

Comments on Letitia Obeng's paper 'Water for Development in Africa'

We have very few specific comments to make on points raised in Letitia Obeng's paper. These are:

1. The introduction of the Nile perch Lates niloticus into Lake Victoria has been an ecological disaster. The perch has preyed on and eradicated many of the lake's endemic and unique cichlid fishes, which are themselves a valuable source of protein long exploited by local fishermen. The Nile perch itself is not regarded as an acceptable food by the communities living around the lake and fetches very low prices in local markets. The introduction of Nile perch has had disastrous consequences for the native and unique fish fauna of the lake and has not provided a better alternative food source for local communities as was originally hoped.
2. There can be a real danger in supplying permanent water supplies in marginal lands. Sinclair and Fryxell (1985) provide convincing arguments, for instance, that the problem of desertification in the Sahel is largely due to human disturbance of the originally stable ecosystem. Traditionally the pastoralists of the Sahel migrated north and south following the rainfall patterns over the region. This allowed them to find water and pasture for their cattle, allowed the vegetation time to recover from grazing and reseed and permitted the coexistence of a varied and rich biota.

Three factors have upset this balance - 1) the development of agricultural projects (mostly peanuts) which has restricted the migratory pastoralists from using much of their traditional southern feeding areas, 2) the establishment of waterholes which allow intensification of ranching and encourage permanent settlement and 3) the provision of medical and veterinary services and other benefits which have led to increases in both human and cattle populations. All three processes have been intensified by well-meaning "aid" projects funded by "developed" countries. Overgrazing, particularly around waterholes, has led to replacement of perennial grasses by annual grasses and eventually by "unpalatable shrubs or by desertification and erosion. Short-term solutions such as provision of food and establishment of new agricultural settlements can only make the problem worse. From a biological and ecological point of view we can recommend solutions but these will involve large-scale resettlement of people and family planning programmes to control population increase. Herds must be severely restricted and culled and wells should not be dug if they do harm to the migratory system. To a biologist the solution is relatively simple but such measures are impossible to implement from both a political and humanitarian point of view. Instead we will have to compromise and attempt local small-scale ecodevelopment programmes involving local communities in rehabilitation of their environment.

Obviously governments are going to be primarily concerned with human needs for water and these will exceed wildlife considerations, yet the two are not incompatible. We would like to develop the theme of greater protection for water sources and critical habitats, such as watersheds and wetlands, for the benefit of both people and wildlife.

Throughout much of Africa water is life. Yet the protection of water resources and the watershed forests and natural grasslands on which water supplies may depend have been sadly neglected. Throughout the tropics, the vital role played by forests, particularly montane forests, has been poorly understood or ignored

and many of the human tragedies that appal us annually, the droughts and floods that bring death and disaster in their wake, are not simply "acts of God" but the consequence of Man's mismanagement of his environment.

Natural vegetation cover plays a very important role in regulating the behaviour of water drainage systems. Particularly important is the "sponge effect" by which rainfall is trapped and held by catchment forests and natural grasslands so that water drains away rather slowly and evenly into river systems, reducing the tendency of floods in periods of heavy rainfall and continuing to release water during periods of dry weather. These functions are lost when the vegetation of upland catchments are destroyed. In the tropics as a whole 90% of all farmers cultivate valley bottomlands and thus are dependent on the activities of the 10% of the population who live in watershed areas. The key example is the Ganges river system: only 40 million people live in Nepal, Uttar Pradesh and the Himalayan foothills, yet the floodplains support 500 million people.

Water supplies are so vital to man's life, agriculture and industry that protection of this water regulatory function of natural vegetation is often of much greater value than alternative uses of such areas and specific areas should therefore be protected as hydrological reserves. It is not always easy to demonstrate directly the value of catchment conservation, usually because of sufficiently long-term data for comparable controls. However, a good example is provided by comparing stream flow on the Bua and Dwanga rivers which drain adjacent catchments in central Malawi. The upper Bua catchment is largely open to cultivation and has experienced a massive expansion of agriculture over the last 10 years. Natural Brachystegia woodlands have been cleared for agriculture, primarily tobacco estates. In contrast the upper Dwangwa catchment is largely protected by the Kasungu national park. The Department of Lands, Evaluation and Water have demonstrated that run-off from the upper Bua catchment, as measured by stream flow, was 50% higher (with consequent increase in soil loss) during 1970-1980 than during 1954-1964, a decade of comparable rainfall in quantity and pattern. The adjacent catchment of the Dwangwa showed no change in amount of run-off between the same two periods (Kombe 1984). The increased run-off, and consequent soil loss, from the Bua catchment can therefore be attributed to removal of natural vegetation.

Selection of areas in need of protection for the preservation of hydrological functions will depend largely on four main considerations:-

- the susceptibility of the catchment to erosion
- the susceptibility of the river to flooding
- the seasonality of water availability, and
- the socio-economic importance of the particular watershed.

The importance of any water system will depend on the number of people dependent on that water supply for drinking water and irrigation needs, the numbers of domestic stock dependent on water to satisfy their drinking and pasture needs, the area and value of downstream agricultural land and the extent of industrial and urban needs. Expensive investments such as hydroelectric or irrigation dams and irrigation canal systems add to the economic importance of the water course.

In recognition of the need to protect the watershed to safeguard a new and extensive irrigation scheme World Bank helped fund the establishment of the 2700 sq.km Dumoga-Bone national park in Indonesia as part of a \$54 million irrigation loan. Expenditure on establishment and management of the park, including preparation of a management plan and hiring park staff, accounted for less than 1% of the total loan. This relatively small investment in wildland conservation helps protect the irrigation investment by helping to minimise siltation and the resulting high maintenance costs and by helping to ensure a steady year-round flow of water. The park also preserves much of the rich flora and fauna that is unique to Sulawesi (Sumardja et al. 1984).

A good case can be made for protecting much greater areas of Afromontane habitat for their hydrological functions alone. Montane forests and vegetation not only protect vital watersheds but such habitats are often home to many endemic species. Yet Afromontane habitats in spite of their biological richness and numbers of unique species, are poorly represented within the protected areas systems of the Afrotropical Realm and have been identified as one of the four major biogeographic zones most in need of urgent conservation action (MacKinnon and MacKinnon 1986).

The Rwenzori mountains are just one example, an area of outstanding natural beauty which harbour several endemic plant and animal species, yet are also the source of the headwaters of the Nile. Although the Rwenzoris are protected as a national park in Zaire there is no protected area in neighbouring Uganda that encompasses this important mountain habitat. The Queen Elizabeth (Rwenzori) National park does not extend into the mountains. Part of the Ugandan Rwenzoris are gazetted as forest reserve but this means simply that these forests are intended for logging in the near future. As a matter of urgency a large national park or similar protected area should be established in Uganda to give adequate protection to the Rwenzoris, an area of outstanding natural beauty and biological richness whose fragile habitats are already being destroyed by human use.

Apart from the need to give greater protection to the watersheds from which most major water sources derive there is also a great need in Africa to give better protection to wetland sites. While a few small lakes and stretches of riverside habitat are protected within reserves, overall too little attention has been paid to the biological richness and general importance of wetland habitats to wildlife, wildlife on which surrounding human communities may depend for food and livelihood.

Wetlands are generally very vulnerable ecosystems depending upon the delicate balance of water levels and water flow, sedimentation, microclimate etc., all of which can be changed by on-site or neighbouring developments. For instance the enormous diversity of endemic fish in Lake Malawi which supports a valuable fishery could so easily be threatened by the introduction of exotic species, or pollution from one of the planned paper mills. The viability of protected wetlands is, more than with most other habitats, dependent upon appropriate landuse practices outside the wetland site which maintain and control the quantity and quality of water flow. Changes in siltation levels and run-off patterns resulting from developments far upstream can affect the waterflow for lowland fields or the balance of coastal mangrove forests. Introduced species are free to pass along interconnecting waterways to compete with indigenous species or change local conditions. A new drainage or irrigation canal can affect watertables over large areas. Boreholes and wells result in lowered

water tables locally; overgrazing by domestic livestock and fires set by man can transform wetland vegetation; a barrage or dam can cut off adult fish from their spawning grounds; water toxins in herbicides or pesticides drain into wetland sites. Because of all of these factors establishment of wetland protected areas can only be one element in a more comprehensive approach to water resource and landuse planning.

That wetlands in the Afrotropical Realm are facing serious ecological stress is seen in the numbers of wetland and other fauna being listed as threatened. But while man's developments cause damage and change to many sites and threaten some wetland species, man is also creating new wetland habitats in the form of reservoirs, dams and irrigation systems. These sites are often of great value to wildlife ready to take advantage of the new conditions provided and some excellent new wildlife areas have been created (e.g. Lakes Kainji, Kariba and Volta); these same lakes have also become important local fisheries.

Africa's rivers, lakes and swamps are critical habitats for many of the Realm's fish, amphibians, reptiles, birds and invertebrates. Spectacular concentrations of game concentrate on the floodplains and grassy swamps to graze on new growth. Yet these wetlands are also crucial routes for communication, fishing grounds and, most importantly, water sources for man and his herds so that few wetland areas can be gazetted as totally protected areas. Solutions to the conservation problems of wetlands, for the mutual benefit of both men and wildlife, will require a greater understanding of the importance and fragility of these habitats and more effective legislation and management to protect them. In addition, because water systems cross international frontiers their safeguarding needs elaborate international cooperation.

Because of their great importance, wetlands are currently the focus of particular attention, by IUCN through the organisation's Wetlands Office, through the international convention RAMSAR and through the wetlands programmes of other agencies (e.g. ICBP). Two forthcoming documents - the IUCN Directory of African Wetlands and the ICBP Review of African wetlands of Importance to Birds will focus in more detail on conservation problems for wetlands and their associated wildlife. The IUCN Review of the Protected Areas System of the Afrotropical Realm lists major Afrotropical Wetlands, of particular conservation importance because of their flora and fauna, and lists recommendations for increasing and improving protection of these sites (MacKinnon and MacKinnon 1986). The conservation priorities for coastal wetlands in Africa have been reviewed by Salm and Chong Seng (UNEP 1984), and by Saenger et al. 1983. Hamilton and Snedaker (1984) provide general principles for the management of mangrove resources.

Water is life, yet as many Africans know only too well, it is not unlimited. It is time to adopt a more rational approach to land-use to better protect and conserve our natural water sources and the habitats on which they depend for quality and quantity of water flow.

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Bibliography

Hamilton, L.S. and Snedaker, S.C. (Eds). 1984. Handbook for Mangrove Area Management. U.N.E.P. and East-West Center.

Kombe, A.D.C. 1984. The Role of Protected Areas in Catchment Conservation in Malawi. In: National Parks, Conservation and Development. Eds. J.A. McNeely and K.R. Miller. I.U.C.N. and Smithsonian Inst.

Mackinnon, J. and Mackinnon K. 1986. Review of the Protected Areas System of the Afrotropical Realm. I.U.C.N. and U.N.E.P.

Saenger, P., Hegerl E.J. and Davie, J.D.S. 1983. Global Status of mangrove Ecosystems. Commission on Ecology Papers No.3. I.U.C.N.

Sinclair, A.R.E. and Fryxell, J.M. 1985. The Sahel of Africa: ecology of a disaster. Can. J. Zool. '63: 987-994.

Sumardja, E.A., Tarmudji and Wind, J. 1984. Nature Conservation and Rice Production in the Dumoga Area, North Sulawesi, Indonesia. In: National Parks, Conservation and Development. Eds. J.A. McNeely and K.R. Miller. I.U.C.N. and Smithsonian Inst.

U.N.E.P. 1984. Marine and Coastal Conservation in the East African Region. U.N.E.P. Regional Seas Reports and Studies No.39.