SECTION 4

SOCIAL AND ENVIRONMENTAL PROBLEMS OF LAKE/WATER RESOURCE DEVELOPMENTS

SECTION 4.1

LOCAL SOCIAL AND ENVIRONMENTAL IMPACTS OF WATER RESOURCE DEVELOPMENTS

Antoine Sendama Mulashi

4.1.1. INTRODUCTION

To the majority of people, large dam-construction and associated man-made lakes conjure up an image of unleashed potential for socio-economic development. They see in this a quick and guaranteed source of clean and cheap hydro-electric power, a means of controlling flooding in regions downstream of the dam, a source of abundant fish supply and a national status symbol symbolizing wealth, power and feats of technological achievements.

Rarely do people associate the construction of a man-made lake with such undesirable consequences as extensive cultural destruction, increased diseases and costly environmental damage. Seldom indeed does it seem to occur to people that unless stringent environmental considerations are taken into account, those for whom the dam is said to be built are bound to suffer unnecessarily, and that the huge investments ploughed into the project may never be recovered.

This paper, which draws on current information and data on man-made lakes in Africa, examines the social and environmental impacts of the lakes on the local population living in the immediate environs of the lake.

4.1.2 LOCAL SOCIAL AND ENVIRONMENTAL IMPACTS OF WATER RESOURCES

Displacement of Population

Ideally, dams ought to be constructed only in areas that are either uninhabited or that are sparsely populated. Clearly this often cannot be possible. Therefore prior to flooding, the people who live in earmarked dam sites have to be moved and resettled

elsewhere. As Table 4.1.1 shows, it can be seen for example that establishment of six African lakes has led to thousands of people being displaced.

Though such a displacement has its inherent unwelcome aspects, it also carries with it (if well planned) an opportunity for the authorities concerned to make available to the relocatees better housing and social amenities that would improve their lives. However, this can only be possible if resettlement of these people is thoroughly planned, not carried out in haste, and if the necessary financial and human resources are available. The evidence available suggests that in most cases to date, the resettlement process has been anything but well planned.

For instance, with the construction of Lake Masinga on the Tana River, an estimated 4,000 to 6,000 persons were displaced (Rogerri, 1985). These suffered different fates depending on which side of the river they had been living on before the flooding. Those on the left bank of the Tana River had been living on government trust lands; prior to the construction of the Masinga dam they were moved by the government to new lands; an evaluation was made of their crops in the fields and the improvements made to the land and they were compensated for these losses. However, they were not compensated for the land since this was state land. As for those on the right bank of the river -- which was freehold land -- they received compensation for their land and were also compensated for the crops in the field and for the improvements made to the land. But how and where to settle was for them to handle. One would have expected that those settled by the government on new lands would have been helped to establish new homes but this was not the case. The displaced had to organise themselves in order to find or build new homes.

Table 4.1.1
People Displaced by the Construction of Six African Lakes
(Rogerri, 1985; Goldsmith, 1986)

Lake	Country	Number of people displaced
Masinga	Kenya	4,000 - 6,000
Kariba	Zambia/Zimbabwe	86,000
Volta	Ghana	80,000
Cabora Bassa	Mozambique	about 25,000
Masser	Egypt	120,000
Kainji	Nigeria	50,000

What was clear was that though the construction of the dam brought about the displacement of thousands of people, the authorities responsible for the construction of the dam did not plan any resettlement programme worthy of the name (Roggeri, 1985). This is disappointing given the fact that by the time of the completion of Masinga dam (1961), abundant information existed relating to the problems of forced displacement of people by man-made lakes and clearly detailing mistakes made in the past. Therefore, the replication of similar mistakes could have been easily avoided.

If those displaced by Masinga Lake seem to have gotten off lightly this was not the case with those displaced by the creation of Lake Kariba almost two and a half decades before. The creation of Lake Kariba caused the displacement of 86,000 people, mainly of the Tonga tribe. They violently protested and struggled to keep their homelands, but in vain. They were made to abandon their rich alluvial valley and were resettled on less fertile upland soil which was hardly enough for them. In addition, during the process of their relocation, due consideration was not given to existing cultural differences between the relocatees and host communities. Displaced communities were simply split up and people from different ethnic backgrounds and speaking different languages with different social customs were lumped and settled together without due regard for these differences. Thus the resettlement caused resentment and conflict between the two communities because of these differences (Linney and Harrison, 1981).

Following this disastrous resettlement programme, it emerged that in actual fact no detailed study had ever been undertaken to assess the best areas for resettlement of the displaced persons (Goldsmith and Hildyard, 1984). Thus again, inept planning subjected tens of thousands of displaced persons to sufferings and relocation stress that could have been otherwise avoided.

Though the constraint of space does not allow a more detailed examination of this question, it is a fact that elsewhere on the continent where large man-made lakes have been constructed the scenario remains much the same. It is characterized by little or no attention being paid, by the authorities responsible for dam construction, to the social impacts of the lake on the local people.

Even in the few instances where the relocation of the displaced persons had been planned for to some degree, other factors mitigated against this. One such interesting example is Lake Volta. In this case, thorough advance planning through the Volta Lake Preparatory Commission had been done prior to improvement. Hence there was no reason why the 80,000 persons displaced by the creation of the lake should

not have been properly resettled. Yet this is exactly what happened. It had been envisaged that the displaced persons were to be resettled in 52 resettlement sites over a period of 3-4 years before the closing of the dam. However, a hitch developed as the cost of resettlement had been grossly underestimated and by the time of resettlement, only 2 years were available for doing so. The siting of the settlement had taken the wishes of the people into consideration and located the resettlement towns on their traditional lands (Linney and Harrison, 1981), but not enough good land was available for the farmers. Land disputes and outbreaks of violence became increasingly common as the resettlement scheme got under way (Goldsmith and Hildyard, 1984).

The picture that emerges from these limited examples suggests that the hundreds of thousands of people forcefully displaced by the construction of dams in Africa, have had to endure undue hardships and sufferings occasioned in the main by poorly planned resettlement programmes. Further, even where thorough resettlement programmes had been worked out, underestimation of the cost of resettlement and bad timing have negated the gains that would have been otherwise made. Given the extensive knowledge gathered from the mistakes of the past, there was no justification for repeating them.

It should therefore be the policy of donor agencies and recipient governments to ensure that, in all cases of dam construction, comprehensive resettlement programmes constitute an indispensable facet of the project.

4.1.3 DRINKING WATER SUPPLY AND SANITATION

The most obvious effect of dam construction is the creation of a reservoir of water; yet surprisingly, information related to dams' impact on the drinking water supply of local communities in the environs of man-made lakes, and on sanitation, is almost non-existent. This absence of such information could lead to the assumption that the provision of safe water and adequate sanitation to local communities has always constituted an integral part of all dam-construction projects and thus need not be dwelt on at length.

However, available evidence suggests that certainly this has not been the case. On the African continent for example, major man-made lakes like Volta, Kariba, Cabora Bassa, Nasser, Kafue and Kainji were either constructed for hydro-electric power production or for flood control and use in irrigation. In general there are no drinking

water supply networks constructed on the sites of these lakes (Rogerri, 1985). In addition, as already indicated, even the people displaced by the construction of the lakes and relocated elsewhere, are inadequately supplied with drinking water supply networks. Hence, the local communities living around these lakes have to supply their water themselves; they do so by using water obtained directly from the lakes for their drinking and other domestic needs.

It can therefore be seen that in general the establishment of man-made lakes in Africa has not helped improve the water supply to the local communities living around the lakes. This becomes even more evident given the fact that the lakes are built on permanent rivers.

What may not be clear is that several factors tend to render a large water reservoir unsuitable for human use without treatment. For example, dam construction severely reduces the rate at which water flows; this tends to encourage the proliferation of micro-organisms, many of which are injurious to human health. In addition, dam water tends to be polluted with all kinds of pollutants like human excreta, chemical fertilizers and solid matter particles brought in by the river.

The creation of a man-made lake without the corresponding provision of clean and adequate water to the local population living around the lake not only loses a great opportunity, but also exposes the population to the risk of all sorts of water-borne and water-related illnesses. Yet dubious economic considerations seem to have made those responsible for dam projects in Africa do just that. Rarely have steps to reduce the risk of the spread of diseases, and to better the lives of those who live in the areas around the lakes (for example by supplying them with drinking water supply networks and sanitary facilities), been incorporated in the construction of dams on the continent.

4.1.4 HEALTH

If planned correctly, the construction of a large dam can have beneficial effects on the health of the local population. However, it could also render a region more vulnerable to disease. The large mass of water created can carry many communicable diseases serving both as a transfer-medium and as a habitat for vectors and intermediate hosts. Diseases which did not previously exist in an area may appear with dam construction, while the prevalence and intensity of some that appeared only at low levels may increase.

Unfortunately, the current record of African dams indicates that dam construction has largely had only detrimental effects on the health of the local population. For

instance, the construction of the Aswan High Dam led to a sharp increase in schistosomiasis (bilharzia). Schistosomiasis is a water-related disease transmitted by aquatic or amphibious (living both on land and in water) snails. After the completion of the Aswan Low Dam, the number of persons attacked by bilharzia in the local community rose from 21 to 75 percent; with the completion of the High Dam this rose to 100 percent in some areas (Lanoix, 1958). Nor were these isolated pockets infested with the disease. Four carefully selected areas for study indicated that with completion of the dam the number of persons attacked by bilharzia had risen from 10 to 44 percent; 7 to 50 percent; 11 to 64 percent, and 2 to 75 percent (Biswas, 1980). To date bilharzia remains endemic in vast areas of Egypt even where it was unknown before the construction of the Aswan Dam (Linney and Harrison, 1981).

The creation of Lake Volta, like that of Lake Nasser, largely had negative effects on the health of the local population. Its construction was followed by the escalation of schistosomiasis brought about by a combination of factors. Abundant nutrients in the young lake led to a bloom of aquatic weeds that provided a habitat for the vector snails. In addition, fishermen, many of whom were already infected, migrated to the lakeshore with the completion of the lake. Despite this, the increase in the incidence of the disease would have been limited if the people resettled with the construction of the lake had been provided with adequate drinking water supplies. Since this had not been the case, most of them had to resort to lake water for their needs. This increased human contact with water caused infection rates to increase greatly. In different areas around the lake, the infection rate rose from 1% and 5% to 60% and 100% (Rogerri, 1985).

The experience of Lakes Nasser and Volta is by no means unique; the construction of Kariba in Zambia/Zimbabwe, Kainji in Nigeria, Cabora Bassa in Mozambique, Masinga in Kenya, Kafue in Zambia, and Kossu in Ivory Coast have all led in some degree to a marked increase in the incidence of bilharzia in the local community. In many of these cases the prevalence of some other water-borne or water-related diseases, for instance malaria, elephantiasis, dysentery and at times river blindness, has also increased.

The cause of this increase is easy to appreciate. Dam construction creates conditions favourable for the proliferation of mosquitoes that transmit malaria and elephantiasis. Further, as already seen, the construction of man-made lakes leads to the displacement and relocation of thousands of people. Yet rarely is the relocation thoroughly planned for and properly implemented, with the relocatees supplied with adequate sanitary facilities. This lack of adequate sanitation facilities in the vicinity of the lake leads to the contamination of the lake water with human excreta and a

consequent increase in the water-related diseases like dysentery. In the case of Kariba Lake, its construction also led to increases in the prevalence of sleeping sickness within the Tonga community who on displacement were relocated to an area infested with the tsetse fly.

Large dams have more often than not had deleterious effects on the health of the local population by bringing about a sharp increase in the prevalence of water-borne and water-related diseases in the local populations. Yet measures to combat the spread of the diseases were largely ignored even where pre-impoundment studies had clearly shown that such an increase was likely to occur.

Due to "economic" considerations, basic preventive measures such as improving the lakesides, mounting information and education campaigns, and implementing basic sanitation programmes, all of which would have shielded the local population from much suffering, were neglected. This therefore brings into contention the claim that large water-development projects are aimed at the improvement of the local peoples' well-being. Those involved in the planning, design, financing and construction of large man-made lakes in Africa would do well to ensure that the projects actually serve to uplift the peoples' well-being.

4.1.5 AGRICULTURE AND FOOD SUPPLY

Every nation strives to achieve food sufficiency for its people, but for many countries in Africa this goal has remained elusive with the increase in food production failing to keep pace with population growth. The reasons for this failure are complex; however, one important hindrance to the expansion of agricultural production is lack of sufficient moisture in the soil. Therefore, since a dam makes it possible to irrigate land lacking in moisture, it can have far-reaching effects on the food security of a region or country.

A dam can exert influence on an area miles away from its site, but in this paper only its impacts on agriculture and food supply in its surroundings will be examined. As Table 4.1.2 shows, the most dramatic impact of dams on agriculture has been the loss of vast areas of land submerged under water and the displacement of thousands of those who worked it. When this loss is followed by resettlement on less fertile and insufficient land, as has often been the case in Africa (Section 4.1.2), agricultural productivity and local food supply is adversely affected.

Silt entrapment within the dam has considerable impact on agricultural productivity

as well. Before the construction of the Aswan dam, the Nile floods spread tonnes of silt downstream. The silt was a renewing source of fertility and riverine agricultural productivity was high. With the construction of the dam, artificial fertilizers now have to be used to maintain the fertility of the soil downstream at a staggering cost of about $100 million (Goldsmith and Hildyard, 1984).

Table 4.1.2
Land Submerged and People Displaced by the Construction of Four African Lakes

Lake	Hectares submerged (approximate)	Number of people displaced
Nasser	400,000	120,000
Volta	848,200	60,000
Kariba	510,000	66,000
Cabora Bassa	380,000	25,000

However, some increase in local agricultural productivity has at times been achieved with the construction of dams. A case in point is Lake Volta where farming has improved and diversified around the lake shores. The shores of the lake are seasonally flooded and then exposed; this has enabled farmers to grow a number of crops such as maize, seat potatoes and vegetables, even at times when lack of rainfall makes farming impossible elsewhere.

But this is in contrast with the area surrounding the lakes of River Tana in Kenya (Masinga, Kamburu and Kindaruma). The purpose of these lakes is simply to produce electricity. Nevertheless, it would be expected that the areas around the lake should be well provided with water so that crops can grow normally irrespective of seasonal changes. But in a study conducted there (Rogerri, 1985) it became clear that the ground water is at levels well below the reach of the root system and thus this dam has had no beneficial effects on agricultural production.

With regard to fish production, dam construction has led to increased fish yields, though this increase has been inconsistent. As is characteristic of new man-made lakes, the bloom of nutrients in the first few years of impoundment led to a rapid increase in the fish population, then with the stabilization of the lakes productivity decreased and the fish population dropped until it stabilized at an equilibrium

generally well below the peak.

Thus, for instance, five years after the formation of Lake Kariba, 3,628 tons of fish per year were being caught. Besides being a source of protein to the local population, this was important to about 2,000 fishermen working the lake. However, with time this yield declined and ten years after the closure of the dam only 907 tons of fish were being caught. By 1978 the fish catch had fallen so much that only a small section of the local population was engaged in fishing (Goldsmith and Hildyard, 1984).

On the Volta Lake the pattern was similar; the 1968 estimated catch was 60,000 metric tonnes, but the level has now dropped off to 42,000 tonnes, a level well below the peak, though still several times more than the catch from the rivers (Obeng, 1977). The decline in fish yield in the man-made lakes in Africa is at times also associated with poor management of the fishing industry besides the decline of nutrients in the lake. For instance, the decrease in the fish caught in Kamburu Lake (Kenya) within a year after the completion of the dam (-37%) seemed to have occurred as a result of improper and uncontrolled fishing; fishermen in the region operating unhindered used very fine nets and even poison to increase their catch (Rogerri, 1985). Understandably, this had a devastating effect of the fish population in the lake.

Storage of large quantities of water by dam construction may make it possible to bring land downstream under irrigation and hence, if well-handled, increase a region's agricultural production. However, for the local people to substantially benefit, irrigation projects at the lakes must be implemented and the supplementary funding required for this budgeted for. These expenditures, measured against the total cost of the dam, and the fact that they would enable the local communities to obtain their food throughout the year regardless of the climatic conditions, are negligible. Nonetheless, where irrigation forms part and parcel of the dam project, necessary measures have to be taken to protect soils and the local populations from its destructive impacts.

With the construction of man-made lakes, the fishing industry viewed as a whole seems to have made some gains. But when these are weighed against the overall social, economic and ecological destructions occasioned by the dams, they pale into insignificance.

4.1.6 PLANT COVER, EROSION AND SEDIMENTATION

Soil erosion commonly takes place in an area where forests have depleted, plant cover is inadequate, soils are organically poor, farming methods are improper and the rains are heavy. When erosion takes place, the run-off water carrying the soil particles may end up in a river. If the rains are heavy and rivers flooded, these sediments -- usually rich in nutrients -- carried by the river are deposited in its flood plains. This is of agricultural importance since it helps the soil renew itself.

The damming of a river therefore prevents the sediments and other solid matter carried by the river from flowing downstream. This makes the sediments accumulate in front of the dam. Consequently, soils situated downstream are deprived of the nutrient-rich sediments and their fertility has to be maintained by use of fertilizers. Further, due to this impeded flow of sediments, the dam's reservoir gradually fills up with the sediments. This not only affects the quality of its water but also reduces the period during which it remains usable. By filling, or silting up, a dam's usefulness with regard to flood control, water supply, navigation and hydro-electric power production is diminished.

Given the present level of deforestation in Africa due to the usage of wood for fuel and the need to increase available land with increasing population, dam siltation poses a serious problem. Thus the construction of Kariba dam and its trapping of silt from the river's catchment area have caused the recession of the delta 80-100 km below the dam (Linney and Harrison, 1981).

The Akosombo Dam on Lake Volta retains even more sediments and the effects of this are more pronounced. Before the construction of the dam, the Volta River, which flows into the Gulf of Guinea,used to carry sediments from its catchment areas right up to the Ghanaian coast. The sea spread these sediments along the coastline right up to Togo, thus making up for erosion by sea waves. With the completion of Akosombo Dam much of the silt is retained in the lake and the coastline has been significantly eroded.

The effect of siltation of Lake Nasser on the fertility of the soil downstream, and the huge sums of money that this costs Egypt, has already been mentioned and needs no further elaboration (Section 4.1.5). But even relatively smaller dams -- for instance Lake Kamburu (Kenya) -- are not immune from this danger of siltation. Lake Kamburu now gets 5.6 million tonnes of sediments -- eight times as much sediments as had been assumed in working out its useful lifespan at its conception (Odingo, 1979). Clearly this indicates the degree of the erosion of the catchment area and of the bank of the River Tana. Despite the magnitude of the problem and the fact that the

authorities are quite well aware of the problem, no reforestation or embankment policy has been established in the areas through which the river and its tributaries run (Linney and Harrison, 1981).

One other impact of man-made lakes in Africa that cannot be ignored is the submersion of forests and vegetation which indeed are sometimes difficult to replace (Ahmad, 1962). Although figures are not available for the total loss of forests and vegetation in Africa to dam projects, these have caused the drowning of thousands of acres of forests and vegetation. Thus, for instance, the area now submerged by Lake Volta was mainly under the cover of riverine forests of varying width and savannah woodland. Given that approximately 848,200 hectares of such vegetation was submerged under the lake the impact of dams on forests and vegetation becomes clear.

Lake Volta was no isolated case. Others, like Cabora Bassa,which submerged about 360,000 hectares of land, or Lake Kariba, which led to the submerging of 510,000 hectares of land, illustrate the point further.

To a certain extent each man-made lake on the continent is under the threat of siltation. This has serious implications since the construction of man-made lakes involves the expenditure of large, usually borrowed, sums of money. Furthermore, being such a costly undertaking with far-reaching social, economic and environmental impacts, maximum benefits ought to accrue if their construction is to be at all justified. Yet siltation can bring a dam's useful life to a quick premature end, reducing the time in which the dam has to pay for itself.

Since soil erosion and especially the erosion of the river's banks and catchment area greatly affects the rate of siltation of the lake, it would make good economic sense to include programmes for soil conservation and re-afforestation into dam construction projects. However, this can only be achieved if donor agencies and recipient governments consult more and arrive at decisions related to dams jointly.

Sound economic and environmental considerations call for the integration in the dam schemes of those measures that increase the chances for the recovery of the funds invested in the project and conservation of the continent's basic natural resource, its soil.

4.1.7 HYDRO-ELECTRIC POWER

The primary purpose of large dams in Africa has usually been for hydro-electricity production; in 1980 Africa was producing 3,207 billion KWh and had an estimated 3,210 billion KWh in the process of development or soon to be developed (Biswas, 1983).

To begin with, from the 70's onwards, the price of oil has been sharply rising, and thus a number of countries have been looking for ways of reducing their dependency on oil, as it consumes a large portion of their hard currency earnings. However, water being a national resource, hydro-electricity production ensures that a country has a reliable and stable source of energy produced locally. Further, relative to diesel, steam or nuclear forms of energy, the cost of producing electricity is low.

Unfortunately, the hydro-electricity generated is generally used to supply towns or industries at the expense of the rest of the country. In fact, whereas electricity is seen as an essential form of energy in the developed countries, in most African countries it is a luxury (Wabulengo, 1989).

There are several reasons why rural electrification has not taken off in Africa despite the fact that the electrification of these areas has been the declared intention of many African countries for many years. To begin with, rural areas of Africa are not usually densely populated; settlement areas are scattered widely and are not industrialised. This makes it difficult to supply electricity to these areas at a reasonable price. Further, since rural people are to a large extent poor, the agencies supplying electricity fear that they would not recover their investments easily if they were to embark on a programme of rural electrification.

In general, therefore, electricity generated as a result of the construction of the major dams in Africa is channeled to the national grid and then distributed to towns and other electrified areas. For instance, the electricity produced at Akosombo Dam in Ghana is used by Kaiser aluminium mines and also exported to neighbouring countries; that from Lake Kariba is used for coal and copper mines in Zambia; that from the Inga Dam in Zaire is meant for the Shaba mine; and the 174MW of electricity from the lakes on River Tana is supplied mainly to towns.

In terms of electricity, as in most other aspects, the local population stands to benefit little. Governments in most cases opt to supply the urban centres and industrial towns with electricity, since these consumers can be reached easily and are able to pay installation and maintenance costs. This is in marked contrast with some developed countries where the areas around lakes are supplied with electricity free of charge, or according to preferential rates (Rogerri, 1985).

4.1.8 CONCLUSION

It is not possible in the confines of this paper to fully examine the impacts of dams on their immediate environments and on the communities living around them. Nonetheless, the picture that emerges from this brief study merits the attention of donor agencies, recipient countries and other interested parties such as local communities and NGOs.

To begin with, it is evident that the local community benefits little from the presence of such man-made lakes. This is true, be it a matter of availability of drinking water, electricity, sanitary facilities, or the improvement of housing and agricultural production. Furthermore, where families were displaced, they were in most cases improperly resettled, and the regions in which they were resettled had or came to have high incidences of bilharzia, malaria and other water-borne or water-related diseases.

Yet these problems could have been anticipated. Indeed, in many cases the problems were known both to donor agencies and recipient governments, but it was expedient not to deal with them.

What this points to is a need for a more realistic approach to cost-benefit analysis -- one that includes both social and environmental conservation measures and impacts at the local level in the dam project appraisals. If man-made lakes are to be of benefit to the local communities as it is purported, and if their record of disaster with regard to their impacts on the environment is to be curbed or minimized, the way in which they are planned, developed and maintained is of fundamental importance.

Failure to give adequate recognition to the need to integrate social and environmental factors in the implementation of the dam projects will continue to be a recipe for disastrous consequences.

REFERENCES

Ahmad, J.Y. 1982. Irrigation in Arid and Semi-Arid Areas. United Nations Environment Programme. Nairobi.

Alexis, L. 1984. The Damnation of Paradise. The Ecologist 14(5/6). December.

Anonymous. 1985. To irrigate or not to irrigate is Kenya's question. The Weekly Review. 1 Feb. 1985. Kenya.

Balon, K.E. 1978. Lake Kariba. Ambio 7(2).

Biswas, A.K. 1980. Water Management for Arid Lands in Developing Countries. Oxford.

Chambers, R. 1970. The Volta Lake Resettlement Experience. Pall Mall.

Goldsmith, E. and Hildyard, N. 1984. The Social and Environmental Effects of Large Dams.
Goldsmith, E., and Hildyard, N. 1986. The Social and Environmental Effects of Large Dams, Volume 2: Case Studies. Wodebridge Ecological Centre. U.K.

Hort, D. 1980. The Volta River Project: A Case Study in Politics and Technology. University Press. Edinburgh.

Lanoix, N.J. 1958. Relation between Irrigation Engineering and Bilharizias. Bulletin of the World Health Organisation.
Linney, W. and Harrison, S. 1981. Large Dams and the Developing World: social and environmental costs and benefits - A look at Africa. Environment Liaison Centre. Nairobi.

Obeng, L.E. 1969. Man-Made Lakes. The Accra symposium. Ghana Academy of Sciences. Ghana.
Obeng, L.E. 1981. Man's impact on tropical rivers. In Lock, M.A. and Dudley, W.D., eds. Perspectives in Running Water Ecology. Plenum Press. New York.

Rogerri, H. 1985. African Dams Impacts in the Environment. The social and environmental impacts of dams at the local level: A case study of five man-made lakes in Eastern Africa. Environment Liaison Centre. Nairobi.

Smolowe, J. and Colton, E.O. 1985. Reassessing the Swan Dam. Newsweek, 25 February 1985.
Symoens, J., Burgis, M. and Goudet, J. 1981. The Ecology and Utilization of African Inland Waters. United Nations Environment Programme. Nairobi.

Walubengo, D. 1969. Rural Electrification Issues and Options from a Southern Perspective. Ecoforum 14(2). December. Environment Liaison Centre International. Nairobi.

PROFILE E:

THE SOCIAL IMPACTS OF THE CREATION OF LAKE KARIBA

C.H.D. Magadza

1. INTRODUCTION

The social impacts of the construction of Lake Kariba can be divided into those that immediately became manifest in the early stages of the project, and those that have taken a much longer time scale to unfold.

Prior to the inundation of the Gwembe valley, the Valley Tonga lived astride an international border as a single social group, making extensive year-round use of the flood plain of the Zambezi River (Scudder, 1971). Their population was estimated at 86,000 people, with 55,000 in Northern Rhodesia and 31,000 in Southern Rhodesia.

Lake Kariba divided the Tonga into two separate political populations. There were no provisions to give the Tonga families choice as to which side of the lake they would prefer to settle on so as to retain the coherence of their family groupings.

2. PRIMARY IMPACTS

The resettlement areas to which the Tonga were moved consisted of mosaics of Karoo sandstone derived soils and alluviums with a high frequency of sodicity and poor rainfall. In these areas only one rain-fed crop per year could be raised. The frequent occurrence of droughts and uneven seasonal distribution of the rain resulted in unreliable production systems.

In addition, the remoteness of their settlement from central services meant that there were limited state services. The Gwembe Valley has endemic diseases such as malaria (plasmodium), sleeping sickness (Tyrpaosoma rhodesiensis), and filarial elephantiasis (Filaria bancrofti).

The combination of these factors led to famine, whose severity has been reconstructed by Weinrich (1977). Thus the immediate impact of the displacement of the Tonga were:

1. Disruption of social structure by separation of closely related family groups, leading to the collapse of peer support systems. Colson (1971) records suicidal deaths among young wives due to lack of elder support in crises.

2. Loss of a flexible flood production system which minimized famine risk.

3. Lack of alternate employment to offset the losses incurred by the displacement, coupled with a lack of state support services, leading to a general psychological despair.

The overall effect was to produce an embittered national minority that, above all, possessed neither the institutional nor the political facilities through which to seek redress.

3. SECONDARY IMPACTS

It is not possible here to give a comprehensive account of the second generation social impacts of Lake Kariba as these are still unfolding. Two major factors have been responsible for the shaping of the secondary social impacts of Lake Kariba. First is the eradication of the tsetse fly, Glossina morsitans, in the belief that this would remove a major constraint to food production by enabling the introduction of cattle for draft power. The second factor was the unpredicted entrepreneurship opportunities the lake would create for those with disposable incomes to invest in exotic ventures such as tourism.

The eradication of the tsetse flies from the Zambezi valley not only enabled the Tonga to keep livestock, but opened opportunities for land-hungry communities on the plateau to move into the valley, thus intensifying environmental stress in this fragile ecosystem (Magadza, 1986). The use of DDT in the control of tsetse flies and mosquitoes has resulted in the accumulation of this pollutant in the Lake Kariba aquatic ecosystem (Magadza, 1989; SEMG, 1987).

The transmigration into the valley also abruptly introduced a cash economy,

resulting in a sudden increase in the cost of living (FGU-Kronberg Consulting and Engineering GMB, 1988), all of which has gone into making the Tonga an alienated minority in their own areas. The relatively high unemployment rate has also led to an upsurge in sexually transmitted diseases.

The overall impact of these factors is that thirty years after the creation of Lake Kariba the original inhabitants of the Zambezi valley are still an impoverished people, accounting for the greatest proportion of malnutrition related morbidities reported at Kariba District Hospital.

Furthermore, the destruction of the plant cover by uncontrolled fires as well as clearing for cultivation has resulted in high silt loads in the rivers flowing into Kariba, as well as converting perennial streams to seasonal ones.

REFERENCES

Colson, E. 1971. The Social Consequences of Resettlement: The Impact of Kariba Resettlement upon the Gwembe Tonga. Manchester University Press.

FGU-Kronberg Consulting and Engineering GMB. 1988. Land Use Study of the Tsetse Fly Infested Omay Communal Lands. FGU-Kronberg Consulting and Engineering GMB, Sondener Strasse 6, Postfach 1266, 6240 Koningstein, West Germany.

Magadza, C.H.D. 1989. Synopsis of the SAREC sponsored project on Ecology of Lake Kariba. In **Magadza, C.H.D., ed. U.L.K.R.S. Bulletin No. 1/89**: Ecology of Lake Kariba. The University Lake Kariba Research Station, University of Zimbabwe.

Magadza, C.H.D. 1986. Conflicts of Resource Use on Lake Kariba Environs. Nature and Resources 22(4).

Regional Tsetse and Trypanosomiasis Control Programme, Malawi, Mozambique, Zambia and Zimbabwe. 1987. Environmental monitoring of tsetse control operations in Zimbabwe. 1986: Impact of spraying and odor-baited targets on treated ecosystems. Scientific Environmental Monitoring Group Report. 5th EDF Account No. 5100.35.94.269. Saarbrucken.

Scudder, T. 1971. Gathering among African Woodland Savannah Cultivators: A Case Study of the Gwembe Tonga. Institute of African Studies, University of Zambia, Lusaka.

Weinrich, A.K.H. 1977. The Tonga People of Southern Shore of Lake Kariba. Mambo Press.