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THE KARIBA CASE STUDY

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Abstract

The Kariba Dam, completed during the second half of the 1950s, was the first mainstream dam built on the Zambezi River. Its construction was partially financed by the largest loan that the World Bank had given up until that time. Considered a successful project even by affected people based on cost benefit analysis, Kariba also involved unacceptable environmental and social impacts. The involuntary resettlement of 57,000 people within the reservoir basin and immediately downstream from the dam was responsible for serious environmental degradation which was one of a number of factors that left a majority of those resettled impoverished. Other factors included inadequate institutional capacity, inadequate opportunities, adverse rural-urban terms of trade, the war for Zimbabwes independence and the bankruptcy of the political economy of Zambia.

Built as a single purpose hydro project, Karibas construction drastically altered, and regularized, the Zambezis natural regime. That adversely affected the flood recession agriculture of Zambian villagers living below the dam as well as the size and biodiversity of the Zambezi delta and the productivity of Mozambiques offshore fishery. Failure to properly drawdown the Kariba and Cahora Bassa reservoirs prior to increased rainfall during the 1999-2000 and 2000-2001 rainy seasons caused significant downstream loss of life, crops, and village and urban infrastructure in February-March 2000 and 2001.

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Introduction

Implemented in British Colonial Africa in the 1950s, the Kariba Dam project is an important case study for numerous reasons. It was the first mainstream dam on the Zambezi River. It was the first large dam financed by the World Bank and involved the Bank's largest loan up until that time (Austin, 1968: 155). It was the first dam in the tropics and subtropics studied by independent researchers throughout the project cycle, with that research providing planners with important information and lessons.

Considered a successful dam even by affected people based on conventional cost benefit analysis, Kariba also involved unacceptable environmental and social impacts. Especially unacceptable were adverse impacts on 57,000 resettlers and irreversible impacts on the delta and other wetlands of the Zambezi River. On the other hand, Kariba produced a number of important benefits that warrant analysis and replication as well as important lessons that have yet to be adequately applied to more recent large dam projects. In the Zambian portion of the Kariba Lake Basin, examples include a successful reservoir fisheries program in which affected people were active participants and effective utilization of the reservoir's extensive drawdown area. Implemented in the 1990s, another example includes the first reparations projects for attempting to offset at least some of the impoverishing aspects of the resettlement program. On the Zimbabwe side, the program has been pushed by the binational Zambezi River Authority and on Zambian side by the government's electricity parastatal with funding from the World Bank and the Development Bank of Southern Africa.

Whether or not Kariba might have been an acceptable development option if World Commission on Dams decision making criteria and guidelines had been followed, is an interesting question. I would suspect that a decision on Kariba's acceptability would have been deferred until after the construction of tributary dams within the Kafue Gorge had been built. If they, plus the existing and planned hydro stations at Victoria Falls which are run of the river installations with no reservoir formation, had met local energy needs until the formation of the Southern African Power Pool in the mid 1990s, Kariba might have remained an unacceptable option

Following a description of the future reservoir basin and its inhabitants and an historical overview of the project, major benefits will be analyzed. These are power generation, tourism, reservoir fisheries, and utilization of the reservoir drawdown area. Environmental and downstream impacts will then be assessed followed by a detailed analysis of the resettlement process with a final section included on major lessons learned.

The Gwembe Valley and the Gwembe Tonga

The Gwembe Valley Prior to Kariba

For farmers like the Gwembe Tonga, the Gwembe Valley (hereafter the Valley) was a harsh, unforgiving environment. Hot, dry and dusty for much of the year, rainfall was low and irregular. Yet flooding was not uncommon. A wider variety of diseases were present than on the adjacent plateaus, including human sleeping sickness (trypanosomiasis). Keeping of livestock in most of the Valley was constrained by animal trypanosomiasis carried by tsetse flies while a wide range of pests from armoured crickets and locusts to elephant and hippopotamus were a constant threat to crops. On the other hand, the rich natural resource base, and especially the fertile alluvial soils along the Zambezi and its major tributaries, allowed population densities to build up to levels which were high by Central African standards.

The Valley is best defined as that portion of the Middle Zambezi Valley in which the Gwembe Tonga are the dominant ethnic group. The upper half of the Middle Zambezi Valley, it begins where the Valley opens out below Victoria Falls and extends 230 miles downstream to the Zambezi-Kafue confluence (Figure 1). Contained within the southern portion of the African rift valley system, the Zambezi River is the dominant feature with the Valley itself lying several thousand feet below the adjacent north and south bank plateaus.

A semi-arid habitat, temperatures are high, with the annual mean maximum hovering around 90°. The Gwembe Tonga identify four seasons. The rainy season generally begins in November-December and ends in March-April. It is followed by a cold season of several months duration which phases into the longer dry season which the Tonga divide into two periods. Extremely irregular from one location to another, and from one year to another, rainfall was marginal for the cultivation of maize and even for sorghum and bulrush millet during periodic years of drought.

The most important arable soils were alluvial with their distribution along the Zambezi and the lower reaches and deltas of its tributaries determining the distribution and density of the Gwembe Tonga. Though approximately two thirds of the surface area of the Valley was on the south bank, only one-third of the human population lived there because of smaller alluvial deposits. This was because more deeply incised tributaries entered the Zambezi up-dip owing to the river not flowing in the axis of the Middle Zambezi Valley syncline. Younger alluvia could be cultivated twice annually with an initial planting at the commencement of the rains and a dry season planting following the withdrawal of the annual Zambezi flood that commenced between the end of February and the beginning of April. Rarely flooded older alluvial soils could only be cultivated during the rainy season, and then required periodic fallowing.

When crops failed, as they periodically did because of inadequate rainfall, inadequate or excessive and premature floods, or a combination of factors, death rates were known to

Figure 1

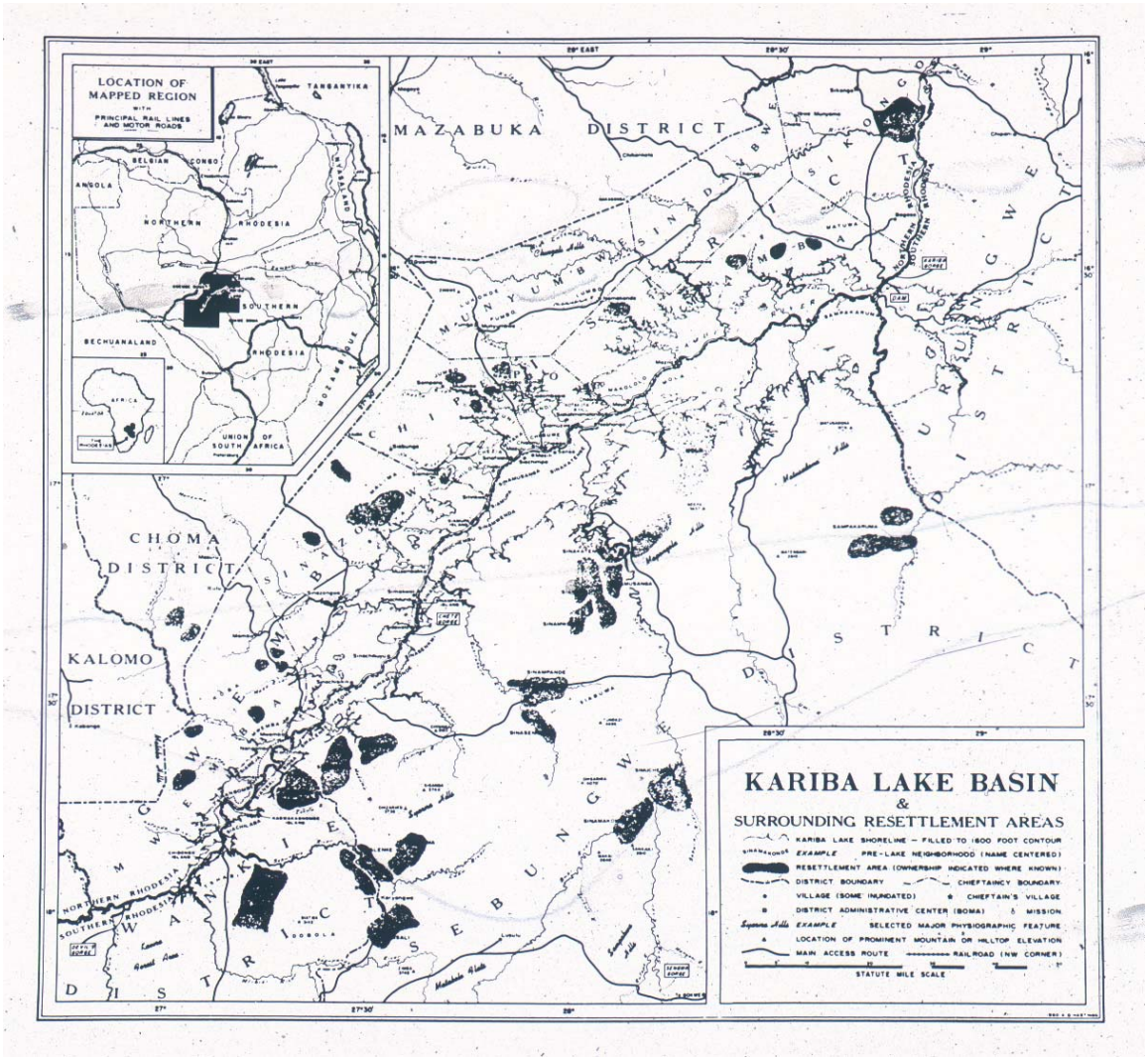

Figure 1 Resettlement Areas in Zambia and Zimbabwe
Source: Adapted from a 1960 Map Drawn by A.D. Hastings

have increased in famine years during the first half of the 20th century. Thereafter villagers had a wider range of options including government-supplied famine relief and wage labor in the developing economies of the two Rhodesias. Two older coping measures remained important. One was leaving food deficit areas to visit kin with better harvests. The other was to rely more on the rich and varied natural resource base (Scudder, 1962 and 1971). During periods of hunger, for example, the Gwembe Tonga relied on harvesting a number of wild grasses that matured in February even before the people's early maturing cereal staples. They also utilized a number of toxic seeds and tubers that required extensive preparation as well as practically ever type of animal that roamed the land, swam the rivers, or flew.

The Gwembe Tonga before Kariba

Before Kariba's construction, the population estimate for the Gwembe Valley was approximately 85,000. Over 90 percent were Gwembe Tonga, as was a still larger proportion of those who eventually were resettled. In describing Gwembe Tonga society, my emphasis is on aspects which were most influenced by the people's experiences with resettlement. These include economic dependency on Zambezi and tributary alluvial soils which were inundated by Kariba Lake and strong social and religious identification with encompassing neighborhoods. Also included is subsequent community unraveling to which resettlement, along with national economic downturn, was a contributing factor. Especially significant were changes in belief systems whereby misfortunes of any sort came to be increasingly blamed on witchcraft.

At the time of resettlement, religion was dominated by a form of ancestor worship whereby the welfare of an individual or an extended kin group was dependent on the goodwill and protection of recently deceased kin. They were the primary instrument of social control. When misfortunes occurred those involved sought the services of diviners to learn the cause. In 1956-1957 my colleague Elizabeth Colson collected information on 206 divinations. In 200 the cause of illness, death or other misfortune was attributed to ancestral displeasure at the failure of the living to behave in a culturally appropriate way. That might be defined as a failure of a man to complete his marriage payments, or of any individual to honor the ancestors through the pouring of libations. Other sources of misfortunate, including witchcraft, were rare.

Varying in size from less than 100 to over 500 residents, permanent Gwembe Tonga villages were focused on alluvial deposits. Where such deposits were extensive as within Zambezi River meanders or in the deltas of the larger north bank tributaries, villages were larger. They were also more closely clustered in neighborhoods of three to seven villages, the neighborhood (*cisi* in the local language) being the largest indigenous political unit throughout the Gwembe Valley. Two important characteristics of the Gwembe Tonga were their organization in matrilineal kin groups and their egalitarian character. For social purposes descent was reckoned through women with all Tonga belonging to the lineage of their mother in which the authority figure in relationship to children, for example, was a woman's brother as opposed to her husband. Such lineages consisted of the living, the dead, and the unborn and were multi-functional units. The

responsible unit for dealing with the ancestors, the matrilineage was also the unit through which wives, land, livestock and other property, and positions and skills, were inherited. In former times, it was also the unit responsible for avenging a member's death.

Though matrilineal, the Tonga kinship system also had a patrilineal bias. Residence was virilocal, with newly married couples frequently living with the father or mother's brother or other male matrilineal relative of the husband until marriage payments were complete. Then the goal of husbands would be to establish their own independent homestead in which to increase their dependents and their wealth in land resources and livestock by taking plural wives and attracting matrilineal kin. Within such homesteads the primary goals of wives was to increase their lineage's size by having as many children as possible and advancing the interests of those children over those of co-wives or other dependents of their husbands.

The egalitarian nature of Gwembe society was reflected in patterns of leadership where a series of checks and balances kept any single individual from gaining too much control over others. Prominent elders and political leaders had influence rather than authority, with Tonga males unwilling to accept decisions made unless they were present at the time and a consensus was reached. Checks and balances were especially evident in regard to religious leaders. Every neighborhood had a ritual leader. Usually a lineage descendent of the first man to pioneer agriculture within the area, his influence was tied to specific villages, fields and sacred zones in which small shrines were periodically renewed.

Based on seasonal changes and discussion within the community, it was the neighborhood ritual leader, working with his wife, who must be the first to plant crops at the commencement of the rainy season as well as the first to initiate a range of agricultural activities - including brewing the first beer from the new harvest. He also must be the first to cut thatching grass as well as to initiate other natural resource activities such as fishing within sacred zones. Such prerogatives coordinated vital livelihood activities within a problem-prone environment and, in the case of sacred zones, managed resource extraction. On the other hand, the neighborhood leader did not have the authority to either name or punish offenders. When the rains failed, or other unexpected events threatened livelihoods, villagers assembled to clap and dance at the residence of an acknowledged prophet. Usually a woman, she would then identify the problem's cause and solution while in a trance. Should the misbehavior of an individual be identified, such as initiating a prohibited activity before the ritual leader, that individual would be identified and required to pay a fine at the neighborhood shrine which people might be required to rebuild under the ritual leader's direction.

Other important customs of relevance to the resettlement process included a mechanism whereby a prominent individual could establish an institutionalized relationship of friendship (*bulongwe*) that would provide security to such important visitors as buyers and sellers of goods and services. Possession dances (*masabe)* were especially important for women under stress in a male-dominated society. Their illnesses were apt to be diagnosed as due to possession by one of a number of dangerous or unfamiliar entities. Cure would require ritualized drumming and dancing paid for by kin, or an erring

husband, that allowed the one possessed to be treated while being the center of community attention.

The primary production unit was the homestead and, within the homestead, each separate household. Where extra labor was needed for such activities as building a house or weeding a large field, one could call on assistance from close matrilineal relatives, although a more common practice was to solicit the help of neighbors with locally brewed beer as payment. Productive activities were varied so as to reduce risk. Agriculture was the most important activity with each family trying to gain access to fields with the necessary range of soils and moisture conditions needed for growing the three main cereal staples. Though bush gardens that required periodic fallowing had become important as population increased after the second world war, most valuable were the more fertile alluvial soils which could be cultivated twice annually without fallowing and where fresh, and highly prized, vegetables could be grown during the long and hot dry season. Both men and women could inherit arable land, with women, in particular, identifying their welfare with alluvial gardens that had been inherited from one generation of female kin to another. Also important was the keeping of livestock as well as gathering, fishing and hunting activities. During the dry season, a majority of men might be absent seeking wage labor on the farms and in the urban centers of the adjacent plateaus.

The Kariba Dam Project: Historical Overview

Introduction

The history of the Kariba project between the 1950s and the present has been influenced by a number of unexpected events that make a difficult evaluation of effectiveness even more difficult. These events include changes in governments as well as in the political economies of those governments. While such changes did not have a major impact on the first stage of the Kariba Project, they did impact upon the second stage which was delayed during the turbulent 1960s due to Rhodesia's illegal unilateral declaration of independence in 1965 following Zambia's independence in 1964. By the time that second stage was finally completed in 1975, Zambia's demand for power had stagnated, increasing by only 2 percent between 1974 and 1980.

In 1980 Rhodesia became independent Zimbabwe. Thereafter the inability of Zambia and Zimbabwe to agree on an equitable pricing arrangement, as well as Zimbabwe's more rapid growth until recently and unreliable power supplies from Zambia, caused Zimbabwe to seek self-sufficiency through the construction of thermal stations powered by nearby coal deposits at Hwange (formerly Wankie). While economic downturn, exacerbated by the AIDS epidemic, currently characterizes both countries, in 1996 Kariba became a key component of the South African initiated-Southern African Power Pool (SAPP) that eventually will link Southern, Central and Eastern Africa. Also in 1996 the Zambezi River Authority (ZRA) announced a rehabilitation program for those resettled in Zimbabwe over forty years ago, with the Zambia Electricity Supply Corporation (ZESCO) announcing a similar program in 1998 for north bank resettlers.

History

A bi-national project, Kariba was also the largest project implemented to date in both Zambia and Zimbabwe. Its history is important because decisions made had national significance for subsequent development. That is especially the case in Zambia where the way in which funds were obtained for Kariba's construction precluded the implementation of a major rural development initiative that might have had a major impact on improving the living standards of the currently impoverished population.

Serious planning for a major dam in the Zambezi Basin began in 1946 in what were then two British colonial territories. Its sole purpose would be to provide electricity to the Northern Rhodesian Copperbelt and the urban industrial centers of Southern Rhodesia. Already globally significant suppliers of copper, the Copperbelt's major multinational mining firms had been undergoing rapid development since the end of the Second World War. Lack of a reliable, low cost supply of electricity was seen not just as a major constraint for further development, but as a crisis in the making. Between 1948 and 1956 coal delivered from Wankie to Copperbelt power stations over an inadequate single-track railway line had to be supplemented by fuelwood that deforested 917 square kilometers in the surrounding areas (Williams, 1985: 48). Energy supplies were complemented in 1956 by temporarily importing electricity from the Belgian Congo to the north – a strategy seen at only temporary because of civil strife (Soils Inc.2000: 9).

During the 1946-53 planning period two dam sites received serious consideration. One was the Kariba Gorge in the Middle Zambezi Valley; the other was immediately upstream from the Kafue River Gorge on a Zambezi tributary entirely contained within Northern Rhodesia. Established in 1946, the Inter-Territorial Hydro-Electric Power Commission appointed an Advisory Panel in 1948 to choose between the two sites. When the Panel initially favored Kariba, the Northern Rhodesia government (NRG) objected and asked the Panel to look more carefully at the Kafue site. Involving a smaller, less expensive dam, NRG argued that Kafue could provide the critically needed power to the Copperbelt at an earlier date than Kariba. Presumably NRG was also influenced by its white settler community that emphasized that Copperbelt needs should be met by a territorial dam as opposed to a shared one,

After the Panel confirmed that Kafue could provide sufficient cheap power more rapidly that Kariba, the Northern Rhodesian settler-dominated legislature voted in 1953 to proceed with Kafue. A Kafue River Hydroelectric Authority was established as the responsible agency. That same year the two territories were joined with Nyasaland to form the Central African Federation. Though short-lived (1953 – 1963), creation of the Southern Rhodesian-dominated Federation shifted the emphasis back to Kariba since its Prime Minister favored the Kariba site for political as well as economic reasons: Kariba would fuse the two Rhodesias by an "arch of concrete" across the Zambezi (ibid: 142; see also Williams 1985: 49).

After the newly formed Federal Hydro-Electric Broad had replaced the Inter-Territorial Power Commission in 1954, an advisory panel of experts supplied by the French parastatal Electricité de France was asked to further assess the two sites. Once again the Kariba site was favored, as it was by a second 1954 report by a distinguished French engineer. Dealing only with electricity generation, neither report included such issues as irrigation or resettlement in spite of the fact that Kariba would require the removal of thousands of people while a Kafue reservoir would displace only a few households at most.

The two French reports decided the issue in December 1954. Kariba would be built first and Kafue second. A Federal Power Board was established, with a project document submitted, in what must be close to record time, in December 1955. The next year cost estimates were increased from £54 million to £80 million due partially to cost accounting, selection of a better site for the dam in the Kariba Gorge and the decision to heighten it by six meters. Because of an increasing demand for energy on both the Copperbelt and within Southern Rhodesia, the same rigid time table was maintained for project completion in1960. That left inadequate time for planning and implementing an acceptable resettlement program. Rather the resettlement of 57,000 people became a crash program to physically remove them before the reservoir began to fill.

The problem of finding extra finance remained. To solve that the Federal Prime Minister requested the multinational copper companies to loan the Federation the necessary finance. That required them to make a choice since the Northern Rhodesian Governor had also requested a loan for a major rural development program that was intended to reverse rural migration to the Copperbelt and the urban centers along the line of rail. Denying the Northern Rhodesia rural development request, and a similar request from Nyasaland, the copper companies opted for funding Kariba. That decision, according to the World Commission on Dams' Kariba Dam Case Study, ended not just Northern Rhodesia's best option for a major rural development program but also Zambia's (Soils Inc. 2000: 142-143). Final funding included a £28.6 million loan from the World Bank, £28 million obtained from the mining companies and Barclays and Standard Banks, and £15 million from the Commonwealth Development Corporation.

Even before financing had been received from the World Bank, construction began in 1956 with the dam wall sealed at the beginning of the rainy season in December 1958. During the first two months water levels rose over 30 meters above normal levels

flooding now deserted villages in the process. On reaching full storage capacity in 1963, the Kariba reservoir became the world's largest. 280 kilometers long, Kariba Lake flooded over 3,000 square kilometers of riverine forests and inland savanna woodland.

In the first half of the 1960s unexpected political events occurred. The Central African Federation broke up in 1963 when Nyasaland became the independent country of Malawi. In October 1964 Northern Rhodesia became independent Zambia. In 1965 the settler government of Southern Rhodesia became Rhodesia by unilaterally (and illegally) declaring its independence (UDI) from the United Kingdom (UK). Though the United Kingdom had created a Central African Power Corporation (CAPCO) at the Federation's termination to take over the functions, staff and assets of the Federal Power Board and a Higher Authority for Power to approve major policy decisions, after UDI Zambia refused to accept the legality of the Rhodesian representatives. That brought decision-making to a standstill until UK, which legally was still the government of what had been Southern Rhodesia, appointed two members to represent south bank interests on the Higher Authority.

Because of such delays, the construction of Kariba Stage 2 was delayed until the 1970s. To protect itself from Stage 1 installations being in Rhodesia, the Government of Zambia (GRZ) had proceeded, in the meanwhile, with two other hydro-electric schemes. One, generating 100 MW, was on the north bank of the Zambezi near Victoria Falls. The other was the 600 MW Kafue Project that was commissioned in 1971. The previous year GRZ planning for the 615 MW Stage 2 got underway with the formation of the Kariba North Bank Company that appointed CAPCO as the project authority. With a loan from the World Bank, the Project was completed in 1977 after a two-year delay because of geological problems and the bankruptcy of the initial civil engineering contractor.

Following Zimbabwe's independence in 1980, cooperation between the two governments failed to improve. In Zambia, the authorities believed that the Kariba project was yielding more benefits to Zimbabwe. Because CAPCO bought electricity at cost, including that generated in Zambia with funds independent of CAPCO's, profit from Zambia's major energy investments went to an organization that not only allocated significantly more joint revenue for extending the transmission system in Zimbabwe than in Zambia but also sold more electricity to Zimbabwe from joint facilities due to that country's higher growth rate during the 1980s. Such problems led to CAPCO being replaced in 1988 by the Zambezi River Authority with a more restricted mandate. Though still responsible for running the Kariba facilities and for planning and implementing additional dams on the Zambezi, the distribution of power as well as budgetary authority had been handed over to the appropriate ministries in the two countries.

Pricing and other disagreements also interfered with decision-making relating to other binational dams. Though feasibility studies have been underway in Zimbabwe for a dam in the Middle Zambezi's Batoka Gorge below Victoria Falls, Zambia's agreement has not been forthcoming. Rather both countries have been pursuing "go-it-alone" policies with Zambia initiating a second stage dam on the lower Kafue and augmenting the capacity of the Victoria Falls hydro station and Zimbabwe developing large-scale, Hwange coal-fired

thermal plants. The only major cooperative venture, and a multinational one at that, has been Kariba's incorporation in the Southern African Power Pool, which will eventually provide an important linkage with increased power production from the Congo River.

Major Benefits

Generation of Electricity

In evaluating the development effectiveness of the Kariba project, it is important to keep in mind the growing energy crisis on the Copperbelt during the 1950s, Zambia's increasing demand for energy between 1964 and 1974, and Zimbabwe's after 1980. It is also important to emphasize that Kariba was not just designed to bring least cost energy to the urban and industrial sectors of two countries, but was also planned as part of an ongoing process of energy development that continues up until this day. Stage1 construction in the 1950s brought on line a maximum capacity of 705 megawatts (MW) provided by six turbines located on the south bank of the Zambezi. Stage 2 followed in the 1970s with four north bank turbines that brought total capacity to 1320 MW.

Though underutilized at times in Zambia, with irregular north bank transmission to Zimbabwe because of ongoing pricing and other disagreements, Kariba power is still cheap in comparison to other sources. That statement even applies to Stage 2 electricity where cost overruns, among other factors, have reduced an expected rate of return of 17% to 8.9% (World Bank 1983: ii). For example, "the average electricity cost in the region dropped by about 30% in the period 1961-1977, while the average price for other commodities and services rose by more than 75%" (Soils Inc., 2000: v). Direct beneficiaries were the mining industries and other industries in both countries as well as their employees. Zimbabwe in particular was able to develop a wider range of electricity-intensive industries including fertilizer production. Governments also benefited, with over 80% of Zambia's foreign exchange coming from copper from the second half of the 1960s until the end of the 1980s.

While the Kariba case study also includes millions of consumers as beneficiaries among a rapidly increasing urban population, in Lusaka as well as other urban centers up to half of that population still lives in poorly electrified peri-urban settlements. As for the Gwembe Tonga, their district councils (aside from those based in Kariba and Siavonga Townships on either side of the dam), schools and clinics only began to receive electricity in the 1990s when Binga was connected to the national grid in Zimbabwe and the Lusitu area and services in and around Sinazongwe town were connected in Zambia.

Fisheries

Introduction

Yet to be extensively applied elsewhere, a major lesson from Kariba concerns the fisheries potential that dam reservoirs have for subsistence and commercial fishing by immigrants and local residents, and for recreational fishing. Immigrants are noted first in the preceding sentence since they, like the urban users of Kariba's electricity, were the main beneficiaries at the expense of local residents. A partial exception was the successful development of an inshore, artisanal fishery on the Zambian side that provided substantial benefits to thousands of resettlers and hosts, and has major implications for large dams elsewhere.

What was known about the fish populations of the Middle Zambezi prior to Kariba's completion was largely restricted to the indigenous knowledge of the Gwembe Tonga. Though the depth and speed of water in the river's primary channel restricted the artisanal fishery to the river's edge and flood plains and to tributaries, the Tonga knew most of the species by name and caught them with a wide range of techniques including valved and valveless baskets, traps, spears and poisons (Scudder, 1960). An important source of protein, fishing also had recreational and ritual characteristics.

I believe the first scientific sampling of the river was in 1956. Present at that time, I was surprised one afternoon to hear explosions coming from the river. On investigating, I found members of the Joint Fisheries Research Organization of Rhodesia and Nyasaland throwing dynamite into the river. Stunned fish were then scoped up for identification. Using such techniques, what was assumed to be an undercount of 28 species were identified (Jackson, 1960).

Though the Federal Power Board's interest was restricted to electricity generation, interest in the reservoir basin within the Federation and the two territories led to the creation of a Kariba Lake Committee (KLC) in 1955. That evolved into the Kariba Lake Coordinating Committee in 1957 with two members appointed from the territorial and federal governments. One of the KLC's first acts was to form a Kariba Lake Fisheries Committee to "examine and report on the industrial, subsistence and recreational fishing potentialities of the Lake." [1] In addition to government fisheries officials, C.F. Hickling, then Fisheries Adviser for the Colonies to the UK Colonial Office, was asked to estimate the fisheries potential of the future reservoir. His and other estimates ranged from 14,000 to 22,000 tons without the stocking of exotics. Those were heady figures that the authorities rounded off as 20,000 tons – a figure that took on an almost magical quality. While that figure proved to be a major over-estimate until stocking occurred in the mid-1960s, its impact was favorable since it led to policies and finance for fisheries development.

A characteristic of all man-made reservoirs is an initial explosion of primary and secondary productivity following impoundment due to a release of nutrients from flooded soil and vegetation. In the Kariba case nutrient content as measured by total dissolved solids increased from a pre-project 26 parts per million (ppm) to 65 ppm by 1963 and

[1] 1951 Annual Report of the Central African Council on the Kariba/Kafue Hydro-Electric Power Committee (from Soils Inc, 2000: viii)

dropping to 42 ppm after 1964-65 (Balon 1974: 139). During the 1959-1963 period, not only did commercial species of fish such as tilapia find an ample food supply and exceptional breeding conditions, but such predators as tiger fish (*Hydrocynus vittatus*) and crocodiles, which had dominated the Zambezi's primary channel, were spread over a much wider area. Resident species also increased from 28 before Kariba to 41, of which 13 were "economically preferred species" in the artisanal fishery (*ibid*: 14).

Because such a rapid initial increase in productivity can be expected to be short lived as nutrient levels decline and predators extend their range, a commercial fishery must be available to exploit it from the start; otherwise natural mortality will reap the harvest. By the time the reservoir reached full storage level in 1963, over 2,000 Gwembe Tonga fishermen on the North Bank were landing between 3,000 to 4,000 tons per annum, with total reservoir landings estimated at about 7,000 tons per annum. Already, however, productivity was decreasing, with yields of 40 pounds per 100 yards of netting dropping to less than 30 pounds in 1963 and 20 pounds in 1967 by which time total landings had fallen to less than 1,000 tons. Though the war for Zimbabwe's Independence restricted fishing activities throughout the 1970s, since 1980 total reservoir landing have gradually increased to about 5,000 tons in the late 1980s. Thereafter they fell again as reservoir levels dropped until 1999 when heavy rains once again brought the reservoir to full storage level.

A deep reservoir, it was expected that the indigenous fish population would be restricted to the reservoir littoral. When the question arose of stocking Kariba Lake with exotic species to colonize the open and deeper waters, Hickling and other experts recommended a "wait and see" approach. The first stocking attempt occurred between 1959 and 1961, when north bank fisheries officials attempted, with little success, to increase the inshore tilapia catch by introducing 26 tons of fingerlings. Further stocking was postponed until a FAO/UNDP/Federation Central African Fisheries Research Institute (CFRI) was established in 1963 as one of several such research institutions serving African man-made lakes. Under CFRI supervision, a small sardine like fish, *Limnothrissa miodon* (called kapenta locally) was introduced from Lake Tanganyika on the Zambian side.

Initial follow-up investigations indicated that the introduction had failed. What had happened, however, was that the introduced fish had left nutrient-poor Zambian waters for the Sanyati Basin on the Southern Rhodesian side where waters had been enriched by fertilizers entering the reservoir from large commercial farms in the hinterland. Not known until after Rhodesia's UDI, that discovery caused an uproar in Zambia's parliament as MPs raged about the loss of Zambian fish, with one MP urging that a net divide the waters between the two countries in order to keep Zambian fish where they belonged. The story ended happily, however, as kapenta not only gradually colonized the entire reservoir but also swam downstream to do the same in Mozambique's Cahora Bassa reservoir. By 1985, total Lake Kariba kapenta landings exceeded 20,000 tons per annum. Zimbabwe remains the main beneficiary with approximately two-thirds of the catch.

Immigrant-dominated Commercial Fishing

From its mid-1950s initiation, the primary interest of the Kariba Lake Coordinating Committee (KLCC) was to establish a Kariba Lake Development Company to exploit the reservoir's fisheries potential. Each of the three governments was to provide capital of a million pounds as was the Colonial Development Corporation. The Company never materialized due to differences in opinion as to the Company's primary purpose and who was to do the fishing. Believing that the Company should foster the greatest economic interests of the partners, the Southern Rhodesian and Federation governments favored an expatriate dominated fishery as did such Northern Rhodesian interests as the Industrial Development Corporation. Though the Northern Rhodesian Government initially favored the Company idea, they also insisted that the primary beneficiaries should be the African population. And because of the magnitude of resettlement, that population initially should be restricted to the residents of the Gwembe Valley. Moreover, NRG insisted that the Company's formation required the approval of the Gwembe Tonga's District Council.

This is the first case that I am aware of where affected people were given the option of deciding how a major dam-related opportunity affecting their welfare should be structured. In a March 10, 1960 letter the District Council rejected the Company idea, stating "We completely refuse to have such a company in our Native Reserve and in Native Trust Lands for the following reasons: (a) we shall not allow a Southern Rhodesian Government to have a say in our District;…(b) we have no faith in the Federal Government to control the water in our Native Reserve in the form of a company… In conclusion we want direct contact between this Native Authority and the Northern Rhodesian Government in all dealings in the matters of controlling the lake." That brought an end to planning for an international organization to deal with issues other than power generation. It also brought an end to international planning for the reservoir until the 1990s when a Scandinavian-funded project led to coordinated planning that is still under way for the artisanal fishery (Malasha 1999 and 2003).

Following the demise of the company idea, the development of the south bank fisheries potential was largely entrusted to Irvin and Johnson - a major South African Firm with both marine and fresh water interests. Allocated concession areas, this firm also purchased fresh fish from resettler and host fishers who were established in a number of camps where they were expected to become full-time fishers. Though the Southern Rhodesian Government stated that it wished to professionalize them, "no serious program was developed towards this end" (Bourdillon et al 1985: 21). Rather, due to various constraints that created a "sense of uncertainty," the artisanal fishery came to be seen as "a tenuous and uncertain enterprise" (*ibid*: 22) which was exacerbated by the war years with the number of active fishers dropping "to about 130-140 in 1977" (Marshall et al 1982: 189).

A major constraint for south bank villagers that continues today was the prohibition against agriculture in the vicinity of fish camps. To reduce risks in a difficult environment, the Gwembe Tonga practice a diversified system of production in which agriculture and livestock management are the most important components. Rather than

becoming full-time fishers according to government's plan, most occupants responded to this prohibition by leaving the camps during the rainy season to cultivate fields back in their villages. After Zimbabwe's 1980 independence, the artisanal fishery began a recovery similar to that on the North Bank with the major difference that Irvin and Johnston continued to have a number of concession areas. By 1983, Bourdillon and colleagues estimate that there were 555 inshore fishers plus another 88 based on three Irvin and Johnson camps (*ibid*:156).

The large scale, open water, kapenta fishery began in the Sanyati Basin when the then University of Rhodesia-affiliated Lake Kariba Fisheries Research Institute "discovered" kapenta two years after their introduction in Zambian waters (*ibid*: 26). Thereafter, the Institute experimented with various capture techniques, with the first firm licensed to fish kapenta on a commercial scale between 1973 and 1975. Thereafter additional licenses were issued, with an estimated 380 kapenta rigs operating on the reservoir in recent years (Soils Inc, 2000: 102).

Whereas Kariba Lake provides only a relatively small proportion of Zambia's inland fishery, its importance to Zimbabwe is much greater. According to Marshall et al (1982 and 1985) by the mid 1980s kapenta not only comprised over 90% of Zimbabwe's wet fish catch in Lake Kariba, but also two-thirds of Zimbabwe's total fish catch. It is hard to overemphasize the importance of the kapenta fishery that has increased Kariba's catch from 5.6 kg/ha in 1968-1969 to over 30 kg/ha in 1986 (Fernando and Holick, 1991). By then total landings exceeded 20,000 tons per annum. They rose to a highpoint of 28,726 tons in 1990.

With the exception of several kapenta rigs owned by the Zambia NGO Harvest Help/Zambia which are rented out to a European operator and rigs owned by the Binga District Council, all remaining kapenta operators are better capitalized immigrants. Though that restricts local benefits to male workers' wages on kapenta rigs and largely female workers who dry the catch, those wages are provided by what is probably the most important single source of employment outside of village agriculture in the Kariba Lake Basin today. Though inadequate to move workers beyond subsistence, in the downward spiraling political economies of both Zambia and Zimbabwe, with their high unemployment rates, they play an important role in helping people survive. There is one major exception. According to Malasha's sources (2001:4), before landing their yield after a night's fishing, kapenta rig crews may illegally sell 30 to 60 percent of their catch to traders involved in the artisanal fishery. In an effort to reduce such loses, some kapenta operators have designed incentive systems whereby rig captains and crews are paid according to the amount of fish landed.

The North Bank Artisanal Fisheries

While Southern Rhodesian officials were primarily interested in a capital intensive, expatriate-dominated commercial fisheries, the Northern Rhodesian emphasis was on an artisanal fishery that would be restricted to the resettler and host population within the Gwembe Valley. This difference in orientation was a result of the different political

economies of the two territories. Southern Rhodesia was a self-governing colony, which, like the federal government, was dominated by the white settler community. Northern Rhodesia was a Protectorate under close control from the Colonial Office in London that insisted that implementation of the Kariba Project not ignore the interests of the Gwembe Tonga. This viewpoint was shared by the relevant Southern Province and Gwembe District colonial officials. What followed was a well-planned and implemented artisanal or inshore fishery, with features that are transferable to other reservoirs in the tropics and subtropics.

Even before the dam was built, the District Commissioner distributed gill nets to schools and select individuals with training provided by the Department of Game and Fisheries. I received one of those nets in 1957 prior to the record March flood which created favorable conditions for gillnet fishing within the Zambezi floodplain and tributary deltas. Young men in the village in which I lived were eager learners who soon could use gillnets from dugout canoes and carry out the necessary maintenance. As the reservoir began to fill during 1959, the first resettler and host fishers were already at work, with the first government survey that August reporting 407 fishers using 748 gillnets and 93 boats of which 87 were dugouts.

The opportunity provided by a commercial artisanal fishery was greatly facilitated by government assistance. Starting in 1959, standardized equipment was sold through the offices of the Gwembe District administration until handed over to two local cooperatives that government initiative had established in the Lusitu area below the dam and in Sinazongwe two-thirds of the way up the reservoir. During 1960 that coop sold 100 gillnets with the number rising to almost 1,000 during 1961. When increasingly sophisticated Tonga fisherman began to complain about inadequate inventory, the District Council complemented the coops with licensed private traders. Also during 1961 a fisheries training center was opened at Sinazongwe that offered short courses and included a section for building improved boats. During 1962, 330 Tonga fishermen (nearly 15 % of those fishing north bank waters at the time) attended courses the length of which was increased from two to four weeks.

A successful credit program with a repayment rate of over 90% was also introduced to cover the cost of nets and boats. By the beginning of 1963 over 2,000 local fishers were using over 5,000 gillnets. Though the number of boats was never accurately counted, approximately one-third were of improved plank and metal construction. Earned before landings began to drop in the mid-1960s, rising per capita income from fishing provided the main source of capital that allowed hundreds of resettler and host households to invest in the education of their children and in a wider range of economic activities including shops, tea rooms and beer halls and the mixed farming of cotton and other cash crops. By the time the artisanal fishery was opened to all comers after Zambia's 1964 independence, the major income earning opportunity was over for all but a small minority. Even that ended during the war years of the 1970s. Since 1980, the fishery has been slowly recovering though it remains primarily a subsistence opportunity for most fishers, at least half of whom are immigrants trying to survive the serious recession that has characterized the Zambian economy since the mid-1970s.

Tourism

Introduction

As with fisheries, tourism did not feature in the planning documents of the Federal Power Board and the World Bank. Nor did the Kariba Lake Coordinating Committee give tourism the same attention that was given to fisheries. What development has occurred since – and it has been considerable – has largely been on an ad hoc basis by entrepreneurs in both Zambia and Zimbabwe. Aside from backward linkages to suppliers, benefits have largely gone to those entrepreneurs and the central governments.

Benefits Accruing to Resettlers and Hosts

As far as resettlers and hosts are concerned, a strong argument can be made that tourism's impact on them has been largely negative. This is because of unequal competition for what were communal lands on both sides of the Zambezi prior to Kariba's construction. On the Zimbabwe side, the entire lakeshore frontage extending 5 km. inland was incorporated within a recreational area that includes three national parks and concessionaire areas for safari operators. Most of the 23,000 resettlers were moved a substantial distance inland to the base of the escarpment. The principal exception is the series of carefully regulated sites for local fishers. Even where a minority of villagers lives closer to the reservoir as in Chief Mola's area in Kariba District and in parts of Binga District, no cultivation in the drawdown area or immediately behind full storage level is allowed.

In Zambia, the land grab by outsiders came later. There the Gwembe Tonga not only maintained communal ownership, but negotiated through their district council in the 1950s the right for resettlers and hosts to leave resettlement sites, if they so wished, to settle along and utilize the edge of the entire reservoir. Many did so with the result that today hamlets and villages are scattered along the edge of the reservoir from one end to another. Where land has been lost, two forces have operated – one national and one local. At the national level lands have been excised for state farms, townships and Zambia's soul source of commercial coal at Maamba. At the local level, some outside entrepreneurs have bribed local chiefs to give them choice pieces of lakeshore frontage for tourism and other commercial activities while others have obtained island leases from district councils for the development of safari camps.

The most spectacular piece of lakeshore frontage is the Kota Kota peninsula where the highest mountain in the Gwembe Valley descends to the edge of the reservoir. That was given to an expatriate who used paramilitary troops to drive the resident population of Tonga fishers and farmers from the area, causing the death of at least one. He then fenced off the neck of the peninsula and stocked the area with game including elephants that periodically swims across to local villages where they forage in cropland. Further down the lake, another bribed Chief allocated the land of several villages and a non governmental agency (NGO) to another expatriate. That land grab failed only because the

NGO's officials rallied the affected headman to confront the chief and to force him to rescind the agreement.

The risk of such land grabs continues today. According to the April 2000 final report of Soil Inc's Kariba Case Study "recently, some 4,600 hectares of land was alienated to about 40 foreign investors in Siavonga's chieftaincy of Simamba" (page 37). Meanwhile safari operators continue to lease islands from the Sinazongwe District Council that cease to be available for use by fishers. No joint ventures yet exist between tourist entrepreneurs and local villagers and their local governments. Unlike the situation in Zimbabwe where a rapid build up of tourism at least has provided a market for local crafts and where safari operators under the CAMPFIRE program share some revenue with local councils, few benefits accrue to the Gwembe Tonga aside from the wages of the few who are employed in unskilled and semi-skilled jobs in hotels and safari operations.

Benefits Accruing to Immigrant Entrepreneurs and Central Government

Tourism has developed much faster on the Zimbabwe side of Lake Kariba simply because the dam construction township was sited there. To accommodate a labor force that had grown to 8,000 workers by December 1956 (Webster 1975: 76), housing was built on flat land close to the dam site, while housing for the project authority and the main contractors was built at the top of an adjacent hill. While no similar development occurred on the north bank until Kariba North Bank Stage 2 began in the 1970s, schools, a hospital, a bank, a club for senior staff, shops, and a large Catholic church (which commemorates approximately 100 workers who died during construction) were quickly added. Kariba Township's population now numbers approximately 25,000.

Tourism began to grow slowly after a commercial airport was opened toward the end of 1958. Conducted tours of the dam facilities began "in March 1962 attracting 10,000 visitors and by 1965 there were over 35,000 people [who] visited the power station per year" (Soils Inc, 2000: 99). Because of world-class scenery and facilities, international tourism made a major contribution with tourists combining visits to Victoria Falls, Kariba Dam and outlying Zimbabwe safari camps and hotels which were accessible by small aircraft and by boat. By 2000 the authors of the Kariba Case Study estimate that there were 4,000 boats operating on the reservoir including 1,500 houseboats and other pleasure craft operating from several marinas – all of which were on the south bank (page 102). Game viewing and recreational fishing were of international quality. Elephant, buffalo and other game graze the grasslands that colonized Lake Kariba's drawdown area. The presence of tiger fish provides the basis for a well-attended annual tournament.

In and around Kariba Township, 7 hotels were built with an estimated value ranging from 1 to 12 million dollars. Counting outlying lodges, total hotel capacity on the Zimbabwe side in 2000 was 706 beds, with the number of visitors ranging from 6,000 to 12,000 a month depending on season (*ibid*: 103). Citing Zimbabwe Tourist Authority figures, receipts from all in-country tourist activities within the Middle Zambezi Valley, which would include canoe tourism, safari operations, and the Mana Pool national park below

the dam, were estimated to be $35 million per annum (*ibid*: 103). Though hotels at Siavonga on the North Bank have become a popular site for Zambian government and other conferences and workshops, it is unlikely that they will be able to attract a significant number of international tourists. While some of the safari operators leasing islands further up the reservoir in Zambian waters may do better, the absence of game viewing areas will continue to be a drawback. That brings up again the tragedy of Kota Kota Peninsula. Now the private reserve of a reclusive expatriate, that area could have become a gem of a national park that, with careful planning as a joint venture between the District Council and the National Park Service, could have provided important benefits to the Gwembe Tonga and the government.

The Reservoir Drawdown Zone

Prior to Kariba's construction, the distribution and density of the 57,000 people who were subsequently resettled was determined by the availability of fertile alluvial soils along the banks of the Zambezi and the lower reaches of its major tributaries. When the people were resettled the large majority were moved inland to much less fertile Karroo sediments that could be cultivated only once annually if rains were sufficient and which also required periodic fallowing. The Gwembe Tonga situation is characteristic of most farming populations that must resettle because of large dam construction. That is a major reason why new opportunities are so crutial if people are to benefit from the resettlement process. Requiring less change for the majority than either commercial fishing or irrigation, utilization of the reservoir drawdown area is a seldom utilized option which requires much more consideration by planners. Reasons for its exclusion vary from ignorance on the part of project authorities to allocating it to different users or restricting access due to water quality concerns. On the south bank, for example, the entire reservoir foreshore was set aside as a national recreational area at the expense of the Gwembe Tonga. Currently in Swaziland the desire of the project authorities is to fence off the Maguga reservoir from the local people for irrational water quality fears relating to a medium sized reservoir whose waters are to be used primarily for downstream irrigation.

Fortunately for the Gwembe Tonga living on the north bank, their local council had negotiated with the colonial government that resettlers and hosts could occupy the edges of the reservoir and utilize its drawdown area once Kariba Lake reached full storage level. In most years reservoir levels begin to drawdown in June-July, remaining down until after substantial inflows begin after the commencement of the rainy season in November-December. That gives at least four to five months during which crops can be grown in the upper drawdown zones that are more than sufficient to grow early maturing maize and horticultural crops. While the growing season was longer prior to reservoir formation when it began with the March-April withdrawal of Zambezi floodwaters, otherwise no major change in production techniques or crops is required. As expected the Gwembe Tonga responded rapidly to the opportunity offered. That was true even on the South Bank where Tonga in Binga District risk arrest by cropping the drawdown area within the prohibited national recreation zone (communication from Susan Langely).

Though the extent of the drawdown area varies from year to year, the area that can be utilized for agriculture and grazing is extensive. That is especially the case on the north bank for the same reasons that pre-dam alluvial deposits there were the most extensive. Within several years of Kariba Lake's formation, most of the drawdown area was colonized by an extensive sward of *Pannicum repens* – a very nutritious grass for domestic stock on the Zambian foreshore and such wildlife as elephant, buffalo and antelope on the Zimbabwe side. Realizing that they have access to one of the best and healthiest (due to initial absence of liver fluke) grazing areas in the country, resettlers used fishing profits and other funds from the early 1960s to build up herds of cattle with oxen then used for the plow cultivation of cotton and other cash crops.

The WCD Kariba Case Study estimated the area available for drawdown cultivation on the north bank to be approximately 2,450 hectares, over half of which was available in the upper third of the reservoir basin (Soils Inc. 2000: 59). While I consider that an under-estimate, it is still a significant area of arable land that has played an important role in helping the Gwembe Tonga survive a seriously flawed resettlement program. That has been the case especially during the increasingly frequent drought years that characterized Central Africa during the 1980s and 1990s. Then the drawdown areas became even more extensive when reservoir levels fell significantly between the 1981/82-1998/99 seasons when Zambezi flows were only half of what they had been during the previous two generations.

In recent years more and more households have moved down to the edge of the reservoir to cultivate the drawdown area, graze and water their cattle and other livestock, and fish. Though much garden land was lost, as were crops, with the return of the reservoir to full storage level due to heavy rainfall during the 1999/2000 and 2000/2001 seasons, the importance of the drawdown area for cultivation and grazing remains. That importance could be significantly improved in two ways. One would require formulation of a simple hydrological model that would allow the government annually to advise farmers when drawdown could reliably be expected to begin and to experiment with potential food and cash crops for the drawdown area. The other would involve two types of zoning. The first would legalize Gwembe Tonga communal ownership to the drawdown area so as to restrict its privatization by both immigrant entrepreneurs and local elite. The second, within each village area, would zone the land for agriculture and grazing and in some areas perhaps for joint ventures with the private sector for tourism and game management. Such joint ventures have made a contribution to the Gwembe Tonga in Zimbabwe as a component of that country's Communal Areas Management Program for Indigenous Resources (CAMPFIRE).

The CAMPFIRE concept (Martin 1986) was pioneered in the Gwembe Valley's Nyaminyami District in the 1980s, the idea being to share revenue from game management, safari hunting, and tourism in communal areas with local people. Now operating in over twenty districts, results vary from one area to another. A major lesson learned over the years has been to decentralize management below the district council level as much as possible so as to spread benefits more equitably. Benefits in the Gwembe Valley include improved social services at community centers as well as some

cash income at the household level. On the other hand, procedures for equitably benefiting those villagers whose personal safety and fields are most at risk from big game concentrations require further attention.

Environmental Impacts

Introduction

Before Kariba, the Middle Zambezi was a typical "sand bank" river (Jackson 1959) in which flood season flows in February-March were usually at least ten times those toward the end of the dry season in October. Silt loads, however, were relatively low with most sediment from the Upper Zambezi being deposited over the Barotse Plains upriver from Victoria Falls. Within the Zimbabwean portion of the Gwembe Valley, little land degradation had occurred both above and below Kariba Gorge. The one exception was the Zambezi's meander zone immediately downstream from the gorges below Victoria Falls. There, on both sides of the Zambezi, the densest Tonga populations in the Gwembe had placed practically all alluvium under cultivation. Fertility had already dropped in the older alluvial soils, with Graham Childe noting the replacement of perennial grasses by annuals (personal communication). Further downstream both above and below Kariba Gorge, the Valley was heavily infested with tsetse fly. Tsetse also occurred on the north bank but were restricted to four pockets. Generally speaking, game populations were high in tsetse zones and human populations sparse.

On the Zambian side, a larger Tonga population had also cleared most of the alluvial deposits below the meander zone except in the largest tsetse fly pocket that covered an extensive area upstream and downstream from the dam site. While Tonga on both banks continued to crop the annually flooded, younger alluvial soils twice annually with no sign of degradation, fertility had dropped in the older inland alluvium as in the meander zone. In 1956-57 we found many former fields under what appeared to be permanent fallow having been colonized by dense stands of various grasses some of which rose above head height toward the end of the rains. As the population increased, Tonga in these areas had begun in the 1940s to clear Karroo sediments up to several kilometers inland from the Zambezi. Such inland soils villagers claimed had never been cultivated before. Initially pioneered by those with inadequate access to alluvial gardens, by the 1950s most villagers had cleared inland fields as the size of their alluvial holdings dwindled due to subdivision and fallowing.

By 1957 extensive inland areas had been cleared for "bush" gardens, with those pioneered by adjacent villages beginning to form a continual strip of cultivated land. Cultivated only during the rains and of lower fertility than the younger Zambezi and tributary alluvia, such soils at best could only support semi-permanent cultivation. Though fallowing had yet to begin prior to Kariba's construction, eventually periods of cropping would have had to be followed by equal length, or longer, fallow periods if land degradation of Karroo sediments was to be avoided. In other words, Colson and I were observing a dynamic system of land use which would have had major environmental impacts requiring a Tonga response if the dam had not been built. Indeed, even before the

decision had been made in favor of the Kariba site, government officials had begun to discuss possible resettlement options to deal with what they saw as an unsustainable system of land use in the meander zone.

Reservoir Basin Impacts

Introduction and "Operation Noah"

Because Kariba Lake was the first major reservoir formed in the tropics, there was little awareness even among scientists as to what actions should be taken before flooding or the nature of the environmental impacts that would follow inundation. That was the case even where some pre-Kariba surveys had been done, examples including what to do, if anything, with wildlife living in the future reservoir basin and the range of estimates as to the future productivity of the fishery. What the local press first called "Operation Noah" began after a Rhodesian journalist wrote up his observations of a visit with several game rangers collecting specimens from the rapidly expanding reservoir in early 1959. Working for the Southern Rhodesian wildlife department, and with inadequate equipment and at considerable danger to themselves, their job was to observe the impact of inundation on wildlife, to collect specimens for museums, and snakes and other fauna for zoological parks.

While there was no intention of attempting the impossible job of rescuing wildlife for release away from the floodwaters, the Kariba Lake basin was soon inundated by members of the international media whose stories led to demands that a major rescue operation commence as well as to supporting funds. In London the Faunal Preservation Society raised £10,000 while the south bank and north bank territorial governments spent £100,000 and £30,000, respectively (Crowcroft 1960). As a result more personnel were recruited who, with slightly better equipment, further risked their lives in both territories to rescue a small percentage of the animals that otherwise would have drowned or, in the case of larger fauna, made their way to the lakeshore. Some of the descriptions of their efforts and of the effects of inundation on wildlife were truly amazing. One journalist referred to millions of crickets pouring out of cracks in the soil to be devoured by vast numbers of birds that "blackened" the skies (Clements 1959: 182). Meanwhile, the children of Gwembe Tonga resettlers were dying of dysentery in the Lusitu and on the Plateau with virtually no recognition in the media.

In the end what was accomplished? On the North Bank, very little granted the consolidation of Tonga resettlers and hosts within a diminished area. Today there is virtually no big game left on the Zambian side of the reservoir. While elephant or the odd lion still swim the Zambezi below the dam to forage in Tonga gardens or feed on Tonga cattle and safari operators have introduced game on Kota Kota and leased islands, otherwise one rarely sees mammals larger than mopane squirrels or the occasional small antelope. On the South Bank the situation is different, with Crowcroft (*op.cit.*) noting that the publicity involved during "Operation Noah" was instrumental in advertising the beauty of the Valley as well as the establishment of national parks and safari areas – at the expense, I need add, of the Gwembe Tonga whose primary access to the foreshore was restricted to a number of fish camps at which other economic activities are prohibited. On both sides, little of scientific value was added to the knowledge of terrestrial fauna during reservoir filling in contrast to hydrobiological and other surveys

in the reservoir which increased with the establishment of the Lake Kariba Fisheries Research Institute in 1963.

Aquatic Weed

As unexpected impacts began to occur following inundation, it is interesting to see how the perceptions of scientists, including my own, changed as knowledge increased over time. Initially, there was a tendency to see unexpected events in a primarily negative light. In a 1972 article, for example, I used the phrase "Ecological Bottlenecks" in describing environmental changes during the 1960s that included invasion of aquatic vegetation, expansion of tsetse fly, and utilization of the lakeshore margin.

The invasion of aquatic weed was first observed during the first half of 1959 when small floating mats (referred to as "sudd" in the literature) of a water fern, *Salvia auriculata*, were seen. By June they were estimated to cover 75 square miles of the slowly filling reservoir. During 1960 other plants began to colonize the mats, with Boughy (1963) reporting 40 species by the end of 1961. During 1962-63 I observed small trees including a banana tree growing in mats where tributaries entered the reservoir through small estuaries. By then nearly 20 percent of the nearly full reservoir was mat covered (Mitchell 1965). Though I jokingly told colleagues that I next expected hippos to be sunbathing on them, at the time the mats were generally seen as a catastrophe.

On the one hand, they adversely affected the Tonga fisheries in several ways. Not only did they keep hand-paddled boats from entering narrow estuaries, but windblown mats often made it impossible for fishers to access gillnets that had been set the previous evening. On the other hand, biologists and hydrologists worried that the mats might produce a dead-zone by de-oxygenating the water beneath them or form a substrate favorable for snails that were the alternate hosts of schistosomiasis. Then the unexpected happened. After the reservoir reached full storage level in 1963, wave action on what was now the world's largest reservoir began to breakup the mats, piling *Salvinia* up on the foreshore, and reducing its extent to 7 percent within a few years. The mats were also seen as having played a favorable role in increasingly the reservoir's biological productivity by locking up in-coming nutrients that might otherwise have been lost downstream. Furthermore, at least in some situations they were associated with higher productivity, with Bowmaker (1968) reporting large numbers of juvenile fish seeking food and shelter beneath the mats. Though still a nuisance to fishers, the mats no longer presented the obstacle that had formerly been the case.

Impacts on Tsetse Fly Distribution

Before Kariba, no tsetse control operations were carried out within the Gwembe for Tonga benefit. On the south bank, the slaughter of thousands of antelope and other mammals within the Valley was intended to keep the fly from expanding onto White settler farms on the adjacent plateau. Policy had the same intention on the north bank although there the government tried to control fly encroachment by establishing control posts where vehicles, bicycles and foot travelers were checked and sprayed for fly while cattle could only be exported from the Valley after inoculation. The only benefit to the North Bank Tonga was the availability since the late 1940s of prophylactic and curative drugs for cattle living close to fly pockets.

Kariba radically changed the situation on the north bank in two major ways. At the insistence of the Gwembe Tonga District Council, resettlement areas were to be cleared of tsetse fly so that resettlers could either take their cattle with them or purchase cattle once there with compensation and other funds. The government was not opposed. In the same department, most tsetse control and livestock officers realized that Gwembe had considerable ranching potential for the Tonga population. Where disease-free, generally speaking cattle, sheep and goats were in good condition due to ample grazing and browse, while Lake Kariba would alleviate the dry season water problem.

A major control operation was begun in 1957 using land-based spraying of insecticides. At its height, four colonial Tsetse Control Supervisors were involved. By 1962, it looked like success was assured. Two of the four fly pockets were no longer seen as threatening while the one closest to the dam site had been significantly reduced. Following a drop at the time of resettlement, cattle populations in all seven chieftaincies had increased by 1962 to their highest number to date.

No control operations were undertaken in the fourth pocket that was located halfway up the reservoir. I suspect that was because of its isolation, the assumption that the tsetse fly would drown once it was inundated by Lake Kariba, or the small number of resettlers from that area. As the water rose, however, the tsetse fly began to move laterally and inland. By 1960 they had spread to previously fly-free Kota Kota Hill. After 1963 when full storage level was reached, shelter along the foreshore became an improved tsetse habitat as trees were more apt to retain some leaf cover throughout the dry season. An increasing population of fishers and fish traders also made it easier for fly to hitchhike a ride inland. As a result, fly spread into Muyumbwe's inland chieftaincy that had been fly-free throughout the 20th century and contained the largest number of cattle of any Gwembe chieftaincy. The result was a disaster, with cattle holdings dropping from approximately one per capita or less than ½ per capita between 1962 and 1966. As fly continued their expansion inland, they also began to threaten the white settler farms on the plateau. A major control operation followed which brought the situation under control. Though Munyumbwe cattle numbers once again were increasing, by the early 1970s, they still had not recovered to their 1962 level in contrast to figures for Gwembe District as a whole that had doubled from approximately 24,000 cattle in 1962 to nearly 52,000 in 1972.

Below the Kariba Dam in the Lusitu area where 6,000 resettlers were moved in 1958, the tsetse fly situation remained precarious throughout the 1960s in spite of extensive spraying and the use of curative drugs. The major reason was the risk of re-infestation from the south bank, with fly either hitch-hiking across on elephants, fishers or poachers or being blown across the river. That remained the situation until the 1980s when Zimbabwe, with financial assistance from the European Community, began an ambitious tsetse control operation based on aerial spraying throughout their portion of the Middle Zambezi Valley. Though that proved successful as a control operation, it was not accompanied by the necessary land use planning with the result that large-scale immigration of cattle-owning farmers from the plateau increased both degradation risks and potential conflict with the host population.

The Reservoir Drawdown Area

Today, as described in an earlier section, the drawdown area is considered to be a major project benefit. On the south bank it provides forage and water for a major world-class concentration of wildlife. On the north bank it provides Gwembe Tonga and immigrants with fishing, agricultural and grazing resources. It was not always seen that way. While the reservoir was gradually filling between December 1958 and July-August 1963 no drawdown cultivation was possible. However when the reservoir level began to drop for the first time later in the 1963 dry season, some Tonga experimented with the planting of early-maturing maize. Results were excellent (communication from C. Mitchell). During the next three years, however, reservoir filling and recession varied far more than had been previously the case as the dam's operators tested the dam's safety by experimenting with different flood releases, including release impacts on the downstream stilling pool. That increased the risks for reservoir drawdown farmers. Hence if the 1963 experimental planting of maize had been repeated in 1964 – as presumably it was by some farmers – the entire crop would have been lost as reservoir levels began to rise again less than two months later. Cultivation risks under such conditions of uncertainty were just too great. Indeed, it was not until after the North Bank Power Station began operations in 1976 that a more regular draw down finally began to benefit Tonga farmers.

Degradation of Resettlement Areas Above and Below the Dam Site

Because of inadequate land for resettlement purposes on the north bank and the continuation of the resettlers pre-dam system of land use, serious degradation has occurred in the most densely populated resettlement areas. Most seriously affected is the Lusitu area below the dam site where 6,000 resettlers where shifted to an area with an existing population of less than 2,000. At the time I estimated that the carrying capacity of the area under the existing system of land use had been exceeded three-fold. While I suspect that was an exaggeration, there is no question that too many people were relocated there. Figure 2 is an aerial photograph of the Lusitu area before Kariba that shows the location where two resettled villages would be moved in 1958. Only a very small area was under cultivation by the host population. Figure 3 shows remote sensing imagery in 1986 while Figure 4 shows the same area in 1992. Expanding areas designated as bare soils are truly bare soils. In drought years the area takes on a Sahelian appearance, with wind-swept dust sweeping across the landscape. Topsoil has been removed to the extent that formerly buried lateral roots of giant baobab trees are now exposed on the surface, with some trees actually toppling over (Figure 5). During recent drought years, livestock either die or must be herded elsewhere there being neither sufficient grazing nor browse to sustain them. Based on our ground surveys a similar situation has been developing in the Siameja resettlement area at the upper end of Lake Kariba and in the Chezia resettlement area in the middle reaches of the reservoir. The situation is truly horrifying for it is, in my opinion, an illustration of what is currently underway, though at a much slower rate of degradation, throughout Africa's woodland savannas – which cover approximately one-third of the continent.

Downstream Impacts

Introduction

Kariba's construction drastically altered, and regularized, the natural regime of the Zambezi. Thereafter low season flows increased, while flood water flows decreased. As

Figure 2 Lusitu Area Land Cover before Kariba Resettlement
Source: Scudder Archives

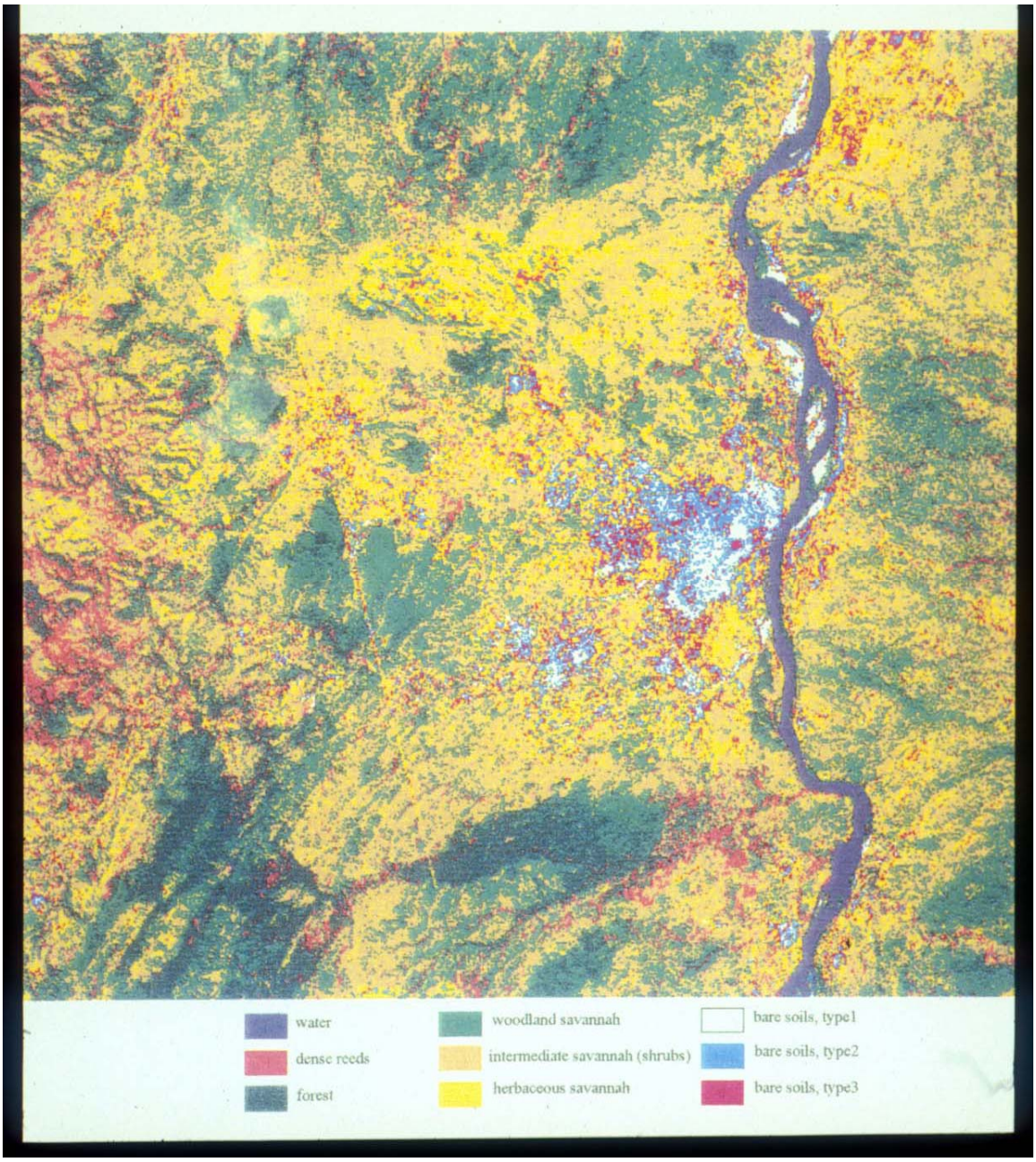

Figure 3. After Kariba Resettlement Lusitu Area Land Cover in 1986
Source: C. Petit, E. Lambin and T. Scudder

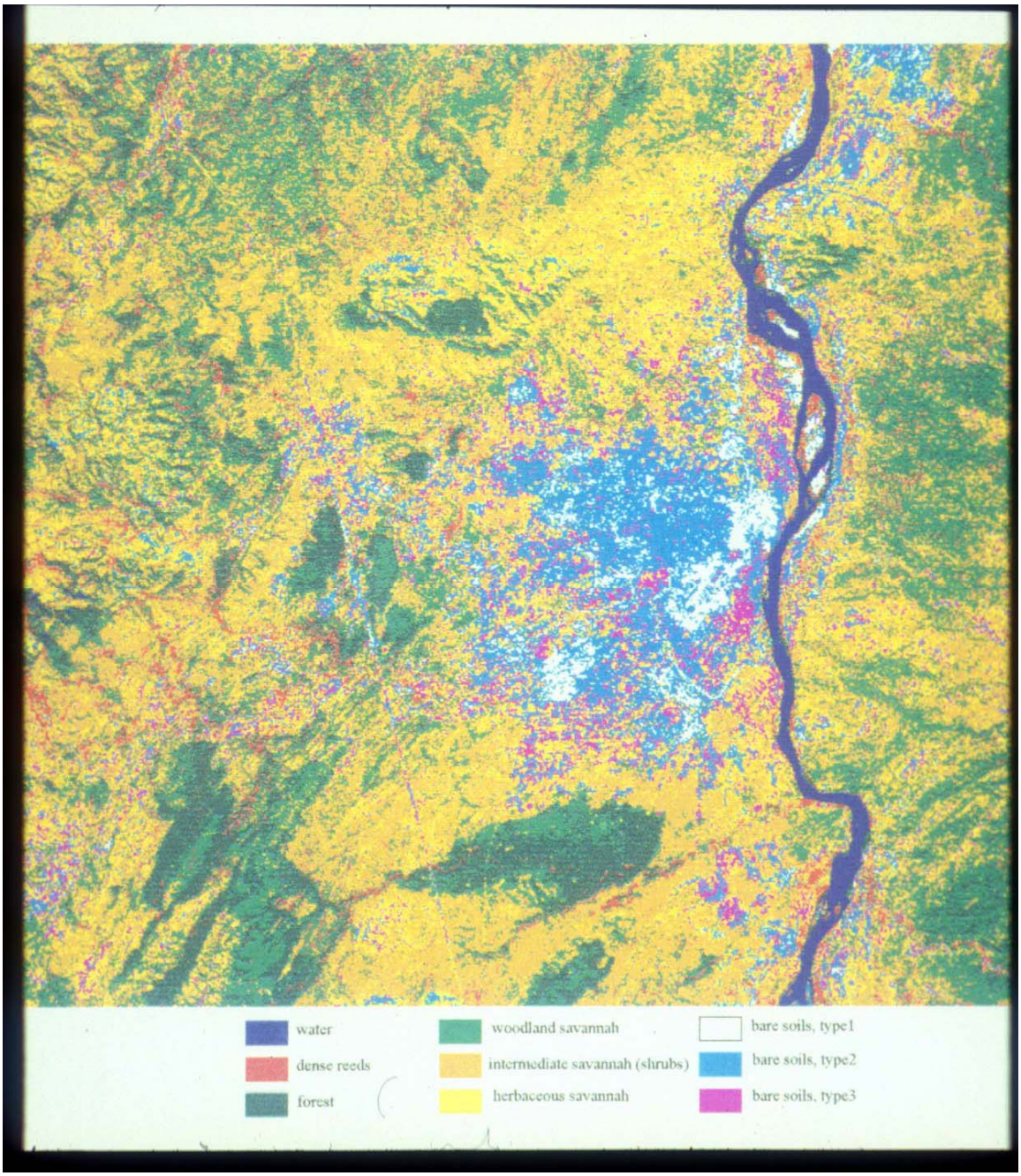

Figure 4. After Kariba Resettlement Lusitu Area Land Cover in 1992
Source: C. Petit, E. Lambin and T. Scudder

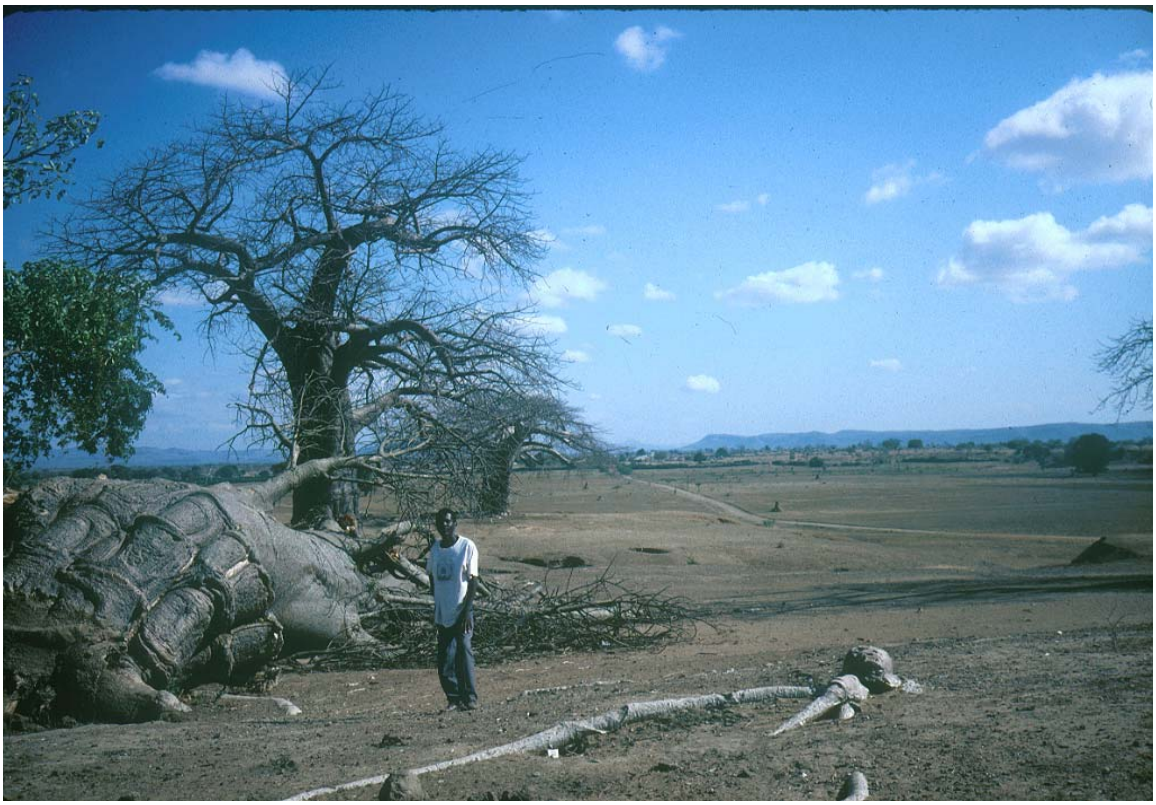

Figure 5. Toppled Baobab and Exposed Roots

Source: Scudder Archives

designed and built, Kariba has reduced capacity to alter the adverse effects of this new regime since its six flood gates are located too high in the dam wall for a policy change that would mandate regular environmental flow releases. Since the 1981/82 rainy season, flood gate spillage has occurred only twice, with reservoir waters being well below full storage level because of reduced Zambezi flows under periodic drought conditions. While the completion of Mozambique's Cahora Bassa Dam in 1975 regularized flows even further in the Lower Zambezi and Zambezi Delta, Cahora Bassa unlike Kariba has the potential to improve downstream conditions. That is because environmental flow releases are possible since the flood gates are located lower in the dam wall. Such flows are also necessary granted estimates that Kariba and other upstream dams regularize over 90 percent of the water input into the large Cahora Bassa reservoir (Beilfuss et al, 1997).

Though little detailed scientific research has been completed on Kariba's downstream impacts and on the cumulative impacts of the Kariba, Cahora Bassa, Kafue and other dams, various scientists have made observations dating back to the 1960s. Especially important are those of Davies who has recently been able to re-examine the pre-dam predictions that he made in the mid-1970s based on rapid surveys that he and colleagues were able to complete before Cahora Bassa's completion (Davies, 1975 and 1997; Davies et al, 1975). More detailed studies are under way, including one under the auspices of Mozambique's Arquivo do Patriomonio Cultural (ARPAC) and the International Crane Foundation (ICF) that is examining ecological and socioeconomic impacts in the delta and along the Lower Zambezi and another involving the universities of Eduardo Mondlane (UEM) and Minnesota on the social history of the Cahora Bassa dam from its construction to the present. IUCN has also carried out a multiyear study on Zambezi Basin Wetlands Conservation and Resource Utilization with a four volume report (2001) published titled *Biodiversity of the Zambezi Basin Wetlands* (See Zambezi Society 2001).

Significant for possibly developing new policies for managing Cahora Bassa was a 1997 workshop at the dam site. Under the sponsorship of ARPAC and the Zambezi Valley Development Authority (GPZ), that gave over 50 scientists, managers and planners the opportunity to discuss the implications of the way in which the dam is being operated for Mozambique's development. More significant still were meetings in the delta in March, 2000 during which President Chissano and his ministers were able to discuss development options, including environmental flow releases, with delta chiefs and researchers (2001 written communications from Rich Beilfuss). Also significant is a South African-funded Strategic Development Initiative for the Lower Zambezi Valley that includes consultants representing various development interests. Included is an ARPAC/UEM/ICF/Minnesota environment impact team that "will evaluate all proposed developments in the context of hydrological needs for the delta in terms of ecological and socio-economic parameters" (*ibid*).

Internationally and in Southern Africa, the need for environmental flow releases is receiving increased attention. A major step forward was a detailed three years study in the Senegal River Valley that showed that such releases from Mali's Manantali Dam would increase economic benefits (Horowitz et al, 1990). In Southern Africa, in a 6 April, 2001 press release about the four volume IUCN wetlands biodiversity report, The Zambezi Society noted that the authors recommend "occasional and significant flood releases from the Zambezi's network of dams…in order to maintain open habitats, clear

clogged channels and flush out accumulated nutrients." Articles during 2001 in South Africa's weekly *Mail and Guardian* and in *Engineering News* also discuss the benefits related to environmental flow releases.

Beginning to draw down the Cahora Bassa reservoir, as well as Lake Kariba when water levels are above the flood gates, no later than June-July rather than months later when dam safety is threatened by rising waters would have two major benefits. Done yearly, except when reservoir levels were exceedingly low, environmental flow releases would enable farmers in the reservoir basins to cultivate a larger drawdown area and allow the extension of grasslands for the benefit of domestic stock and wildlife. Downstream flow releases, followed by reduced flows, to simulate a more natural flood regime, would nurture wetlands, increase fishery productivity and allow flood recession agriculture when water levels began to decline. The second major benefit from such improved flood management would be a significant reduction of the major flood losses associated with the floods of 2000 and 2001.

What evidence is available suggests that release of such environment flows is a win-win situation in that it need not adversely affect power generation. According to Gammelsrod, "it has been demonstrated… that without using more water from the Dam, but just allowing for the redistribution of the runoff well within the operational possibilities, the CPUE [catch per unit effort] of shrimp along the Sofala bank can be increased by at least 17%" (1992). Emphasizing that his figures were "highly preliminary,"Wilson reached a similar conclusion in his paper at the 1997 dam site workshop:

"This note provides some preliminary estimates of the potential for modifying water discharge rates from Cahora Bassa without major compromise of its hydro-electric production with the objective of enhancing other socio-economic benefits in the Zambezi basin through sustaining essential ecological processes…Calculating opportunities based on actual rainfall data demonstrates that in the vast majority of years it is possible to achieve either the reduced dry season flows necessary or the increased discharge for artificial floods, without any prejudice of hydro-electric production…It should also be noted that economic factors would probably make it appropriate to sacrifice some hydro-electric production in order to create artificial floods in drier years" (1997).

One of those "economic factors" would be reduction of the type of severe economic and financial costs that have been caused by the 2000 and 2001 floods. In the meanwhile both Cahora Bassa and Kariba continue to be operated as uni-purpose projects for hydropower generation with the result that no environment flow releases have yet to be made nor are the reservoirs drawn down as a flood management procedure. On the contrary, the policy remains to conserve every drop of water for electricity generation with the result that irreversible ecosystem impacts continue to have significant human, economic and financial costs.

The Downstream Situation in Zambia

On an annual basis, scouring by silt free waters is eroding river banks in both Zimbabwe's Mana Pools National Park and Zambia's Lower Zambezi National Park, with the result that large riparian trees continue to topple into the river. Where it occurs, as in the Lusitu Delta, flood recession agriculture has been greatly curtailed since flooding only rarely inundates flood plains. Vital dry season grazing is also reduced as is

the productivity of the fishery. In February 2000 and February 2001, flood releases from Kariba devastated communities from below the Kariba Gorge to the Mozambique border as well as within Mozambique. Following the drought years of low-inflows during which reservoir levels had dropped, the Zambezi River Authority was unprepared for the exceptionally heavy rainfall during the 1999-2000 season. Nonetheless, releases could have been better phased rather than the Authority waiting to commence them toward the end of the rainy season in late February. That was certainly the case during the 2000-2001 season when drawdown of a now full reservoir should have begun before the commencement of the rains in late 2000 so as to avoid a repetition of the February 2000 flooding. Unfortunately that lesson has not learned until the 2001-2002 rainy season when anticipatory flood-management releases began in December at the start of the rainy season.

Inadequately announced to downstream residents, releases in late February 2000 destroyed much of the maize crop in Chief Chiawa's area just before its harvest. According to a BBC report March 8, "More than 12,000 people are at risk of starvation… Crops of maize, bananas, pumpkins and groundnuts were submerged by the rising flood waters. Local people have been so desperate to salvage any of the precious food that they have been diving from canoes to try to harvest the underwater crops…at least one farmer has been attacked and seriously injured by a crocodile…Local people complain that they were given very little information…and there certainly seems to be no contingency plan in place to help people" (BBC, March 6, 2000).

The next week two researchers familiar with the area submitted a report on the situation to UNICEF (Bond and Ndubani, March 14, 2000). After three flood gates were opened on February 26th, downstream Zambezi waters had risen the next day by "at least" five meters in the Lusitu area and below Chirundu "with the flood waters sometimes reaching 1.5 kms inland." In Chiawa approximately two-thirds of the households of a population of about 8,000 had their riverbank gardens flooded. Noting that the March harvests from those gardens would have brought the annual hunger period to an end, the authors concluded that the "opening of the spillgates at Kariba dam has had a devastating impact on the livelihood of people living downstream…The impact of this flooding in the most food scarce months has implications for diet, income and health in the short term and in the long term. In the short term, people will be extremely short of their usual foods for at least three months and an increase in the prevalence of malnutrition, diarrhea and malaria is imminent. In the long term, it will take over a year for the bananas to grow and produce and for households to recover from the effects of the floods" (*ibid*). Though some privately organized relief had arrived by the time of the authors' visit, no assistance had yet been provided by the Government of Zambia.

Closer to the dam, floodplain farmers suffered similar loses in Chief Chipepo's and Chief Sikongo's areas. Following a prolonged period of misfortune, the despair and anger of those farmers is reflected in the records of one of our former research assistants who had two fields in the flooded delta of the Lusitu River and was trying to restore his family's livelihood as a farmer.

"Immediately the land became ready I planted the local sixty days variety of maize. The soil was wet as the sowing took place within the rainy season. The germination was excellent and to ensure healthy growth of the maize plants I began to

weed around the plants. Fate was still with us. The Zambezi River banks had not been flooded due to the opening of the Kariba Dam sluice gates for many years. But information came that the water level in the lake had reached a dangerous level. We wondered why the Zambezi River Authority would choose to open the sluice gates at a time when people still had their maize in the fields rather than do that job after harvest time.When the flood waters came one of our two fields was completely submerged. The other field was partially submerged. The submerged field became water logged to the extent that the maize growth became stunted and eventually resulted in the death of the plants*. I can't express the anger that came into our family as a result of that flooding*" (Sikagoma Adam Senete 2000 manuscript; my italics). As for Bond and Ndubani's prediction of a one year recovery period, a year later – almost to the day – the Zambezi River Authority again opened a number of flood gates to make another untimely release of flood waters.

The Situation in Mozambique

Kariba's impact, combined with that of Cahora Bassa and dams on the Kafue, have had an even more serious impact on Mozambique's much larger riverine population as well as on Zambezi River ecosystems. While the riverine population in the Middle Zambezi Valley between Kariba and the Mozambique border numbers substantially less than a quarter of a million people, well over a million inhabit the Zambezi River Valley in Mozambique. During 1993 I had the opportunity to visit villagers living close to the Lower Zambezi upriver from Marromeu. As we walked from the village down to the Zambezi that was about a kilometer away, my village host explained that when he had been a child herding goats flood waters annually had reached close to the village but now Zambezi waters were largely restricted to the river's primary channel. As a result, much less land was available for flood recession agriculture and there was less grazing during those critical months at the end of the dry season. The productivity of the fishery had also gone down. When I asked him why such major changes had occurred, his answer was Cahora Bassa.

During 1996, I overflew the Zambezi from the dam site to the Indian Ocean with Luis Covane, the director of ARPAC, Beilfuss and Davies. Because of reduced flooding we noticed that people had moved their residences closer to the Zambezi channel, in some cases even building on islands. Having reduced their resource base, the dam had also placed them at greater risk from poorly planned flood releases since Cahora Bassa was being operated in the same fashion as Kariba. Such releases occurred in both 2000 and 2001.

Negative impacts of the March 2000 flooding were especially serious in Tete – the largest city in the Mozambican portion of the Zambezi Valley – where suburbs were flooded. By the end of March, flooding was said to have affected 635,000 people, 180,000 of whom were living in emergency shelters. 81 people were reported dead.

In February, 2001 once again the holding capacity of both Kariba and Cahora Bassa had been reached so that releases had to be based on dam safety issues as opposed to the interests of downstream populations. Suburbs in Tete once again were being flooded with Radio Mozambique reporting that the high portion of the city was an island surrounded by water. Further downriver in Mutarara 55,000 people were reported to be

affected, 15,000 of whom were being accommodated in shelters while 26,300 were in shelters in Caia District. In the towns of Marromeu and Luabo, the government had urged 80,000 people to seek out higher ground, while the need for evacuating up to 50,000 people in the delta was being considered. By the end of the month, 400,000 people had been affected, with 77,000 displaced and 41 dead. Serious impacts continued through March. Schools were especially hard hit in Sofala Province that includes the towns of Marromeu and Caia. There 50 schools were closed. In Tete Province 25 schools were reported as completely destroyed with another 50 inundated.

While the financial and economic costs of the 2000 and 2001 floods can be calculated, it is much more difficult is to assess the costs of reduced flooding since 1958 on the offshore Sofala Banks, on the delta and on riverine wetlands. As previously noted, the productivity of the Sofala Banks shrimp fishery, which is one of Mozambique's major sources of foreign exchange, has been adversely affected with reduced yields correlated with dam-induced reduced runoff (De Silva 1986; Gammelsrod 1992). According to Davies, "Cahora Bassa has wrought massive geomorphological and ecological changes on the system" with actual changes "far worse" than even he had predicted in the 1970s (2000 communication to World Commission on Dams). In addition to reduced shrimp productivity, changes include collapse of the Sofala Bank fisheries and coastal erosion. In the delta, Davies estimates a 40-45 percent loss of mangroves. Outlying channels have been clogged with aquatic vegetation that is no longer flushed out, while the productivity of former grasslands for wildlife has been reduced by the invasion of woody plants. In the main river, fish stocks have declined, while changes in vegetation suggest "saline wedge intrusion" (*ibid*).

The Resettlement Process

Introduction

The Kariba Dam was the first large dam built in tropical Africa that required the resettlement of large numbers of an ethnic minority; indeed one of the first such dams anywhere in the tropics. Aside from touring officials and researchers little was known about the interrelationships between such people and the natural flood regimes of tropical rivers. In the Kariba case the topic of resettlement was never even considered by the Federal Government and its advisers in the decision-making process as to whether to proceed first with the Kariba or the Kafue dam. Once the decision was made in favor of Kariba, the only reference to resettlement in Federal Power Board and World Bank documents was budgeting for the removal of 29,000 people as opposed to the 57,000 eventually resettled (Soils Inc. 2000: v, 29-30). As for the responsibility for planning and implementing resettlement, that was handed over to the Northern and Southern Rhodesian territorial governments which in turn passed it on to the relevant district and provincial officials.

Aside from a brief discussion of the planning approach on the Southern Rhodesian side, and occasional comments for comparative purposes, the discussion that follows relates to the 34,000 Gwembe Tonga resettled on the north bank of the Zambezi. In spite of being inexperienced in dealing with a major resettlement program, and understaffed and under-financed, the response of local Northern Rhodesian officials to the constraints imposed upon them was commendable. The major constraint was the short time period available.

Additionally, planning that had been completed during the first year was adversely affected when the decision was made in June 1956 to heighten the dam by six meters. That increased the number to be relocated from the south bank from 11,000 to 23,000 and on the north bank from 29,000 to 34,000 (Colson, 1971: 26). Though less of a problem in Southern Rhodesia where a prior decision had been made to resettle most people well inland from the future reservoir, on the north bank that decision would cause inundation of resettlement areas under preparation in Chief Chipepo's area (Figure 1 in Chapter 5). For colonial officials and the thousands of people involved, planning had to commence again with only 18 months remaining before early completion of the dam would result in the dam wall being sealed in December 1958.

Stage 1: Planning for Resettlement

Introduction

In August 1955 the Federal Power Board notified the two territorial governments which resettlement costs would be reimbursed. Restricted to 'a restoration of living standards' only policy, they were "confined to transportation, compensation and supervision" following submission of detailed accounts (Soils Inc. 2000: 32). Thereafter the two governments followed radically different policies.

Southern Rhodesia

While Northern Rhodesian policy advocated indirect rule through customary or appointed leaders and local councils, direct rule was the policy in Southern Rhodesia. There N.C. Cockcroft was the commissioner responsible for the future Kariba Lake Basin. Having toured the area extensively over a number of years, he was concerned about the future of the Gwembe Tonga. As early as 1949 he sent a nine page report to his superiors titled "Removal of Natives Consequent upon the Kariba Gorge Hydro-Electric Power Scheme – Scientific Research." The River People, as he called them, "are the most unsophisticated, unspoiled and natural community I have encountered and a most fertile ground for scientific research."

Cockcroft was concerned that relocation would destroy Gwembe customs as well as cause resentment and adverse health impacts. He wanted a complete study to be made including photography and recording of music and song - "especially the haunting melody of their boat songs." Delay he wrote "will be fatal." As for resettlement, Cockcroft suggested two possibilities. One was to move the people below the dam to land that could be irrigated once the reservoir filled. The other was to shift them well back from the Zambezi to more fertile inland areas at the base of the escarpment. In either case he hoped that the edge of the reservoir, which he saw as otherwise unproductive, would become a game reserve.

Cockcroft's concerns and development suggestions were rejected by his superiors. In a letter to the Chief Native Commissioner the next month, the Provincial Commissioner wrote "I do not share the view that the resettlement of the Bantonka (*sic*) will have any serious repercussions. They will be brought into close contact with civilization for their benefit and for that of the Colony" (quoted in Soils Inc 2000: 30). When resettlement finally began "The district magistrate assembled head men and elders to inform them that the dam would be built and they should be ready on a given date to move to sites that

they might help select. Lorry transport and some building materials would be provided. Taxes would be remitted for two years and grain would be issued free of charge until they were once more able to harvest a crop. They could expect nothing else" (Colson, 1971: 20). Most sites selected (Figure 6) were inland from the future reservoir.

Northern Rhodesia

Government Planning: 1940s-1954

The situation on the Northern Rhodesian side, where more people lived on less land, was more complex. As early as the mid-1930s touring officials had concluded that Tonga reliance on the cultivation of older alluvial soils was not sustainable. By the 1940s, reports suggested that the carrying capacity of the land under the Gwembe Tonga system of agriculture had been exceeded in the upper portion of the Valley. When the Gwembe's first five year development plan was drawn up in 1953, resettlement was mentioned as a possible solution to the recurrent hunger periods and occasional periods of famine. Discussion of a possible Kariba scheme in the late 1940s reinforced consideration of that option. Two locations were mentioned. One involved shifting people to the adjacent plateau where rainfall was higher and land available.

The second location was the Lusitu area within the Valley but downriver from the dam site (see Figures 1 and 6). Starting below the hills through which the Zambezi had cut the Kariba Gorge, the Lusitu area extended downriver to Chirundu. It incorporated the lower reaches of the Mpendele, Mutulanganga and Lusitu tributaries. In the 1940s the private sector had suggested to the territorial government that 30,000 acres were suitable for the commercial cultivation of sugar cane. While a private sector scheme was rejected because the land was gazetted as Native Reserve, as early at 1948 S.P. Bourne, the Gwembe District Commissioner, suggested that the area could be developed as a large scale smallholder resettlement scheme which could solve both the hunger problem and Kariba resettlement should the dam be built. A small-scale pilot project of approximately 200 acres was initiated with water pumped from the Zambezi.

When memos began to circulate within the government in 1952 about Kariba, Bourne included the Lusitu irrigation scheme as a resettlement option in his 1953 five year development plan for the district. Should the pilot project prove successful, he suggested that a sugar scheme of 5,000 to 10,000 acres could follow including a factory for milling up to half a million tons of cane annually. Bourne's model was the Sudan's Gezira Scheme with 3,000 – 4,000 Tonga families cultivating small holdings. His superiors, however, rejected his 1953 pleas for investigations of possible resettlement areas in the belief that the Kariba scheme would not materialize (S.P. Bourne, 1957 correspondence). By the time Kariba was chosen and serious resettlement planning began in 1955, Bourne had been transferred to another district and his scheme apparently forgotten although the Lusitu remained an important resettlement destination to which 6,000 resettlers were eventually moved in 1958.

With the wisdom of hindsight, failure to follow-up on Bourne's dreams has proved to be a costly mistake for such a irrigation scheme may well have been the only solution for raising the living standards of the Lusitu area's current population of over 20,000 Tonga

resettlers and Goba hosts. Other crops than sugar cane and other water source possibilities exist. Crops, as currently successfully grown on a 1,000 hectares private sector scheme thirty miles further down the Zambezi, could include vegetables, fruits, and such specialty crops as marigolds and paprika for food coloring. Though pumping from the Zambezi remains an option, water could also be drawn from a Kariba Lake offstake at Mundulundulu (Figure 12). According to a 1960 Alexander Gibb and Associates report, "Extensions north [from Kariba Lake] toward Lusitu would not be hard. Using a tunnel or pipeline, water could flow into a Mpendele tributary...Pipeline lift [past Chief Simamba's Palace] would have to be only 1 1/2 miles long and 110 feet vertical rise" versus a tunnel of 5.5 miles length to avoid pumping costs.

Gibb and Associates had in mind the irrigation project starting in the vicinity of the Kariba North Access Road in the Mpendele drainage using a small delivery weir perhaps 15 feet high for 12 hours storage. Irrigation water then could flow into both the Mpendele and the Mutulanganga drainage. The latter is important because that would also give the dense Tonga population in the Lusitu River basin access to the scheme. Though the Gibb report considered such a scheme to be technically and economically feasible, at that time the Federal Power Board had no interest in irrigation. Today, with the existence of the Southern Africa Power Pool and potential hydro surpluses, such an offtake for irrigation becomes more feasible.

Government Planning: 1955-1958

1. Introduction

Because Kariba was the first major dam built in Central Africa, neither the Gwembe Tonga nor the territorial government knew what to expect. As for perceptions of what might be involved, the Tonga's were more realistic than those of the Provincial Administration (PA) that was the responsible planning and implementing agency. Though none of the PA and technical department staff had resettlement experience, they were well trained and dedicated colonial officials who showed considerable imagination throughout the resettlement process. For planning purposes they used aerial photographs and foot traverses for identifying possible resettlement areas. When areas were identified, they took headmen and other villagers to inspect and comment upon them. Once specific areas were selected, they encouraged villagers to begin building houses there and to clear new land so as to minimize the time when no fields would be under cultivation. Most successful were their attempts to open improved and newly sited schools at the same time as removal so as to minimize the time lost for children's education. Realizing the importance of water, they tried – and failed – to provide adequate supplies. Even as difficulties began to build up during 1957, optimism as to a favorable outcome continued, with District Commissioner Sugg stating in May correspondence that "I think, eventually, that everyone will be a good deal better off."

2. Selecting Resettlement Areas

Once the decision was made to proceed with Kariba, activities under the leadership of the District Commissioner included asking villagers where they wished to move, increasing the involvement of the district council in the resettlement process, completing land surveys for identifying potential resettlement areas, providing water supplies, and planning post-removal development activities. Without exception all villages wished to

remain within the Gwembe Valley.[2] Villages also wished to resettle immediately inland from the future reservoir, preferring to move further up the tributaries around whose deltas and lower reaches, or in whose proximity, they were clustered. As is the case with a majority of involuntary resettlers throughout the world, moving the shortest distance possible both geographically and sociologically would allow them to remain with a familiar host population in a familiar habitat. For such reasons no villages wished to move into the Lusitu area below the dam site, or even to the more familiar plateau which, unlike the Lusitu, at least was occupied by Tonga-speakers.

3. Involving the Gwembe Tonga District Council

The Provincial Administration had two important reasons for involving the Gwembe District Council in the resettlement process. One was due to the Colonial Service's policy commitment to indirect rule. In that regard, the PA can be considered a pioneer in attempting to involve a population undergoing dam-related resettlement in at least part of the decision making process. The other reason was less commendable since it was based on using the Council's approval of resettlement as a counterfoil to the growing influence of the African National Congress (ANC). Proscribed in 1953, the independence-oriented ANC had opposed the Federation's creation and it opposed the Kariba Project as one more example of efforts by white minority interests to dominate the political economy of both territories.

While local councils in many British colonies derived their authority from the involvement of customary leaders, such was not case with the egalitarian Gwembe Tonga. In that case, the Colonial Government had arbitrarily appointed seven village leaders with varying degrees of influence in their neighborhoods as Gwembe Tonga chiefs. The council that was build around them starting in the 1930s was considered to be a Colonial not a Gwembe Tonga institution. Furthermore in its earliest years, the majority of its employees came from outside the Valley due to the small number of local people with sufficient education.

The upgrading of the council was a major priority of S.P. Bourne when he became District Commissioner in 1947. In 1949 he moved its headquarters from the plateau into the middle of the Gwembe Valley. By 1953, four councilors dealing with health and education, agriculture, public works and water development, and finance, along with three nominated and three elected members, had been added to the 7 chiefs and their assessors. Subordinate staff numbered 123. By 1955, the chief councilor was the first Gwembe Tonga to have received some university education. This was E. Habanyama who had attended a one year course at England's Bristol University. Thereafter increasing pressure was put on the Council to take a public stance affirming the Lusitu's benefits for the 39 villages that the PA wished to resettle there. While this position was agreed upon at a Council meeting during the latter half of 1957, by November the Council had yet to make a public declaration causing the administration to complain that villagers remained unaware of the Council's position. They did agree, however, to tour the 39 villages in March 1958 to inform them of the need to move to the Lusitu and of the

[2] Some individual households opted for resettlement in the neighboring plateau where they had kin and cattle.

area's advantages. That visit occurred on schedule with the District Council then formalizing their endorsement of the necessity for the Lusitu move in a Local Council Order.

While the Council continued to be seen by Gwembe villagers as a pawn of the colonial administration, nonetheless Habanyama and his colleagues were able to negotiate in 1955 ten very important concessions (Colson 1971:22-23; 1958 Gwembe Commission Report):

1. People were to have a choice as to where they moved, whenever possible.
2. Compensation should be paid to the Council to cover general losses and to individuals to cover personal losses.
3. Shrines should be given care.
4. The Council should have the right to license and tax new enterprises attracted to Kariba Lake.
5. Customary law would not be changed.
6. Government should not demand that people change their agricultural methods.
7. The Council should not be forced to help with the building of the dam and need not require its people to work upon it.
8. Food should be supplied to people who had to leave their gardens to open new land.
9. Government should attempt to remove tsetse fly from proposed resettlement areas.
10. The people should be allowed to reoccupy any land which was not in fact flooded.

For development purposes the 9th and 10th points were especially important. The 9th point enabled the Gwembe Tonga to effectively integrate cattle into their farming system and to provide a source of cash income. Unlike the situation on the south bank, the 10th point sanctified the subsequent movement of hundreds of families back to the edge of the reservoir and the utilization of its drawdown area and inshore fisheries by thousands. Also important was a government decision that the inshore fisheries initially would be reserved to Gwembe residents.

4. Arable Land Surveys

By the end of 1956, approximately 80,000 acres had been identified within the valley for resettlement purposes. Soils in half of those areas, however, were considered poor sands or sandy loams for farming so that the inadequacy of the land base for the most important component of the resettlers' economy was known to colonial officials from the start. The two best areas were Buleya-Malima in the central part of the district with 12,000 acres of good sandy loams under acacia woodland and up to 15,000 (and perhaps 20,000) acres of good sandy/clay loams in the Lusitu area.

In addition to an inadequate land resource base throughout the Valley for resettlement purposes, nearly one-quarter of that land was in the Lusitu area which resettlers continued to reject. Though good land was also scarce for resettling villages in other areas, the

worst situation was in Chief Chipepo's area where less than 6,000 acres of generally poor soils were available in inland areas for the resettlement of nearly 10,000 people living in 56 villages. Part of that land became unavailable after the 1956 decision to heighten the dam. By then it was clear to the administration that the only possible option for 39 of those villages, containing a majority of Chipepo's resettlers, was removal to the Lusitu.

Tours by Chipepo headmen and selected villagers of inland areas began in November 1956. Five sites were available in several of which preliminary allocation and marking of gardens began in May 1957 following the end of the rainy season. Though requiring increased use of scarce resettler labor resources for later development, some of that land would eventually be inundated by the rising reservoir. Apparently with the agreement of the villagers, its use was a concession to the scarce land resources in the area. Presumably it was also part of the Administration's plan to prepare shallow areas of the reservoir for inshore fishing by clearing the bush. Except for the construction of schools, which were generally ready to receive children when resettlement occurred, preparation activities were inadequate. Lack of promised water supplies for drinking, washing and construction purposes was one reason. Over-estimation by the PA of available village labor was another (Colson, 1971).

Granted the desire of all villages to remain in the Valley, the PA planned for Lusitu resettlement from the start. With the insistence of the District Council that resettlers should remain under their current chiefs no matter where they moved, an important step – successfully accomplished – was for the two resident chiefs below Kariba Gorge to agree not just to accept thousands of resettlers but also their continued allegiance to Chief Chipepo. The first Lusitu tour by Chipepo headmen was in December 1956. It was combined with a visit to the dam site. None of those involved showed the slightest interest in such a move. The Lusitu was too far away; a conclusion that also applied to the land of another Tonga chief that was traversed en route to the Lusitu. While they liked the visit to the dam site, they considered the Lusitu visit a "waste of time." They also asked at the visit's end "if visits of this kind could be curtained during the rains as inconvenience was caused to the planting of their gardens" (PA November 1956 Tour Report).

During 1957 the PA continued to hope that a majority of Chipepo's headmen could be persuaded to make the Lusitu move for, as the district commissioner wrote in a March letter, that area "appears to be the only possible place for the majority of Chief Chipepo's people to move to." In the meanwhile preparatory work commenced which included tsetse control operations, survey of sites for the possible construction of weirs, and drilling of water supply boreholes.

Well aware that Lusitu soils were better for agriculture than those available at the inland sites, some Chipepo villagers and headmen did consider a move there. Following a visit by 60 resettlers from 15 villages in May 1957, individuals from ten of those tentatively chose village sites and garden areas close to the Zambezi between the Kariba Hills and the Mutulanganga. Noting that they came from some of the most "recalcitrant villages" the accompanying PA official exulted that at least some villagers were shifting away from their previous dogmatic assertion that they would only move when the water came. Increasingly optimistic about solving remaining resettlement problems, he hoped to establish nuclei later that year from all 39 villages slated for Lusitu resettlement. Then the

majority could be moved during 1958. His optimism was unrealistic, as was the belief of the authorities that earlier involvement of the District Council in the resettlement process might have changed people's attitudes.

5. Water Supplies

Provision of adequate water supplies prior to resettlement was a failure which can also be generalized for dam-related resettlement in other parts of the world. In the Kariba case, the problem began when the first four villages were moved in 1956 because of proximity to the dam site. As noted in the 1956 Annual Report of the District Council, the delay in providing water supplies there was unfortunate. Not only did similar delays occur in other villages subsequently moved inland from the future reservoir, but inadequate supplies continue to this day in many areas. Initial water supply problems also plagued a majority of the 6,000 people moved to the Lusitu. There boreholes drilled either came up dry or were saline, with inadequate supplies remaining until a reticulation scheme of piped water pumped from the Zambezi was built in 1960. Providing unpurified water, that scheme remains the major source of water today for a majority although periodically the system breaks down.

Today the two resettlement areas with the densest population of resettlers are the Lusitu area and the Siameja area at the upper end of Kariba Lake. By 2001, "Provision of adequate good quality water for the Lusitu community is the biggest social problem the people are currently facing…Some health problems (particularly those pertaining to diarrhoea and dysentery) … could be associated with excessive amounts of chemical elements and the faecal coliforms present in all sources of water " (Yambayamba et al 2001: viii and 52). There as well as in the Siameja area inadequate water supplies are also a contributing factor to ongoing outbreaks of cholera (previously nonexistent in the Valley). Inadequate water supplies also remain a major problem within the Zimbabwe portion of the Valley. In Binga District, "Its remains an irony to the River Tonga that most of them do not yet benefit from the great resource of Kariba Lake, their former waters." Despite a growing population, and "despite all the efforts that have been made in the past, there remains a serious problem in Binga District regarding the availability of safe drinking water" (Tremmel, 1994: 48-9).

6. Development Activities

Development activities planned to restore, and hopefully improve, Gwembe Tonga living standards concentrated on education, agricultural development, and development of an inshore, artisanal fishery. Successful development of an inshore fishery has had especially important policy implications for future dams since it documented that reservoir fishing could provide an important economic opportunity for resettling and host populations.

Both the District Council and the Provincial Administration emphasized the importance of improving educational facilities and school attendance. At the Council, Habanyama's influence was especially important. Before going to England, he had been Councilor for Agriculture and Education. Increasing school enrollment, especially for girls, remained a major concern that was reflected in a Local Council Ordinance requiring primary school attendance for both genders under threat of punishment of neglectful elders. Providing improved and upgraded schools at the time of removal was a major success, including the

1958 opening of the first full primary school for girls. Plans were also initiated for the Valley's first secondary school. "Opened" in 1962 when the first class was accommodated at an existing secondary school on the Plateau, students were transferred in 1964 to their newly built school on the edge of Kariba Lake.

Planning for agricultural development emphasized erosion control, crop production and tsetse fly control. Probably because the Gwembe Tonga wanted it, and the District Council insisted on it as one of their ten points negotiated with the Central Government, tsetse control had the most successful results. At the height of control operations, four supervisors from the Department of Game and Tsetse Control oversaw activities. The technology used combined residual spraying from the ground of a mixture of DDT and Dieldrin with bush clearing. Spraying eventually proved successful in allowing all resettled villages to obtain cattle, including those that had none due to their previous residence in tsetse zones. The extensive bush clearing associated with fisheries development and clearing of new fields in resettlement areas reduced the danger of re-infestation by destroying the fly's preferred habitat. Subsequent increases in cattle throughout the Valley allowed the majority of the Gwembe Tonga for the first time in their history to shift from hoe cultivation to mixed farming based on ox traction. That reduced labor constraints. During the initial years of resettlement, it also allowed larger fields to be cultivated.

Planning for erosion control had little local support. Though kilometers of contour ridges were eventually made, the Gwembe Tonga had little interest in their maintenance. After several rainy seasons they vanished. The major constraint for increasing crop production was too little arable land surrounding resettlement sites, and the lower fertility of most of what land was available in comparison to the alluvial and colluvial soils that the Gwembe Tonga preferred. Planning by agricultural staff concentrated on experimenting with different crop and crop rotations in small demonstration gardens opened on different soil types. Experiments were also initiated with tie ridging within fields to retain rainfall.

Most successful was planning for an inshore artisanal or peasant fishery. Aware that arable land resources were insufficient, the District Commissioner saw fishing as the future mainstay of the local economy. This belief came from his acceptance of the estimate of the Kariba Lake Fisheries Committee that reservoir water less than 100 feet deep could produce 20,000 tons of fish each year on a sustainable basis. Though subsequently shown to be too high, this estimate led to a well-prepared planning process that subsequently was to play a major role in the Stage 3 development of the Gwembe economy. Presumably it also helped the District Commissioner resist the efforts of those who wanted to restrict fishing to a commercial company or open it to all Africans. Should such policies be enacted, how could the Gwembe Tonga be expected to restore, and hopefully improve, their living standards?

The District Commissioner's plans for developing the fishery had two components. One dealt with preparation of the future reservoir; the other was targeted at the Gwembe Tonga. Reservoir development involved both territories and the Federal Government, each of which had provided a million pounds sterling. Though the experts disagreed on the future productivity of the fishery, all agreed that it would be essentially a gill-net fishery. They also agreed that some bush clearance from shallower waters would be necessary to allow gill nets to be set at varying depths. The big question was how much at

what cost. The final decision was to clear approximately 250,000 acres which was half of the most suitable areas. At the far end of the future reservoir, land was cleared right down to the Zambezi's primary channel which would be at about 120 feet depth when the reservoir reached full storage level. Elsewhere, clearance was to a depth of about 60 feet. Eventually 126,000 acres were cleared on the north side and 108,000 on the south side. Total costs were £2.5 million or £19 an acre. Uncleared areas were alternated with cleared ones. Ironically the former proved to be the most productive since uncleared bush provided a substrate for a wide range of plant and animal products that provided food for fish.

As for the Gwembe Tonga component of the District Commissioner's plan, prior to resettlement he allocated a number of gillnets to potential Tonga fishers and to select schools. Plans were also drawn up for a fisheries training center at Sinazongwe half way up the reservoir and for a series of fish camps and District Council fish markets along the edge of the reservoir. The Council was also authorized to collect a levy from fish traders as they left the Valley.

Gwembe Tonga Perceptions

Gwembe Tonga anxiety about what the future might bring, though ill-defined, was prescient. It was increased by understandable suspicions as to the reasons for their resettlement. As my colleague George Appell said when we were both graduate students at about the same time as Kariba resettlement was underway, love of natal environment may well be a cultural universal. To the Gwembe Tonga "there is nothing like the Zambezi Valley. There is nothing that can replace the beauty of the hills and their hearts are in the shrines of their forefathers" (Gwembe Tonga District Council Annual Report, 1956).

In October 1956 after Colson and I had each settled into a village soon to be resettled, we were surprised by the villagers' friendly acceptance of our presence. After all, we worked for an organization that they associated with a government that planned to displace them and whose name was prominently displayed on our land rovers. Later we came to suspect that they were in denial about their forthcoming removal, such denial being one coping mechanism used by people in similar predicaments throughout the world to deal with an unacceptable reality.

To those involved, denial also had a rational basis since people simply did not believe that it was possible to flood their villages by building a dam many kilometers downstream. Even headmen who had been taken to the dam site to view construction activities could not relate them to their impending removal. In Mazulu Village where I was living, the headman continued building a new homestead not because he believed that more compensation would be forthcoming but rather to reflect his increasing status as a prominent villager. As for my efforts to explain future flooding by filling reservoirs that I made in termite mounds, they were met by amused disbelief that they had any relationship to a dam being build over 50 kilometers downstream in Kariba Gorge.

As people increasingly began to realize that the government did, indeed, intend to move them, the belief began to circulate that the real reason was to allow white settlers to move into the area to farm the fertile alluvial soils fringing the Zambezi and its major tributaries. That belief was reinforced by the extensive bush clearing begun in 1957 for

the development of an artisanal fishery. Since clearing of bush by hand or by tractors connected by a large ball and chain were techniques also used for preparing land for farming, and was restricted to shallow areas of the future reservoir several kilometers inland from the Zambezi, the 'fisheries development' explanation struck Gwembe villagers as an insult to their intelligence. On the contrary, such bush clearing was proof that the land was being cleared for farming by white settlers or as airstrips for bringing them in (GTDC Annual Report, 1957).

As bush clearing, road construction and other preparatory activities continued, any doubts that the Gwembe Tonga may have had about their forthcoming involuntary removal vanished. Hesitantly an unknown proportion began to plan for their evacuation. Fearful of tsetse fly and big game in the designated resettlement areas, some began to shift their livestock to relatives in the Valley who lived outside the inundation area, and on the Plateau. Relying on the familiar, an increased emphasis by all was placed on kinship in undertaking preparatory activities (Colson, 1971: 70-71). That included transferring to relevant senior kin across the Zambezi ritual activities essential for the continued ancestral protection of the living. While we do not know when such transfers began, their occurrence showed that at least some recognized the possibility that water might separate them in the future.

Stage 2: Physical Removal, Multidimensional Stress and Early Attempts at Adaptation

Physical Removal

The move from old to new sites became a stress-laden crash program for the majority. In spite of a commendable effort made by resettlement officials, the time available before the dam wall was sealed was inadequate. Though eventually PA officials were complemented by agricultural, veterinary, tsetse and game control, fisheries, and forestry staff, and by private sector firms for provision of water supplies, more staff was needed. The efficiency of those involved was also restricted by lack of radio communication (often requested but only supplied at a late date) and transport. Number and quality of water facilities continued to be inadequate, while those that existed often broke down, ran dry or produced undrinkable water. As a result people too often were moved to ill-prepared sites at which they also became dependent on food relief.

Due to their inexperience, Government staff also made mistakes. The most serious was to inform future resettlers they would not be forced to move at any particular point in time. Rather, if they wished, they could remain in their villages until the water began to rise. That was an unacceptable position as the officials subsequently learned when the Zambezi flooded to record heights in February-March 1957 and March 1958. Because rapidly rising water could cut off some villages once the dam wall was sealed, that policy had to be replaced by mandatory resettlement on specific dates. Another mistake was to prohibit people from planting dry season river bank and delta gardens after the record 1958 flood although in that case many villagers planted their gardens anyhow and reaped a good harvest which reduced their dependence on food relief following removal.

A third mistake was to blame what opposition arose not on resettlement as such but on the inability of the Tonga to understand what was both necessary and good for them and on local agitators and the African National Congress. More aware of cultural nuances such as the concern of one neighborhood to shifting its shrine to another ethnic area, the

members of the District Council had a more realistic perception of the situation. On the other hand, both the Council and the Administration were sensitive to the confusion among resettling villages caused by the decision to heighten the dam, especially where that decision required telling villages in Chief Chipepo's area that they could no longer go to previously agreed upon inland areas. Both were also sensitive to possible problems between hosts and resettlers in what would be more crowded areas of human settlement.

Only the four villages closest to the dam site were resettled in 1955. During 1956 planning and preparation continued in other inland areas as well as in the Lusitu. In Chief Chipepo's area the first three villages moved to one of the five inland areas in August 1957, while nuclei from other villages occupied three of the other four sites (the fifth to be resettled during 1958). All five moves were considered successful by the authorities who noted that children only missed one day in shifting between schools in the first area. Though inadequate water supplies continued to be a problem, and village labor constraints slowed village reconstruction and land preparation, hence prolonging the period of dependence on government supplied food, removal proceeded in other inland areas on schedule.

Far different was the situation in the Lusitu where the district officer in charge wrote in September 1957 "much time and effort were wasted, and frustration experienced, in an abortive attempt to establish during the month, nuclei of resettlement villages…40 villages were to have taken part by sending representatives, 2-3 from each, to the Lusitu to demarcate and establish on the ground village sites only. These people would then have returned after 2-3 weeks to their villages had they so wished" (PA September 1957 report). Response, however, to that approach was "wholly negative." Showing his increasing frustration, the official began to blame the people for what he saw as their "truculent, even belligerent attitudes" which were interfering with administration activities. All such opposition, including whatever opposition was noted in other chieftaincies, was blamed on local and outside agitators rather than on the resettlement process.

Based on current knowledge of the multidimensional stress and hardships associated with involuntary resettlement, the negative reactions of the Gwembe Tonga to the Lusitu move in particular were predictable and understandable. Well over a hundred kilometers downstream, the Lusitu was an unfamiliar habitat settled by a different ethnic group - the Shona-speaking Goba. In Tonga opinion, it was also an area to be feared. For reasons that remain unknown, the Lusitu was sparsely populated in spite of its good soils. Of particular concern to the Tonga, who buried their dead individually close to their houses, Goba villages were interspersed with what appeared to be abundant cemeteries located within sacred groves. While Colson and I speculated that the area had been heavily hit by the 1918-19 influenza epidemic, or perhaps by smallpox that had continued to recur in the Valley until 1948, or sleeping sickness, the Tonga explanation was a particularly virulent form of witchcraft. Called *nghozi,* this originates when the deceased, believing himself killed by witchcraft, arranges for medicine to be placed in his grave that will not only kill the witch who attends the funeral but also all mourners at the witch's own funeral and all mourners at funerals thereafter.

In an effort to alter people's negatives attitudes, in October 1957 the chief's deputy (who subsequently became Chief Chipepo) was moved to the Lusitu along with two staff.

Within a month he was threatening to move back with his family to his old home, by foot, if necessary, because of lack of food and inadequate government progress in providing appropriate housing and tractor-plowing of new fields. Those activities were completed, however, by the end of the year at which time the resettlement officer reported that the three families involved "are favorably impressed" with the area though residents in the 39 villages continue to be anti-Lusitu.

When the rainy season ended in March-April 1958 none of the 39 villages had yet to be moved. Resistance was strongest among villages that fronted on the Zambezi. Though five inland villages accepted relocation in May, within the next few months their new village sites were largely deserted, most villagers having returned to their old homes because of the failure of the new boreholes to provide adequate water supplies. Opposition increased in June when one headman and his villagers refused outright to move to the Lusitu. Attempts to arrest him caused a riot during which PA staff and members of the Local Authority were forced from the village.

Resistance thereafter spread. Having failed to convince the villagers to move, and aware of the imminent closing of the dam, the PA mandated a September date for commencing removal. Lorries were brought in. By then a large number of village men had assembled in one neighborhood to emphasize their unwillingness to move. The administration called in the mobile police. Then the territorial governor arrived in full ceremonial dress and accompanied by a military band. While the police paraded along the floodplains of the Zambezi, the villagers held their own maneuvers nearby. They had spears, clubs and utilitarian and ceremonial axes. The police had guns. Failing to negotiate a solution to the impasse, the governor ordered the people into the lorries. The Gwembe men charged the mobile police who, believing their lives under threat, fired. Eight Gwembe Tonga were reported to have died and at least 32 were wounded.

No police or administrative staff were seriously injured, probably because the Tonga had not intended to use their weapons. A story told by Clements is suggestive that the Tonga were play-acting. While on tour before the slaughter, the district office in charge asked an old man why he was armed with spears. The reply was "I am going to the war." When asked who he was going to fight, the old man is said to given the district officer a friendly grin before replying "Why, you, of course!" Subsequently the old man was killed after being shot in the chest by the mobile police (1959: 145). The confrontation was not inevitable. It arose because a group of well meaning amateurs was attempting to plan and execute a complicated resettlement operation with inadequate time and resources and no access to external expertise.

Never expecting that the Government would go so far as to kill them, the people's opposition to the Lusitu move immediately collapsed. During the next few months the majority of the 6,000 people were trucked to the Lusitu. Some 8,500 sheep and goats were also moved by vehicle, while 300 head of cattle trekked to the Lusitu, "without loss" as the District Commissioner wrote approvingly in his 1958 annual report. As elsewhere throughout the Valley, the lateness of the move until after the commencement of the rainy season meant that what cropland could be cleared and planted would be totally inadequate to feed the resettlers. Their dependence on food relief was to continue until the 1959/60 rainy season harvest at the very earliest.

The Multidimensional Stress of Resettlement

Introduction

Cockcroft's prediction in 1949 that Gwembe Tonga resettlement in Southern Rhodesia would cause health problems, resentment and loss of customs anticipated the physiological, psychological and cultural components of multidimensional stress which became a major threat to Gwembe Tonga society and culture during Stage 2. During Colson's visit to the Gwembe Valley less than two years after the completion of resettlement, people told her how they saw being "removed from their homes and forced to live in hostile environments" as an attack on their humanity (*buntu)* and their vital force (*buumi).* Similar comments continued to be made during our 1962-63 restudy (Colson, 1971: 70-71). In 1999, over 40 years after removal, Fanuel Cumanzula, from Chief Binga's area on the south bank, still referred to how Gwembe Tonga lost their "dignity and humanity" at the time of resettlement (EMG 2000: 6.3). Researchers in 2000 were told stories of three elders in Chief Sinazongwe's area refused to move even as rising water surrounded them. One linked his identity to a tamarind tree which he could not leave behind, challenging the authorities to remove him and the tree. As with the other two elders, he only left when relatives came in a dugout canoe to remove him (Soils Inc. 2000: 31).

Compulsory resettlement hit at the core of Gwembe Tonga's pride in their independence. It hit at the status of all people with influence down to the household head since he, as protector of his dependents, was unable to reverse the administration's resettlement decision. It is hard to imagine a more total means for demonstrating a people's impotence, or lack of control over their future, than to move them against their will from a familiar land to an unfamiliar one.

Physiological Stress

Since the mid-1950s Colson's and my research methodology has placed major emphasis on trying to record every birth and death in three villages and approximately half of those in a larger fourth village (Figure 1). Analysis of the accumulated data during the 1990s by demographer Samuel Clark indicate that marital fertility declined immediately after physical removal, dropping from 11 children in 1956-58 to 8.5 in 1959-61 before rebounding to 9.5 as prosperity increased during 1962-64. Though child mortality declined during the 1959-61 period, presumably because of improved medical facilities, mortality rates among the elderly were significantly higher during the 1959-61 period than they were from 1962 through 1964.

While lack of pre-resettlement public health surveys make it difficult to associate morbidity and mortality with specific resettlement-related conditions and illnesses, what data is available suggests that resettlement was responsible for increased morbidity and mortality in specific areas. With one major exception, those areas shared two common features. One was inadequate water supplies; the other the increased "strangeness" that accompanied removal to a more distant and unfamiliar area. The major exception was on the south bank where Chief Sinakatenge moved inland along a familiar tributary. Though

hushed up at the time by the Southern Rhodesian authorities, there an epidemic of human sleeping sickness broke out that killed an unknown number of people.

On the north bank, the highest mortality rates were recorded among 1,600 of Chief Mwemba's people who were moved to two locations on the Plateau and among the 6,000 resettlers moved to the Lusitu. In the plateau resettlement areas, epidemics of chicken pox and measles killed 41 children in January 1959. Subsequently the majority of those resettlers moved back to the Valley. In Lusitu crowding, inadequate water supplies, and severe protein deficiencies presumably increased the death rate from dysentery in the months immediately after resettlement. By the end of January, 80 people had died. Again small children were the main victims. Later that year, as the dry season progressed, women and children, but no men, began to die of "an acute condition of sudden onset and high and rapid mortality" (Gadd, Nixon et al, 1962: 495). A few additional deaths occurred late in the 1960 dry season. In all 56 women and children died including approximately 10 percent of the population in one village. Convinced that witchcraft substances (*nghozi)* were responsible for the deaths and would eventually kill all resettlers, people were terrified. Fearing that agitators might be intentionally poisoning people, the administration grouped some villagers from the most affected area together where food and water supplies could be monitored. For others, they relaxed the Ordinance that they had pressured the District Council to pass that prohibited Lusitu villagers without a permit from returning to unflooded areas in the reservoir basin. Two villages left the Lusitu area never to return.

Even in 1962, after the mystery deaths had stopped, the Gwembe Tonga view prevailed that the land was bad. According to a senior headman quoted by Colson, "This is an area where people were not meant to live. It would not be so bad if the adults died and the children lived, for that would mean that life would go on. But when children die, as they do in Lusitu, this means an end to life (*buumi)"* (1971: 55).

The actual cause of the mystery deaths remains unknown. Based on the symptoms, the clustering of deaths toward the end of the dry season, and the age and sex of the victims, the most likely cause was consumption of toxic plants gathered by women and children during periods of food scarcity. Ideally Gwembe Tonga meals should include a cereal staple that can be dipped in, or consumed with, a side dish or relish. Relishes included animal protein as well as cultivated vegetables and wild plants. In 1956-57 wild food plants were the dominant relish for family households prior to their move to Lusitu (Scudder, 1971: 20). In Lusitu, toward the end of the dry season when fires had swept the ground of plant material, women and children may well have confused toxic tubers with ones that were edible in their former homes.

Psychological Stress

Throughout the Valley the first two years following removal were the most difficult for the Gwembe Tonga (Scudder and Colson, 1982: 142, Colson, 1971). Both "grieving for a lost home" (Fried, 1963) and anxiety for the future characterized Gwembe Tonga resettlers. In the Lusitu, reactions to the mystery deaths are an extreme example of the impact of resettlement on mental health. Everywhere older adults accused the administration of throwing them away in the bush where they would be buried amidst the stones as opposed to the older Zambezi alluvia on which so many riverine villages were

built. Women were especially concerned. Seldom well traveled, they had a closer identification than men with alluvial gardens which had come to them through their mothers and mother's mothers. Identification with these lineage lands was very strong. Year after year women had rebuilt or re-thatched their garden shelters on the same spot. Here generations of their ancestors had carried on daily activities or sat out rain showers while their children had played close to the shelters during the hours of sunlight. The sense of continuity and peace found within these gardens was destroyed forever when Kariba was sealed.

Neighborhood ritual leaders were especially concerned since their legitimacy was tied to specific shrines and to specific gardens in which they must initiate agricultural activities for the welfare of all. Could such fields and shrines be re-established in resettlement areas, all of which fell under the ritual leaders of the host population? As with resettlers the world over, the Gwembe Tonga were reluctant to leave behind their dead and their homes. On the south bank, Sibulobe Mutale said "We wondered about our ancestors whose graves would soon be covered by water. Even after we moved, we still returned to plant in our gardens by the river and stay in our old huts. We visited our former villages until our huts were flooded over and no village could be seen" (Tremmel, 1994: 36).

As people of the Zambezi, most of whom were moved inland to water-stressed areas, the theme of water figured prominently in people's reactions to resettlement. Tremmel has best documented this in his 1995 *The People of the Great River* the subtitle of which is *The Tonga Hoped the Water Would Follow Them.* That sub-title was provided by one of his 16 co-authors who were south bank Tonga whose experiences he documented. Throughout their collaboration she kept stating "we left with our property and our bodies, but we left our water behind. We would like our water to follow us" (page 39). Water figured prominently in the lives and statements of others among the 16. Born in 1927, Luwo Mudenda is partially blind and can "no longer walk the long distances needed to reach safe drinking water. Instead, she is forced to drink water from ponds where animals drink" (*ibid*, 12). Solomon Mutale lost eight of his children after resettlement. In explaining why he said "When we stayed by the river, the water was fast-flowing and safe to drink. Once we were moved, we had to drink stagnant water and I think this is what killed my children" (ibid: 42) and "In our new settlements, we rely on the rain. Before we could always rely on the river. If there is no rain now, we fail to feed ourselves and there is no water in our borehole or stream" (*ibid*: 49).

Socio-cultural Stress

Socio-cultural stress was primarily caused by loss of influence by individuals and loss of familiar cultural inventory which could have eased adjustment immediately after removal. Starting at the household level, all types of leadership were adversely affected when removal occurred in spite of people's opposition. Leadership, both political and religious, "at the neighborhood level was largely a victim of relocation. And was not clearly re-instituted even ten years later" (Colson, 1971: 206). This applied to neighborhood ritual leaders who were unable to transfer their influence to resettlement sites and to headmen. Chiefs from the four relocated chiefdoms also lost influence. So too did the District Council which the administration had compelled to endorse orders supporting removal and, in the case of Lusitu resettlers, banning return to areas of origin. Especially hard hit was Chief Councillor E. Habanyama who had done the most to adapt

resettlement to Gwembe conditions. Not only did he lose influence in the Valley but his cooperation with the administration adversely affected his ability following independence in 1964 to gain prominence on the national scene.

Reduction of cultural inventory affected all aspects of Gwembe Tonga culture. Indigenous knowledge of a Zambezi River habitat had reduced relevance in inland areas with different topography, soils and plant communities. In the economic realm, closer government supervision made it more difficult to continue such proscribed activities as cultivation of marijuana and a range of customary hunting techniques. Sheep, an important means for 'banking' wealth, fared poorly in inland resettlement areas with most dying. Family relationships were seriously strained while lineages were weakened because of "a diminished emphasis upon corporate rights and responsibilities (Colson, 1971:71). Varying from one area to another, customs relating to ritual activities and to major life events were truncated. At the neighborhood level field and shrine based rituals associated with the agricultural cycle stopped as did puberty rituals in those communities that had practiced them.

Loss of cultural inventory and socio-cultural stress were most serious in the Lusitu where conditions differed most from the resettlers' previous habitat. Not only was the Lusitu inhabited by a host population belonging to a different ethnic group and speaking a different language, but they lived in a land that the resettlers believed was a 'killing field' because of its many cemeteries and sparse living population. The many deaths from dysentery and the mystery disease in late 1958 and during 1959 provided confirmation of that belief. Gwembe Tonga fears may also have been exacerbated by archaeological investigations during 1960-62 of an early iron age site that was found in one neighborhood during the construction of a water storage tank. During excavation, 40 bodies in close proximity were found.

Not only did frequent deaths during the initial period of resettlement make it difficult to complete appropriate funeral ritual, but the Goba, with different rituals, told the resettlers that they must stop their distinctive funeral drumming and wailing because it offended the spirits of the land (Scudder and Colson, 1982: 141). Tonga uncertainty about how to behave also delayed the reconstruction of lineage shrines necessary for propitiating the ancestors, and the building of hunting shrines. It is hard for an outsider to imagine the impacts of such a situation. So unsure of how to behave, the resettlers initially sought out Goba diviners to explain the causes of misfortune since they were unsure if the skills of their own diviners were transferable.

Adjusting to Adversity

In coping with resettlement, a majority of the Gwembe Tonga clung to the familiar wherever possible, even to the extent of behaving as if a socio-cultural system was a closed system. They were risk-adverse, presumably clinging to the familiar as a way to avoid additional change that might increase uncertainty and stress in their lives. Brothers and other close kin began resettlement working more closely together than they had before removal. Those who had had separate homesteads were apt to rebuild in a single expanded homestead. Such kinship solidarity increased throughout the Valley "just prior to resettlement as people talked and worked on kinship matters…Spectacular

reconciliations appear to have been the order of the day, soon to be given even more solid recognition in the form of new homestead alignments" (Colson, 1971: 72).

House types were transferred without change, with resettlers rejecting administration suggestions that they build better houses and otherwise "develop" their villages. They replied that it was better to build in easily replaced materials so that homesteads could be shifted as circumstances required. Explaining this viewpoint to Colson in 1963, one elder said he told the administration in the late 1950s "We shall live as we are accustomed to live following our own laws…Here a man builds as he wishes, and within his homestead he follows his own law. We do not want your regulations. We do not want your assistance" (Colson, 1971: 173).

Agricultural techniques were also transferred without change, with the resettlers initially emphasizing regaining their former self-sufficiency. For most that took at least eighteen months during which homesteads were rebuilt and fields cleared and planted that were large enough to adequately house and feed homestead residents. Adequate rain fell during the 1959/60 season. For many resettlers March-June 1960 harvests brought the necessary self-sufficiency for the first time since removal.

In the Lusitu, Gwembe Tonga resettlers adjusted existing customs to interact with Goba hosts and to the land. The best alluvial soils were under Goba tenure. Due to the sparse Goba population and the absence of cattle for plowing prior to the tsetse control operations, much of that land was uncultivated. Sticking to the familiar, prominent Tonga men and women used the customary bondfellow *(bulongwe)* relationship to gain access to such lands in exchange for plowing the fields of their Goba "friends." As for altering the perception that the land was bad, that was the accomplishment of a Tonga spirit medium living in one of the resettled villages. He claimed that it was not the land that was bad, but malevolent people living in the land. Furthermore, claiming possession by a new spirit (*mangelo* or angel) of Lusitu origin (but unknown to the Goba) he said that he could counter the witchcraft of such malevolent people as well as cure barrenness and insanity. Several miraculous cures, including birth of twins to a Mazulu woman who had formerly been barren, helped convince resettlers that his interpretation was correct and that the effects of witchcraft could be detected and nullified (Scudder, 1968: 173-74). In the years that followed other Lusitu healers claimed possession by *mangelo* and the ability to successfully treat witchcraft victims. Drawing on Tonga concepts of spirit medium, possession dance (*masabe*), and divination (*kusonde*), the *mangelo* cult subsequently spread throughout the Valley. By 1965, Colson's Lusitu informants no longer considered Lusitu death rates to be higher than those prior to resettlement. By then the large majority also stated an unwillingness to return to their former village sites even if Kariba Lake should empty.

It would be wrong, however, to leave the impression that resettlers were totally unable to respond in new ways to new conditions and opportunities. Gaining access to the land of a different ethnic group in the Lusitu was an innovation though one based on a customary procedure. The same was true of the *mangelo* cult where "a familiar institution (spirit possession) was modified by drawing on Christian beliefs to deal with a new situation" (Scudder, 1993: 143). There, as elsewhere throughout the Valley, a minority of resettlers also responded quickly to the opportunity to fish commercially the new reservoir. On the other hand, the organization of fishing operations was based on familiar kinship patterns.

While the administration had hoped to form fishing cooperatives and a strong fishers organization, the social organization of the fishery continued to be kin-based – a common pattern being a senior kinsmen advancing a younger relative the capital to acquire the necessary equipment. Should the fishing operation prosper other kin would be recruited to assist, with the most successful then establishing themselves in the same way. As for life in the fish camps, there too both resettlers and hosts grouped themselves, and sold their surplus, in customary ways. During 1959, eight fishing camps were established along the middle reaches of the reservoir. The largest contained 128 fishers. The camp itself stretched along the lakeshore for about three miles with fishers grouping themselves according to village and neighborhood. As with basket and pot makers, and practitioners of other skills, they expected buyers of any surplus to come to them.

Stage 3: Economic Development and Cultural Renaissance

By 1961, the large majority of resettlers had regained their former self sufficiency. By the mid-1960s homesteads once again were fissioning in the Lusitu. There resettlers had begun to attend Goba beer drinks and funerals. Intermarriage between Tonga and Goba was also becoming increasingly common. Between 1962 and the mid-1970s resettlers throughout the Valley pioneered a more diversified economy that enabled a majority to raise their living standards to a higher level than ever before. During the same time period, they enjoyed a period of cultural embellishment which I have characterized elsewhere, with some exaggeration perhaps, as a cultural renaissance (Scudder, 1993: 143). For Colson and myself returning to the Middle Zambezi Valley at this time was a joy. I believe three factors were responsible for improving living standards. One, difficult to pin down, was psychological. Having survived those most difficult initial years, people appear to have realized their potential to cope with, and overcome, hardship. They became more willing to experiment.

Ironically, a second factor was the very reduction in cultural inventory that had proved so stressful during the initial years of resettlement. Three examples relate to land tenure, leadership and agricultural ritual. Prior to resettlement the better alluvial soils were all in use under customary rules of tenure. Even in the bush well inland from the Zambezi, land available for pioneering agriculture had become increasingly scarce. Though resettlement disadvantaged women because of their dependence on men for land clearance, it provided an opportunity for the most enterprising men to acquire new land irrespective of the amount of lineage land that they had had access to prior to removal.

The loss of leadership associated with resettlement also allowed new leadership to arise based on experience, enterprise, imagination and education. Waiting for the neighborhood ritual leader to initiate agricultural and other livelihood activities was an effective way for informing the members of a consumption-oriented egalitarian society when key tasks should be carried out in a problem-prone and high risk environment. Even before resettlement, however, such rituals were being ridiculed by school boys and some young men. Should such ritual have been transferred immediately to the resettlement areas it would have provided a constraint to agricultural initiative and innovation by those who wished to carry out early planting, for example, or follow the advice of the Department of Agriculture and the small number of farmers who had left villages for government-inspired agricultural schemes. Though eventually agricultural

rituals were re-introduced, by then they were taken less seriously by those involved and were not seen as constraining by those who ignored them.

The third factor was the new opportunities provided by Kariba Lake and the Gwembe's increasing incorporation into a wider political economy. Accompanying social impacts and responses were of two very different sorts. One, a blossoming of Tonga culture, stressed continuity. The other, an increasing wealth differential and social stratification, fostered change through the formation of a class structure with a widening gap between the relatively well off and the poor. Education and such commercial activities as fishing, sale of cash crops and livestock and small businesses played a particularly important role.

In 1962, the first stream for Gwembe secondary school students opened at the Monze Secondary School on the Plateau. In 1964 students transferred to the newly built Chipepo Secondary School on the edge of Kariba Lake. Graduating one year after Zambian independence, Gwembe students, and those who followed during the next few years, were in an excellent position to fill the new jobs that came with Independence and the departure of former colonial civil servants.

The experience with fisheries development in man-made lakes in the tropics and subtropics is for an explosion of productivity to occur during reservoir filling and immediately thereafter. In the Kariba case the reservoir did not reach full storage level until the 1963 dry season so that the period of highest productivity lasted for over five years. Careful planning by the administration meant that the Tonga had the opportunity to benefit from that surge of productivity before the reservoir stabilized and productivity dropped.

Fishing was a seasonal activity during the dry season. During the rains, fishers returned to their villages to cultivate, a pattern that was encouraged by the Department of Fisheries declaring a December-March closed season until the mid-1960s. Between the end of 1959 and 1962 the number of north bank Gwembe Tonga fishermen had increased from 407 to over 2,000, with resettlers more actively involved than hosts. During that time period, north bank Tonga fishers dispersed over the entire length of the reservoir establishing camps along the shoreline and on islands. Fishers distant from markets, built under the authority of the District Council, sun-dried and smoked their catch which was then either transported to the markets for sale, sold to itinerant traders, or marketed by the fisher himself. Caught by over 5,000 gillnets, recorded landings reached 3,000 tons and rose to 4,000 tons during 1963. Thereafter productivity began to drop, with landings by less than 500 fishers dropping to less than 1,000 tons during 1967. By then fishing had become more a subsistence than a commercial activity for the gradually decreasing number of fishermen. When the north bank fishery was opened to all Zambians in 1964, the proportion of Gwembe Tonga dropped to less than 50 percent of the total.

During the 1959-1963 period income from fishing for unskilled fishers, who on the average owned three nets and rented boat space, approximated that for unskilled wage labor (Scudder, 1971: ms). While skilled fishers made significantly more, the large majority of all fishers accumulated savings as the cost of living in the fish camps was very low (with the Gwembe Tonga's insatiable consumption of beer of any sort being the major expense). Savings were used for a wide range of consumptive and productive activities, as well as for self-financing of marriage at an earlier age than was the case

among those farming in the villages. Though women were not actively involved in catching fish or mending nets, the fishery also played an important role in their further incorporation into a market economy. While a few settled in the fish camps or became fish traders, the majority came from their villages to sell beer and such agricultural produce as eggs, fowl, cereal stables and vegetables. As for fishers, most financed the education of relatives. They also purchased cattle, as did many of the relatives whose education they financed, as well as such farming equipment as plows and ox-drawn carts.

Following the colonization of the reservoir's annual drawdown area with a nutritious grass (*Panicum repens)*, the Gwembe Valley became one of the best cattle grazing areas in the country. Between 1962 and 1972 herd size more than doubled from 24,000 cattle to over 52,000. In the villages, the large majority of farm families were able to switch from hoe cultivation to ox traction which in turn expedited the growing of cash crops when the fishery began to decline. Cotton, brewing sorghum, and maize were the principle cash crops. In 1963 there were only 43 cotton growers. By the 1966/67 season there were over 350 with the total increasing to over 600 in the early 1970s. By then, more smallholder cotton was grown in the Valley than in any other Zambian district. Capital from fishing also played an important role in funding the proliferation of beer halls as well as small general stores for serving an increasing demand for a greater variety of consumer goods. Bicycles, transistor radios, and paraffin lanterns were no longer rare. Diets were improved with more consumption of animal protein. Improved village housing was furnished with folding and other chairs, small tables and spring beds and mattresses with blankets and sheets. Kitchen ware improved as did clothing for men, women, and children.

For me, cultural renaissance began one night in 1962 when some Lusitu resettlers re-commenced funeral drumming. Subsequently "neighbourhood teams of drummers and singers not only eclipsed their performances in 1956-57, but were invited to the capital to greet political leaders on their return from trips abroad in the years immediately preceding and following independence" (Scudder, 1993: 143). In 1965 puberty rituals were re-introduced in one Lusitu neighborhood that had practiced them before resettlement. In serious drought years agricultural ritual, now involving both Goba and Tonga shrines, also reoccurred. Another feature was a proliferation of hunting shrines such as I had never observed prior to resettlement.

Stage 4: Handing Over and Incorporation

When Colson and I returned to the Valley in 1971, handing over and incorporation had begun even before the first children born in resettlement areas had reached their teens. While there had never been a specialized resettlement agency to hand over assets to local institutions and line government agencies, a special resettlement fund had been established in 1960. Earlier the Northern Rhodesian government has submitted a claim to the Federal Power Board (FPB) for relocation and development purposes that exceeded £3 million. Following negotiations, £2.6 million were agreed upon in August 1960. Of that amount nearly half had already been spent, while the District Council had received £200,000 as general compensation.[3] Exceeding a million pounds, the remainder was to be

[3] At the household level, £372,000 were received to cover value of lost housing and other household structures as well as loss of agricultural production (Colson 1971: 23). Most cash compensation was

paid into a Gwembe Special Fund over a five-year period. Decisions on the Fund's use were made by five trustees, two of whom represented the District Council.

During 1961, a development program was drawn up for complementing the activities of existing government departments by providing funds for additional staff, equipment and infrastructure. Activities focused on irrigated and dryland agriculture, tsetse control, the Kariba Lake fishery, education, public health and such public works as feeder roads. In April 1966 the Fund ceased to exist, with remaining funds handed over to the District Council.

An accelerating rate of development between the 1960s and the first half of the 1970s sped up the incorporation of the Valley people into the political economy of newly independent Zambia. Increasing emphasis on, and access to, secondary school education at the time of independence opened up jobs in the government sector. Though the largest number were as primary school teachers in the Ministry of Education, by the 1970s Gwembe had also produced its first Government Minister, a university professor and senior civil servants as well as several jet pilots. Serviced by an all-weather, macadamized road, Zambia's first and only coal mines opened in the central portion of the Kariba Lake basin during the 1960s. Along with the commercialization of agriculture and fishing, mining accelerated the Valley's incorporation into the Zambian national economy.

Such development was not sustainable, so that successful movement of the resettlement process through Stage 4 has not occurred. Downturn characterized by increasing economic impoverishment and social disorganization at the village level began in the mid-1970s and has yet to bottom out. Reasons for the downturn were multiple, of which resettlement was only one. Adverse international terms of trade were another with the price of copper, which provided 80 percent of Zambia's foreign exchange, dropping at the same time during the 1970s that the price of imported oil quadrupled. 1981 reports of the International Labour Organization and the World Bank note the devastating economic impacts that followed, with the Bank referring to "a prolonged economic slump" (1941: 4.30) and ILO calling a 52 percent fall in real Gross Domestic Product per head during the 1974-1980 period "an unsought and unenviable record by international standards" (1981:3). The more recent AIDS epidemic is also a factor with adult death rates rising from the late 1980s to the present. So too is drought, the frequency of drought years increasing during the 1980s and 1990s.

The Zambian economy and the Valley were also hard hit by Rhodesia's Unilateral Declaration of Independence in 1965 and by the war for Zimbabwe's independence during the 1970s. At the national level, exports formerly routed to the south had to be rerouted to the Tanzanian port of Dar es Salaam. As a leader of the Front Line States against Rhodesia, Zambia also bore disproportionate costs, including raids by Rhodesian forces into Zambian territory. Bordering Rhodesia, the Valley was especially hard hit. Controlling Lake Kariba, Rhodesian forces caused the total collapse of the fishery until after Zimbabwe's 1980 independence, while presence of land mines throughout the

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probably spent on food during Stage 2 although Colson has case material where it was also spent by some household heads on clothing , educational expenses, and for agricultural and fishing equipment.

Valley disrupted government services dealing with education, public health and agriculture. With the cessation of tsetse control, mortality among cattle increased to the extent that some villagers had to revert back to hoe cultivation. Land mine explosions, as well as attacking Rhodesian forces, also killed Gwembe residents, including people in each of Colson's and my four study communities.

The major reasons for downturn, however, were government policies since independence. In spite of reduced revenue due to the fall in copper prices, Seidman's analysis indicates that the government did not lack the necessary "investable surpluses" after the mid-1970s to follow a basic needs investment strategy for the country's rural majority. But, she argues, "necessary institutional changes have not been made to ensure that these surpluses are directed to the appropriate expansion of productive sectors" (1979: 107). What those surpluses were used for included housing and other subsidies for government and parastatal employees, and increases in public sector allowances and salaries. High paid officials, for example, "are eligible for…commuted car allowances, entertainment allowances, payment of electricity and water bills, the provision of one or two servants and a security guards as well as for generous subsistence allowances when traveling abroad," while the "total annual additional cost of the salary rewards…exceeds the sum we estimate to be required to meet basic needs in water, health, education and housing over the next five years " (ILO, 1981: 130).

Though the President of what was then a one party state claimed to be a development advocate for Zambia's more than 500,000 rural households and successive national development plans advocated improved national distribution of expenditure, the development policies implemented continued to favor the urban-industrial sector. According to Simon "more then 80 percent of productive capital went to the Copperbelt and towns along the line of rail" since independence in 1964 (1979:14), while the 1981 ILO report stated that "in many respects, there has been a deterioration in the proportion of total expenditure going to the rural areas, not just a stagnation" (page 7). Hence when budget cuts are made they fall "on provincial votes more than headquarters, on district votes more than provincial, and on allocation to subdistrict levels heaviest of all. It is the periphery that suffers first and gets least" (page 74). Urban bias was also reflected in adverse rural-urban terms of trade that had been declining since Independence with "a total decline since 1965 of 65 percent (page 7). Such adverse conditions have continued under the new 1991 government until the present. According to the International Fund for Agricultural Development, at 80 percent Zambia has the fourth highest percentage of rural poor of 144 developing countries (IFAD, 1993). Estimating rural poverty at 76 percent in a late 1994 report, the World Bank described it as "more prevalent, deeper and more severe than urban poverty" (ii). As for terms of trade, the Bank reported a drop for the rural poor "by more than 60 percent over the eighties" (v).

Turning now to the Gwembe Valley, it can not be argued that people there are worse off than in other rural areas of Zambia since available resources vary from one area to another. What can be documented, however, is that resettlement has contributed in a major way to downturn by crowding resettlers into host areas that are unable to support the combined population without serious land degradation. As a result living standards have seriously declined from the level achieved between 1962 and the early 1970s.

Throughout the valley newly married couples – resettlement's second generation – were finding it increasingly difficult to obtain land to cultivate. Where old fields were subdivided by relatives to accommodate them, continued cultivation without fallowing reduced fertility and crop yields. Agricultural yields dropped as villagers reverted to hoe cultivation after selling off their cattle and plows to purchase food during increasing periods of hunger. The remains of bicycles that were functional in the 1960s were now apt to be seen hanging in trees while busted spring beds rusted outside houses that were no longer being improved.

In the most densely settled areas, gully, sheet and splatter erosion removed top soil and reduced field size. Deforestation along Zambezi tributaries increased flash flooding during the rainy season and caused formerly perennial streams to run dry during the latter part of the dry season. Widening tributary channels, flash flooding also eroded streamside alluvial gardens. During the dry season, the Lusitu resembled areas in the West African Sahel immediately below the Sahara desert as wind-swept barren land expanded as the years went by.

Deteriorating economic conditions were accompanied by community unraveling. Alcohol abuse among men increased and spread to women. Assault, murder, and suicide increased within the most adversely affected communities as did poisoning and maiming of a neighbor's domestic animals. Theft increased not just within communities but within households with children stealing cattle and other livestock from their parents and matrilineal kin (Cliggett and Colson, manuscript). Rather than blaming the government and government policies for their misfortunes, villagers blamed the jealousy and witchcraft of their neighbors, with fathers now identified as witches for the first time (Colson, 2000) and perhaps even mothers. As a belief system based on the ancestors as the controlling influence in people's lives waned, it was replaced by a belief system in which witchcraft, for the first time, was the dominant component.

Though the increasing prominence of witchcraft beliefs and accusations is a major characteristic of declining living standards, other Gwembe Tonga responses have been more positive. Especially important has been out-migration from the most densely settled and degraded areas throughout the Valley to other rural locations with a higher agricultural potential. Within the Valley, individual homestead have broken off from villages to colonize the edge of Kariba Lake so that today homesteads and small hamlets can be found from one end of the reservoir to the other. There utilization of the drawdown area for the cultivation of maize and other crops plays a key role in helping people survive as does fishing and the grazing of livestock within the drawdown zone.

Outside the Valley, thousands of Gwembe Tonga have initiated the pioneer and difficult settlement of sparsely populated land on the Plateau where arable soils had yet to be farmed because of such factors as isolation, tsetse fly infestation and inadequate water supplies and social services. In both the Valley and pioneer areas, formation of a wide range of village and neighborhood committees has potential for eventually reversing community decline. In pioneer settlement areas such committees involve men and women over wide areas who are organizing to bring roads, water supplies, and school and clinics to their communities. In Valley villages they involve school, food distribution, reforestation, sport, and other activities. More controversial, but important as a substitute for, and protection against, witchcraft, is the increasing membership in a growing number

of fundamentalist Christian churches such as the New Apostolic and Faith Apostolic churches. [4]

Current Efforts at Resettlement Rehabilitation

The Coming of Age of Reparation?

Once again current activities resulting from Kariba's construction over 40 years ago provide an opportunity to advance knowledge about resettlement issues. In this case the issue concerns reparations for resettlers impoverished by poorly planned and implemented resettlement. While the Coville Confederated Tribes had claimed reparations in 1951 due to their resettlement in the 1940s in connection with the Grand Coulee Dam (WCD 2000, 128), the United State's government's agreement to pay was delayed until the mid-1990s. By then the Government of China already had begun initiating a reparations policy for the 383,000 people who had been inadequately resettled between the mid-1960s and the 1970s when the Danjiankou Dam had been constructed on a Yangtze River tributary. Two Chinese policies with important global implications were pioneered during the 1980s. The first was to set aside a fixed percentage of the revenue from the sale of electricity for the benefit of resettlers. The second was to establish a "remaining problems fund" to further facilitate development activities (CYJV, 1988). Subsequently, in 1986, the Ministry of Water Resources and Electric Power initiated a program for the rehabilitation of some 5 million resettlers in 46 resettlement areas (WCD, 2000: 129).

While China's "remaining problems fund" associated with Danjiankou resettlement may be the first major attempt by a government to correct resettlement deficiencies, Kariba's Gwembe Tonga Rehabilitation and Development Program (GTRDP) is the first to be funded by international donors. From such precedents, the November 2000 final report of the World Commission on Dams states that "There is an increasing number of examples of reparations being made for past inequities." While that is an important step forward, with the exception of China, the issue of reparations continues to be dealt with on an inadequate ad hoc, case by case, basis. Kariba, along with cases involving Native Americans in the United States, is an example. Until donors and borrowers develop more inclusive international and national policies, inadequate attention will continue to be paid to procedures for addressing the reparations issue.

The Kariba Case: Reparations on the Zambian Side

The inauguration of the Gwembe Tonga Rehabilitation and Development Project (GTRDP) in December, 1998 was due to a unique series of circumstances which cannot be expected to produce similar efforts elsewhere. In 1995, a World Bank mission was in Zambia appraising a major project for the rehabilitation of Zambia's electricity sector that overlapped with one of my revisits to the Gwembe Valley. The terms of reference for that Mission also included assessing environment and resettlement issues so that future projects would comply with World Bank guidelines. Because the leader of the Bank mission was a colleague with whom I had previously worked in Lesotho, I invited him

[4] Still more recent is the arrival of Baptist missionaries from the United States (Colson, personal communication).

and his team to visit the Lusitu area where several members of our research team were resident. Two visits followed, with the second including the Managing Director of the Zambia Electricity Supply Corporation (ZESCO) which was to be the implementing agency for what subsequently was funded by the World Bank as the $215 million Power Rehabilitation Project.

Members of the Bank Mission, as well as the ZESCO official, were appalled by the environmental degradation and poverty that they saw and for which they realized Kariba's construction bore a major responsibility. An ecologist, one member estimated that it would take the Lusitu area 40 years to recover IF there were no people living there! Following their visits, I was requested to write a review of the situation that would include possible development scenarios for raising living standards. Meanwhile the World Bank Mission recommended that the proposed Power Rehabilitation Project (PRP) now include, as an add-on, a rehabilitation component for Kariba resettlers. After ZESCO agreed to be responsible for such an effort, I assisted in writing the terms of reference for a planning study. Two novel components drawn from my earlier review were "a reservoir level forecasting system to provide village level data" to improve the timing of previously risky agricultural activities in the drawdown area and a "land use and resource assessment of Gwembe Tonga spontaneous relocation areas" (World Bank, Annex 5, 1995: 2-3). The second component was intended to facilitate the sustainable development of the major pioneer settlement area on the plateau to which thousands of Gwembe Tonga were migrating. Both were incorporated within the Power Rehabilitation Project. The key component in the Gwembe portion, however, was the rehabilitation of the Bottom Road (Figure 1). Formerly connecting villages from one end of Gwembe Valley to the other, and essential for marketing village produce, portions had become impassable during the war years.

In January 1997, the Institute for Economic and Social Research (INESOR) of the University of Zambia was contracted to carry out the planning study. Though funded by the World Bank, ZESCO had appointed an excellent GTRDP manager. This was Claire Limbwambwa who made an important contribution to the study. Using a local research organization was important and INESOR put together a team of university researchers and experienced senior officials from relevant government departments. Though a number of members spoke Tonga, a team weakness was its failure to incorporate any of a number of good Gwembe Tonga scientists. At my insistence, this constraint was partially corrected by using World Bank funds that had been set aside for my involvement as an adviser to recruit Bennett Siamwiza -- a resettler and lecturer at the University who had written his master's dissertation on the history of famine in Chief Mwemba's area. ZESCO also appeared to have a bias against using Gwembe Tonga professionals. Though I suspect a political factor to be involved, the main reason may be influenced by the example of international donors to not use host country personnel – a policy which I am convinced seriously weakens project planning and implementation.

Titled *Development Strategies and Rehabilitation Programmes for the People Affected by the Construction of the Kariba Dam: Proposed Implementation Plan (*Vol. 1) and *Final Composite Report* (Vol. 2), INESOR's final report was submitted to the World Bank in December 1997. Covering the topics in the terms of reference, it provided the necessary information for the World Bank's appraisal document (Report No. 17019-ZA) for the

Power Rehabilitation Project. That allocated approximately 5 million dollars to five activities as follows:

"(a) the rehabilitation of 365 km of a key road ('the Bottom Road') that connects the three districts that have received the resettled people; (b) water resource development combining improved water supply and improving cropping patterns along the margins of the reservoir that are timed to coincide with the patterns of reservoir drawdown and refilling; (c) improvement of land use through strengthening agricultural extension facilities. In addition, a fund is to be created to support micro-projects dealing with land use; (d) upgrading of health facilities and services; and (e) electrification of three of the large villages (Chipepo, Gwembe Boma and Sinazeze), as well as the area around the reservoir" (World Bank, 1997: 12).

At the Zambian end, funding would come through ZESCO, the intention being that eventually an electricity surcharge would provide funds for past and future resettlement activities as is currently the case in China. For international finance, a separate project account in ZESCO's parent ministry would be required, with funds coming through the World Bank's International Development Agency ($0.5 million) and the Development Bank of Southern Africa ($4.5 million). Located in South Africa, the Development Bank of Southern Africa (DBSA) would also be actively involved in project supervision as well as the financing for the Bottom Road. Claire Limbwambwa would head up a field-based project management unit under a steering committee to be co-chaired by the Permanent Secretary of the Ministry of Energy and Water Development and "a nationally prominent" Gwembe Tonga (*ibid*, Annex 12: 5).

The Gwembe Tonga Rehabilitation and Development Program was inaugurated at Siavonga in December 1998 for a three year period. All seven Gwembe chiefs were present along with the Gwembe's three members of parliament. The introductory speech was given by Professor Mwindaace Siamwisa – both a Gwembe Tonga resettler and a leading Zambian scientist. The next month tragedy struck. An exploding landmine killed an expatriate consultant surveying the rehabilitation of the Bottom Road. That set back the entire project, with the Zambian army only completing an expensive program of de-mining during 2003. Bureaucratic delays within DBSA, however, must also share responsibility for delayed project implementation, with effectiveness of their loan delayed until the end of 2001. By then depreciation of the South African currency meant that loan funds would suffice only for the design of the Bottom Road. That was poorly supervised, with the contractor misusing what were already inadequate funds by producing a more expensive design that was poorly suited to Gwembe conditions. I believe that the World Bank must share some of the responsibility here because, as the main donor for the Power Rehabilitation Project, the Bank should have retained responsibility for the design and implementation of the most important component of the Gwembe Tonga Rehabilitation and Development Project. That responsibility should have included more financial resources as opposed to relying on DBSA as the main international donor and more professional supervision through use of the Bank's social science expertise.

Though the World Bank extended the project for another two years when it ended in December 2002 and contributed another $2.5 million, available funding continued to be inadequate for essential Bottom Road reconstruction. As a result of de-mining and inflated road design costs, budget estimates had increased from $12.3 million at appraisal to nearly $110 million based on the government's assessment. Other implementation problems responsible for unsatisfactory results to date were institutional. One arose from the add-on status of the Gwembe Tonga component which I believe, as noted above, led the World Bank to commit inadequate supervisory staff from its Social Group. Inadequate political will on the part of the government and local politics were another factor. From the start local politicians tried to influence project staffing by having unqualified supporters recruited as the three GTRDP local liaison officers. Appointment of expensive international staff also was delayed by the World Bank's international competitive bidding requirements. Were recruitment was completed, in some cases agencies contracted to complete various components had re-assigned key personnel because of delayed receipt of funds. In the meanwhile a well-equipped office was opened in Siavonga, new vehicles were provided for the liaison officers, and a radio program began advertising the expected benefits of the project. Soon my colleagues and I began getting letters and reports from research assistants and Gwembe villagers complaining about project vehicles moving about but doing nothing and a radio program trumpeting benefits but unable to announce achievements.

Some important results, however, had been achieved by the end of 2004. Perhaps most important was de-mining of the Bottom Road which most likely would not have occurred without the GTRDP project. Electrification had been extended to the Chipepo Secondary School and Chipepo Harbor area as well as to community clinics and other schools. The main clinic serving the harbor area was being renovated with four smaller clinics being built elsewhere in the Valley. At least 19 of 30 tube wells planned under the project had completed, while a school and clinic were being built in the main plateau pioneer settlement area to which Gwembe Tonga were migrating, and efforts were underway there to improve water supplies. Little, however, has been accomplished that could increase local production and improve household incomes. And unless funds are found to improve the bottom road not just marketing problems will remain but broader problems of access to and from Gwembe villages.

The extent to which further efforts will be made to address results which were unsatisfactory at the time the two year extension ended at the end of 2004 remains to be seen. Efforts on the part of the Government of Zambia, the World Bank and DBSA to address outstanding problems continue with a joint World Bank-DBSA mission planned for April-May 2005. A further extension remains a possibility. More specifically, DBSA has agreed to use remaining funds to improve the central portion of the bottom road that connects Chipepo Harbour with the rest of Zambia.

Reparations on the Zimbabwe Side

My original hope was that a binational rehabilitation and development project could have been launched in which the joint Zambezi River Authority (ZRA) would have been the key agency working together with relevant Zambian and Zimbabwean institutions.

Preceding a July 1996 ZRA-sponsored workshop at Kariba Town, a team of nine ZRA staff, including ZRA's Chief Executive, Michael Tumbare, completed a one and a half month survey of resettlement areas on both sides of the reservoir. Their June 1996 draft report, titled *Kariba Dam's Operation Noah Re-Launched,* emphasized the need for a $142 million project what would attempt to rescue the Gwembe Tonga in the same way that the original Operation Noah had rescued thousands of animals from drowning at the time of inundation. With the foreword written by Zambia's Minister of Energy and Water Development and Zimbabwe's Minister of Transport and Energy, the signs for a joint approach to rehabilitation and development looked good.

Terms of reference for a binational Gwembe Tonga study were discussed in detail during the July workshop. As well as the Gwembe Tonga component of Zambia's Power Rehabiltation Study, they included the Gwembe Tonga in Zimbabwe, with the Zimbabwe Electricity Supply Authority (ZESA) to play a role similar to ZESCO's. Overall scope of the study was expanded to include "collation of ecological data downstream of Kariba Dam and assessment of effects of downstream biophysical changes on the Lower Zambezi River to Mozambique." The budget for a two-year study to start in January 1997 was estimated at $385,000. Willing to take on sponsorship and to be involved in whatever development program resulted, ZRA circulated the draft terms of reference within a fortnight.

Though no funding sources were mentioned aside from the ZRA's Zambezi Valley Development Fund to be financed primarily by a one percent fee on water used for generating electricity (Tumbare, 1999), and the possibility of a levy on revenue from sale of electricity, the assumption by myself as well as others in Zambia and Zimbabwe, including the ZRA's Chief Executive, was that the World Bank would be a major donor. Such was not to be, however, with momentum stopping when Bank officials decided to restrict their contribution to the Gwembe Tonga component of Zambia's Power Rehabilitation Project.

I fault the World Bank for losing a major opportunity to show its commitment to environment and resettlement issues by addressing serious defects relating to its first major dam project. I also fault the World Bank for its unwillingness to support the initiative of the Zambezi River Authority to expand its responsibilities to include the environment and affected people both within the reservoir basin and downstream. Should the proposed study have been carried out, it might very well have led to a program of environmental flow releases prior to the February-March 2000 and 2001 floods which could have reduced loss of life in Mozambique and loss of millions of dollars worth of crop and other damages throughout the Lower Zambezi Basin and the lower portion of the Middle Zambezi. In turn, such a study could also have been internationally precedent setting, including advancing the cause for environmental flow releases from Mozambique's Cahora Bassa Dam.

Major Lessons Learned

1. Mainstream dams on major rivers like the Zambezi should be built, if at all, only as a last resort for meeting essential development goals. Though a careful consideration of alternatives might well have favored the hydro-electric option under Central African conditions, at the time a tributary dam in the Kafue Gorge would have met Copperbelt

and Southern Rhodesian needs with much reduced environmental and social costs. Consideration of a wider range of options thereafter may or not have led to a mainstream dam.

2. Generally speaking, larger dams should be planned and implemented as multi-purpose rather than as single purpose projects. In the Kariba case, the omission of irrigation was a serious deficiency since the irrigation potential of land below the dam on both sides of the river had already been established. But because planning was the exclusive prerogative of government agencies interested only in energy production, no wider planning occurred before the decision was made to proceed with Kariba.

3. Major costs of mainstream dams, yet to be adequately dealt with by planners even today, are downstream environmental and social costs. Where incorporated within a multi-criteria analysis through adequate environmental, health and social impact assessments, I would suspect such costs to have precluded the construction of a good number of existing mainstream dams, or, at the very least, have required significant environmental flow releases and greatly improved resettlement outcomes. As Kariba was designed, environment flows – though never released to date – require nearly full reservoir levels. Cahora Bassa, on the other hand, is designed for such releases which current research indicates should be incorporated within dam operations for the benefit of downstream habitats, the delta in particular, and communities.

4. While the timing of environmental flows should attempt to reflect natural conditions to the extent possible, an effort should also be made to use them to improve conditions for cultivation of the reservoir drawdown area. The overall goal should be to approximate natural conditions by simulating the equivalent of a one to five year flood as frequently as possible. To avoid the type of uncertainty that characterized the operation of the Kariba Dam during the 1960s and more recently, the timing of dam safety work involving flow releases should also reflect, to the extent possible, impacts on downstream and reservoir users. This is not a problem unique to Kariba, a more recent example being where operators at the Manantali Dam on the Senegal River made unnecessarily ill-timed releases at the expense of hundreds of thousands of downstream users (Adams, 1999).

5. Budgeting for resettlement as a project cost requires detailed pre-project demographic, health and socio-economic "baseline" surveys. Though Kariba resettlement was considered a project cost, budgeting was based on totally inadequate information on the number of future resettlers as well as consideration of their needs and rights. As formulated and implemented, the Federal Power Board's mere "restoration of living standards" policy was responsible for the further impoverishment of the large majority of resettlers on both sides of the Zambezi as well as for the degradation of the major resettlement areas.

6. As now required by multilateral donors, a resettlement plan must be prepared during the period of feasibility studies and approved before a decision is made to commence construction. In the Kariba case, serious resettlement planning was delayed until after construction began. Because less than three years was a totally inadequate

planning period, resettlement became a crash program to evict resettlers from the future reservoir basin before the dam was sealed.

7. Based on the Kariba experience, as well as that of such subsequent large dams as Ghana's Volta Dam at Akosombo, Egypt's Aswan High Dam, India's Sardar Sarovar Dam, and Lesotho's Highlands Water Project, construction and resettlement schedules must be synchronized. As defined, synchronization requires not just physical removal to completed housing, but also provision of adequate water and sanitation facilities, such social services as schools and health facilities, and initial implementation of development opportunities for raising living standards.

8. Far more attention should be paid in resettlement planning to development opportunities for raising resettler and host living standards. Still frequently neglected , such opportunities should include fishing the reservoir and utilizing the reservoir drawdown area for the benefit of project affected people as opposed to more experienced, politically connected and capitalized immigrants.

9. Because a successful resettlement outcome can be expected to take time, donor policy guidelines should require post resettlement monitoring as well as further assistance in the event that guideline requirements are not being met. Kariba provides an excellent example of the need for such monitoring, re-evaluation and further project assistance. According to the World Bank's *Profiles of Large Dams,* "there is evidence …of an improvement in the standard of living" as an impact of resettlement (1996:82)! Nothing could be further from the truth.

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