Lakes National Park: Report on Status and Proposals*. Ethiopian Wildlife Conservation Organisation, Addis Ababa, Ethiopia. 14pp.

Hillman, J. C. (ed.) 1993. Ethiopia: Compendium of Wildlife Conservation Information. NYZS - The Wildlife Conservation Society - International, New York Zoological Park, Bronx, NY and Ethiopian Wildlife Conservation Organisation, Addis Ababa, Vol. 2. 332 pp.

Kassahun, W. 1982. *Comparative limnology of Lake Abijatta and Lake Langano in relation to primary and secondary production*. M.Sc Thesis, Addis Ababa University, Addis Ababa, Ethiopia.

Kolding, J. 1989. *The fish resources of Lake Turkana and their environment*. Unpublished Thesis for the Cand. Scient. Degree in Fisheries Biology. University of Bergen, Department of Fisheries Biology, Bergen, Norway.

Tesfaye, H. 1990. *Wetlands and waterbirds in Eastern Africa*. Proceedings of the IWRB Workshop in Uganda, 3-12 March 1990.

Wetlands, birds and Important Bird Areas in Ethiopia

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An introduction to wetlands

A wetland is the collective term for ecosystems whose formation has been dominated by water and whose processes and characteristics are largely controlled by water (see Abebe, this volume). As defined by the Ramsar Convention, wetlands include a wide variety of habitats, as well as man-made wetlands such as rice fields and reservoirs (Barbier *et al*, 1996). In addition, the Convention (Article 2.1) provides that wetlands incorporate riparian and coastal zones adjacent to the wetlands (Ramsar Convention Bureau, 1997).

In trying to categorise the wide range of wetlands encompassed by the Ramsar definition, Scott (1989) defined 30 groups of natural wetlands and nine manmade ones. For illustrative purposes, it is possible to identify five broad wetland systems that include estuaries, marine wetlands, riverine wetlands, palustrine and lacustrine wetlands (see Abebe, this volume) (Barbier *et al*, 1996).

The complex interactions between biotic (fauna and flora) and abiotic (soil, water and topography) components of wetland systems make them amongst the earth's most productive ecosystems. Wetlands are very important for the multifarious values that they provide free of charge. They constitute a resource of great economic, cultural, scientific and recreational value. They are described both as 'the kidneys of the landscape' because of the functions they perform in the hydrological and chemical cycles, and as 'biological supermarkets' because of the extensive food webs and rich biodiversity that they support (Mitsch and Gosselink, 1993).

The values and services that wetlands provide can be broadly categorised as:

– Functions: flood alleviation, erosion control, stream flow regulation, water storage, ground water recharge, retention of pollutants, water purification, nutrient cycling, exchange of water between the surface and the groundwater and the surface and the atmosphere.

– Products: fish, fuel wood, timber, fodder for domestic animals, habitat for wetland-dependant species, rich sediments used for agriculture in the floodplains, fibre for thatching roofs and handicrafts.

– Attributes: diversity of species, aesthetic beauty, cultural heritage, tourist attractions, recreation such as bird watching, sailing, education and archaeology.

Despite all these direct and indirect services, many wetlands have historically been considered as unproductive 'wasteland' swamps full of slimy creatures, harbouring diseases such as malaria, and *Schistosomiasis*. Indeed, it is this view that has led to the extensive drainage and conversion of wetlands. All this has been done in the name of improving public health, for intensive agricultural and fisheries production, or land reclamation for industrial or urban development.

Recently, however, the more wetlands that have been lost, the more society has begun to appreciate their benefits. There is now a growing awareness that many wetlands are more valuable in their natural, or only slightly modified state, than if drained, dyked or built upon. Many countries that have sought to prevent any further wetland loss or degradation, and promoted their sustainable use, exemplify the trend towards wetland conservation.

Towards that end, the Ramsar Convention on Wetlands of International Importance was put in place to promote the conservation of wetlands and their sustainable management. Since the Ramsar Convention promotes only those types of wetlands that fall within its criteria, wetlands that do not meet these criteria are left in a precarious situation. Ethiopia has not ratified the Ramsar Convention, and hence has not designated a single Ramsar Site. In addition, Ethiopia has also not ratified the African-Eurasian Migratory Waterbirds Agreement (AEWA), so the future for Ethiopia's wetlands and waterbirds is in some doubt.

Wetlands in Ethiopia

Because Ethiopia forms a watershed between the Mediterranean and the Indian Ocean, it is often referred to as the 'water tower of northeast Africa'. The western and northwestern parts of the country drain into the Mediterranean Sea via the Abay, Baro and Tekeze Rivers, while the eastern and southeastern parts of the country drain into the Indian Ocean via the Wabe Shebelle and Genale Rivers.

Because of its large lakes and rivers, different landforms and large size, Ethiopia is endowed with an array of different wetlands too numerous to be counted. Moreover, recurrent droughts, the need for electric power generation, reliable potable water supplies and irrigated agriculture for increased food production have all positively contributed towards the creation of additional wetlands in the country.

Given this, a surprising number of Ethiopians take it for granted that wetlands refer to visible water bodies such as lakes. Wetlands, such as swamps, marshes, floodplains, mudflats, etc, are considered unproductive and unhealthy 'wastelands'. The biodiversity component of these wetlands is never considered important. If the capacity were there, wetlands would probably be converted into other forms of land use.

Perhaps for these reasons, wetlands and their management are poorly addressed issues in Ethiopia. There is little or no awareness of the current status, threats or values of wetlands, or even the need for their conservation and sustainable utilisation. Although there are individuals in various organisations with some sort of wetland expertise and awareness, no coordination exists between these organizations for the conservation, management and wise use of wetlands in Ethiopia. At another scale, the mandates of stakeholder institutions to address wetland issues are not clearly defined. As a result,

there is no entry point for one to initiate any effective wetland undertaking at the moment.

The major gaps with regard to wetland issues in Ethiopia are summarised as follows:

- Lack of awareness of the wetlands concept: definitions, resource base (how much and where?), threats, traditional use and wise use of wetlands, their appropriate management and the need for their conservation.
- Insufficient resources: human resources, expertise/technical knowledge, financial, working documents such as manuals, guidelines, spreadsheets and tools, equipment, vehicles, etc. and capacity for research, data collection, information, networking documentation and communications.
- Lack of advocacy tools/documents that can give rise to the formulation of a wetlands policy, strategies, action plans and legal frameworks. There are no 'bargaining chips' with which to approach appropriate government bodies to take conservation action, or donors to solicit funding.
- Lack of a single focal institution/inter-ministerial steering committee that can serve as an entry point to initiate wetland conservation activities and advocacy roles.
- Lack of a sense of ownership/responsibility: the government is neither giving due attention nor allocating enough resources and support for wetland initiatives.

Although the mission and roles of each stakeholder with regard to the wetlands of the country is not clearly defined, there exist various government institutions that are directly or indirectly involved in wetlands-related activities. Paradoxically, the roles of many of these conflict and there is inadequate coordination and collaboration amongst them. Below, the major stakeholders and their roles in Ethiopia's wetlands are listed. The roles indicated should not be considered exhaustive, and are mentioned here only to provoke discussion.

Ministry of Water Resources

- Gives due attention mainly to major rivers, river basins and lakes.
- Involved in conversion and water works (dams, irrigation canals, drilling of wells).
- Development of drinking water supplies.
- Formulated a Water Policy that addresses wetlands very little.

Ministry of Agriculture

- Development of small dams and pans for domestic stock.
- Determines land-use planning.
- Conversion of wetlands into farmlands (drainage, micro-dam construction, development of pans and ponds).

Environmental Protection Authority

- Environmental Impact Assessment (EIA).
- Policy issues.

Ethiopian Electric Power Corporation
- Macro-dams (hydroelectric plants).
- Irrigated farms (adjacent to dams).

Ministry of Industry:
- Establishment of non-environmentally friendly industries, such as tanneries and textiles, on wetland edges.
- Pollution.

Ministry of Health
- Draining and spraying.

Investors
- Construction of industries, recreation centres, etc.
- Conversion and pollution.

Because of lack of awareness of the current status of wetlands, and the absence of any concerted conservation efforts, Ethiopian wetlands are threatened in the following ways:

Demographic Pressures

Cultivation, especially of green maize and vegetables, results in soil disturbance and reduces the ability of wetlands to control erosion. Intensive over-grazing and trampling results in the formation of gullies and dries out wetlands. Disturbance caused by human activities at the edges of wetlands hampers the breeding of wetland-dependent species. Occasional burning to clear land for agriculture and to prompt the new growth of reeds is a threat often encountered. Draining sites makes them unsuitable for wetland dependent-species and the wetland becomes less able to purify or store water or to regulate stream flow. Cutting grass for fodder, thatch and the construction of boats can reach critical levels if it is not carried out sustainably. Where population density is low, wetlands are used mainly as a source of reeds for thatching village huts. Changes in vegetation as a result of wetland drainage and cultivation are already having impacts through swamp reed shortages that now occur in some areas. These shortages have sometimes badly affected the swamp reed trade, and some communities have established rules to protect the last remaining areas of wetland because of the need for reeds.

Development Pressures

Wetlands are threatened by several development pressures including damming, which destroys habitats for wetland dependent-species. Wetlands may be modified for industrial and technical purposes and mining, e.g. the soda ash extraction plant at Lake Abijatta has a detrimental effect on the lake levels.

Pollution

The pollution of wetlands arises from human-induced activities and natural sources. The use of agricultural inputs, such as chemical fertilisers and herbicides, and pesticides (such as DDT) for malaria control schemes, can contribute towards the pollution of wetlands. Eutrophication, which occurs naturally in some lakes, results in animal

deaths. For example, over 2000 Lesser flamingos were found dead at Green Lake in 1995, an event attributed to the eutrophic conditions in the lake.

Mismanagement

The loss, destruction and siltation of habitats result from anthropogenic activities and can arise from over-grazing and agricultural practices in the water catchment of wetlands.

Weed Infestation

Alien plants compete with indigenous plants and destroy or alter the habitat of indigenous plants and animals. The Akaki Wetland near Addis Ababa has already been totally infested by water hyacinth and the surrounding mudflats, once heavily populated by waders, no longer attract these birds.

Avifauna and wetlands

Wetlands shelter countless species of fauna and flora, of which the most widely explored, scientifically studied and appreciated are the birds (Carp, 1980). Many wetlands are renowned because of their birdlife. Indeed, around 12% of all African bird species are found in and around wetlands (Mafabi, 1995). In Ethiopia, 204 (around 25%) of bird species are wetlands-dependent. Although many of these birds are known, much about their habitats remains uninvestigated.

There are two categories of waterbirds: wetland specialists and generalists. Specialists are those that nest, feed and roost in wetlands. Wetland specialists are wholly dependent on aquatic habitats, and cannot survive without them (Airinatwe, 1999). Examples are ducks, gulls, herons, waders, crakes, the Black-crowned crane, etc. Generalists are those birds that are frequently found in wetlands, but are sometimes seen in other habitats as well, such as ibises, herons, some weavers, warblers, plovers etc. Cranes, for example, are generally regarded as terrestrial birds, but breed exclusively in wetlands, especially favouring seasonal grass swamps. If their wetland habitat is lost, cranes will be driven to extinction. For this reason, two out of the six African crane species (the Wattled and Black-crowned cranes) are now endangered because of threats to their wetland habitats.

Waterfowl, wetlands and conservation

The Ramsar Convention defines waterfowl as bird species that are ecologically dependent upon wetlands (Rose and Scott, 1997). The waterfowl definition excludes kingfishers (*Alcedinidae*) and some birds of prey, and includes a few non-wetland species such as some seabirds and stone-curlews. The avian genera defined as waterfowl are *Gaviidae*, *Podicipedidae*, *Pelecanidae*, *Phalocrocoracidae*, *Anhingidae*, *Ardeidae*, *Balaenicipitidae*, *Scopidae*, *Ciconiidae*, *Threskiornithidae*, *Eurypygidae*, *Jacanidae*, *Rostratulidae*, *Dromadidae*, *Haematopodidae*, *Ibidorhynchidae*, *Recurvirostridae*, *Burhinidae*, *Glareolidae*, and *Charadriidae*.

Birds migrate in response to biological requirements, such as the need to find suitable locations for breeding and for raising their young, and to feed. Migratory birds are dependant on their destination sites and those located along the way (van Vessem,

1997). Waterfowl concentrations in wetlands can often reach spectacular proportions, and are one of the most obvious indicators of the richness, health and diversity of the wetlands they frequent. Furthermore, the long migrations of some waterfowl, and the fact that some species are the prized quarry of hunters, have made these birds a favoured subject for research, surveys, education and recreation throughout the world.

This clearly demonstrates that there must be international responsibility for their conservation, including the designation of an adequate network of the wetlands on which birds can depend in different seasons. Accordingly, experts on every continent contribute to coordinated waterfowl monitoring programmes, making waterfowl one of the most comprehensively studied groups of animals on Earth. It is hoped that by working closely together on an international level, we can best learn how to successfully manage our wetlands and the waterbirds that depend on them. This is particularly true for migratory waterbirds, which are the shared resources of many countries. Some of these migrants use Ethiopian wetlands as wintering grounds during the northern winter (from November to March). Other species, such as Lesser flamingo, Lesser moorhen, Glossy ibis, Cattle egret, etc. are intra-African migrants. The remainder are resident birds which reside in wetlands perennially.

Birds can be used as bio-indicators with which to identify wetlands of international importance. International action for wetland conservation started with birds and the Convention on Wetlands become internationally important in the conservation of waterfowl habitat (Mafabi, 1995). Birds are the sole cause for the formulation and development of the Ramsar and Bonn Conventions and the African-Eurasian Migratory Waterbirds Agreement (AEWA). The presence of birds contributes towards the designation of important sites for conservation, lending support to the Biodiversity Convention.

Habitat loss is the single biggest problem facing waterbirds. Other threats are disturbance and persecution. Persecution can be deliberate or accidental. Some agricultural communities consider waterbirds, such as ducks, geese and cranes, as crop pests, and seek to control them by killing them or trying to scare them away. These methods are not usually specific to the target bird species and hence many other birds may be adversely affected (Airinatwe, 1999). This is a significant threat, especially for the vulnerable Wattled crane. Another case of direct persecution is hunting for food, although luckily this is comparatively insignificant in Ethiopia compared to other countries.

Accidental persecution occurs mainly as a result of chemical poisoning and fishing. Some fish-eating birds, for example, get entangled in fishermen's nets. This is a significant cause of mortality for pelicans, the Great crested grebe (*Podiceps cristatus*) and the African darter (*Anhinga melanogaster*) (Airinatwe, 1999).

The conservation of waterfowl poses many challenges. Many species are migratory, and therefore require a network of wetlands throughout their 'flyway' in order to complete their annual cycle. In addition, they often congregate in large numbers in relatively small, but vital wetlands at certain times of the year, making their populations vulnerable if these sites become threatened. Waterfowl are also vulnerable to human activities, including hunting, and suffer from pollution, habitat loss or disturbance. This means that their populations can be monitored as indicators of the health and quality of

the environment. Additional reasons for conserving waterfowl populations are that they are a spectacular and popular wildlife resource. In some countries (developed and developing) they are also an important economic resource either through sport or subsistence hunting or through tourism.

For these reasons, it is important to have a good base of information about the distribution and status of waterfowl populations, so that conservation measures can be formulated and necessary actions taken in appropriate time if a species or a site comes under threat. The need for international co-operation in collecting such information is essential, since many species migrate between different countries.

The mechanism for achieving this exists in the International Waterfowl Census (IWC), a programme of waterfowl counts co-ordinated by Wetlands International (Rose, 1990). The counts are carried out in mid-winter, when populations of migratory waterfowl are relatively stable and concentrated into discrete areas of wetland habitat where they can be counted most easily. A network of volunteers from over 100 countries, including ornithologists and conservationists, undertake the counts. Thousands of highly competent amateur observers also offer to count them regularly. Site/regional co-ordinators that liase closely with Wetlands International usually organise the counts. Counts are collected at the level of individual wetlands, and then summarised by country, flyway or continent. The major aims of the IWC include the following:

– Gathering information on the distribution and abundance of waterfowl at the level of individual sites, regions and flyways, so as to contribute information to enhance the conservation of waterfowl populations and their wetland habitats.

– Monitoring trends in the size of waterfowl populations in order to detect ecological problems and find solutions before species or wetlands become irreversibly affected.

– Promoting awareness of the aesthetic and economic values of waterfowl and their wetland habitats so as to enhance their conservation.

As an integral part of the IWC, Wetlands International initiated the African Waterfowl Census (AfWC) in 1991, which has been conducted in Ethiopia annually ever since. The first six counts were co-ordinated by an expatriate volunteer and since then by the Ethiopian Wildlife and Natural History Society (EWNHS). A staff member of the Society, who has been designated as national co-ordinator for the counts, implements the programme with voluntary and collaborative assistance secured from within and outside the country. Counts occur in January and February and compiled data are forwarded to the Wetlands International Africa Regional Office based in Dakar, Senegal. Table 2 below summarises the data gathered during AfWC 2000.

The Important Bird Areas (IBAs) of Ethiopia

An additional and vital tool for the conservation of waterfowl and their wetland habitats are Important Bird Area (IBA) designations. IBAs are:

– Places of international significance for the conservation of birds at global, regional and sub-regional levels.

– Sites exceptionally important for birds – bird 'hotspots'.

– Sites that are important for non-bird biodiversity - biodiversity 'hotspots' (although, it should be noted, a site's designation as a biodiversity hotspot is not necessarily sufficient for it to qualify as an IBA).

Table 2: Summary of bird species counted in Ethiopia during AfWC 2000

No.	Site Name	Survey Date	# of species	# water-fowl spp.	Total # of waterfowl
1.	Lake Abijatta	22/01/00	51	44	31,119
2.	Akaki Wetland	15/01/00	62	43	11,364
3.	Lake Ardibu	22/12/99	73	39	962
4.	Areket Swamp	30/01/00	54	36	3,383
5.	Lake Ashenge	25/12/99	69	38	6,501
6.	Lake Awassa	26/01/00	159	84	14,462
7.	Babo Gaya Swamp	16/01/00	60	42	3,929
8.	Berga Floodplain	14/01/00	57	21	672
9.	Borkena Marsh	20/12/99	117	49	1,915
10.	Boyo Wetland	29/01/00	78	43	1,802
11.	Chelekleka Swamp	16/01/00	74	45	2,786
12.	Lake Chitu	28/01/00	47	13	55,826
13.	Green Lake	17/01/00	65	20	1,151
14.	Gudo Flood plain	13/01/00	41	25	913
15.	Lake Hayk	23/12/99	92	38	1,682
16.	Infranz Wetland	01/01/00	84	32	490
17.	Koka Dam	18/01/00	111	53	3,596
18.	Kurt Bahir Swamp	03/01/00	74	29	686
19.	Lake Langano	23/01/00	69	39	1,101
20.	Shesher-Wollala Swamp	29/12/99	98	62	16,761
21.	Tikurit Marsh	02/01/00	95	38	537
22.	Tikur Wuha	27/01/00	95	30	308
23.	Yiganda Marsh	31/12/99	108	35	925
24.	Wagetera Swamp	28/12/99	67	34	13,000
25.	Lake Ziway	20/01/00	125	58	1,855

The use of IBAs as a conservation tool has been developed by Birdlife International, which is represented in over 100 countries worldwide. In Ethiopia, its partner organisation is the Ethiopian Wildlife and Natural History Society.

IBAs are selected using standardised and internationally accepted criteria, which preferably include existing protected area networks where appropriate. If sites are meant for migrant birds, they should provide for the birds' requirements for the duration of their presence. To qualify as IBAs, sites must have species that are globally threatened, with a very small world range and/or concentrations confined to particular habitat types (notably wetlands).

The IBA programme was initiated in Europe in 1985 and extended to the Middle East. Since the end of 1994, it has been underway in Africa, and Ethiopia was one of the first African nations to begin the work of identifying IBAs. This work began in 1995 and culminated at the end of 1996 with the production of a first inventory in 1995 (Tilahun *et al*, 1996). The second phase of the IBA programme is underway with funding secured from GEF/UNDP for the period 1998 – 2002.

IBAs form habitats for Ethiopia's endemic and globally threatened species and are used by wetland congregatory species. They also act as flyways and wintering grounds for Palearctic, Eurasian and intra-African migrants. From a conservation point of view, the IBA network could ensure the survival of a correspondingly large number of other taxa in the region. Planners and/or decision-makers can use data collected through the IBA process for setting priorities for conservation action. This is relevant where the effective targeting of funds is necessary for various conservation purposes, including the gazettement of sites. Information gathered during the process can assist in advocacy work, promote awareness programmes, build upon an internationally accessible database, provide guidance for the development of policies and act as a tool for promoting conservation priorities to governments, donors and NGOs.

Ethiopian IBAs and wetlands

In Ethiopia, a total of 73 hotspots have been identified as Important Bird Areas (IBAs). 30 of these sites (41% of the total) comprise wetlands, while the rest are representative of other types of ecosystems, indicating the importance of wetlands as bird habitats. Nationally, Ethiopian IBA sites have been grouped into three conservation categories: critical (19), urgent (23) and high (31). Table 3 depicts the relationship between IBAs, wetlands and their conservation status.

Amongst other things, wetland ecosystems provide shelter to the following categories of bird species of Ethiopia:

Endemic

- Spot-breasted plover (*Vanellus melanocephalus*)
- Blue-winged goose (*Cyanochen cyanopterus*)
- Rouget's rail (*Rougetius rougettii*)

Table 3: The relationship between IBAs, wetlands and their conservation status

IBA Site Categories	Total	%	Wetland IBAs	%
Critical	19	26.03	4	13.33
Urgent	23	31.51	12	40.00
High	31	42.46	14	46.67
Total	**73**	**100.00**	**30**	**100.00**

Globally Endangered Species

– White-winged flufftail (*Sarothrura ayresii*)

Vulnerable Species

– Wattled crane (*Bugeranus carunculatus*)
– Corn crake (*Crex crex*)

Near-threatened Species

– Blue-winged goose (*Cyanochen cyanopterus*)
– Ferruginous duck (*Aythya nyroca)*
– Lesser flamingo (*Phoeniconaias minor*)
– Black-crowned crane (*Balearica pavonina)*
– Rouget's rail (*Rougetius rougettii*)
– Great snipe (*Gallinago media*)
– African skimmer (*Rynchops flavirostris)*
– Basra reed warbler (*Acrocephalus griseldis*)

Data deficient Species

Black-winged pratincole (*Glareola nordmanni*)

Recommendations and conclusions

As Ethiopia still needs to make progress addressing wetland issues, it is recommended that the following activities take place in the very near future:

Raise Public Awareness

In order to alert the public to the values and functions of wetlands and the need for their wise use, a series of public awareness campaigns are needed. These should include the production and distribution of awareness materials (posters, leaflets and fact sheets), involve the mass media to carry features on wetlands and conduct a series of awareness-raising seminars and workshops.

Play Advocacy Roles

Develop a national policy and legal framework for the conservation, management and wise use of wetlands, ratify conventions and agreements on waterfowl and wetlands of international importance, promote the wise use of wetlands, create wetland reserves, and liase with other parties on issues of wetland conservation.

Assessment of Wetlands Resource Base

Conduct surveys and compile a preliminary inventory of wetlands, that is, develop a computer database for sites in the inventory.

Prepare an action plan

An action plan for wetlands should be prepared that considers, amongst others, the identification of areas important for biological diversity, unique flora and fauna, endangered species, or those that are of national or international importance and make recommendations for their protection (through law enforcement). The plan should also seek the improved management of wetlands so that the various uses can be retained without conflict. An increasingly vital aspect is the participatory approach, which seeks to involve and directly benefit local people in wetlands conservation. If this is not achieved, conservation objectives will be unattainable, especially in Ethiopia, with its alarming human population growth rate. Last but not least, rehabilitation activities in water catchment areas will ensure that functions and benefits from wetland resources are maintained well into the future.

Conduct Research and Monitoring at selected wetlands

Identify and prioritise wetlands for research and monitoring activities. Involve the site-adjacent community in the research and monitoring activities to make them aware of the importance of the target wetlands. Incorporate the outputs of the research and monitoring into existing community traditional knowledge to come up with wetland management plans.

A Focal Institution for wetlands

This institution could be a government body or made up of a number of different bodies in the form of a national steering committee. Its task will be to lead the cause for wetlands in the country and, amongst other things, will look at issues of wise use, management, research, monitoring and networking.

Wetlands occupy less than 7% of the earth's surface, but their importance is disproportionately much greater. Wetlands are often shared by different countries making them inherently international in scope. As a result, a collective, collaborative approach is essential if efforts for their conservation are to succeed (Wetlands International, 1998). Although wetlands management and conservation are local issues, most waterbirds use many wetlands, travelling between local wetlands and across national boundaries during the course of their annual cycle. So how do we match the need for the wise use of local wetlands with those of internationally migrating birds? The big challenge is to identify best practice approaches and priorities for the conservation of waterbirds and their wetland habitats within the overall context of sustainable development.

References

Airinatwe. J. 1999. Wetlands and Waterbird Conservation in East Africa: Strategies for Conserving Migratory Waterbirds. *Wetlands International Publication* No. 55. Wageningen, The Netherlands 71pp.

Barbier, E. B., M. C. Acreman, and D. Knowler 1996. *Economic Valuation of Wetlands: A guide for Policy-makers and Planners.* Ramsar Convention Bureau. Gland, Switzerland 127pp.

Carp, E. 1980. *A Directory Western Palearctic Wetlands.* Compiled for UNEP, Nairobi, Kenya and IUCN, Gland, Switzerland 506pp.

Mafabi, P. 1995. Wetlands and their Wildlife. *Swara* 18 (1): 36

Mitsch, W. J. and J. G. Gosselink. 1993. *Wetlands.* 2nd Edition. Van Nostrand Reinhold, New York, U.S.A. 537pp.

Ramsar Convention Bureau, 1997. *The Ramsar Convention Manual: A Guide to the Convention on Wetlands* (Ramsar, Iran, 1971), 2nd ed. Ramsar Convention. RCB, The Gland 170pp

Rose, P. 1990. *Manual for International Waterfowl Census Coordinators*. The International Waterfowl and Wetlands Research Bureau, Slimbridge, Gloucester, England. 30pp.

Rose, P. M. and D. A. Scott, 1997. Waterfowl Population Estimates. 2nd Edition. *Wetlands International Publication* No. 44. Wageningen, The Netherlands. 106pp.

Scott, D. A. 1989. Design of Wetland Data Sheet for Database on Ramsar Sites. A Report to the Ramsar Convention Bureau. Gland, Switzerland. Mimeograph.

Tilahun, S., S. Edwards and T. B. Gebre Egziabher (eds.) 1996. *Important Bird Areas of Ethiopia: A first inventory*. Ethiopian Wildlife and Natural History Society, Addis Ababa. 300pp.

Wetlands International. 1998. Wetlands: A Source of Life. Wetlands International. Brochure prepared for the 2nd International Conference on Wetlands, 7-14 Nov. 1998, Dakar, Senegal.

van Vessem, J. (ed.) 1997. *Determining Priorities for Waterbird and Wetland Conservation.* Proceedings of Workshop IV of the International Conference on Wetlands and Development 9 - 13 October 1995, Kuala Lumpur, Malaysia. Wageningen, The Netherlands, Wetlands International.

Wetlands research in south-western Ethiopia: the experience of the Ethiopian Wetlands Research Programme

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Introduction

Over the last three years, the Ethiopian Wetlands Research Programme (EWRP) has carried out research on the wetlands of south-western Ethiopia. The EWRP was established in 1997 by the Huddersfield University (UK) in collaboration with Addis Ababa University, and with technical support from the IUCN's East African Regional Office and the University of East Anglia (UK). The programme was financed by the European Commission with additional contributions from Huddersfield University.

The EWRP's field offices are based in Metu, in the Illubabor Zone of Oromia Region, 600 km southwest of Addis Ababa. The programme has carried out various types of research into the valley bottom wetlands of Illubabor, and has undertaken awareness creation with local communities, governmental organisations and NGO staff. After three years of work, the programme is finalising its activities.

The overall objective of this first phase of the EWRP was "to contribute to the sustainable management of wetlands in Illubabor Zone, south-western Ethiopia" (Wood, 1996). The six specific objectives of the first phase were to:

- identify the nature, extent and trends in drainage and the use of wetlands;
- assess the ecological impacts of different types of wetland use and drainage, including changes to hydrology, pedology and biodiversity;
- identify and assess local socio-economic processes leading to changing wetland uses;
- building on the existing indigenous knowledge where appropriate, identify management practices which will ensure the sustainable use of wetlands;
- disseminate an understanding of wetland dynamics and sustainable management practices, and support the development of a local monitoring and management capacity;
- at regional, national and wider levels, contribute material to debate on policies which impact upon wetlands.

This paper outlines the methodology and research approaches adopted by the EWRP to undertake this work and summarises the research findings and outputs achieved under each objective.

The research approach of the EWRP

A range of different research approaches and techniques were adopted by the EWRP, and synchronised to investigate the current status of Illubabor's wetlands. The research approach was distinctive in that it tried to bring researchers from different disciplines together and to integrate their efforts to arrive at a conclusive output. The various approaches used included detailed case studies, the use of Participatory Rural Appraisal techniques to support scientific work, paying attention to indigenous knowledge and linking research work with information dissemination and incorporating policy research.

Researchers from a whole range of backgrounds, such as hydrology, pedology, biodiversity, socio-economics, natural resources and policy, undertook this work. Because wetland use and change is the result of the complex interactions between and within human and environmental systems, it was necessary to involve this range of disciplines. Most research on wetlands does not integrate a wide range of disciplines and pays little attention to local knowledge. As a result, the EWRP was considered a pioneering project in the region (Howard, 1998, pers. comm.).

On the environmental side of the programme, there were three activities: hydrological monitoring and analysis, biodiversity assessment and analysis and pedological analysis. There were also three major socio-economic activities: socio-economic surveys, PRAs and policy analysis.

The programme recognised the importance of local knowledge in all aspects of its work. Local communities know their environment well, having lived there for generations, observed the seasons and understood the environmental and social processes that take place. Some communities have exploited wetlands continually for centuries. Through this long-term utilisation, a body of local knowledge has evolved that guides the use of the wetlands. Thus, the investigation of this knowledge was given paramount importance by the EWRP and investigated in depth. PRA tools and discussions with the farming community were used extensively to investigate this local knowledge.

PRA tools also complemented and supported formal social science field surveys. Even the environmental monitoring work was supplemented with PRA methods in the field to explore local environmental knowledge, management practices and skills. These PRAs generated a lot of practical information that supplemented scientific knowledge and helped researchers to understand the complex issues of wetland use and management.

The programme used two different survey approaches: detailed case studies and zone-wide surveys. 'Core sites' were selected for detailed scientific and socio-economic monitoring. The zone-wide survey was undertaken to understand broader trends in wetland use and to provide a context within which to place and interpret core site findings.

The nature, extent and trends in wetland drainage and use in Illubabor Zone

Government staff and knowledgeable farmers were interviewed in all of Illubabor Zone's *woredas* so as to gather data from a variety of sources on wetland use and history. Data were derived from current and past reports, and PRA meetings were held to investigate the history and influences on land use change, especially wetland use. Within the project's focal area (including core sites), detailed land use mapping was undertaken and digitised using aerial photographs from 1982 and 1996.

Illubabor covers 226.7 km^2 of which 1.4% is covered by swamps and marshy wetlands. If floodplains and seasonally flooded grassland are included, the total wetland area of Illubabor is estimated to cover 4 - 5% of the zone. Out of the total of 375 *kebeles*[3] found within the eleven *woredas* of Illubabor, 325 have wetlands (Hailu 1998: 27).

Wetlands are a small but significant part of the resource base in Illubabor. Virtually every household in one way or another uses them, directly or indirectly (Table 4).

Table 4: Wetland uses in Illubabor

Use	Estimated proportion of households
Social/ceremonial use of reeds (including urban dwellers)	100%
Medicinal plants	100%
Thatching reeds for house construction	85%
Thatching reeds for granary roofing	>50%
Domestic water from springs	50%
Dry season grazing	>30%
Water for livestock	>30%
Temporary crop-guarding huts of reeds	30%
Cultivation	10%
Craft materials	5%

Other minor uses include establishing coffee and tree nurseries on wetland fringes, clay collection for making pottery and use of bark from wetland trees for making ropes. In addition, some wetland plants, such as '*enna*' (*Aeschynomene schimperi*), are used as animal feed, while others are used for human food, such as palm trees (*Triestemma auritanum*) (Hailu and Abbot; 1998, Hailu, 1999).

Environmental monitoring was undertaken in eight wetlands, focusing on hydrology, biodiversity and pedology. The characteristics of the eight wetlands studied are summarised in Table 5.

[3] A '*kebele*' is the smallest Ethiopian administrative unit, and comprises a number of households.

Hydrology

The EWRP hydrological monitoring programme consisted of weekly measurements of ground water levels using dipwells located throughout the wetland study sites, weekly measurements of water chemistry (pH and electrical conductivity) and monthly measurements of nitrate and phosphate concentrations. Water chemistry was measured at the source and outlet of the wetlands. Hydraulic conductivity was also studied to explore the rate at which water flowed through the wetland soils.

Table 5. Study sites and their development stages (Source: Dixon, 1997)

Wetland	**Category**	**Description**
Chebere	Pristine (little human interference)	No drainage or crop cultivation on site, natural vegetation, reed harvesting available.
Wangenye and Kowna Chatu	Partially cultivated	Some areas undergoing drainage and cultivation, natural vegetation present.
Bake Chora, Dizi and Supe	Fully cultivated	Whole wetland drained and cultivated
Hurumu	Degraded	Previously cultivated and drained but now mostly abandoned. Characteristic grassland with occasional natural vegetation.
Tulube	Rehabilitated	Previously cultivated and drained but exhibiting original natural vegetation

The water table in the wetlands is influenced by rainfall, development or management. The water table levels in the wetlands declined steadily from the wettest period in July and August, through to April. With increasing rainfall in April/May, the water table level rose rapidly to its average wet season level within a short period of time (Conway and Dixon, 1999). Less disturbed wetlands possessed generally higher and more uniform water table levels, whilst disturbed wetlands had lower and more variable water tables. The disturbed sites exhibited much greater dispersion in their range of values over the years and possessed lower absolute water table levels than undisturbed sites. In addition, on no occasion in the disturbed sites did the mean weekly water table level rise above the surface (Conway and Dixon, 2000).

Hydraulic conductivity was higher in less disturbed sites and water levels recovered instantly when water was removed from a dipwell by suction. In significantly changed or modified wetlands, hydraulic conductivity was low (Conway and Dixon, 2000).

In terms of water pH and electrical conductivity, no significant variation was recorded between disturbed and natural wetlands. Temporal variations in pH values were, however, observed with values declining between May and November.

The study of nitrate and phosphate concentrations in the wetland sites revealed higher phosphate values than nitrate values. There was no significant difference in the concentration of either nitrate or phosphate between modified and non-modified wetlands (Conway and Dixon, 2000).

Pedology

Major pedology activities undertaken included surveys of the soil variations within the wetlands, between the wetlands and uplands, laboratory analysis of soil samples and indigenous knowledge assessment through PRA discussions in all core sites.

The dominant wetland soils of central Illubabor were identified as umbric gleysols, gleyic luvisols and gleyic alisols (Asmamaw, 1998; Belay, 1999; Solomon, 1998; Yizelkal, 1998). These soils had formed on alluvial sediments that were derived from basaltic rocks on the adjacent slopes. The soil profiles were generally marked by abrupt horizon boundaries and sharply contrasting colours. Almost all the soils described in the wetlands had matrices that were free of stones confirming the alluvial origin of the parent materials. The texture of the soil fraction was generally clay, although the soils also included a considerable presence of silt. The better-drained wetland soils generally developed vertic properties during the dry seasons, when cracks opened up to 3 cm wide and the fissures extended to depths of 60 cm, suggesting the presence of smectite clay. All of the wetland soils were salt-free and their reactions were strongly to very strongly acidic. Organic carbon and nitrogen content was generally high, but showed a considerable decline with cultivation. The available phosphorous in these soils was mostly very low. The nutrient storing and exchanging capacity of the soils ranged from very high to high levels apparently because of their variable content of semectite and kaolinite clay minerals.

The local farmers referred to wet soils as '*cheffe*' after the local name for the predominant type of wetland vegetation. They also identified two *cheffe* sub-units on the basis of depth - a shallow (less than a cubit) and a deep (greater than a cubit). They also identified two soil horizons within each one of these soil sub-units - the '*guracha*' ('dark') layer constituting the topsoil, and the '*daleti*' ('grey') constituting the sub soil. Farmers invariably agreed that the sub-soil was inferior in quality and productivity when compared to the top soil. They also reported that, with cultivation, the dark colour of the topsoil usually changed in time to a greyish shade reflecting fertility loss. They noted that such a change in soil quality was usually followed by a change to the types of weeds that grew on cultivated wetlands. They also pointed out, however, that loss in productivity of wetland soils did not proceed very far because the soils were constantly rejuvenated by the inflow of fertile materials from the super-adjacent slopes (Belay, 1999).

Newly drained and cultivated wetlands were invariably rich in organic matter. In time, these soils lost their organic matter content with subsequent loss of productivity and quality. Farmers also burnt weeds and crop residue prior to cultivation, although in the long-term this leads to a decline in organic matter. After cultivation, the only other change to soil properties identified was an increase in bulk density.

Biodiversity

Vegetation sampling was undertaken in the core study wetlands during the dry and wet seasons. Further sampling was conducted outside the study wetlands in Bure, Bedele and Ale Didu *woredas*. Samples were collected following a moisture gradient transect using both purposive and random sampling. A total of 19 transects and 185 quadrat samples were placed and information gathered. In each sample plot, all vascular plant

species were recorded and the percentage aerial cover and abundance of each species estimated. Further biomass sampling was undertaken in smaller quadrats ($1m^2$) for the identification of communities in core study sites.

A bird species survey was undertaken in core wetland sites and both wetland and non-wetland dependent bird species recorded. Habitat classification of the seven study wetlands was also undertaken. Using PRA techniques, local indigenous knowledge on the use and classification of wetland vegetation was investigated.

The inventory of the wetland plants yielded ninety-five species of plant. Ninety of these were identified and the rest are pending identification. Ninety-three of the species were emergent macrophytes, one a submerged plant (*Ottelia ulvifolia*) and another, still pending identification, was a floating, leafed plant. All plants collected from the study sites were classified into wetland-dependent, wetland-associated and non-wetland species. There were twenty-seven wetland-dependent fifty-one wetland-associated seven non-wetland dependent species (Woldu and Kumelachew, 1999; Woldu and Yeshitela, this volume).

Seventy-two species of vascular plants, belonging to twenty-eight families, were registered in the seven core wetlands studied in the end-of-wet season sampling. The families *Poaceae* and *Cyperaceae* had the highest number of species. In contrast, forty-four species of vascular plants belonging to twenty-two families were recorded from the five core sites studied during the dry season (Woldu, 2000).

In the wet and dry seasons, six community groups were identified. The study revealed that in relatively pristine wetlands, various wetland-dependent plants with a higher potential for water tolerance dominated. With long-term drainage and cultivation, non-wetland species started to invade the wetland. Plant species unable to withstand this competition usually disappeared. General increases to plant diversity reduced the diversity of wetland plant species, replacing them with more common meadow grasses and weeds common to cultivated areas.

The effect of grazing and biomass harvesting on habitats and plant species was not as drastic as cultivation, with a gradual shift in species composition. The biodiversity study indicated, however, that those wetlands grazed for a long period of time tended to be more similar to degraded and drained wetlands than to pristine ones.

A total of ninety-two species of birds from forty families were recorded for all sites. Out of the total forty-eight Afrotropical birds in Ethiopia, seventeen (35.4%) species were recorded from the study sites. There were also three endemic and five near-endemic bird species (Taddesse, 1999).

Farm decision-making and socio-economic processes

PRAs surveys were used to identify key issues in all study areas. During the two working seasons of the project, 78 PRA sessions, involving more than 1,000 farmers, were undertaken. The PRA surveys explored farmers' perceptions of wetland use and management. Particular emphasis was placed on local systems of wetland management and the institutional arrangements and management capacity of local communities.

A conventional questionnaire survey involving 1,120 farm households explored key issues needing quantitative data. The data gathered using the survey was analysed and

compared with that generated using the PRA techniques. The results from the questionnaire survey and the PRA sessions were found to be complementary in most cases.

The major findings in this study are divided into two categories. The first reveals the socio-economic determinants that influence wetland use, while the second relates to local institutions, institutional arrangements and the managerial capacity of local communities.

According to the local farmers, wetland cultivation in the region started during the era of Dejazmach Geneme (1911-1918), principally to ensure food availability in the traditionally grain-deficit summer months. Key informants reported that in those days, peasant death from starvation was common in the summer months and it was this problem that prompted Dejazmach Geneme to order the beginning of wetland cultivation. Coupled with this, coffee production started in the zone at about the same time, thereby making it necessary to expand cultivation to wetlands as more and more upslope land was taken for coffee (Solomon, 1999). Approximately 20% of the total wetlands in Illubabor have been cultivated each year between 1986 and 1998 (Hailu, 1998). The latest information from the Zonal Agricultural Office indicates that approximately 7,100 ha of wetland had been cultivated by 1999, representing 35% of the total valley bottom wetland area (Illubabor Zone Department of Agriculture, 1999). Maize is the dominant crop.

Both the PRA and questionnaire surveys determined that it was mainly the wealthier members of the sample *kebeles* that engaged in wetland cultivation rather than the poor peasants (see Wood, this volume). The economically better-off members of the community were better able to carry out wetland cultivation, not only because they had claimed land in the wetlands, but also because they could deploy adequate labour both for cultivation and for crop guarding (Hailu and Abbot, 1998; Hailu, 1998; Solomon, 1999).

Four community institutions that operated in the past and, in some cases, continue to operate, were identified using PRA tools and case studies. These included reciprocal labour institutions, socio-cultural/traditional institutions, neo-political institutions and indigenous community management institutions (Abbot and Hailu, 1999). Each of these institutions had their own functions and acceptance within the local communities. Reciprocal labour institutions identified during the assessment were called, amongst others, '*dado*' '*debo*' and '*jige*'.

Socio-cultural/traditional institutions involved the '*gada*' system, brought by Oromo settlers from the east 150 - 200 years ago. The *gada* system consists of a series of administrative systems (*Abba Laga*, *Abba Ganda*, *Tulla*, *Shennie* and *Eder*), each of which had different roles within the community. At present, the *gada* system no longer operates in Illubabor, but the *Tulla* and *Eder* are still popular and respected institutions within the community.

Neo-political institutions comprised the *kebele* and the *shennie* of which the latter was once part of the *gada* system. These institutions currently form part of the government administrative system and are responsible for the day-to-day running of activities within their jurisdiction.

In Gechi-Borecha *Woreda*, there exists a functioning wetland labour-management institution (the Wetland Cultivation Co-ordination Committee), which is based on the traditional administrative *Abba Laga* system.

In summary, some of those institutions that command the respect and support of the community are potentially important for natural resources management and should be supported and encouraged.

Appropriate management technologies

A thorough investigation was undertaken within the study sites and more widely to identify practices relating to wetland management. Different management practices relating to resource management were identified, recorded and analysed. Study sites included:

- sites of good management where sustainable use appeared to occur;
- sites of poor management where degradation appeared to occur;
- rehabilitation sites where interventions had been undertaken to try to regenerate degraded wetlands.

Discussions were held with farmers' groups on different issues relating to:

- local understandings of different management practices;
- the success or failure of practices in achieving sustainability;
- the pressures on farmers which lead to the use of different practices.

With the help of PRA tools, intensive case studies and thorough discussions with key informants, a wide body of indigenous knowledge was explored which could assist sustainable wetland management in the future. Using local knowledge, some communities in Illubabor were able to successfully managed their wetlands without degradation. This knowledge could be synchronised with scientific findings and used for future extension work, and even to reverse wetland degradation.

Training and dissemination of technologies

The objective of this project activity was to "develop capacity within communities, local authorities and development organisations working in Illubabor to address wetland management issues." It was planned "to develop wetland management and monitoring capacity in farming communities, government and NGO staff and researcher organisations," this being achieved through "research, field discussions, training and workshops, and the production of extension materials which allow easy understanding and application by all wetland users" (Wood, 1996).

Because of the limited national sensitivity to wetlands, the project has also been involved in various types of awareness raising activities, and not just the dissemination of project findings. Nevertheless, within the project life the following activities were accomplished in order to disseminate information and build capacity for sustainable wetland management in south-western Ethiopia:

- information dissemination through meetings and workshops;
- research training informally and through training courses and workshops;
- production and circulation of training and extension material;
- presentation of papers and posters at national and international meetings;

– preparation and publication of research and extension material and their dissemination.

The diverse beneficiaries of these various activities have included over 1,548 farmers, 55 *kebele* leaders, 157 *woreda* agricultural staff, 9 zonal officials from a variety of ministries and many others (EWRP, 2000).

The overall impacts of these activities has been:
– improved capacity for wetland management and training within Illubabor and at the national level amongst a range of beneficiaries from farmers to government officials
– a higher level of awareness in Ethiopia and internationally about Ethiopia's wetland issues
– availability of research, extension and policy briefing materials for use in Illubabor, nationally and internationally

Policy

The research undertaken by the EWRP has shown that there is little attention given specifically to wetlands in Ethiopian government policies and legislation (although see the discussion in Fisseha's and Mesfin's papers, this volume). The Conservation Strategy of Ethiopia does identify wetlands as an important facet of the environment but generally emphasises their importance in terms of the role they play in the hydrological cycle. The recent Water Resources Policy is reported to make no mention of wetlands. In other words, wetlands are small ecosystems which to date have not attracted much attention. Policies are instead developed for major ecosystems and their resources, such as forests, agricultural land and grazing land.

It is only at lower, community, levels that there is evidence of policies specifically designed for wetlands. This seems to be increasingly common as pressures on resources increase and by-laws are developed, for instance to protect wetlands for reed production or cultivation rather than allowing access to be opened to cattle grazing. Similarly, some NGOs have identified wetlands as key resources and have developed policies to support the communities using them as an alternative to forest clearance (Wood, 1999).

It is, however, clear that wetlands have been indirectly affected by a range of Ethiopian government policies. In many of these cases, it appears to be by chance that these policies have had an impact on wetlands (Wood, 1999). Some of the policies adopted by the Dergue Regime that directly or indirectly affected wetlands include land tenure, the 'green revolution', settlement, villagisation, surplus producers, *woredas* and coffee expansion. At present, the Extension Package Policy and the Wetland Task Force mission are the other activities that have a direct impact on wetlands. Furthermore, community policies that have had impacts on wetland management in the past still do so at present.

Threats to wetlands

In Illubabor, wetlands have traditionally been used for harvesting reeds for the roofs of rural houses ('*tukuls*'). In addition, these wetlands have increasingly been used for agriculture ever since the reign of Melenik II. Since the Dergue Regime, approximately

one third of the total valley bottom wetland area has come under cultivation for growing food crops at one time or another (Hailu, 1998).

The complete drainage of wetlands has lead to a number of ecological and economic problems. Some of these are immediate and clearly linked to drainage, such as the scarcity of thatching reeds, vegetation change, lowered water tables and reduced access to drinking water (Wood, 1996). Other problems are more complex and long-term, such as declining agricultural productivity, reduced availability of land for 'hungry season' crops, increased fluctuations in stream flow, reduced water quality and downstream hydrological impacts.

Eucalyptus, banana, sugarcane, and '*chatt*' cultivation on the edges of wetlands, and teff ('*debi*') cropping in wetlands, has been identified as a threat for the survival of these areas. Farmers are of the opinion that the cultivation of these crops and trees on the wetland edge is responsible for their drying out.

Grazing by domestic stock has also been identified as a threat to wetlands. When grazing follows continuous cultivation, wetlands easily become degraded and lose their natural characteristics. Livestock trample the soil and compact it and their grazing destroys natural vegetation. They erode drainage channels leading to gullies and increase water outflow. These effects often result in the complete degradation of wetlands by reducing the water table and by changing the original vegetation.

Conclusions

Although the research work undertaken by the EWRP has been able to generate a wide range of information on some wetlands in the south-western highlands, this is not sufficient to answer all the problems facing the country's wetland resources. Further research work is vital in the wetland field to strengthen what has been done and to add to the body of knowledge already explored. Only then can we develop findings that can respond to future challenges. In addition, the research work of the EWRP was focused on the study of Illubabor's valley bottom wetlands, specifically on marsh and swampy wetlands. There is a considerable range and diversity of wetland types in the country and all should be studied in depth.

The approaches and the methodology that have been used by EWRP for investigating wetland issues have proved to be effective in meeting research needs and generating an enormous quantity of scientific information and data on local community perspectives.

References

Abbot, P. G. and A. Hailu, 1999. *Institutional arrangement for wetland management in Illubabor*. A paper presented at the National Workshop on Sustainable Wetland Management, Addis Ababa, 13th December 1999. Ethiopian Wetlands Research Project.

Asmamaw, L. 1998. *Soils, soil degradation and soil management systems in and around Chebere wetland, Illubabor, Ethiopia*. A thesis presented to the School of Graduate Studies, Addis Ababa University. Addis Ababa, Ethiopia.

Belay T. 1999. (with a contribution from Solomon Tekalign). *Characterisation and management of wetland soils of Metu Area, Illubabor Zone, Oromia Region.* A paper presented at the National Workshop on Sustainable Wetland Management, Addis Ababa, 13th December 1999. Ethiopian Wetlands Research Project, Metu, Illubabor.

Conway, D. and A. B. Dixon. 1999. *The hydrological monitoring programme*. A paper presented at the National Workshop on Sustainable Wetland Management, Addis Ababa, Ethiopia, 13th December 1999. Ethiopian Wetlands Research Project, Metu, Illubabor.

Conway, D. and A. B. Dixon. 2000. *Ethiopian Wetlands Research Programme – Hydrology.* Final report, Ethiopian Wetlands Research Project and Huddersfield University, Metu, Illubabor, Ethiopia and Huddersfield University, UK.

Dixon, A. B. 1997. *The sustainable hydrological management of valley bottom wetlands in Illubabor, South-west Ethiopia*. A report prepared in support of the application for transfer of registration from Master of Philosophy to Doctor of Philosophy, December 1997. Huddersfield University, UK.

EWRP, 2000. *Training and dissemination of technologies to develop wetland management and monitoring capacity for sustainable wetland management*. A draft final report for the objective. Ethiopian Wetlands Research Project, Metu, Illubabor.

Hailu, A. 1998. *An overview of wetland use in Illubabor Zone, South-western Ethiopia*. *A* woreda *survey*. Ethiopian Wetlands Research Project, Metu, Illubabor.

Hailu, A. 1999. *Nature, extent and trends in wetland drainage in Illubabor Zone, Southwest Ethiopia.* A paper presented at the National Workshop on Sustainable Wetland Management, Addis Ababa, 13th December 1999. Ethiopian Wetlands Research Project, Metu, Illubabor.

Hailu, A. and P. G. Abbot. 1998. *A progress report on the activities of the field office, field season* 1997-8. Ethiopian Wetlands Research Project, Metu, Illubabor.

Illubabor Zone Department of Agriculture. 1999. Summary report of six month's achievements, Metu, Illubabor.

Solomon, T. 1998. *Soils and soil management practices in Tulube catchment, Illubabor highlands, Ethiopia*. A thesis presented to the School of Graduate Studies, Addis Ababa University, Addis Ababa, Ethiopia.

Solomon, M. 1999. *Socio-economic determinants of wetland use in Illubabor in the Metu and Yayu-Hurumu* Woredas. A paper presented at the National Workshop on Sustainable Wetland Management, Addis Ababa, 13th December 1999. Ethiopian Wetlands Research Project, Metu, Illubabor.

Tadesse W. 1999. *Bird species diversity study report*. Ethiopian Wetlands Research Project, August 1999, Metu, Illubabor.

Woldu, Z. and Y. Kumelachew 1999. *Plant biodiversity annual report for field year 1998-99*, Ethiopian Wetlands Research Project. Metu, Illubabor.

Woldu, Z. 2000. *Final biodiversity report*. Ethiopian Wetlands Research Programme, Metu, Illubabor.

Wood, A. P. 1996. *Sustainable wetland management in Illubabor Zone, south-west Ethiopia.* A research proposal submitted to the European Union. Huddersfield University, UK.

Wood, A. P. 1999. *Policy implications for wetland management*. A Paper Presented at the National Workshop on Sustainable Wetland Management, Addis Ababa, 13th December 1999. Ethiopian Wetlands Research Project, Metu, Illubabor.

Yizelkal F. 1998. *Characteristic sand classification of wetland soils in Dizi, Hurumu and Wangenye*: *South-western Highlands of Ethiopia*. A thesis presented to the School of Graduate Studies, Addis Ababa University, Addis Ababa, Ethiopia.

Wetland plants in Ethiopia with examples from Illubabor, south-western Ethiopia

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Introduction

Ethiopia has diverse wetlands of various origins in different parts of the country. An inventory of these and detailed studies of their vegetation, plant species composition and hydrology, has yet to be made. The Ethiopian Wetland Research Project (EWRP) carried out multidisciplinary studies on the wetlands of Illubabor in South-western Ethiopia where most wetlands owe their existence to high rainfall and associated multi-storied forest communities (Yeshitela, 1996).

In Illubabor, wetlands cover approximately 5% of the total land area. These wetlands are natural reservoirs for some of the region's major rivers, and contribute towards the maintenance of its biological diversity. Wetlands in most parts of South-western Ethiopia, particularly headwater wetlands, have been subjected to drainage for dry season maize cultivation. With continued drainage and cultivation, the natural vegetation is altered. In order to understand the extent of the changes occurring and to provide management methods for the utilisation of wetland resources, ecological studies of wetland vegetation are very important. The objective of the present study is to address the impact of drainage on wetland plant biodiversity in Illubabor.

Wetlands are environments subject to permanent or periodic inundation or prolonged saturation of their soils. These conditions are suitable for the establishment of hydrophytes and/or the development of hydric soils or substrates (Tiner 1999). Wetlands may span a continuum of environments where terrestrial and aquatic systems intergrade. The frequent occurrence and abundance of *Cyperus latifolius* and *Aeschynomene abyssinica* in most intact wetlands suggests that the pristine vegetation type of Illubabor's wetlands may have been dominated by these species.

The assessment of biodiversity considers the following important values:
- species - values of a particular species, endemism or critical conservation status;
- communities - value assemblages and number of organisms;
- ecosystem and habitat values – wetland type and its habitat for organisms;
- landscape values – aesthetics, topography and contribution to scenic values;
- functional values – relating to the environmental values played by the wetland;
- global values – significance of the biodiversity on a global scale.

Methodology

To address the impact of drainage on wetland plant biodiversity, the following methodology was employed:

- Species composition was studied along selected transects in sixteen randomly and preferentially selected wetland sites. Eight of these sites comprised the EWRP 'core' sites, while the remainder were distributed throughout Illubabor. Sampling occurred in the wet and dry seasons of 1997. Transects were selected to represent the variations in wetlands. Relevés (16 m^2) were established along the transects at a maximum of 10 m intervals. Plant species were recorded and their percent cover estimated. These were later converted to a 1-9 scale following the modified Braunblaquet method (Westhoff and Maarel, 1978).
- The species in 1m^2 quadrats placed in the relevés in each wetland were clipped to base, dried separately in the air and then in an oven at 80^oC for 48 hours. The average biomass of the species was then determined for each wetland.
- The species were classified into wetland-dependent, wetland-associated and non-wetland species depending on their frequency of occurrence in these habitats. Wetland plants are those plants which do not occur outside wetlands while wetland-associated plants are facultative.
- The life-form of each species encountered was determined.
- The biodiversity values of the species in these groups were calculated for the sites and for the communities. The method employed combined both species richness (the total number of species recorded) and a scarcity value (the occurrence of the species in the study sites) following Omoding (1996).
- Discussions were held with the farmers on the use of the wetland plants and the succession of wetland plant communities following harvesting, drainage, cultivation and grazing. A conceptual decision tree was constructed based on the discussion and careful observation in the field.

Table 6 below shows details of the core wetland sites selected for interdisciplinary monitoring.

Results and discussion

Amongst other ways, wetlands in Illubabor react to the intensity of human interference by altering their species composition and abundance. Multivariate analyses of the

vegetation data gave six dry season plant communities and six wet season ones, indicating that the wetlands show spatial as well as temporal variations.

Table 6. Details of the core wetland sites where biodiversity monitoring was undertaken

	Level 1	**Level 2**	**Level 3**	**Level 4**
Wetland	Broad Habitat Type	Specific Habitat Type	Habitat Structure	Management/ Threat
Anger	Inland water	Stream Swampy Freshwater spring	Medium flowing Open water Herbaceous Clear water	Natural Cultivation Diversion
Beke-chora	Inland water	Stream Freshwater marsh Swampy Freshwater springs	Open water Slow flowing Herbaceous Clear water	Natural Cultivation Grazing Diversion
Chebere	Inland water	Stream Swampy	Slow flowing Herbaceous	Natural Harvesting
Dizi	Inland water	River Swampy Freshwater spring	Fast flowing Herbaceous	Cultivation Rural water supply
Hurumu	Inland water	Stream Swampy Freshwater marsh Freshwater spring	Slow flowing Herbaceous Clear water Rocky bottom	Grazing Rural water supply
Supe	Inland water	Stream Freshwater marsh Swampy Freshwater	Open water Slow flowing Herbaceous Clear water	Natural Cultivation Grazing Diversion
Tulube	Inland water	Stream Freshwater marsh Swampy Freshwater	Medium flowing Open water Herbaceous Clear water Brownish water Rocky bottom	Natural grazing Nursery Rural water supply
Wangenye	Inland water	Stream Swampy Freshwater spring	Slow flowing Herbaceous Clear water Rocky bottom	Natural Harvesting Cultivation Diversion

The spatial variations are directly attributable to differences in exploitation, while temporal variations can be related to the moisture content of the substratum during the drier part of the year. At such times, some annual plant species that perform well when partially submerged or when the soil is fully saturated, wither away when the ground water lowers. This results in different species associations during the wet and the dry seasons. The dry season communities of some wetlands, however, resemble the wet season communities of other wetlands suggesting that the water level of some wetlands

does not fluctuate as much as it does in others. The dry and wet season communities with their different species are shown in Tables 7a and b (on page 53).

The sum of the frequency of a species group in the sample plots of a wetland can be related to the scale of disturbance to the wetland (Omoding, 1996). A wetland with a low biodiversity value of wetland-dependent species and low biodiversity value of a combination of wetland-dependent and wetland-associated plant species, would be more disturbed than the one with a lower value of the same species group. These values, which are summarised in Table 8, therefore indicate that Anger, Chebere and Dizi are more disturbed than the other five wetlands. The less diverse life-form composition and the relatively low percentage cover of the species and the relatively low biomass are suggestive of the occurrence of frequent disturbance in these wetlands.

Table 8. Biodiversity values of wetland-dependent and a combination of wetland-dependent and associated plant species and the estimated biomass for the EWRP core sites in Illubabor

	Biodiversity values		
Wetland	Wetland-dependent plant species	Wetland-dependent and associated plant species	Biomass in g/m^2
1. Anger	10.75	22.00	350.00
2. Beke chora	13.25	27.88	Not available
3. Chebere	9.63	17.90	1587.70
4. Dizi	9.96	25.38	562.10
5. Hurumu	11.25	27.25	777.80
6. Supe	12.65	24.40	1155.10
7. Tulube	12.75	25.13	308.93
8. Wangenye	13.25	26.50	2119.6

The wetland-dependent, non-wetland and wetland-associated plant species in Illubabor's wetlands are shown in Tables 9a-c. The occurrence and abundance of these species in a community or site is a direct consequence of the intensity of human interference.

The indigenous knowledge of the people living around the wetlands provides some information on how pristine wetland plant species react to disturbances. The decision tree in Figure 3 shows the dynamics of wetland plant species when disturbances are either intensified or relaxed. The decision tree suggests that there can be a terminal phase in wetland exploitation, in which certain plant communities, such as *Cynodon dactylon*, dominate wetland vegetation, and from which the wetland may not recover. The decision tree also indicates that recovery to *Cyperus latifolius* and *Aeschynomene abyssinica* communities is possible when disturbance is relaxed. Other intermediate communities which may occur include *Guizotia scabra* and *Persicaria glabra* and *Plectranthus* sp.

Table 7a. Summary of the wet season plant communities and their occurrence in the core wetlands

Community type	Anger	Beke chora	Chebere	Dizi	Hurumu	Tulube	Wangenye	Supe	Total
Snowdenia petitiana-Guzotia scarba	0	0	0	1	0	0	0	0	1
Cyperus latifolius-Panicum hymeniochilum	1	1	1	0	1	1	1	1	7
Leersia hexandra-Panicum hymeniochilum	0	0	1	0	0	0	0	1	2
Cyperus latifolius-Thelypteris bergiana	0	0	1	0	0	0	0	0	1
Hygrophila auriculata-Digitaria ternata	0	1	0	0	0	0	0	1	2
Cyperus brevifolius-Fuirena stricta	0	1	0	0	1	0	1	0	3

Table 7b. Summary of the dry season plant communities and their occurrence in the core wetlands

Community type	Anger	Beke chora	Chebere	Dizi	Hurumu	Tulube	Wangenye	Supe	Total
Cyperus latifolius-Juncus effusus	0	0	0	0	1	0	0	0	1
Anagalis serpens-Leersia hexandra	0	0	0	0	1	0	0	0	1
Cyperus latifolius-Panicum hymeniochilum	1	0	0	0	0	1	1	1	4
Leersia hexandra-Thylypteris bergiana	0	0	1	0	0	0	0	0	1
Cyperus latifolius-Aeschenomene abyssinica	0	0	0	0	0	1	1	0	2
Commelina bengalensis-Pennisetum thunbergii	0	0	1	0	0	0	0	0	1

Wetland-dependent, non-wetland and wetland-associated plant species in Illubabor. Note: G = grass; H = herb; S = shrub; F = fern.

Table 9a. Wetland-dependent plants

	SPECIES	FAMILY	LIFE FORM
1	*Aeschynomene schimperi*	FABACEAE	S
2	*Cyperus elegantulus*	CYPERACEAE	H
3	*Cyperus flavescens*	CYPERACEAE	H
4	*Cyperus latifolius*	CYPERACEAE	H
5	*Cyperus mundtii*	CYPERACEAE	H
6	*Cyperus platycaulis*	CYPERACEAE	H
7	*Echinochloa ugandensis*	POACEAE	G
8	*Eragrostis botryodes*	POACEAE	G
9	*Fimbristylis dichotoma*	CYPERACEAE	H
10	*Floscopa glomerata*	COMMELINACEAE	H
11	*Fuirena stricta*	CYPERACEAE	H
12	*Hydrocotyle sibthorpioides*	APIACEAE	H
13	*Impatiens ethiopica*	BALSAMINACAEAE	H
14	*Jussiaea abyssinica*	ONAGRACEAE	H
15	*Leersia hexandra*	POACEAE	G
16	*Oldenlania goreensis*	RUBIACEAE	H
17	*Oldenlandia lancifolia*	RUBIACEAE	H
18	*Ottelia ulvifolia*	HYDROCHARITACEAE	H
19	*Panicum hymeniochilum*	POACEAE	G
20	*Panicum subalbidum*	POACEAE	G
21	*Persicaria glabra*	POLYGONACEAE	H
22	*Phyllanthus boehmii*	EUPHORBIACEAE	H
23	*Sacciolepis africana*	POACEAE	G
24	*Schenoplectus corymbosus*	CYPERACEAE	H
25	*Sesbania dummeri*	FABACEAE	S
26	*Smithia elliotii*	FABACEAE	H
27	*Thelypteris confluens*	THELYPTERIDACEAE	F

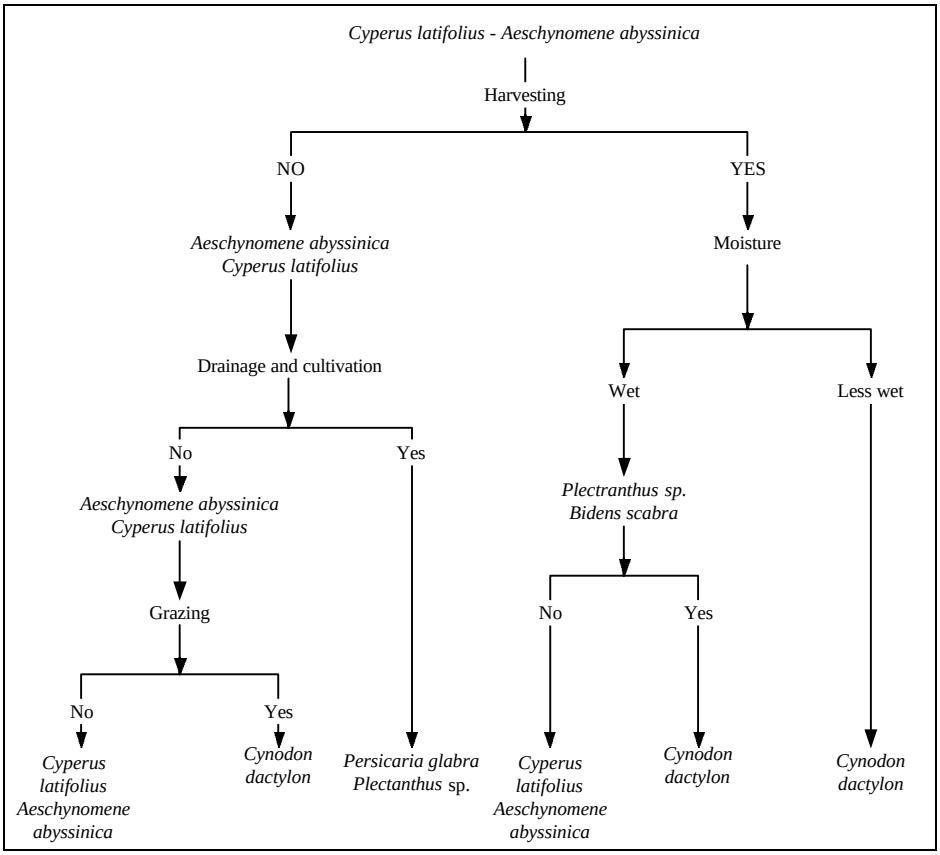
Table 9b. Non-wetland plants

	SPECIES	FAMILY	LIFE FORM
1	*Bidens pachyloma*	ASTERACEAE	H
2	*Brassica carinata*	BRASSICACEAE	H
3	*Commelina latifolia*	COMMELINACEAE	H
4	*Cynodon dactylon*	POACEAE	G
5	*Eragrostis tenuifolia*	POACEAE	G
6	*Galensoga quadriradiata*	ASTERACEAE	H
7	*Rumex abyssinicus*	POLYGONACEAE	H

Table 9c. Wetland-associated plants

	SPECIES	FAMILY	LIFE FORM
1	*Acanthus arboreus*	ACANTHACEAE	S
2	*Achyranthes aspera*	AMARANTHACEAE	H
3	*Aeschynomene abyssinica*	FABACEAE	S
4	*Ageratum conizoides*	ASTERACEAE	H
5	*Ajuga remota*	LAMIACEAE	H
6	*Alchemilla cryptantha*	EUPHORBIACEAE	H
7	*Alchemilla pedata*	EUPHORBIACEAE	H
8	*Anagallis serpens*	PRIMULACEAE	H
9	*Arthraxon prinoides*	POACEAE	G
12	*Celosia schweinfurthiana*	AMARANTHACEAE	H
13	*Commelina africana*	COMMELINACEAE	H
14	*Commelina diffusa*	COMMELINACEAE	H
18	*Cyperus brevifolius*	CYPERACEAE	H
19	*Cyperus dichroöstachys*	CYPERACEAE	H
20	*Cyperus distans*	CYPERACEAE	H
21	*Cyperus microstylis*	CYPERACEAE	H
22	*Cyperus rigidifolius*	CYPERACEAE	H
23	*Cyperus welwitschii*	CYPERACEAE	H
24	*Digitaria ternata*	POACEAE	G
25	*Dissotis canescens*	MELASTOMATACEAE	H
26	*Dissotis princeps*	MELASTOMATACEAE	H
27	*Drymaria cordata*	CARYOPHYLLACEAE	H
28	*Geranium aculeoidea*	GERANACEAE	H
29	*Guizotia scarba*	ASTERACEAE	H
30	*Hydrocotyle mannii*	APIACEAE	H
31	*Hygrophila auriculata*	ACANTHACEAE	H
32	*Leucas deflexa*	LAMIACEAE	H
33	*Paspalum scrobiculatum*	POACEAE	G
34	*Pennisetum thunbergii*	POACEAE	G
35	*Persicaria senegalensis*	POLYGONACEAE	H
36	*Plectranthus punctatus*	LAMIACEAE	H
37	*Pycnostachys eminii*	LAMIACEAE	H
38	*Ranunculus multifidus*	RANUNCULACEAE	H
39	*Ricinus communis*	EUPHORBIACEAE	H
40	*Satureja paradoxa*	LAMIACEAE	H
41	*Scleria lagoënsis*	CYPERACEAE	H
42	*Snowdenia petitiana*	POACEAE	G
43	*Solenostemon porpeodon*	LAMIACEAE	H
44	*Sphaeranthus flexuosus*	ASTERACEAE	H
45	*Spilanthes mauritiana*	ASTERACEAE	H
46	*Thunbergia alata*	ACANTHACEAE	H
47	*Triestemma mauritanum*	MELASTOMATACEAE	H
48	*Triumfetta pilosa*	TILIACEAE	H
49	*Triumfetta rhomboidea*	TILIACEAE	H
50	*Veronica abyssinica*	SCROPHULARIACEAE	H
51	*Vigna parkerii*	FABACEAE	H

Figure 3. Disturbance and Succession in Wetlands in the Study Area



Conclusion

This study of eight of Illubor's wetlands suggests that there are many headwater wetlands in Illubabor with *Cyperus latifolius* and *Aeschenomene abyssinica* as the original pristine vegetation type. Human interference by way of drainage, cultivation, biomass harvesting and grazing leads to the formation of new community types which can indicate the type and scale of the interference. The scale of interference can also be judged by the biodiversity values of the species groups. The study also shows that although the wetlands of Illubabor are resilient, a terminal phase can be reached when drainage, cultivation and grazing are practiced continuously. Additional studies that are required include a detailed investigation of the fauna of the wetlands and experimental studies on the dynamics of the vegetation to verify the lessons obtained from indigenous knowledge.

References

Omoding, J. 1996. A habitat classification scheme for East Africa. In *Mechanisms for conserving wetland biodiversity*: Report of a Workshop on Wetland Biodiversity Conservation, Mbale, Uganda 1-3 May 1995 (ed. G. Howard) pp. 32-34.

Tiner, R. W. 1999. *Wetland Indicators: A guide to Wetland Identification, Delineation, Classification and Mapping*. Lewis Publishers, Boca Raton 400pp.

Westhoff, V. and E. van der Maarel, 1978. The Braun-Blanquet approach. In *Classification of Plant Communities*. (ed. R. H. Whitataker) pp. 287 – 399. 2nd ed.W. Junk Publishers, The Hague.

Yeshitela, K. 1996. *Forest communities in southwestern Ethiopia*. Msc. Thesis, Addis Ababa, Ethiopia.

Wetlands, gender and poverty: some elements in the development of sustainable and equitable wetland management

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Introduction

The debate about the future of wetlands tends to divide between those seeking to develop these areas for agricultural production (Inland Valleys Consortium, 1995) and those who believe that wetlands must be preserved as much as possible in a pristine state to maintain their ecological contributions to the global environmental system (such as the Ramsar Convention). The debate tends to be polarised between the search for production to meet human consumption needs and conservation for ecological well-being. In concentrating on the big argument, this debate tends to ignore a number of very important issues that relate to the impact of different wetland uses upon communities and, in turn, the overall sustainability of wetlands. I address two of these issues in this paper:

– that wetlands are not all similar and that they produce different benefits depending on their characteristics and how they have been altered; and

– that communities are not all uniform and that differentiation, in terms of gender, socio-economic status, age and other personal characteristics, means that wetlands have stakeholders with different sets of interests, needs, rights and power or influence.

This paper seeks to explore how these two sets of variables interact in order to provide a number of questions and some preliminary answers about the relationships between gender, poverty and wetlands. It also seeks to show how these considerations are central to the development of sustainable wetland management.

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Wetland Benefits, Gender and Poverty

Benefits

There are many different types of wetland in Ethiopia. If the IUCN (1996) wetland typology is used, Ethiopia has representatives of almost all wetland types, with the exception of coastal ones. For instance, it has riverine wetlands of a seasonal and permanent nature along many of its rivers, palustrine wetlands (swamps and marshes), lacustrine wetlands around lakes, montane peat bog wetlands, as well as man-made wetlands around dams.

These diverse wetlands produce a range of benefits of both an ecological or environmental nature, such as flood control and biodiversity maintenance; and of a socio-economic, production or use nature, such as plants, crops, fish and grazing (Barbier *et al*., 1996). This paper will focus on the latter type of benefits as the ones whose distribution is particularly important for socio-economic and gender issues.

The nature of the use benefits available in any given wetland will vary depending upon the types of environmental conditions in the wetland, the way in which the wetland has been manipulated or not by communities and the cultural norms and values of the communities who have access to it. In the first column of Table 10, the range of possible use benefits which might be found in a wetland are shown, based on experience from southwest Ethiopia. These various benefits may be gained directly in some cases (Column 2) by immediate use or collection, or indirectly (Column 3) in other cases through sales or other distributional processes. There are also wider impacts upon the well-being of society which come from these wetland benefits (Columns 4 and 5).

Beneficiaries

The key point to note from this table is that wetland benefits are distributed unevenly, especially in terms of immediate use, but also to some extent in terms of financial distribution, which is affected by needs and income availability. This raises important questions about the processes of gaining access directly and indirectly to the benefits produced by wetlands. It also shows how differentiation in society, in terms of gender, wealth and age, as well as in terms of social rules, determine which people can obtain which benefits. In addition to gender, age and socio-economic status, some of the specific factors that explain this differential access to wetlands and their resources include:

- perceptions of value (for instance which groups need reeds for roofing);
- availability of household resources which are needed to gain particular benefits from wetlands (such as oxen to obtain crops, or capital for brick making);
- demands from household resources which require certain benefits to be obtained from wetlands (such as cattle which require dry season wetland grazing);
- skills and their distribution in society (especially for medicinal plant collection, but also fishing and wildlife hunting);

– political regulations/processes and how they impact upon different groups in society (including local access rules and the institutions which develop, implement and maintain them);

– societal role rules, which determine activity norms and the roles expected of different genders and age groups.

Table 10: Use Benefits from Wetlands and Beneficiaries in South-west Ethiopia Note: other use benefits in East Africa can include fuel, fish, wildlife and materials for boat construction.

Benefits	Collectors/Status		Overall Beneficiaries	Wider Impacts
	Gender	Status		
Water	Women	All, except rich	All	Health
Reeds	Men	Often poor	All for roofing, especially women for mat making	Shelter, supplementary income
Agriculture	Men	Mid-rich, non-aged	All through sales	Domestic and wider food security
	Men	Poor share-cropping	Poor households	Food for survival
Medicinal	Men	Skilled	All, especially poor	Health
Grazing	Men	Richer	Households with cattle	Facilitates wealth accumulation
Palm fronds	Men	Often poor	All, especially poor women	Supplementary income
Brick making	Men	Very rich	Rich and poor daily labourers	Contributes to shelter for rich

Hence, in studying the interactions between a society and wetlands, analysis should include consideration of a matrix (such as Table 10) which explores the relationship between the range of use benefits and beneficiary groups. This analysis, however, must go beyond the question of 'who gets what?' and ask questions about the causal processes that lead to this and the institutions and societal structures which influence access to these benefits.

Systemic effects

One further aspect of the beneficiaries dimension which needs to be addressed is the wider impacts of wetlands. Wetlands are part of hydrological systems, and alterations to them can impact upon stream flow and hence on downstream areas and their communities. Changes in water levels in wetlands can also have an impact upon the local water table and upon crops grown on the lower slopes of the catchment, and so affect people other than those using the wetlands and their resources.

In addition, changes in wetlands and the products they produce can have wide ranging impacts when it is recognised that these products fulfil roles within livelihood systems. Hence, the loss of one product from a wetland caused by its transformation could lead to impacts elsewhere in the rural resource/livelihood system. For instance, wetland drainage may destroy a source of craft materials, forcing craftspeople to look elsewhere for these items. This may in turn increase the pressure on other resources and impact upon the environment and other people. Hence, there is perhaps a need to include a second beneficiaries matrix for those not involved directly or indirectly through the benefits listed in the table above, but through the environmental system and livelihoods linkages.

Awash Valley Wetlands and Development - an example of wetland transformation and poverty creation

During the 1960s, seasonal wetlands along the lower Awash River were developed for cotton production. This development was based on the state's land tenure system, which refused to recognise the rights of the Afar to pastoral land, including wetlands. As a result, the state alienated some of these wetlands from the Afar community and rented them out to international companies.

The irrigation technology available to these companies allowed them to develop a new type of use benefit - cash crops or cotton - that replaced the traditional benefits - primarily grazing - that the Afar had obtained for centuries from these wetlands. Instead, benefits were appropriated by foreign companies, their shareholders and the Ethiopian State (in the form of foreign exchange earnings or savings and taxes).

This transfer of benefits was not a minor development. It completely undermined the way of life of thousands of people, as without the dry season grazing on the wetlands, the livestock, and hence the people who depended on them, could not survive. There was widespread famine and mortality following the establishment of the estates, and many Afar were forced to leave the area (Bondestam, 1974). Reports of this disaster do not consider the differential impact upon households of different socio-economic status or upon gender groups but clearly there would have been differential abilities to cope with the situation depending on resources, skills and opportunities, as has been seen in other famine situations in the country (Wood, 1976).

It should also be noted that, due to irrigation off-take, there were systemic impacts downstream on those making traditional use of the river who were affected by lower flows. The ecological status of the wetlands in the lowest part of the Awash basin, such as Lakes Abe and Afambo, are reported to have been affected, although this author does not have access to any formal reports from that area.

This case shows how rules set up by a society through its state institutions, in this case the ability to alienate land, and the powerlessness of some groups in society, usually the poor and women, but in this case, some Afar groups, can have devastating effects, destroying a whole way of life. This is not at all unusual with wetland development (e.g. in the Hadejia-Nguru wetlands of northern Nigeria [Hollis *et al*., 1993]) and confirms the need for all stakeholders to be included in discussions concerning wetland development.

Agricultural development in Illubabor Zone: a micro-scale example

The Ethiopian Wetlands Research Programme (EWRP) has for three years been studying small valley-head and mid-valley wetlands in Illubabor Zone, which are being used to varying degrees for agriculture. This agricultural use is often long standing, the drainage technology having been first applied during the early decades of the 1900s.

Who are the wetland farmers?

In developing the project design, initial field visits led to the view that wetland farming might be undertaken by poor farmers who were unable to obtain sufficient upslope land to meet their family needs. Wetlands could be seen as marginal to the farming system and a resource that only the poor would need to use. Studies during the last three years have shown that the reality is very different and that, in contrast, it is wealthier groups who control and use these areas. Surveys by Tegegne Sishaw (1998), Afework Hailu (1998) and Solomon Mulugeta (1999) show that it is middle-rich farmers who most frequently exploit wetlands, and the very poor are the least involved. Interestingly, the richest are not that involved in wetland cultivation. These studies show that, to some extent, wetland agriculture is resource sensitive. In other words, it requires certain resources, notably oxen and money or food for daily labourers, in order to be undertaken successfully.

The question about why the richest farmers do not seem to be involved in wetlands has not been fully explored. It may be that they diversify into other activities, which are risky or are less hard work, as they get older and as young adult labour leaves the household. In fact, it may be that wetland cultivation, being part of a cycle of household economic development and demographic structural change, is best undertaken only at a certain stage and by households with adequate resources.

These three surveys and the Participatory Rural Appraisal (PRA) studies undertaken by the project (Hailu and Abbot, 1998, 1999) show that another factor affecting wetland cultivation is successful claims to this type of land. Again, it appears that it is generally the better off households who have access to wetland areas and that other socio-economic groups do not. This is a complex story, however, as most access rights to wetlands originate in Haile Selassie's time and have developed out of the initial choices by households and landlords about who should cultivate wetlands in those days. These original use rights to wetlands continued through the Dergue period as there was no major redistribution of wetland rights, or other rights to land, in Illubabor after the 1975 Land Reform Proclamation. What this points to is the importance of political processes, which in this case have ensured that the richer households have maintained their rights to wetlands up to the present time and prevented a widening of access to these areas for cultivation. The only exception to this is with respect to settlers – immigrants from northern Ethiopia - who have been allocated wetland by communities who were not using them.

In this situation, it may be argued that wetland use rights were, at a time of land reform in 1975, appropriated by better-off farmers. Through cultivation, they have extracted wealth from these resources for their own benefit. In so doing, they have undermined the other benefits of these areas which could be obtained by more of the community if they were used and managed in different ways (see below).

One further point to note is that wetland agriculture is particularly heavy work and so is not undertaken by women. As a result, there are no home gardens or vegetable cultivation by women in wetlands. There have been some efforts by an NGO to encourage wetland cultivation of vegetables by women, but this has had very limited success.

Wider socio-economic and gender implications of wetland agriculture

As the Awash Valley case study shows, an important question is 'What is the impact of wetland transformation upon those who have traditionally used wetlands?' In the Illubabor case of wetland drainage for agriculture, the scale of the impact upon the members of the community who are not wetland farmers depends on the extent to which the wetlands are transformed for agriculture and the impacts of this. In the case where only small patches of wetland are drained and the overall vegetation and water level is little affected, the impact can be small. Where the whole wetland is transformed by drainage, however, and the wetland dries out and degrades to rough grazing, the impacts can be very serious, especially on women and the poor of both sexes. This scenario is explored below.

Temporally and spatially extensive drainage affects the water level in wetlands and, in turn, the groundwater level in the surrounding areas. This will cause springs to dry up, a phenomenon well known in Illubabor - some 150 springs are reported to have dried up in Metu *Woreda* during the last thirty years according the Ministry of Agriculture (Metu Woreda Agricultural Development Office, 1998). The loss of nearby spring water has had a number of serious impacts, including greater time and labour effort for women to collect water from more distant springs. This increase to the women's workload may have an impact upon their other activities leading to less attention to other domestic, family and agricultural tasks. In extreme cases, greater time requirements on one activity may lead to increased child malnutrition if attention to children is reduced. Alternative responses to the loss of local springs may be to use streams as sources of water, which are likely to be more polluted, increasing ill health, especially amongst children. In turn, this ill health can affect farming and other domestic and economic activities, reducing food security and economic well-being.

Where the water table is lowered, there will be impacts upon crops grown in the wetlands and on lower slopes near the wetland. Several cases of the former have been identified in Illubabor (see Hailu *et al*, 2000). Although no specific examples of lower slope impacts have been found in Ethiopia, in Rwanda this is clearly a major problem with banana groves on the lower slopes above drained wetlands becoming less productive and even abandoned (pers. obs. Kayenzi Commune).

The complete drainage of wetlands for cultivation leads to a loss of the natural sedge, which is collected for roofing. In Illubabor, only the rich can afford the alternative tin roof, so the rest of the community is forced to search for roofing materials in wetlands further afield. In some cases, grass will be used as a replacement but this is generally seen as unacceptable in this high rainfall area. Reed collection may be possible from other wetlands in the *kebele* or from neighbouring *kebeles*. If the latter is the case, however, the host community will not generally allow the poor to collect reeds for sale or other uses beyond what they need to thatch their own roofs. The trouble is that reed cutting and selling is an important activity which poor men use to supplement

inadequate food production or to meet cash needs. Reed shortages can also undermine local craft activities, which are generally undertaken by poorer women and are an important supplement to domestic resources. Similar problems are found with respect to other products collected from wetlands. Men who collect palm fronds or medicinal plants and women who process the palm fronds used for basket and mat weaving, will have their livelihoods undermined when wetland drainage and cultivation destroys their raw material base (Fricker, 1999).

When wetlands are completely transformed, the major winners are those who are farming these areas, who are then able to develop their preferred economic activities. Most of the rest of the community lose out, except possibly poorer men who obtain wage labour opportunities connected with wetland drainage and land preparation. Opportunities may also open for land-scarce farmers who are able to make wetland share-cropping agreements with wealthy elderly or widowed farmers unable to farm by themselves. The overall effect of wetland transformation for agriculture is, however, that a much smaller section of the community gains benefits from these areas than was the case when the wetlands were in their natural state.

Finally, if over-drainage occurs, and wetlands become perennial rough grazing with neither springs nor sedges or medicinal plants, the distribution of benefits is further altered. In this case, it is only wealthier cattle owners who can benefit from this use of the former wetlands. Even cattle owners may lose out if drainage is so excessive that these areas are not even useful as dry season grazing.

This case study again shows that the transformation of wetlands has serious socio-economic and gender-specific impacts. Women in general (except the richest who do not collect water) and most poorer males, along with specialist groups such as medicinal plant collectors, lose opportunities for income generation and obtaining use benefits when wetland agriculture is developed. This differential impact of wetland transformation makes it clear that a better community management system is needed which will address, in a more inclusive and representative way, the needs of all groups in society.

Wetlands as protected areas: a cautionary note

Like elsewhere in the world, most wetlands are found outside protected areas in Ethiopia. Some organisations see improved wetland management as being achieved through the inclusion of these areas within protected areas. This approach seems to be inherently flawed, as the majority of wetlands will never obtain such a designation. Hence, it is important that sustainable wetland management is achieved by influencing what goes on in wetlands outside protected areas rather than trying to designate wetlands as protected areas. In addition, the designation of wetlands as protected areas can have serious negative effects on communities in the areas surrounding them by increasing poverty and gender-specific hardships by removing access to the wetland. There is no detailed evidence of this in Ethiopia, although it is known that the Rift Valley protected areas, such as the Lakes Shala and Abiyata National Park, disrupted the livelihoods of people in the surrounding areas. There exists detailed experience of the way a protected area designation on a wetland disrupts rural communities, and affects the poor worst (Gujja, 1998).

Conclusions

As with all natural resource management issues, poverty and gender are important dimensions of wetland use and transformation. In Ethiopia, wetlands will continue to play an important role in the lives of a large proportion of the population in one way or another. They are an important contributor to groundwater and hence to the maintenance of water supply and in turn rural health. They also contribute a wide range of other products such as food, fodder, medicinal plants, reeds and in some cases fish. As this paper has shown, making use of some of these wetland resources can be restricted by access rules which depend on local level political processes or by household resource constraints which limit people's ability to use wetland resources in certain ways, such as for agriculture. Additionally, it has been shown that when wetlands are altered or transformed in some way, some of the benefits that they produce may be destroyed and this can be particularly damaging to the interests of the poor and women. Hence, social equity can be, and is often, worsened by wetland development and transformation.

Given these problems, two general conclusions can be drawn. The first is that wetlands need to be managed in ways that recognise the full range of benefits that they can provide. A use regime needs to be developed that ensures that the fullest range of benefits are produced from wetlands for the local community in a sustainable way and within a framework that also maintains the wetland's ecological functions sustainably. Such a regime will require local experimentation for each type of wetland and socio-economic setting, but will generally involve building on local knowledge and recognising the interests of the different stakeholders who are interested in the range of wetland-produced benefits.

The second conclusion concerns the way in which the management of wetlands needs to be developed to ensure equitable access to wetland-produced benefits. This requires agreement amongst all wetland stakeholders of the uses to which a wetland can be put and its management arrangements. This must be couched within a framework that recognises basic limitations to the sustainable use or production of use benefits. To achieve this, it is necessary to develop local institutions for wetland management that can ensure equitable and democratic decision-making and can build up a consensus about the management of the wetland. Possible management methods include stakeholder analysis disaggregated by gender and socio-economic status, as well as community-level Environmental Impact Assessments (EIAs). These would help to identify the impacts of different wetland management options with respect not just to the environment but also to different groups in the local community and beyond.

Making sure that different groups of women and men of different socio-economic status are included in these processes and have effective representation should not be seen as an additional burden for those concerned with wetland management. Rather, it should be recognised as vital because unless the whole community is involved in management decision-making, and a consensus obtained, the sustainable use of wetlands will not be achieved. Wetland management, which is developed by the few for the few, only sets up a basis for future conflict and for worsening the poverty and exclusion of the politically weak. Often, it facilitates the over-exploitation of wetland resources by one group and undermines the ecological functioning of these areas. In contrast, the sustainable use of

wetlands can only be achieved if it is based upon an understanding of the interests of all the stakeholders and the achievement of socially sustainable management arrangements.

References

Barbier, E. B., M. Acreman and D. Knowler. 1997. *Economic valuation of wetlands.* Ramsar Convention Bureau, Gland, Switzerland, 127pp.

Bondestam, L. 1974. People and Capitalism in the Northeast Lowlands of Ethiopia. *Journal of Modern African Studies* 12 (3): 423-439.

Fricker, V. 1999. *The family breadwinners - A study of women entrepreneurs in south-west Ethiopia.* A dissertation submitted in partial fulfilment of Master of Science in Entrepreneurial Studies, University of Stirling, UK.

Gujja, B. 1998. Wetlands: who can use them wisely? Paper presented at the Second International Conference on Wetlands and Development, 8 – 14 November, 1998, Dakar, Senegal.

Hailu, A. 1998. *An overview of wetland use in Illubabor Zone, south-west Ethiopia*. Ethiopian Wetlands Research Project, Metu, Illubabor.

Hailu, A. and P. G. Abbot. 1998. *A progress report of first year PRA activities of the Field Office*. Ethiopian Wetlands Research Project. Metu, Illubabor.

Hailu, A. and P. G. Abbot. 1999. *A progress report of second year field activities of the Field Office*. Ethiopian Wetlands Research Project . Metu, Illubabor.

Hailu, A., P. G. Abbot, A. P. Wood, A. B. Dixon, Z. Woldu and B. Tegegne 2000. *Report for Objective 4: Sustainable Management Systems*. Ethiopian Wetlands Research Project, Metu, Illubabor and Huddersfield University, UK.

Hollis, G. E., W. M. Adams, and M. Aminu-Kano. 1993. *The Hadejia-Nguru wetlands*. IUCN, Gland 244pp.

Inland Valleys Consortium/Consortium Bas-Fonds 1995. *Annual report*. WARDA/ ADRAO, Bouake, Ivory Coast.

IUCN 1996. *A Wetland Classification System for East Africa***.** Regional Wetland Biodiversity Group Meeting, Mbale, Uganda. 1- 3 May 1996. International Union for the Conservation of Nature and Natural Resources (mimeo).

Metu Woreda Agricultural Office 1998. *Natural Resources Assessment of Metu Woreda*. Ministry of Agriculture, Metu, Illubabor.

Mulugeta, M. 1999. *Socio-economic Determinants of Wetland use in the Metu and Yayu-Hurumu Weredas of Illubabor Zone*. Paper presented at the National Workshop on Sustainable Management of Wetlands in Illubabor Zone, 13th December 1999, Addis Ababa, Ethiopia. Ethiopian Wetlands Research Programme, Metu, Illubabor.

Sishaw, T. 1998. *Agriculture and Land use in and around the Wetlands of Wangenye Backe Chora Peasant Associations, Illubabor Zone*. Masters Thesis, Dept of Geography, Addis Ababa University. Addis Ababa, Ethiopia.

Wood, A. P. (1976) Farmers' responses to drought in Ethiopia. In *Rehab: drought and famine in Ethiopia.* (ed. A.M. Hussein) pp. 67-88. London: International African Institute, African Environment Special Report 2.

Challenges and opportunities of Ethiopian wetlands: the case of Lake Awassa and its feeders

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Introduction

Lake Awassa is one of many Ethiopian wetland resources. It lies near the town of Awassa in the middle of a series of rift valley lakes at an altitude of 1680 m and 275 km south of Addis Ababa. The lake has a surface area of 90 km^2, a volume of 1.036 x 10^9 m^3 and a drainage area of 1,259 km^2 It is a terminal lake with no reported outflow. Compared to other rift lakes, however, the water is relatively dilute probably due to some sort of subterranean inflow (Makin *et al*., 1976), dilution from the feeder Tikur Wuha River and past basin overflow.

The water of the lake supports different species of phytoplankton (Kebede, 1987), freshwater invertebrates (Kibret and Harrison, 1989; Fernando *et al*., 1990; Mengistou *et al*., 1991; Green and Mengistou, 1991), bacterioplankton (Zinabu, 1988) and six species of fish of which three are endemic and commercially important (Dadebo, 1988). Different species of waterfowl, hippopotamus and reptiles also reside in, and are supported by, the lake. Shallo Swamp drains into the lake through the Tikur Wuha River.

The community of Awassa and its environs has utilised the resources of these wetlands as a livelihood source for a very long time. The water of the lake is used for irrigation, bathing, recreation and as drinking water for domestic use and wildlife. The fishery of the lake supplies vital fish protein and incomes for the people of the area and beyond. The wetland yields grasses and other vegetation on which cattle may be grazed, boats constructed ('*tankua*'), mattresses, mats and agricultural implements created and houses built.

The lake, the river and the swamp are presently faced with serious ecological problems due to deleterious anthropogenic activities in the catchment. The construction of irrigation and drainage systems, clearing of forest, building of factories and use of fertilisers, herbicides and pesticides all contribute towards the damage of these indispensable but fragile systems. Until now, the institutional and legal framework for developing and ensuring the sustainability of wetlands is lacking in the region. A Regional Conservation Strategy is in the final stages of completion. The pace of such reforms, however, cannot keep up with the pace of environmental damage.

In order to develop and use these wetland resources wisely, therefore, full attention should be paid to understanding the dilemmas that they face and identifying ways to conserve them. The past and present status of these resources must be carefully and regularly monitored, assessed and identified. Harmful trends that impair the natural qualities of these wetlands must be reversed using appropriate strategies and pertinent laws must be reinforced by involving all stakeholders in their design and implementation.

Functions and values of the wetlands

Lake Awassa

Wetlands provide natural resources and services for humanity. They are a source of food, tourism, cultural resources, flood control and improved water quality. They are also important to biodiversity and wildlife conservation.

The town of Awassa is famous and attractive primarily due to the lake. The town and the lake are celebrated resorts for local and foreign visitors. The magnificent views of the lake from resort hotels together with the many precious waterbirds makes the wetland one of the country's most renowned tourism centres.

There are six fish species in Lake Awassa, including *Oreochromis niloticus, Clarias gariepinus, Barbus* sp. and *Garra* sp. of which the first three are commercially important. In 1996, the total landings of these three species was 533 tons, of which 90% was. *O. niloticus* while *C. gariepinus* and *Barbus* sp. contributed 7% and 3% respectively.

Many different species of plants, animals and micro-organisms make the lake highly bio-diverse. The littoral area is covered with emergent and submergent macrophytes, which serve as shelter, hiding areas and breeding zones for weed bed fauna (annelids, crustaceans and insects), protozoans, rotifers, cladocerans, copepods, ostracods and fish. It is dominated by an extensive bed of '*qetema*' (*Cyperaceae*) and '*fila*' (*Typha* sp.). The dominant floating grass is *Paspalidium germinatum*, and other floating plants include the Blue water lily (*Nymphaea coerulea*), water cabbage (*Pistia stratiotes*) and the smallest flowering plant in the world, *Wolfia arrhiza* (Tilahun *et al*., 1996).

This lake supports more than a hundred species of water birds, including local and palaearctic migrants. One of the most striking natural history features of the wetland is the large population of Marabou storks. Other wildlife species like hippopotamus, otters, monitor lizards, Vervet and Colobus monkeys are found in and around the lake (Tilahun *et al*., 1996). The system as a whole serves to stabilise the microclimate, and the cultural and religious services it offers to local inhabitants are considerable.

Shallo Swamp

The Shallo Swamp has a surface area of 77 km^2. The water is slightly acidic (humic acid) due to the large biomass degrading in the standing water. Very little is known about the chemistry, physical features and biota of this wetland. Recently, studies have commenced on the wetland's phytoplankton biomass, weed bed, benthic fauna and waterfowl. The major functions and values of the wetland are as follows:

- the water is used by local Sidama and Oromo people for irrigation, sanitation and as drinking water for domestic animals;
- much of the runoff from Lake Awassa's catchment area drains first into the swamp and then gradually flows to the lake via the Tikur Wuha. Thus, the system plays a vital role in controlling flooding, particularly that originating from the Wondo Gennet highland areas;
- diverse species of water fowl, weed bed fauna, zooplankton, phytoplankton, fungi, bacteria, amphibians, reptiles and macrophytes inhabit the wetland. This makes it an important regional biodiversity domain;
- people graze their cattle on the wetland's grasses and exploit its vegetation for a host of domestic needs;
- there is only one fish species in the wetland, *Clarias gariepinus*, and it serves as a good source of protein for the local people. The fish harvest has no commercial significance;
- the wetland plays an important environmental service by maintaining the hydrology of the area, stabilising the microclimate and serving as a buffer against harmful additions from natural processes and human activities in the catchment.

River Tikur Wuha

The River Tikur Wuha is Lake Awassa's only influent. It serves different purposes for people, domestic use and wildlife. The river gets its name (which means black water) from the black humis-rich soil bed. Its pH ranges between 7.00-7.6 and conductivity (K_{25}) between 410-919. The phytoplankton biomass measured in terms of Chl-*a* ranges between 4.0 –7.6 $\mu g l^{-1}$ (Zinabu, 1998).

Threats and challenges

Assessing the past and present conditions of wetlands provides valuable information about the potential obstacles to efforts to sustain these crucial ecosystems. Based on this perspective, efforts are being made to identify the challenges that these wetlands face. The following activities are considered major threats to the health of Lake Awassa, the Tikur Wuha and Shallo Swamp.

Industrial activities

Untreated toxic discharge from industries in Awassa's industrial estate have, since the 1980s, attracted increasing concern. At present, state-owned factories (textile, flour, ceramics, sisal and tobacco) operate within the estate. While the flour and tobacco factories release no waste into these ecosystems, the other three factories do. The nature and amount of waste discharged from the ceramic and sisal factories has not been investigated, but discharge from the Awassa Textile Factory has been studied.

Awassa Textile factory is the largest and dirtiest factory in Lake Awassa's catchment. It has a capacity of 24,288 spindles, 124 shuttle rapier looms and a finishing plant with a capacity to dye, print and finish 36.1 million square metres of fabric per annum. The factory is highly energy, chemical and water intensive. At existing production capacity

(less than full capacity) it discharges 50 m^3 of wastewater per hour, rising to 120 m^3 at full capacity. The effluent is coloured, high in BOD (750 ppm), COD (1,500 ppm) and total suspended solids (500 mg/l). It is highly alkaline (a pH of 12) and hot (Desta, 1997).

The factory has chemical waste treatment facilities (acid and alkaline dosage units) but none of these are functional because, it is said, of the prohibitive cost of hydrochloric acid and sodium hydroxide. Consequently, the factory releases untreated wastewater into Shallo Swamp. By the time the waste reaches the swamp, virtually all of its chemical, biological and physical characteristics are unchanged except for its temperature. About 1,200 m^3 of this waste water is discharged daily. The impact of this effluent upon the Shallo Swamp can reverberate throughout the Lake Awassa hydrological system, affecting the biological, chemical and physical characteristics of the resource and the societies that have long relied on it.

There is a lack of scientific information on the type, magnitude and velocity of ecological damage caused by this industrial effluent to these ecosystems. It is possible that their degradation could go unnoticed for a long time before culminating with disastrous effects. This lack of knowledge makes it difficult to identify with any degree of certainty the damage and rate of degradation taking place in these water bodies through time. If, however, the chemical composition of the enterprise wastewater is determined, it is possible that the quality parameter changes to the receiving aquatic system can be predicted.

Solids are present in textile effluent generated from fibrous substrate and processed chemicals. The solids can affect the natural aquatic environment by hindering oxygen transfer and reducing light penetration. Moreover, solids that settle on wetland beds can cover flora and fauna resulting in an anaerobic layer (Taylor, 1984).

The BOD from organic process chemicals varies widely. Some chemicals, such as starch, are completely biodegradable, while others, such as refractory compounds in dyes, are essentially non-biodegradable (Cooper, 1978). Effluent containing high concentrations of xenobiotics (synthetic organic contaminants) could therefore deplete Dissolved Oxygen (DO) in the receiving stream, resulting in fish kills and objectionable water quality (Cooper 1978).

Phosphates are present in the detergents used in wet processing. Together with nitrogen, a proper balance is necessary for normal biological processes. Excess concentrations of either may appear in the effluent and reach the wetlands. If nutrient concentrations in the receiving waters become high, algal blooms may occur. Such changes to the trophic status of the water body (eutrophication) can affect fish populations in a number of ways. They increase nutrients and turbidity, alter the food chain and ionic composition of the water, increase organic matter accumulation in the sediment, decrease metalimnetic and hypolimnetic oxygen (and hence cause fish suffocation) and cause changes to water temperatures and macrophyte communities (Taylor, 1984).

In the textile industry, some processes require highly acidic conditions, while others highly alkaline ones. Consequently, wastewater pH can vary greatly over time and some form of neutralisation is necessary. The absence of such a system can lead to a gradual change in water quality, hindering or halting biological processes and ultimately

disturbing the food chain and affecting the gains that surrounding human inhabitants obtain from these water bodies.

At times, the wastewater from the textile factory is directly discharged into Shallo without first being pumped into a biological lagoon. This heated discharge (waste heat) can bring a subtle change to the water quality of the receiving system as many aquatic organisms are extremely sensitive to increased water temperatures (Taylor, 1984).

There is already an observable change in the quality of Shallo Swamp. Residents of the area have long drunk the water, but this is no longer potable. It was also used to water domestic animals. Now, when human and domestic animals drink the swamp water, they get sick, lose weight and abort (Desta, 1997).

The discharge has also affected irrigated agriculture near to the swamp. One farmer commented, "I did not have a problem growing good quality vegetables, *enset*, and coffee plants before this factory was here. Over the last three or four years, however, the size of my fruit and the taste of my vegetables has changed. Leaves turn white, dry and ultimately fall off. It has brought economic setbacks for my family and for other people here. I think the textile waste is destroying our life and future and the life of our children".

Even though there is a lack of scientific understanding about the impact of the factory's wastewater, there is a clear indication that the voluminous discharge of the textile factory and its toxic ingredients are affecting the natural quality of the surrounding wetlands, causing social and economic problems for the local community.

Land degradation

There is no doubt that the number of people living in Lake Awassa's catchment has increased substantially in the last couple of decades. As the size of the population grows, people are compelled to clear land for agricultural activities to ensure their survival in conditions where alternative means of existence and agricultural innovation are limited. Recently, much of the forest cover around Wondo Genet was burned for unknown reasons. As the vegetation cover of the catchment declines, nutrient and sediment loads increase and, at least theoretically, alter the chemical and physical features of wetlands. This, in turn, modifies species composition, distribution, abundance and the activities of organisms that rely on these aquatic ecosystems. Lake Awassa's water level has increased, inundating Marabou nesting sites. The stork nests in *Acacia albida* trees, which are killed when the lake floods. The dead trees are then felled by locals for firewood. Consequently, the birds are forced to move to live in *Acacia albida* trees in Awassa town, and have to fly further to get food around the lake.

Urbanisation

Awassa is a rapidly growing town. Its population is presently estimated to be 100,000. Business activities are expanding in many sectors, and unless they are tailored in the right direction and managed carefully, nearby wetlands may suffer negative consequences. For instance, the amount of solid and liquid wastes generated by different sources (e.g. hotels, health centres, households and factories) are increasing in size and composition. Practically all of Awassa's sewer lines end up in the lake. The municipality has no system to collect and manage solid and liquid wastes. Time will

come when managing waste by discharging it into the lake will cease primarily due to the damaging effect of the volumes involved.

Most of the waste from developing societies is organic, although toxic inorganic and pathogenic wastes are not absent (Lardinois and van de Klundert, 1993). Organic waste loading in such systems contributes to BOD rises, affecting different ecosystem elements, including biological resources (Miller, 1995; Cunningham and Saigo, 1995).

Agricultural activities

Many agricultural activities within the basin are subsistence-based, although a few large-scale farms exist close to the lake. The notable one is the Centre for Preparation and Expansion of Selected Seeds, which uses various agro-chemicals (pesticides, herbicides, fungicides and fertilisers). The amount and types of chemicals used is not easily determined, but certainly leached chemicals from this and other small-scale farming reach the lake via the drainage system. Although their impact can be imagined, scientific studies are needed to objectively assess and quantify their impacts.

Opportunities: what can be done?

There is no doubt that the wetlands of Awassa are facing degradation. At the same time, efforts to assure the health and normal functioning of this ecosystem are negligible. This section considers ways in which to reverse existing damaging trends and to improve the situation.

The attention given to emerging problems by stakeholders around Awassa is far from sufficient. We should not wait until a time when the problem is irreversible and lose our precious resources forever. Hence, different actors need to be sensitised, to accept the existence of problems and to show a willingness to start working on them.

In Ethiopia, we lack an efficient property rights structure. Breaches in efficiency (maximizing the present value of net benefits to society) and sustainability occur in resource allocation when there are ill-defined rights structures (Tietenberg, 1994). Properly designed property rights systems include four characteristics: (1) Universality: all resources are privately owned and all entitlements completely specified. (2) Exclusivity: all benefits and costs accrued as a result of owning and using the resources should accrue to the owner. (3) Transferability: all property rights should be transferable from one owner to another in a voluntary exchange. (4) Enforceability: property rights should be secure from involuntary seizure or encroachment by others (Tietenberg, 1994).

Exclusivity is frequently violated in practice. It occurs when an agent making a decision does not bear all of the consequences for his/her actions. In this case, the Awassa Textile Factory and the local community share the benefits of the wetlands from conflicting directions. The factory uses them as an end point for its waste, but the community uses them as a source of different resources for ensuring their survival. Because the factory does not bear the cost of reduced benefits to the local community, it is not sensitive to the costs it externalises in its decision-making. As a result, it continues to dump its waste into the aquatic system and an efficient allocation of resources is not attained. This situation is referred to in general as a ‘negative externality’. It exists whenever the welfare of some

agent directly depends not only on his/her activities, but also on activities under the control of some other agent (Tietenberg, 1994). In this instance, waste dumping into the wetlands imposes external costs on the fishery, tourism, agricultural activities, etc. Because the factory does not have to bear this cost, it has no reason to embrace ecological issues in its business operations. Hence, an ill-defined property rights structure results in the reckless dumping of wastewater into aquatic ecosystems, prompting environmental costs (aesthetic costs and health risks) not internalised by the factory. The largest category of resources for which environmental costs (negative externalities) arise, are those that are not exclusively controlled by a single agent or source. Such resources are known as open-access resources. In the absence of any attempt to correct market inefficiencies (by failing to formulate and put in practice appropriate property rights definitions), it is difficult to properly use and maintain these vital resources.

The regional Water, Energy and Mines Bureau holds the rights to regional water resources, including the swamp around the industrial area. The Bureau is legally mandated to protect the wetland from external damage. Ever since the factory commenced operations, however, the Bureau has never charged it for dumping its waste into the Shallo Swamp. This demonstrates the absence of an efficient property rights structure.

Our wetlands have not been adequately studied and regularly monitored. As a result, we lack the basis to talk about their futures in relation to human activities in the catchment. While we face constraints to the regular monitoring of our wetlands, substantial work with existing capacities can still be carried out, provided we devote time, expertise and meagre resources.

Until very recently, Ethiopia lacked any wetlands policy, strategy and legislation on wetlands. It is hoped that new water and environmental policies can reverse deleterious existing trends and protect the country's wetland resources for sustainable utilisation. Different sectoral and cross-sectoral policies must be applied to avoid gaps, overlaps and conflicts. People, however, usually fail to put such policies into practice. Therefore, every part of society should work hard to enforce laws and bring about desired changes. Ways and means must be sought to minimize and eventually halt the clearing of vegetation cover in the catchment. Stringent laws must be enacted and enforced to save the forest cover of Wondo Genet area and elsewhere. Sound strategies and projects need to be designed and implemented to rehabilitate degraded lands. The community of Awassa, initiated and organized by the municipality and supported by Debub University, is expected to plant and replant selected and appropriate tree species that could serve as the nesting, resting and breeding ground of disturbed bird species.

In ten to fifteen years form now, the waste from Awassa town is expected to increase in volume and composition complexity. Unless action is taken immediately, the problem may worsen, and result in serious damage to the wetlands. Therefore, a low-cost system to collect and manage solid and liquid waste from urban areas must be developed and implemented.

The amount and type of agricultural chemicals used in the catchment and leached into the wetlands has to be studied. The impact of inorganic nutrient loading as a result of agricultural activities in the area has to be assessed carefully. If loading levels exceed the resilience of the ecosystem, strategies must be devised to regulate the situation.

There are a number of strategies that may be employed to arrest and prevent the continuing pollution of Lake Awassa, the Shallo Swamp and the River Tikur Wuha:

- Environmental Impact Assessment of new development projects in the catchment;
- incorporating environmental education into the national curricula;
- empowering local communities to conserve and protect their wetlands;
- providing incentives for human activity that embraces ecological considerations;
- placing reasonable pollution charges against polluters;
- enhancing stakeholder awareness through programs in the media, workshops, short courses, etc.
- set ambient environmental quality standards and environmental audit systems for business operations in the catchment, and follow their implementation;
- put in place economic disincentives for ecologically and economically ugly products, processes, operations and technologies in the catchment;
- catchment treatment and promoting conservation-sensitive cultivation practices.

Conclusions

The interconnected wetlands at Awassa support various vital biological and non-biological resources. These resources provide various essential functions and values for the community that has long lived in the area. They support the lives of the human population, domestic livestock and wildlife. They are, however, being degraded as a result of unmanaged and harmful human activities in the catchment. Land use and modification, industrial discharge and activities associated with urbanization are the major causes of this degradation. In order to reverse these emerging problems and conserve these fragile but crucial wetlands, immediate and appropriate action must be taken by the responsible stakeholders. This includes rapidly assessing risks in relation to threats and impacts to yield sound strategic action plans and projects. Concerned and responsible bodies should initiate projects that are geared towards a continuous wetland inventory, monitoring and risk assessment. Otherwise serious ecological damage may well occur.

References

Cooper, S. G. 1978. *The Textile Industry: Environmental Control and Energy Conservation*. Noyes Data Corporation, New Jersey, USA.

Cunningham P. W. and B. W. Saigo. 1995. *Environmental Science: A Global Concern*. 3rd ed. W. C. Brown Publishers, Boston, MA, 612pp.

Dadebo, E. 1988. *Studies on the biology and commercial catch of the catfish* Clarias mossambicus (Pisces: Clariidae) *(Peters) in Lake Awassa, Ethiopia*. M.Sc. thesis, Addis Ababa University 73pp.

Desta, Z. 1997. *Industrial Environmental Management: the case of Awassa Textile Factory, Ethiopia*. M.Sc. thesis Wageningen Agricultural University, The Netherlands 95pp.

Fernando, C. H., S. Mengistou, and S. Belay, 1990. The Chydorid Crustacean *Alona diaphana* (King) Limnetic in Lakes Awassa and Zwai, Ethiopia, with a Discussion of Littoral and Limnetic Zooplankton. *Hydrobiolia* 75 (1990): 15-25

Green, J. and S. Mengistou. 1991. Specific diversity and community structure of Rotifera in a salinity series of Ethiopian inland waters. *Hydrobiologia* 209 (1991): 95-106.

Kebede, E. 1987. *A seasonal study on the species composition of phytoplankton biomass in Lake Awassa, Ethiopia*. M.Sc.thesis. Addis Ababa University 70 pp.

Kibret, T. and A. D. Harrison, 1989. The benthic and weed-bed faunas of Lake Awasa (Rift Valley, Ethiopia). *Hydrobiologia* 174 (1989): 1-15.

Lardinois I. and A. van de Klundert. 1993. *Organic Waste: Options for small-scale Resource Recovery*. Urban Solid Waste Series 1. WASTE/TOOLE, Amsterdam 132pp.

Makin, M. J., T. J. Kingham, A. E. Waddans, C. J. Birchal and E. W. Eavis. 1976. *Prospects for irrigation development around Lake Zwai, Ethiopia*. Land Resources study No 26. Ministry of Overseas Development, UK. HMSO. 316pp.

Mengistou, S., J. Green, and C. H. Fernando. 1991. Species composition, distribution and seasonal dynamics of Rotifera in a Rift Valley Lake in Ethiopia (Lake Awasa). *Hydrobiologia* 209 (1991): 203-214.

Miller G. T. Jr., 1995. *Environmental Science: Working with the Earth.* 5th ed. Wadsworth Publishing Company, Belmont, CA, 540pp.

Taylor, M. 1984. *Changes in water quality and its effects on fish populations*. A paper presented at the Great Lakes Seminar, December 10, 1984.

Tietenberg, T. 1994. *Environmental Economics and Policy*. Harper Collins College Publishers, New York 528pp.

Tilahun, S., S. Edwards and T. B. Gebre Egziabher (eds.) 1996. *Important Bird Areas of Ethiopia: A first inventory*. Ethiopian Wildlife and Natural History Society, Addis Ababa. 300pp.

Zinabu, G-M. 1988. *Dynamics of heterotrophic bacterioplankton in an Ethiopian Rift Valley lake (Awassa*). Ph.D. thesis. University of Waterloo, Ontario, Canada, 180pp.

Water resources policy and river basin development as related to wetlands

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Introduction

Preliminary studies indicate that Ethiopia has an annual surface runoff from river basins close to 122 billion cubic meters of water. Of this, between 80 - 90% is contributed by four river basins located in the west and south-west of Ethiopia. The remaining eastern and central river basins yield only 10-20% of the runoff (Ministry of Water Resources, 1999).

The extreme spatial and temporal variability in the climate and rainfall of the country is one reason for its uneven water distribution. The range between the highest monthly mean discharge is several times greater than the lowest monthly mean discharge in almost all of Ethiopia's large rivers. For example, low flows of the Tekeze River are in the order of $5m^3/s$, while average daily high flows are as high as 2,000 m^3/s (NEDECO, 1998). A large proportion of Ethiopia's smaller rivers and streams dry out completely during long dry spells in many areas.

Against this background, the frequency of drought has increased over the past three decades, resulting in significant social, economic and environmental imbalances. There are also growing constraints to water supplies in Ethiopian dry lands. Other issues compounding water supply include watershed degradation and poorly managed wetlands. This imbalance is one of the issues that the Ethiopian Water Resources Management Policy attempts to address in its formulation.

Clearly, therefore, there is an urgent need for a coherent guiding national policy to steer the management and distribution of Ethiopia's water resources and, in particular, its wetlands as vital components in the water cycle. In this paper, I provide an overview of the country's water policies and consider the attention that they give to wetlands and their management.

Importance of wetlands as a component of water resources

Wetlands are an important component of water resources in Ethiopia. The potential evapo-transpiration from wetlands is apparently very high because they lose water efficiently through dense hydromorphic vegetation. Wetlands, therefore, have an influence on rainfall humidity and microclimate stabilisation and are, hence, essential in the hydrological cycle and rainfall generation. Their hydraulic and hydrological functions and uses include ground water recharge, increased low flows (ground water

discharge), water storage, flood protection, continued stream and river flow, sediment trapping, and as water supply for people, livestock and wildlife. Their water quality functions include filtration, nutrient stripping (nitrogen and phosphorus), biodegradation of toxic compounds, heavy metal stripping and accumulation, and wastewater treatment. The various functions and uses of wetlands strongly support local regional and national economies.

Wetland-related policy issues

The management of wetlands presents problems because of the many interests competing for their use. The major interests in wetlands include drainage for agriculture, human settlement and reservoirs for irrigation and/or hydropower generation, grazing and for harvesting construction material (reeds and sedges for thatching and roofing). If excessive, these activities can lead to reduced water supply, increased incidences of water contamination, flooding, loss of biodiversity, desertification, reduced fish production and reduced tourism. Wetland-related policy issues must, therefore, be cross cutting in nature, and an integrated wetland resource management strategy calls for the coordination of several agencies.

The Ethiopian Water Resources Management Policy's Statement on Wetlands

The Ethiopian Water Resources Management Policy (Ministry of Water Resources, 1999) uses the same definition of wetlands as the Ramsar Convention (see Abebe, this volume). One of its five main objectives is to conserve, protect and enhance water resources and the overall aquatic environment on a sustainable basis. Wetland issues are only, therefore, referred to indirectly.

The Policy's statement on General Policy includes the following: "promote and encourage conservation of existing water systems and efficient utilisation of water as is feasible in the development of new schemes".

The Water Allocation and Apportionment policy states that the basic minimum water requirement of Ethiopia should be recognised as the reserve (basic human and livestock needs, as well as an environmental reserve). This should have the highest priority in any water allocation plan. This statement is significant when considering the environmental minimum requirement for terminal wetlands in some Ethiopian rivers and streams.

The Policy on Environment states that environmental conservation and protection requirements should be incorporated as integral parts of water resources management. This statement clearly upholds the need to conserve and protect the wetland environment while promoting water resources development and proper management.

Regarding water resources protection, the Policy identifies the procedures and mechanisms to deal with trends and events detrimental to water resources, including waste discharge, source development and catchment management.

The Policy on Disasters, Emergencies and Public Safety states that the protection of water bodies and water systems from pollution and depletion should be ensured.

The Policy on Water Supply and sanitation states that water bodies should be protected from pollution by wastewater and other waste indiscriminately discharged by industries and other institutions.

River basin development and the integration of wetland issues

The Ethiopian Water Resources Management Policy contains Master Plans, which provide for economic development programmes and some guidance for user-related sustainable management of wetlands, and which provide us with some insight into how the policy might work. In this section, I consider the Master Plan for the Development of Surface Water Resources in the Awash and Abay River Basins.

The Awash Basin Master Plan made a preliminary investigation of three major swamps in the basin, including Borkena, Becho and Gedebassa (Gewane). Each of these swamp areas possesses a perennial and an annual flood component. The primary worries for these wetlands concern water lost from the system via flooding around the wetlands and through evaporation. If the flooding could be controlled, the amount of available water could be increased and the flood plains freed for agricultural development.

The Becho Plain is located in the upland area of the basin at an altitude of about 2,100 m. The main area of annual flooding comprises some 4,500 ha, where several tributaries of the Awash come together. Much of the land adjacent to the flooded area – some 16,000 ha - suffers from poor surface and internal drainage (Halcrow, 1989). The protection of this area requires an adequately designed surface drainage project for the ground lying above the flooded area.

The Borkena Swamp lies some 35 km south of Kombolcha town. The total area covers about 12,000 ha, comprising 7,000 ha of permanent swamp and 5,000 ha of annually flooded land (Halcrow, 1989). The valley bottom soils are normally wet even in dry years and the area serves as an emergency grazing ground for the livestock of local highlanders displaced by recurrent drought, and for Oromo and Afar lowlanders. The permanent swamp also provides reeds and sedges for thatching and fencing. Halcrow (1989) estimates that the annual silt retention of the swamp is 0.74 million tonnes, and concludes that existing high levels of ecosystem productivity and utilisation should be considered as benefits. As such, the area is not recommended for drainage and, in any case, the reduction in dry season grazing for the pastoralists could have serious repercussions.

The Gedebassa Swamp is located at the northern end of the middle Awash Valley. The swamp and its environs play an important role in providing for the needs of the local Afar pastoralists and their animals. The area is extensively used for dry season grazing when the flood waters have receded (Halcrow, 1989).

The Abay River Basin study has determined that the wetland coverage of the basin is 579,876 ha or 2.9% of the basin area. The study also prepared a project profile for the Lake Tana Fogera Plains Nature Reserve. It was explained in the project profile that the wetland is an important resting-place for migratory birds (BCEOM, 1998). The project

recommended that a nature reserve and not a national park be established within the proximity of the lake that would include:

– an area of land for the protection of terrestrial and avian fauna

– an area of the lake so that aquatic biodiversity may be maintained.

This area would cover 570 km^2 of which 350 km^2 would be reserved for terrestrial species and 220 km^2 for aquatic species.

The need for a policy on Ethiopia's wetlands

The general objective of the Ethiopian Water Resources Management Policy with regard to wetlands is to ensure that measures are implemented to protect wetland ecosystems. In particular, the measures relate to the protection of aquatic life, and the planning and implementation of water resource conservation activities. Because of the critical role that wetlands play in the water cycle and in Ethiopia's hydrology, it makes sense to consider a separate policy, which will deal exclusively with these important resources. Such a policy would need to be able to cope with the multiple functions of wetlands, and ensure that the whole landscape into which wetlands are integrated is managed. In addition, the policy would need to be able to deal with the multiple uses of wetlands, such as grazing, rain-fed agriculture, irrigated agriculture, conservation, recreation etc. There is a need, therefore, to develop a National Wetlands Policy as an important integral part of Ethiopia's Land Use Policy. There is also a need for the establishment of a National Wetland Biodiversity Conservation strategy that encourages the wise use and the exploitation of natural wetlands.

Recommendations

– The management and conservation of wetlands should be based on research, planning and monitoring.

– The coordination of wetland management requires the signing of memoranda of understanding between the Ministry of Agriculture, Ministry of Water Resources, Environmental Protection Authority, Biodiversity Institute, Ethiopian Agricultural Research Organisation and the Ethiopian Wildlife Conservation Organisation and the Regional States. This would demonstrate the recognition of multi-sectoral interest in wetlands.

– An Environmental Impact Assessment should be carried out before undertaking any development that involves wetlands.

References

Ministry of Water Resources, 1999. *Ethiopian Water Resources Management Policy*. Addis Ababa.

Halcrow, Sir William and Partners. 1989. *Master Plan for the Development of Surface Water Resources in the Awash Basin*. Ethiopian Valleys Development Authority. Vol. 8, Annex J: Irrigation and Drainage.

BCEOM. 1998. *Abbay River Basin Integrated Development Master Plan*. Ministry of Water Resources, Addis Ababa. Vol. III, Project Profiles.

NEDECO. 1998. *Tekeze River Basin Integrated Development Master Plan*. Ministry of Water Resources, Addis Ababa. Volume I, Main Report.

Wetlands policy development in Ethiopia

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Introduction

For many years, the ecological and economic importance of wetlands has been poorly understood. They were either perceived as wastelands with no useful purpose to society or as a source of disease and a threat to public health. Because of this, a number of countries directly supported their drainage, and provided tax benefits and subsidies to projects and activities that drained wetlands. Such drainage has often been directly undertaken by public agencies.

Now, however, it is recognised that wetland ecosystems have multiple and critical functions maintaining ecological balances, and that upsetting these may entail serious environmental, social and economic costs. Currently, there is general agreement on the beneficial role that wetlands play as ecosystems, as sources of different products or as providers of different services at a national, and, in particular, community level.

Despite this understanding, however, the development of detailed conservation and wise use measures for wetlands is a slow process. The lack of concrete management actions on the ground is also increasingly becoming an issue in Ethiopia. The critical questions therefore are:

– are there public documents that identify the issues and actions required to conserve wetlands?

– is there legislation that makes the conservation and wise use of wetlands a mandatory requirement in Ethiopia?

Ethiopia suffers from a multitude of environmental problems. In order to address these, the country has adopted an environmental protection strategy characterised by a three-stage approach. The first stage incorporates environmental concerns into the supreme law of the land - the 1994 Ethiopian Constitution has a large environmental scope that defines the environmental values to be preserved and protected. Under Articles 44 and 92, the rights of Ethiopian citizens to a clean and healthy environment are described. The Constitution proclaims that the government and citizens have a duty to protect the environment, and that the design and implementation of programs and projects should not damage or destroy the environment.

The second stage was the formulation of environmental policy, which sought to determine the objectives and strategies that would be used to ensure respect for environmental values as envisaged under the Constitution, while still taking into account the prevailing economic, social and cultural conditions of the country. In this

regard, the Environmental Policy of Ethiopia was approved by the Federal Council of Ministers on 2 April 1997.

The third stage was implementation. This refers to actions undertaken to achieve the objectives of Ethiopia's legislation, in part via the design of appropriate rules for compliance and enforcement.

In this paper, the various national policies that relate to wetlands are described and evaluated.

Is there a policy on wetlands?

Wetlands-related policy is contained in Ethiopian water resources, agriculture and environmental policies. The Conservation Strategy of Ethiopia, which forms the basis for the Environmental Policy of the country, has also mentioned wetland-related issues. Unlike the national environmental strategy, the Gambella Region's Conservation Strategy contains a separate section devoted to wetlands. This suggests that while wetland conservation has become a concern in Ethiopia, it is taken more seriously in some regions than others, depending on circumstances.

At both National and Federal levels, critical wetland issues are addressed in relation to problems of land use, water resources management or biological diversity conservation as follows:

Wetlands in water resource policy

The treatment of wetlands in this policy is described by Fisseha (this volume). The Environmental Policy of Ethiopia also addresses water resources, and emphasizes the need to integrate the rehabilitation and protection of wetlands with the conservation, development and management of water resources. This policy element, therefore, could serve as an entry point by which the immediate actions pertinent to the protection, conservation and rehabilitation of wetlands can be taken.

Wetlands in land use planning

There are still some important environmental protection and management tools missing. One of these is a strategic land use plan. In many cases, the greatest threat to wetlands is land use policy and planning. This may reduce the amount of available land, placing pressure on wetlands as an alternative land source.

In this regard, the Environmental Policy and the Conservation Strategy of Ethiopia have already identified the conditions and variables that a land use plan will need to take into account, amongst which wetland values are contained. Here, again, the term 'wetland values' is considered sufficiently wide to accommodate the ecological, social and economic values associated with wetlands.

The Federal Rural Land Administration Proclamation is more of a policy document than a legal one. It targets land set aside for social services, in particular grazing and other communal land use to be carried out in accordance with a location's peculiarities and through communal participation. Wetland resources have traditionally been used for grazing cattle, growing crops and for domestic water and other communal use. When land is then set aside to fulfil various social functions, or when strategic land use plans

are formulated at the local level, the opportunity to address the wise use and conservation of wetlands arises.

Land use planning can, therefore, provide ample opportunities for addressing wetlands issues and concerns.

Wetlands in other environment-related policies

One threat to wetlands is unregulated social and economic development projects. Development will impact wetlands in different ways, and an early assessment of the ways in which a wetland will be affected minimises the social and economic costs of restoring a wetland after it has been damaged.

The Federal Environmental Policy and the draft proclamation on Environmental Impact Assessment provide a basis upon which environmental impact assessments (EIAs) can occur prior to any development undertaking in an environmentally sensitive area. Such 'environmentally sensitive areas' are considered to include wetlands.

Synergy with existing policies

Although a national wetland policy for Ethiopia would draw attention to specifically wetlands-related issues, it is clear from the discussion above that wetlands are well represented in existing national policies and legislation. It is therefore debatable as to whether or not a wetlands policy is actually needed.

An alternative strategy could be to ensure that synergy exists between relevant existing policy and legislation, which could then serve as a basis for enabling local-level action to occur. More wetlands-specific policy and legislation could be formulated at the regional level to address specific and localised wetlands problems, such as is the case in the Gambella Region. Such an approach may be more appropriate at the regional level where circumstances specifically demand such policy and legislation.

Wetland policy and strategy implementation

A serious problem with much Ethiopian policy is the failure to adequately implement it. Policy documents do not, of course, implement themselves. Implementation demands the enactment of other subsidiary governmental documents, such as legislation, standards and other technical guidelines. Although policies and strategies exist to protect wetlands at the federal level, it is probable that these are not based on an understanding of the often very localised problems and difficulties facing wetlands.

The question of how the conservation and wise use of wetlands can be made a legally binding requirement then arises. How, in addition, can compliance and enforcement be assured?

In order to ensure that federal policies and legislation have a value and, importantly, a meaning at the local level, studies are needed that will generate data to demonstrate the costs and benefits of wetlands conservation on the one hand, and the effects of converting them to support alternative land use practices on the other. Additional data that may be needed are a resource inventory of Ethiopia's wetlands, the identification of endemic species if any, and defining the degree of threat to the wetland, where possible

in financial terms. The serious economic, social and environmental repercussions of damage to wetlands must be well understood and disseminated if national policies are to be adequately implemented at the local level. At present, however, agendas promoting conservation and the wise use of resources tend to be overlooked in favour of approaches that promote food security.

Wetlands involve multi-sectoral issues and hence require multi-sectoral approaches co-ordinated by a body representing or comprising diversified interests and stakeholders. An additional important question concerning the implementation of wetlands-related policy, therefore, relates to the identification of a suitable body to oversee implementation and to ensure that these multi-sectoral interests are adequately served.

The Environmental Protection Authority (EPA) may be a suitable organisation to assume these responsibilities, including the determination of whether or not Ethiopia should remain a member of the Convention of Biological Diversity and/or if it should accede to the Ramsar Convention.

Additional data needs

In addition to the data needs identified earlier, the following data will be necessary for developing a broad consensus on the need for special attention to wetlands, and to formulate legislation and technical guidelines pertaining to wetlands:

- types of wetlands and resources present in existing wetlands;
- the functions and values of wetlands in the country's regions;
- the revision of patterns of use and impacts of development on wetlands;
- an historical review or inventory of wetland loss and its impacts;
- an examination of the relationship of wetlands to other sectoral resource management issues;
- the value of wetlands to the environment and people, and
- the examination of opportunities and constraints to development programs at different levels.

Conclusion

In this paper, I have argued that the history of environmental conservation in Ethiopia has been characterised by a three stage approach. In the first stage, environmental concerns are identified. The second stage is to formulate policy capable of meeting and addressing these concerns. Finally, the third stage seeks to implement policy and legislation.

I have reviewed the country's environmental legislation. Granted, Ethiopia has no legislation that specifically deals with wetlands, but I have argued that wetlands are adequately represented in a series of environmental policies and legislation, and the need for a specific wetlands policy is limited.

At the macro-level, therefore, environmental and, more specifically, wetland concerns are addressed. There exist, however, difficulties in implementation, primarily because of

the problem of translating federal policy into locally-relevant controls and regulations on wetlands exploitation and damage. I have argued that research is required to ensure that federal legislation is site-specific and that, in this way, the value and importance of wetlands can be demonstrated at the local level, engendering a basis for conservation, management and regulatory implementation. In addition, I have argued that an organisation is needed to oversee the diverse and multi-sectoral interests that wetlands may attract, and to ensure that national legislation is adequately implemented, monitored and enforced. I have suggested that the Environmental Protection Authority is suitable for this role.

The task ahead will need to focus on how we should go about finalising the implementation stage, based on existing policy, strategy and legal documents rather than trying to reinvent the wheel by developing a stand-alone wetlands policy.

Environmental impact assessment and the wise use of wetlands

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Introduction

Wetlands are areas where water is the primary factor controlling the environment and associated plant and animal life. They occur where the water table is at or near the surface of the land, or where the land is covered by shallow water (for additional definitions, explanations and uses of wetlands, see Abebe, this volume). Wetlands contribute in no small way to our quality of life and survival, providing a wide variety of important benefits to local people, downstream populations and to the nation as a whole. They perform many vital functions, including water storage, storm protection and flood mitigation They are valuable in that they provide humans with tremendous economic benefits, such as water supplies, fisheries, agriculture, energy resources etc. Wetlands even have cultural importance and, in some cultures, they provide special values related to religious and cosmological beliefs. In addition, wetlands are a source of aesthetic inspiration, provide wildlife with a sanctuary, and form the basis of important local traditions.

Wetlands are dynamic ecosystems, which continually change naturally due to subsidence, sea level rise, drought, erosion and siltation. Natural change is normal and expected, but direct and indirect anthropogenic activities have affected considerably the vital functions, values and attributes of wetlands. If wetlands are to thrive, they must be managed wisely, sustainably, sparingly and with care. In order to realise the benefits that can be derived from wetlands, and to avoid, mitigate or compensate adverse impacts upon them, it is imperative that Environmental Impact Assessments (EIAs) are undertaken before major development activities occur. The objective of this paper is, therefore, to indicate the importance of EIA to the wise use of wetlands, and to describe the steps through which an EIA must pass in order to adequately evaluate the threats that human activity, settlement and development pose to wetlands[5].

[5] The following paper draws upon CSIR (1999), Environmental Protection Authority and CSIR (1999) and UNEP (1996).

Major impacts of development projects on wetlands

Broadly speaking, direct threats to wetlands may result from physical, chemical or biological changes to the surrounding environment. Each of these impacts are considered below.

Physical changes

Physical changes may be the result of:

Reduced water input

This will happen as a result of drainage, ground water abstraction and surface water diversion, which may lead to the drying of wetlands and the shrinkage of their areas. If prolonged, this results in flora and fauna loss. Wetlands' inability to reabsorb moisture after drainage impairs their flood control functions. Other important impacts are the acidification of wetland soils and increased salinity. Lake Abijatta is a good example of such an impact.

Increased water input

Increases to the groundwater table may arise as a result of upstream impoundment, and may cause an increase to the wetland area, its deepening and an increase of its productivity. In arid areas, however, salinisation and alkalinisation may result from evaporation and reduce the productivity of soils or wetlands and undermine them as a reliable water source. In addition, stagnant water may represent a potential health hazard from waterborne disease.

Artificial stabilisation of water levels

This can occur as a result of barriers and flood control measures. The natural productivity of the wetland will be reduced since its normal nutrient cycling, which normally occurs when water levels rise and fall, will be curtailed.

Flooding in wetlands

When flooding occurs, marginal habitats may be lost. Regular or seasonal variations to water levels may inhibit vegetation growth at wetland margins and reduce productivity and habitat availability. The incidence of water-associated diseases may also increase.

Rises to the ground level

Wetlands may be filled to, for example, develop infrastructure or urban areas to curb the health risks that wetlands pose, or increasing the area under agriculture. Wetland habitats, their functions and products may be completely destroyed in the process.

Increase of sediment in wetlands

Deforestation, upstream soil erosion, construction and mining activities may cause sediment loads in the water to increase. This will reduce the penetration of light and hence primary productivity. Too much sediment can have abrasive effects on aquatic organisms, especially fish. Increased sediment loading can reduce the life span of a reservoir and aggravate the risk of flooding.

Reduction of sediment in wetlands

This may happen as a result of upstream impoundment, causing increased bank erosion downstream. The final consequence will be loss of property, habitat and productivity.

Chemical changes

The impacts related to chemical changes are:

Water salinity

This occurs as a result of natural salinisation and the release of irrigation drainage water, certain industrial effluents and mine waters. Salinisation may cause ecological changes, and cause the loss of salt-sensitive species and, possibly, their replacement with salt-tolerant species. In sudden and extreme cases, this can cause habitat destruction. Otherwise, salinisation will reduce water quality and curb its usefulness as a source for drinking or industrial use.

Increased organic loading of water

The discharge of sewage and industrial waste directly into a wetland can increase its organic load. This, in turn, increases the water's Biochemical Oxygen Demand (BOD), possibly causing its de-oxygenation and the death of aquatic life. Such nutrient additions to water may also cause eutrophication when the concentration of nitrates and phosphates reach levels that encourage the growth of algae. Depending on conditions, the type of algae to grow may be undesirable – such as filamentous algae and red tides. Fish kills may also result and biodiversity could decrease.

Increased levels of toxic materials

Common toxic materials include heavy metals, organic chemicals and pesticides, originating from agriculture, industry, mining and other hazardous waste. These may cause the mortality of aquatic life and, if persistent, the destruction of the wetland's habitat.

Biological changes

Biological changes result from:

Over-exploitation of natural resources

The over-exploitation of wetland resources, such as vegetation and fisheries, can cause changes to the wetland habitat. This may expose the wetland to erosion, produce changes to soil structure and cause the loss of protection and food for juvenile fish species. Over-fishing will change the species composition of the wetland, encouraging smaller and less commercially attractive species to achieve dominance.

Introduction of exotic species

This may occur intentionally or accidentally. Exotic species tend to have no or fewer biological controls on their population growth than do indigenous species. This gives them a biological 'edge' over local species, which may result in the latter's loss. Species of concern include the Nile perch (*Lates niloticus*) and the water hyacinth (*Eichornia crassipes*).

An overview of Environmental Impact Assessment

Wetlands are subject to continuing threats and degradation. Because of human activities and development, the maintenance of wetland functions, values and attributes have become increasingly challenging. In order to ensure that wetlands are sustainably utilised, it is essential to integrate environmental concerns into development. Environmental Impact Assessment (EIA) allows this to occur. An EIA may broadly be defined as an activity designed to identify and predict the impact of proposed legislation, policies, programmes, projects and other operational procedures on the bio-geophysical environment and the health of human populations, and to interpret and communicate information about these impacts. It is a planning and decision-making tool. It aims to eliminate, minimise or compensate negative impacts and optimise positive ones. Until the end of the 1960s, nature was treated as an infinite supply of resources to be used for human benefit. Early EIA attempts were often crude and limited to technical and economic feasibility studies. As a consequence, many development endeavours were harmful, reduced predicted benefits and caused considerable public disquiet.

It was largely due to public pressure that, in 1970, the U.S. National Environmental Policy Act (NEPA) introduced an EIA requirement to American planning and development. Initially, EIAs focused on biophysical impacts. Between 1970 and the early 1980s, EIAs sought to integrate and involve the public in development planning. From the mid to late 1980s, the emphasis was on the cumulative effects of environmental mismanagement and policy integration. More recently, from the mid-1990s to date, EIAs have been concerned with ensuring environmental sustainability.

In Ethiopia, development planning and decision-making in the past focused on short-term technical feasibility and economic benefits. Little attention was paid to environmental and social considerations, resulting in further damage to the country's fragile environment. Wetlands are amongst those environmental systems that have suffered the consequences of this disregard. Several examples can be cited in Ethiopia, including the observed physical, chemical and biological changes to Lakes Abijatta and Kilole, the impact of exotic fish introductions to Lake Hayk, and the water hyacinth infestation of the Aba Samuel and Koka Reservoirs.

The major underlying reason for the above problems is the absence of any legally-binding EIA policy. The Government of Ethiopia, cognisant of the magnitude of the country's environmental degradation and its adverse impacts on social, economic and cultural development, has taken some important measures. These include, amongst others:

- the establishment of the Environmental Protection Authority (EPA) under Proclamation No. 9 of 1995, which has the following objetive: "to ensure that all matters pertaining to the country's social and economic development activities are carried out in a manner that will protect the welfare of human beings as well as sustainably protect, develop and utilise the resource bases on which they depend for survival";
- the EPA, consistent with its mandate, formulated the country's Environmental Policy in April 1997, which provides, amongst other things, policy directives for environmental impact assessment of various programmes and projects. Moreover, the EPA has been making important efforts in developing a legally-binding EIA system that includes draft guidelines and environmental legislation.

The importance of EIA

An EIA is undertaken for the following reasons:
- to integrate environmental considerations into development planning, policies and programmes so as to ensure environmental sustainability;
- so as to make an informed decisions;
- to reduce time and costs;
- for better compliance with standards;
- to increase acceptance of development.

EIA is an important tool in the sustainable development of wetlands. It helps to predict and identify the likely adverse impacts of wetland development. It helps to integrate important considerations, such as cumulative and synergistic effects, possible alternatives, and appropriate mitigative and follow-up measures. It is an essential instrument with which to realise the sustainable use of wetlands by taking into account their ecological, social and economic sustainability. Sustainability is taken into consideration in Strategic Environmental Assessments (SEAs), which help to ensure that wetland conservation and sustainable use are incorporated into sectoral policies, programmes and plans.

The EIA Process

The EIA process involves a number of stages, which can be incorporated into the project cycle. These steps are summarised in Table 11 and, in this section, each is considered in turn.

Screening

This is the process of determining whether or not a proposal needs to be subjected to an EIA and the level of the assessment that may be required. The important questions that may need to be answered include the following:

- will the proposal result in changes to land-use – such as intensive agriculture, forestry, or aquaculture - causing wetland loss?
- Will the proposal affect the rate of wetland drainage? Such an outcome may arise from, for example, price subsidies for agricultural production or public health.
- Will the proposal result in an increase of water abstraction or use from the ground or surface causing a depletion of the water available for wetlands?

- Will the proposal result in the over-use and wastage of water?
- Will the proposal result in changes to hydrology through, for example, flood control or hydropower generation?

Table 11: EIA and the Project Cycle

PROJECT CYCLE	**Environmental Assessment Process**	**Wetlands Action Points**
Project Identification Pre-feasibility study	**Preliminary Environmental Assessment** Initial Screening Potential impact identification Possible mitigation measure Final Screening	Consider national water and wetland issues Consult wetland sites inventory Address lists of potential project impacts upon wetlands
Project Formulation Feasibility study Project planning and detailed design	**EIA Preparation** Scoping and public consultation TOR Identification of alternatives EIA Planning environmental management plan and monitoring	Describe water and wetland issues in project area Describe wetlands area (baseline survey) Assess wetlands functions, use and value Involve stakeholders
Project Appraisal	**EIA Review** Review EIA report, Public consultation	Consult communities, wetland users and NGOs.
Project Approval Negotiation Approval	Incorporate environmental condition (permit conditions)	Consult environmental law and wetland specialist
Project Implementation Implementation and supervision Implementation, mitigation and enhancement measures	**Environmental Monitoring** Monitoring of mitigation and enhancement measures Monitoring of environmental and Socio-economic indicators	Monitor wetlands management indicators Monitor ecosystem status Wetland users and economic status indicators
Project Evaluation Performance audit Recommendation for substance follow-up	**Environmental Audit** Effectiveness of mitigation and enhancement measures Recommendation for follow-up;	Carry out wetlands ecosystem survey Survey wetlands users Socio-economics
Follow-up Activities Design needed new project activities	Adjust mitigation and management measures	Sustain wetland conservation and wise-use

- Will the proposal result in changes to, or the intensification of, chemicals – such as agriculture and forestry chemicals - that are likely to damage wetland ecosystems?
- Will the proposal result in changes to upstream systems such as watersheds or upland forestry?
- Will the proposal lead to the introduction of exotic species?

- Will the proposal result in the increase of pressure – such as hunting or fishing - on wetland flora and fauna?
- Will the proposal result in the loss of wetland benefits for local stakeholders and communities?

A number of screening methods have been devised to date. Some important ones include:
- decision-maker's discretion;
- initial environmental examination;
- project lists with or without thresholds; and
- exclusion lists.

There are usually three possible outcomes of the screening process:
- proposals which do not require additional environmental investigation, and will not have a significant environmental impact;
- proposals which require limited environmental study because the environmental impacts are known and can easily be mitigated;
- proposals which require a detailed EIA to determine the extent and magnitude of adverse impacts and to propose a range of appropriate mitigation, monitoring and management measures.

In the absence of EIAs, the following may result:
- changes to the hydrological regime (timing, flow rate);
- changes to water quality (turbidity, sediment, chemical purity and temperature);
- changes to health risks resulting from hydrological or water quality changes (eg. malaria or *Schistosomiasis*);
- loss or disturbance of wetland flora and fauna;
- the prevention of flora and fauna dispersal or migration;
- loss of valued wetland products or functions.

Scoping

Scoping refers to the process of identifying from a broad range of potential problems key decision-making issues that need to be addressed by an EIA. Scoping is a process of interaction between the interested public, government agencies and proponents in the process of identifying issues with respect to a proposed development. Scoping is important to the sustainable use and development of wetlands because:
- it sets the appropriate spatial and temporal boundaries of an EIA study;
- it identifies important issues and concerns (interests);
- it enables interactions between interested and affected parties with regulatory authorities;
- it considers reasonable and practical alternatives;
- it establishes the terms of reference (TOR) for the EIA process.

The scoping process involves a series of general steps, which can involve different approaches pertinent to a particular situation. These steps are instrumental in the identification and integration of wetland-related issues into a planning process:
- preparation of the general background of the proposal;
- notification and involvement of all concerned and interested parties;
- identification of key issues of significance.

Key issues of significance could include:
- the current uses and benefits of the wetland;
- wetland uses and benefits that would be lost (including those that are still be intact) after the project is implemented;
- the number of people to be affected by changes to the wetlands, e.g. loss or gain of water access and availability, reduced or increased flood risk;
- monetary values of uses lost or gained compared to the value of the project.

There might also be a need to consider other significant benefits lost or gained which cannot be given a monetary value, including the cost of providing alternative sources of income, water and food supply, flood protection, biodiversity and amenity values. Balancing the costs of retaining wetland functions and values against alternative projects and issues of sustainability are important considerations during EIAs.

Terms of Reference (TORs)

The development of TORs is the outcome of the scoping stage. The TOR sets out what the EIA is to cover and how it is to be managed. The main components of a TOR include:
- background - introduce the project and the most critical environmental issues involved;
- setting the context of the assessment - the problem, objectives of the EIA, legal and policy basis;
- required information - description of the project, biophysical and human environment;
- institutional and public involvement;
- obvious impacts;
- analysis of impacts - positive, negative, cumulative, immediate, reversible, irreversible, temporal, spatial significance and cost-benefit analysis;
- alternatives - to the project, within the project;
- mitigation and monitoring - impact management plan, environmental plan;
- conclusion and recommendations - key aspects of project decisions and findings of technical matters, non-technical summary including economic benefits.

Conducting an Environmental Impact Study

This involves the scientific and objective analysis of the scale, significance and importance of impacts identified in line with the TOR. It comprises the following steps:

A baseline study: this should focus on the assessment of the physical, biological and social environment of wetlands, which could be affected by the proposed development. This may include ecological, hydrological and socio-economic studies of wetland user communities. This phase of the study can also consider the provision of information on 'pre-project' conditions and include a budget for the EIA.

Impact identification: this includes the identification of major impacts related to major issues identified during scoping. One approach is to name all the proposed impact sources e.g. changes to the hydrological regime, use of chemicals, introduction of exotic species etc.

Impact prediction: this phase of the study will try to answer the question of what the extent of the change brought about by the proposal or project on the wetland and its beneficiaries will be. Prediction attempts to determine the causes and effects of the impacts, and relies on data and analysis from baseline studies. Where possible, impacts should be predicted quantitatively.

Evaluation of significance (impact analysis): this phase should attempt to determine whether the impacts analysed are acceptable, if they can be mitigated or if they are unacceptable with reference to their magnitude and importance (value). Significance of impacts can be evaluated by considering:

- characteristics of impacts – type and nature, magnitude, prevalence, timing, duration, frequency, likelihood, reversibility or irreversibility and significance;
- existing or present policies, legislation, regulation or accepted standards;
- protected status of wetland ecosystems, species or landscape;
- acceptability to potentially affected people and the general public.

Mitigation: this is a measure aimed at preventing, reducing or rectifying adverse impacts and enhancing a benefit. Alternative approaches to mitigation include:

- eliminating effects;
- improve existing conditions;
- creating new resources;
- replacing lost resources in kind;
- lessening impacts to acceptable levels;
- creating off-setting benefits (compensation).

A wide range of mitigative options could be considered, including:

- changing the project site or location, routes, processes, timing, raw materials and/or operating method;
- introducing pollution controls, monitoring and/or public education;
- compensating and offering restoration of damaged resources, offering money to affected people and/or off-site programmes.

The whole idea of mitigating the impacts of projects upon wetlands should be to:

- ensure that all project alternatives are considered in the design phase and during the EIA process;
- to make sure that decision-makers realise the full costs of the loss of the wetland and its functions;
- ensure that adequate compensation for the loss of the wetlands has been agreed upon with wetland users;
- consider whether wetland functions can be provided or created elsewhere (rehabilitation possibilities);
- develop wetland management components for remaining wetlands to optimise residual functions and benefits.

Preparation of an Environmental Impact Statement (EIS): an EIS is the report that presents both in summary and detailed form the findings of the Environmental Impact Study. Its purpose is to provide information about the project in a way that classifies the choices available and the consequences of each choice. It is also a document that aids decision-making. A typical EIS will include:

- an executive summary- non-technical and concise;
- a description of the legal framework;
- a description of the environment (bio-physical and human);
- a description and evaluation of impacts;
- mitigation measures;
- follow-up mechanisms;
- a statement on the extent of involvement;
- gaps and uncertainty.

Review: this is an integral element of the decision-making system by which information in the EIS is appraised for its accuracy, adequate assessment of environmental effects and implications for the implementation of the proposal.

Monitoring: this is the repeated observation of one or more elements or indicators of the environment according to a pre-arranged schedule in order to test predefined ideas of how the development may affect the wetland. Impact monitoring assesses the effect of the activity (project) on the natural and human environment and estimates its magnitude. Inclusion of a framework for monitoring can significantly improve the effectiveness of an EIA.

Post project audit: environmental auditing is a systematic process of obtaining and evaluating information about the environmental aspects (consequences) of an operation, an organisation or a site, accompanied by an appraisal of the effectiveness of management measures to prevent harmful impacts. It is a hindsight evaluation of how well impacts were predicted and how appropriate prescribed mitigation measures were. Environmental auditing is useful to assess or check compliance with, and the performance of, environmental plans as required by the EIS. It is also an opportunity to learn from experience to refine project design, plans and policy formulation in an environmentally sound manner.

Public involvement: every project, plan or policy for which environmental assessment is prepared involves changes. Such changes may arouse public fears, concerns and expectations. Thus public involvement should be an integral part of the EIA process, and must receive due consideration in the sustainable development and protection of wetlands. The level of public involvement will often depend on peoples' ideological stance, economic, social groups and other influencing factors. The level of involvement may be classed as follows:

- co-option: this is an attempt to manipulate public opinion as if the affected people have already accepted or endorsed the proposal. This can be made possible by correction, persuasion or by the promise of compensation;
- informing: advising affected people about the planned activity. This does not seek peoples' reactions, and is, therefore, one-way communication from the proponent to the public;
- consultation: this involves seeking the public's view and opinions that may then be used to contribute minor changes or additions to the project. Project control and decision remains with the proponent;
- collegial or partnership: assumes the public as a partner, especially those affected by the project. This approach results in strengthening the project by correcting any

weak points and even redirecting it. Its guiding principle is mutual benefit to both the proponent and the public;

– devolution of power or community control: the idea here is that local populations are brought into the cycle from the beginning. Local decision-making plays a leading role in the implementation and follow-up of the proposed activity.

There is enormous advantage to involving the public in the EIA processes, which can provide easy access to, and obtain information about, the local environment, economic and social system. As a result, understanding the potential impacts of proposed activities will be enhanced and the identification of alternative sites better designed. Mitigative measures can be appreciated and conflicts and delays minimised. Most important, local participation will increase the acceptability of the project, and create accountability and a sense of local ownership during project implementation. The groups that are directly affected, including intended beneficiaries, risk groups and other stakeholders, should be involved in this process. An enabling environment is needed to ensure that a meaningful, effective and legally binding participation amongst those involved is achieved. This involves developing an effective participatory framework to determine the dissemination of information, timeframes, sampling of participants and identification of site locations.

Conclusion and recommendations

Wetlands have diverse benefits and their sustainable use should be maintained. To ensure this, environmental impact considerations during the formulation and implementation of wetland-related policies, programmes, plans, strategies and projects should receive the utmost attention.

References

CSIR. 1999. *Environmental Assessment and Management Training Manual*. A manual presented on EIA training. Addis Ababa, Ethiopia.

Environmental Protection Authority and CSIR. 1999. *Guideline document on Environmental Assessment and Management*. Unpublished Document.

UNEP (United Nations Environment Program). 1996. *Environmental Impact Assessment Training Manual*. Preliminary Version. United Nations Environment Program, Nairobi, Kenya.

Towards Sustainable Wetlands Management: The Ugandan Experience

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Introduction

Over the weekend of 4-6 March 2000, a fence was erected around an area bordering the Golf Course on Kitante Road in Kampala, partly blocking the view over one of the last large green corridors in the City. As was to become clear, a hotel and shopping mall were to be built in the fenced-off area that included about two hectares of wetland. Within days, a public and political debate unfolded that raged for several months and pitted members of the environmental sector, ministers, parliamentarians and Kampala residents against one another. Two questions were at the heart of the debate: first, to what extent economic development - in this case a US$ 2 million private investment - should take precedence over the protection of green public space? The related second question was whether or not a construction should be allowed in an urban wetland?

For insiders following this debate closely, it was striking to see not just the public outcry about the construction as such, but more importantly, the quality of the debate, particularly that by those opposing the project. Several newspaper articles spelled out in detail the importance of Kampala's wetlands for storm water absorption, drainage, filtration and purification, and the potential dangers of indiscriminate filling of wetlands for the City's infrastructure, public health and long-term prosperity. Despite the construction going ahead, probably because of legal and political reasons, the planners, EIA-evaluators and politicians have learned one important lesson: environmental issues, and wetland issues in particular, are in the public domain, and if not handled properly, can do tremendous damage to one's image and professional or political future. For many Ugandans concerned about the environmental future of their country, this should be a heartening realisation.

The significance of this small event can only be understood in the light of what has happened in Uganda during the last 15 years in terms of the promotion of wetland issues, the inclusion of wetland management in major legislation, and the development of viable alternatives for destructive wetland use. This article will give a brief overview of the evolution of the National Wetlands Programme from a small project developing a National Wetlands Policy, to a concerted national effort by the Government of Uganda and civil society to sustainably manage Uganda's vast wetland resources.

The Importance of Wetlands in Uganda

With an estimated 13% of Uganda's land surface, wetlands constitute the most widespread ecosystem in the country. In comparison, wetlands cover twice as much land as forest area. In central and western Uganda, large papyrus swamps store enormous quantities of water, and provide local communities with a huge stock of raw materials for the production of mats, baskets, thatch, clay and sand. In the east, many seasonally wet valley bottoms placed in an undulating landscape, have been turned into rice fields, and provide dry-season grazing for livestock. Uganda's natural rangelands in the so-called cattle corridor, a relatively dry narrow belt running from the south-west to the north-east, are dotted with wetlands critical to the survival of cattle during the dry season. In the far west and south-west of Uganda, many wetlands have been converted into agriculture and livestock farms, stimulated by Government policy in the 50s and 60s as a means to deal with the high population pressure in the surrounding steep hills.

Much as wetlands supply an array of products to many people, the hydrological services that they provide form the single strongest argument for promoting sound wetlands management. In Uganda, wetlands form the backbone of an entire drainage system. Apart from Lake Victoria in the south, Lake Kyoga in the centre and the western rift valley lakes, most of Uganda's surface water is absorbed and stored in its wetlands. They function as fresh water reservoirs that slowly release their water, either underground to replenish aquifers, or laterally towards the major drainage basins. This slow release of water increases water availability during the dry season for domestic use, edge cultivation or livestock watering. It keeps bore holes, shallow wells and springs functioning, and by trapping silt and pollutants, wetlands contribute to public health by providing relatively clean water to millions of people.

Lastly, wetlands in Uganda harbour an enormous stock and diversity of flora and fauna. Many of these have economic value and are harvested and used locally. Many others have intrinsic values that are usually only appreciated by ecologists and nature lovers until their economic values become apparent, for instance through tourism.

Some attempts have been made to assess the economic value of Uganda's wetlands. Preliminary research carried out by the National Wetlands Programme and IUCN suggests that wetlands contribute hundreds of millions of dollars per year to the country's economy. For example, the purification functions of the 5 km^2 Nakivubo wetland in Kampala, are valued at an estimated US$ 1.3 million per year (Emerton *et al*, 1999). Figures for rural wetlands in the east show that papyrus harvesting and mat making contribute in the range of 200 US$ per year to a family's income.

Although wetlands have always been important for local livelihoods and national economic prosperity, they were officially considered a nuisance, harbouring disease, bad spirits, blocking communication and taking up valuable agricultural land for a long time. Many people still think like this. This view was translated into subsidised drainage in densely populated areas, and widespread filling in urban areas to create space for industrial and residential estates. It was only when serious flooding, microclimatic change and rural water shortages were linked to wetland degradation that a conducive environment for sustainable wetland management started to emerge.

Strategies for achieving sustainable wetlands management

The Uganda National Wetlands Programme (NWP) story starts in 1986, when the then new Movement Government under President Yoweri Museveni, placed a ban on further wetland drainage until a policy on the sustainable use of wetlands could be developed. This position was the government's reaction to widespread and uncontrolled drainage of wetlands in the west of the country, which started to affect water availability during the dry season and allegedly changing the micro-climate in affected districts. Three years later, the National Wetlands Programme's first phase started with technical assistance from IUCN. The sole purpose of this phase was to develop a National Wetlands Policy. In subsequent years, it became clear that a much wider, multi-pronged approach was required to achieve the goal of sustaining Uganda's wetland resources. Through experiences over the last ten years, the NWP has identified at least six key strategies that must be pursued more or less simultaneously to achieve sustainable wetland management. These are:

1. create an awareness and appreciation of wetland functions and values at all levels of society;
2. develop a knowledge and understanding of wetland stocks and the ecological and hydrological processes of wetlands;
3. develop a knowledge and understanding of the socio-economic uses of wetlands;
4. develop a wetlands policy, legislation and wise use criteria, and incorporate or harmonise wetland issues in other laws and policies;
5. develop an institutional framework and capacity for wetland management in the government and civil society;
6. develop best practices for sustainable resource use and wetland system management.

Underlying these strategies is a national vision for wetland management, which is central to programme development and growth as it functions as a reference point against which to gauge the appropriateness of strategies, outputs and activities in wetland management. For the NWP, the vision has evolved over the last ten years with increasing insights gained during programme implementation. Today, it emphasises the importance of wetland appreciation, and a commitment to sustainable wetland management to benefit the people of Uganda and its environment. The complexity and interdependence of the vision, the various strategies and their outputs and how they relate to each other is shown in Figure 4. These different strategies are discussed in the following paragraphs.

Start and Strategy 1: Identifying Issues, Allies and Creating Appreciation

Probably the first step in making wetlands an issue is developing an initial level of interest and appreciation for wetlands amongst people who matter. Many of the first wetland initiatives in any country are spearheaded by ecologists, who will try, against public and political priorities, to argue the case for wetlands importance on ecological and biodiversity grounds, usually under the guise of their eco-tourism potential and option values. The NWP has learnt, however, that economists, planners and politicians

looking for hard cash, food and land for their constituencies, usually brush these arguments aside.

In Uganda, the breakthrough that prompted public concern for, and interest in, wetlands took place on the basis of two important messages:

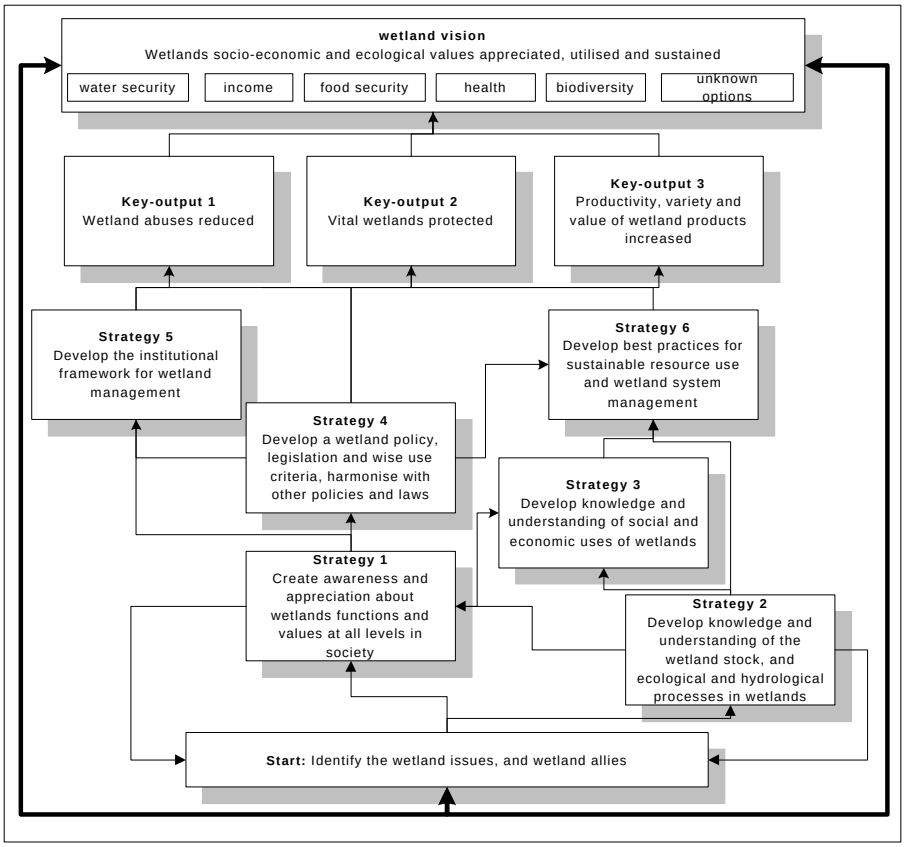

Figure 4: Broad strategies used in the National Wetlands Programme to improve wetland management in Uganda

Wetlands can and should be utilised to benefit ordinary people

Although this message is at the core of the wise-use concept, it is often interpreted and disseminated by communicators in a form that allows for no modification of the natural wetland at all. In the course of ten years of NWP experience, it was realised that narrowing management options to this level is, in many cases, not necessary, difficult to defend, and, as a result, alienates resource users, national planners and politicians from the programme. When management options were opened up to include uses that allowed for wetland modifications up to a certain non-destructive threshold level, a much wider acceptance of the NWP's ideas was achieved.

Wetland abuse leads to direct economic damage

Over the past few years, the NWP's messages have emphasised the flooding, water shortages and related health problems that wetland abuse can cause, and the impact of such outcomes on rural productivity and livelihoods. When extensive flooding occurred in Kampala, economic and health statistics could be linked to wetland abuse. In a lecture during the 2000 World Wetlands Day, the Ministry of Health presented a paper in which it claimed that a cholera outbreak in Kampala in 1999, caused by indiscriminate wetland filling, cost the state over US$ 2 million in medicines alone. Such powerful statements are capitalised upon, and start to bring national economists and planners over to the wetland cause.

The above two principles in communication have won allies who were originally suspicious of the NWP's agenda. The Ministry of Agriculture, which was once convinced that wetland rice cultivation should be allowed under strict conditions, helped in the development of guidelines for rice cultivation in wetlands. Likewise, industrialists, health officers and city engineers can put considerable pressure on the City's Planning Department once they see that their investments, the health of their clients or their infrastructure is being ruined by unplanned wetland filling. A recently conducted survey showed that after ten years of communicating wetland issues, 39% of the population has an acceptable level of understanding and appreciation of wetlands and what they do for them as individuals. Considerable efforts and resources have been spent to achieve this result, but it is Uganda's experience that extensive, continuous, creative and quality communication on wetland issues is the key to a successful policy formulation process and its subsequent implementation.

Strategy 2 and 3: Building a Knowledge Base

When the NWP started its work in 1989, it was realised that there was a disturbing lack of information about almost everything to do with wetlands. The information gap was, and is, almost endless: where are the main wetland systems located? How do they work ecologically and hydrologically? What economic value do they have for the country? What are they being used for? What do people think about them? Answers to these questions are essential to create long-term political and public support for sustainable wetland management, to develop sustainable management options for various wetland types, and to help planners to make informed decisions about which options to apply where. With hindsight, the NWP distinguishes the following approaches to its research and data collection over the last ten years:

– A 'quick and dirty' data collection exercise during the first phase of the NWP sought to answer the question: in broad terms, how important are wetlands for Uganda? Existing maps and literature were studied to assess the surface area covered by the country's wetlands, and, through consultations with resource users, to assess the actual uses and issues at hand. The information collected formed the basis for the development of the National Wetlands Policy.
– A detailed stocktaking of all Ugandan wetlands. This exercise, now known as the National Wetlands Inventory (NWI), started on a small scale in six districts, but was decentralised and scaled up during the last three years. The NWI is a large-scale mapping and surveying exercise, to a large extent carried out by district

officers with the facilitation of the NWP. All collected data are stored in an automated database for future reference and updating. The NWI forms the base line for monitoring long-term trends in wetland use and to assist districts to make wetlands management decisions. Both in terms of time and finances, the NWI uses more project resources than any other project activity.

– In-depth studies on wetland ecology, hydrology and economy. Various research projects have been carried out to deepen understanding of the country's wetland functions and processes. Examples are a national biodiversity inventory, which has prioritised wetlands in need of protection for biodiversity reasons, and soil studies to assess the suitability of wetland soils for agricultural and other uses. Of late, economic evaluations, carried out in close collaboration with IUCN, have put hard figures to the value of wetlands. In turn, this has helped to enlist macro-economists and planners to the wetland cause. At present, the main data gap relates to wetland hydrology, an extremely complicated and expensive research topic.
– Studies to increase resource productivity, value and diversity. These studies, often carried out in close collaboration with resource users, are meant to increase the monetary output of wetlands to support resource-users' livelihoods. Examples are studies to improve the harvesting and usage of papyrus, rattan cane (*Phoenix reclinata*), fish and to improve edge cultivation and rice growing. The output of these studies are a series of guidelines for resource users, which aim at maximising wetland outputs while minimising wetland degradation.

The wetland research agenda needs to be carefully tailored to gain maximum public and political support for the wetland cause. Some hard data that show the overall importance of wetlands for the country need to be generated to support the policy formulating process. Simultaneously, participatory research programmes need to start as soon as possible to generate proposals for improving use and livelihoods so as to muster general support for policy implementation. Collaborative research projects between universities and other scientific institutions can slowly generate detailed stocktaking, biodiversity and ecological data.

Strategy 4: Develop Policies and Legislation

The National Wetlands Policy

An officially recognised National Wetlands Policy is an essential step towards the sustainable management of wetlands in Uganda, and was the main thrust during the National Wetlands Programme's first four years of existence. With hindsight, it is clear that the process of policy development was severely underestimated in terms of time and human resources requirements.

In Uganda, policy development started with very little political support, awareness and information. Rushing towards a policy under such circumstances has the danger that it creates a document that has little support beyond its initiators, and may not be realistic in terms of its objectives and implementation mechanisms. At the same time, it does not help to postpone the publication of a wetlands policy until the whole country is behind the idea, and all relevant information has been collected and digested. This would mean postponing it indefinitely.

The aim of the Wetland Policy is to provide a broad framework for wetland management, and to that end should stipulate:

- The general objectives of wetland management in the country
- The guiding principles for sustainable wetland management, on which to base the prioritisation of wetlands for various management options
- A series of proposals for operationalising the policy, outlining the necessary institutional framework, legislation, information needs, and implementation guidelines

Ugandan experience suggests that a very prescriptive document may hinder fitting in additional insights, institutional developments and other factors that will inevitably occur after the Wetland Policy has been published. The process of developing a National Wetlands Policy is at least as important as the final product. If carried out well, the process should aim to achieve the following additional outputs:

- *Creating sufficient political will at all levels of government for sustainable wetland management.* Uganda is fortunate that the policy-making process is driven by the highest office in the country. This created an entry point for consultations with district and village administrations, which in turn helped to incorporate the ideas and wishes of actual users in the final policy document. This high-handed drive, however, has the danger that administrations at local levels feign support, while preferring the ongoing destructive wetland use systems. Until today, the implementation of the Wetlands Policy in the west and south-west faces stiff, although hidden, resistance, despite extensive consultation in those areas during the policy formulation process.

- *Creating awareness and appreciation for sustainable wetland management in civil society, particularly amongst the resource users*. The need for wetland awareness and appreciation at all levels in society cannot be over-emphasised. Organising the policy developing process as a participatory bottom-up exercise does not only create ownership amongst resource users for the final document, but can be an effective tool to explain the need for sustainable wetland management, and exchange ideas on how to achieve this. Consultation efforts should be supported by nation-wide campaigns through the electronic and printed media, which should also create sufficient awareness within the press to publicise wetland issues on a regular bases once the Wetland Policy is issued.

- *Enlisting support form other natural resource management sectors*. Wetlands are multi-sectoral resources, of which management responsibilities are traditionally distributed between a variety of departments and ministries like agriculture, livestock, fisheries, and water development. Consultations early in the policy development process are crucial to harmonise existing, and often wetland unfriendly, sectoral policies with the new Wetland Policy. Eventually, the aim is to forge permanent working relationships with other sectors through, for example, the formation of an Inter-Ministerial Committee for Wetlands, or establishing wetland focal persons in the various departments.

Wetland legislation

An official Wetland Policy is a declaration of intent to develop legislation, but of itself carries no legal weight as far as enforcement is concerned. Uganda was fortunate in that between 1995-1998 an array of important laws were produced, which created the opportunity to insert wetland clauses into key legislation. Between 1995 and 1998 wetland clauses were incorporated into the National Environment Statute (1995), The Constitution (1995), The Local Government Act (1997) and the Land Act (1998).

This quick succession of laws and attendant wetland clauses gave the National Wetlands Policy muscle. It also created, however, a certain level of confusion notably on the status of wetlands as a natural resource. This first started when the Constitution (1995) vested "the ownership of land in the people of Uganda', but also stated that "...wetlands…shall be held in trust by the government for the good of all people". This trustee doctrine has put wetlands in the same class of natural resources as forest reserves, rivers, lakes and national parks. At first glance, this would seem to be a tremendous opportunity for strict wetland management. Until today, however, Uganda is still grappling with the full implications of this situation. Large tracts of Uganda's seasonal wetlands are managed under customary management regimes, either as common or individual property. The new Constitution takes the management responsibility away from the original 'owners' and vests it in a trustee, as yet unidentified.

Problems with the implementation of this clause arise from the following two facts. Firstly, it is impossible for any single institution to effectively manage Uganda's wetlands. The hundreds of thousands of kilometres of wetland edge are impossible to oversee, let alone to control. In effect, this means that the law cannot be implemented as it is. The issue is being addressed by prioritising vital wetlands that are in need of a strict management regime, gazetting them and placing them under district or national administrative control. All other wetland areas will have to remain under customary controlled management regimes.

Secondly, the clause has made many traditional wetland owners, whether individuals or communities, suspicious about the intentions of the National Wetlands Programme (NWP). In areas where wetlands have been converted to farmland, wetland users, politicians and even district administrations try to avoid any dialogue with the NWP, afraid that they may end up losing their land. The NWP has taken the position that it will not challenge established and proven user rights, but over time will demand user practices that comply with the National Wetland Policy, and subsequent wetland resource guidelines.

Strategy 5: Develop the Institutional Framework

The management of wetlands has traditionally been scattered across a wide range of institutions with sometimes conflicting policies and interests. Sooner or later, therefore, a wetlands programme is confronted with the problem of how to rationalise the institutional framework for wetland management. Whereas the question will come up early in a programme's life-span, it may take years before a functional institutional framework is operational.

Ugandan experience suggests that, first, support for the establishment of an institutional framework grows with political and public support for wetland management; and second, that a suitable institutional framework may eventually evolve from the policy formulation process and wetland legislation.

Given the multi-sectoral nature of wetlands, some sort of initial co-ordination structure for wetland promoting activities is needed. In Uganda, this was provided by the National Wetlands Programme, which, in the first three years, consisted of two people with ideas and some financial resources provided by an external donor. At an early stage, linkages and coordination were brought in through the establishment of an Inter-Ministerial Committee (IMC) for Wetlands. The function of the IMC was to build support for wetlands management in sectoral departments, to exchange information across sectors, to develop a policy framework, and to endorse the eventual Wetlands Policy. The IMC, made up of participants from seventeen ministries and departments, was extremely useful in the policy formulation and institution-building process. It created the necessary awareness and appreciation for the need of a Wetlands Policy, and it assisted in forging broad support within the Government for a permanent Wetland Unit.

Whereas the Wetland Policy itself already pointed to the need for a co-ordinating and management body, the incorporation of wetland clauses into National Environment Statute (NES) and the Constitution made the actual establishment of a Wetland Unit just a matter of time. As explained earlier, the Constitution vested the responsibility for wetlands management in the Government. At the same time, the NES was developed and introduced the concept of a 'Lead Agency' for wetlands, which was to advise the National Environment Management Authority on all major management decisions concerning wetlands.

With the Constitution calling for active involvement of central and local governments in wetland management, but no institution to catalyse such initiatives, the easy way out was to vest wetland management responsibility in the National Environment Management Authority through the NES. The result was, however, that no Lead Agency for wetlands was defined and that NEMA acquired both a supervisory and a wetland management role. This situation lead to poor wetland management decisions because of the conflicting interests between the two roles compounded by the absence of a clear Lead Agency. This anomaly was realised and eventually addressed by establishing a Wetlands Inspection Division (WID) in the Ministry for Water, Lands and Environment in 1998. The activities of the WID were further operationalised through the development of a Wetland Bill, that will vest wetland management oversight and monitoring in the WID, and regulate the relationship between the districts and central government with respect to wetlands.

Uganda's decentralisation policy and legislation has devolved responsibility for the management of natural resources to the districts, with an advisory and monitoring role for the WID. Although in the long-term this may be the most feasible and viable institutional arrangement for non-vital wetlands, active wetland management by the districts is severely hampered by a shortage of capabilities and resources. These problems also exist at the lowest management level, the sub-counties and their environment committees. An additional problem at that level is that users and their

supervisors are in many cases one and the same person, which creates possibilities for unchecked wetland abuse. After ten years of building appreciation, knowledge, legislation and institutions at national and intermediate levels, the local level institutional arrangement proves to be the ultimate challenge. The NWP tries to meet this challenge by establishing economically viable wetland management options for local wetland managers that enlist resource users to the wetland conservation cause.

Strategy 6: Develop Best Practices for Sustainable Wetlands Use

Very few people will disagree that without the support of local users, politicians and institutions for sustainable wetland management, laws and policies will have no serious impact on the state of the wetlands in a country. This is especially true in Uganda, where possibly one in every three rural inhabitants interacts with a wetland on a daily basis. Therefore, the development of wetland management options that are acceptable to resource users ultimately determines the success or failure of any wetland programme in a rural and natural resources-based economy.

The community activities of the NWP have been one of the most difficult components during the ten years of wetland activities. One of the problems has been that community activities were originally carried out with a mixture of not always compatible objectives: information collection about local wetland uses, knowledge building on specific resources, tools development for community wetland management, community development and livelihood improvement, to mention but a few. For example, research oriented objectives are difficult to merge with livelihood improvement objectives, if only because per definition it cannot be guaranteed that the management options being tested are indeed beneficial. Participating communities may be very disappointed as a result, because they may have invested considerable time without seeing any measurable returns.

Related to this, is the question to what extent a wetlands programme is prepared to compromise community objectives of livelihood improvement with wetland conservation objectives. A community research programme with the (hidden) aim to prove that the best wetland is an undisturbed wetland, and which refuses to consider community proposals for wetland modifications, may end up with a disgruntled community and a degraded wetland. With a more pragmatic approach based on give and take negotiations between the NWP and local users, the first multiple use management plans have been produced and aim to maintain basic hydrological and ecological functions of wetlands, while allowing for modifications that increase wetland benefits considerably for users.

For a national wetlands programme it is questionable whether it should get involved in frontline livelihood improvement programmes. In the Ugandan case, where 15 technical staff deal with 30,000 km^2 of wetlands, activities at the resource users level are so localised that it will have no impact whatsoever on the national wetlands conservation objective. A national wetlands programme, should in principle therefore concentrate on the generation of systems, procedures, tools and information for the community management of wetlands. It should do this in active participation with a limited number of communities who are well aware that the programmes' activities do not guarantee increased incomes or other tangible benefits. Once some success has been achieved, the

actual replication of the wetland management system should be left to organisations that are on the ground and better equipped to carry out community development activities.

Conclusion

Wetlands in Uganda are vast, complex and extremely valuable ecosystems. Their value is derived not so much from the products they deliver to the resource user, but from the hydrological and ecological services they provide almost unnoticed. The invisibility of the wetlands' services is their tragedy, and is the foremost reason for their large-scale demise. Planners, economists and politicians usually have no idea what wetlands do for the economy, the health or the prosperity of their countries. They often see wetlands only as valuable land for agriculture, industrial estates or urban development, and believe that they can do away with the wetland through filling, channelling, or, it sometimes seems, praying. Local users may have a better understanding of the value of wetland products, but that understanding does not necessarily lead to sustainable wetland use since maximising on a few products may make the whole system, and notably its services, collapse. The misconceptions of wetlands are so deep and widespread that to turn wetland degradation around is an uphill task, which needs a long-term outlook, and considerable persistence, creativity and resources.

The National Wetlands Programme in Uganda has been active for ten years. It has gained successes at the national level by approaching the wetlands issue from multiple fronts. Central to these successes has been a continuous and aggressive wetland information campaign. This campaign, which, after ten years is still increasing in magnitude and aggressiveness, has produced the necessary critical mass of people who will think about and support matters related to wetland conservation in decision-making fora. This has paved the way for actual wetland conservation action, including the development of a policy, institutional framework, and a public opinion that can turn against cases of wetland abuse as was shown in the Golf Course case.

The NWP is still a long way from sustainable wetland management in Uganda. With policy, legislation and an institutional framework more or less in place, the challenge lies in the development of viable management systems for rural users. Such management systems need to combine the conservation objectives of the NWP with the livelihood improvement objectives of users. Only when such management systems can be voluntarily agreed upon and effectively implemented by resource users throughout the country will the NWP have achieved its objective of sustaining Uganda's wetland resources for current and future generations.

References

Emerton, L. 1998. Valuing Wetlands in Uganda. IUCN - The World Conservation Union, Nairobi, Kenya

Emerton L., L. Iyango, P. Luwum and A. Malinga 1999. The Present Economic Value of Nakivubo Urban Wetland, Uganda. IUCN Eastern Africa Programme, Economics and Biodiversity Programme, Nairobi, Kenya

Appendix I. Ethiopian Wetlands

No	Name of Wetland	Co-ordinates	Altitude
1	Abay Lake	07° 55’ N 38° 22’ E	1850
2	Abbaya Lake	06° 15’ N 37° 55’ E	1169
3	Abbe Lake	11° 10’ N 41° 45’ E	243
4	Abijatta Lake	07° 37’ N 38° 35’ E	1578
5	Adobed Lakes	11° 22’ N 41° 36’ E	340
6	Affambo Lake	11° 25’ N 41° 42’ E	800
7	Afrera Lake	13° 10’ N 40° 52’ E	- 102
8	Alemaya Lake	09° 24’ N 42° 01’ E	2100
9	Aloba Lake	10° 14’ N 39° 39’ E	1800
10	Ardibu Lake	11° 15’ N 39° 46’ E	1900
11	Aruato Lake	09° 42’ N 41° 14’ E	900
12	Asaita Lake	11° 34’ N 41° 28’ E	400
13	Ashenge Lake	12° 35’ N 39° 30’ E	2443
14	Assale Lake	14° 10’ N 40° 20’ E	- 125
15	Awasa Lake	07° 00’N 38° 25’ E	1675
16	Awash Melkasa Lake	08° 29’ N 39° 19’ E	1500
17	Bale Mountains Lakes	06° 50’ N 39° 51’ E	4000
18	Barachet Lake	08° 17’ N 39° 03’ E	1800
19	Basaka Lake	08° 55’ N 39° 52’ E	980
20	Beda Lake	09° 55’ N 40° 23’ E	609
21	Billi’uli Lake	11° 50’ N 41° 45’ E	100
22	Bishoftu Lake	08° 47’ N 39° 01’ E	1900
23	Boyo Lake and Swamp	07° 30’ N 38° 02’ E	1900
24	Budamada-Tido-Ameda Lakes	07° 04’ N 38° 06’ E	1550
25	Chamo Lake	05° 50’ N 37° 45’ E	1108
26	Chew Bahir Lake	04° 45’ N 36° 50’ E	520

27	Chitu Lake	07° 24’ N 38° 25’ E	1540
28	Chomen Lake	09° 30’ N 37° 17’ E	2000
29	Dabashi Lake	07° 11’ N 38° 33’ E	1680
30	Dalay Lake	10° 08’ N 40° 31’ E	700
31	Debhile Lake	09° 20’ N 40° 06’ E	800
32	Dendy Lake	08° 50’ N 38° 05’ E	2800
33	Deneba Salt Lake	11° 04’ N 40° 53’ E	400
34	Dipa’a Lake	05° 11’ N 36° 16’ E	400
35	Dukahini Lake	08° 55’ N 38° 45’ E	1800
36	Dunkaga Lake	09° 40’ N 40°15’ E	1000
37	Ellen Lake	08° 23’ N 38° 59’ E	1700
38	Etosha Lakes	07° 55’ N 39° 19’ E	3200
39	Fogera Swamps	12° 05’ N 37° 50’ E	2500
40	Gamarri Lake	11° 30’ N 41° 42’ E	339
41	Gargori Lake	11° 45’ N 41° 30’ E	400
42	Garner Lake	06° 56’ N 34° 29’ E	500
43	Gefu Lake	11° 22’ N 41° 28 E	400
44	Gesi Lake	07° 34’ N 34° 11’ E	440
45	Gewani Swamps	09° 55’ N 40° 32’ E	1500
46	Giuletti Lake	13° 18’ N 41° 02’E	- 80
47	Hara Gebaya Lake	11° 50’ N 39° 50’ E	2600
48	Hayk Lake	11° 20’ N 39° 43’ E	1900
49	Hertale Lake	09° 55’ N 40° 25’ E	600
50	Kaddabasa Lake	10° 15’ N 40° 30’ E	600
51	Kemisse Swamps	10° 42’ N 39° 50’ E	1400
52	Koka Lake	08° 26’ N 39° 10’ E	1589
53	Langano Lake	07° 35’ N 38° 45’ E	1582
54	Liddo-Debado Lake	09° 33’ N 40° 14’ E	750
55	Loma Lake	11° 58’ N 40° 57’ E	400

56	Mago Lake	05° 43’ N 36° 16’ E	600
57	Melka Wakena Lake	07° 09’ N 39° 25’ E	2300
58	Mey Igiri Lake	10° 59’ N 39° 39’ E	2500
59	Ota Lake	09° 38’ N 40° 19’ E	800
60	Sawata Lake	11° 30’ N 41° 40’ E	700
61	Shalla Lake	07° 28’ N 38° 30’ E	1558
62	Tana Lake	12° 00’ N 37° 20’ E	1785
63	Tefki Swamps	08° 50’ N 38° 35’ E	2700
64	Tehiyo Lake	11° 39’ N 41° 30’ E	250
65	Temren Lake	07° 57’ N 38° 04’ E	2900
66	Turkana Lake	04° 35’ N 36° 04’ E	400
67	Wagaan Lakes and Swamps	08° 00’ N 34° 00’ E	400
68	Weyto Lake	05° 25’ N 36° 53’ E	520
69	Wonchi Lake	08° 53’ N 37° 54’ E	3387
70	Yardi Lake	10° 13’ N 40° 29’ E	562
71	Zangana Lake	10° 55’ N 37° 01’ E	2700
72	Zuquala Lake	08° 32’ N 38° 52’ E	3500
73	Zwai Lake	08° 00’ N 38° 50’ E	1636

Seminar attendance

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