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Social Aspects of Hydropower Development

Perspectives and Experiences: Hydropower development and Resettlement (Ghana).

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1. INTRODUCTION AND BACKGROUND

The purpose of the Volta Development was to hasten the overall economic development of Ghana. Production of cheap electricity was seen as creating a necessary precondition for industrialization in the country. For Ghana the construction of a large dam for purposes of developing the vast hydropower potential of the Volta was seen as the most economic means of providing adequate supply of electricity. In pursuing this objective it was recognised that the dam envisaged on the Volta would require substantial investment .It would create a vast lake, which would drown a large part of the country resulting in the displacement of people. It would disrupt and unbalance the eco- system, change the hydrology of the water system, and the life cycle of fish and other living organisms.

Perhaps one of the biggest impacts of Volta development is the flooding of 8500km² or 3.6% of the country and displacement of 80,000 persons who have to be resettled. The thrust of this paper will focus on how VRA managed the Resettlement programme associated with the Volta Project. I will first give a background description of why Ghana undertook the Volta River Development; describe what the Resettlement package entailed.

Thereafter I will go on to discuss the down side of Resettlement and the positive outcomes of Project environmental impacts which also affect the human population in the basin. The final section of the paper will draw lessons from experiences of VRA in resettlement that we hope will inform all of us grappling with conditions of resettlement. Ghana is hoping to build another dam on the Black Volta at Bui and already some of the experiences we have had from Akosombo and Kpong Hydropower development are helping us to design the programme to mitigate the social and environmental impact of the proposed development.

In Ghana, with a population of 20 million and a per capita income less than US\$ 400 per annum, hydropower is a dominant source of electrical energy supply. Ghana has very little fossil fuel. Crude oil production is very little. Discoveries of natural gas have been made in North and South Tano: but to-date proven capacity is small and has not been able to attract investors. This explains why natural gas for electricity production is planned to be sourced from the West African Gas Pipeline (WAGP).

The Volta River Development project comprises a 912MW hydro plant at Akosombo and a 160MW plant at Kpong further down stream. The first phase of the project covering the dam and initial power plant was completed at 15% below cost estimates and completed ahead of time. When the reservoir fully formed in 1967 it had flooded out about 80,000 people or 1% of the total national population at that time. They were occupying 8500km² or almost 4% of the total land surface of the country. The project did perform well. However, growing demand for electricity has necessitated the development of a 550 MW thermal plant, the Takoradi Thermal Power Plant, in Ghana, to fill in the supply gap and enable the reservoir to be drafted to its optimum level in the period of high inflows. With thermal supplementation the long-term sustainability of the electricity supply from the Volta reservoir had been assured. In the year 2002; the unit cost of hydro generation was about 2 US cents/kwh as against 6 US cents /kwh for thermal generation. Thus on grounds of cost alone, Akosombo hydro development which went into operation in 1965, has been most economical source of electricity supply for Ghana's industrial, commercial and domestic use. It was not until 1997 that thermal supplementation was injected. The growth of demand on the public system from about 65MW in 1965 to about 1000MW in 1997 has been supported wholly by hydro. This rapid increase in electricity use has in no doubt contributed to poverty alleviation in Ghana. The credit must go to the availability of the relatively low-cost electricity from the hydropower developments.

A cardinal philosophy behind Volta River Development was that no one should be worse off as a result of the development. The dislocation of 80,000 people and their relocation in 52 settlement towns around the 7,300 km perimeter of the lake has made an unfavourable impression which has cast hydro in a negative light.

This has affected decision criteria with respect to dams in general. Thus the Bui project has been held back by challenges and considerations beyond the need to minimize social dislocation and environmental disruptions as well as ensure maintenance of property rights.

Some of the points I will make in this paper and some of the issues I will discuss can be found in other presentations I have made elsewhere^{1*}

2. THE VOLTA RESETTLEMENT PROGRAMME

2.1 Conception And Planning

The Volta River Development provides Ghana the electricity infrastructure to develop the industrial resources of the country. But it also displaced some 80,000 people from 740 villages. Many eked out a precarious existence as subsistence farmers in dry savannah country of the north where the vegetation is light. Others in the wet forest, around the Afram in the South and also bordering Togo in the East farmed cocoa and other cash crops and were better off than most people in Ghana.

Most of their houses were mud huts with thatched roofs valued at less than £20 each in prices of the mid-sixties. There were 6 main ethnic groups Ewe, Akwamu, Krobo, Kwawu, Krachi and Gonja as well as some small groups such as the Konkombas. Most of them lived in their traditional homelands but others like the Tongu Ewes were migrants living in fishing communities near the river and the Konkombas in migrant Yam farming communities in the north. These lived in areas of other ethnic groups. Like other rural Ghanaians, all these lived in closely knit units of the extended family around their traditional units.

¹ See for example (1) A paper entitled "VRA's Experience in Managing Impact of Hydropower developments" published by the Journal of Hydropower & Dam in the Procedures of a conference on Hydro 2000 in Bern, Switzerland, October 2 – 4

The philosophy underpinning the resettlement program was that conditions be created which would be satisfactory to the people to be displaced and in which they would have opportunities to participate in the development programme of the country which had been outlined in the Government's 7 year Development Plan which was launched in 1965.

In early 1963 VRA set up a Resettlement Office to plan and execute the program to resettle people to be displaced by the impending Volta floods. There was at the time hardly 3 years left for detailed surveys, planning, construction and evacuation before lake fill. The question therefore was what organisation to build to undertake the program. VRA was anxious to avoid the situation which would force dam construction which was proceeding magnificently to be disrupted.

The VRA Act had stipulated that measures be taken by the Minister of Social Welfare to assist in the resettlement of persons to be displaced by the project. But by 1963 with barely 3 years left for the lake to fill a Government machinery had not been established to execute the program. The VRA as the agency most concerned with the timely construction of the dam and the power plant therefore assumed responsibility for the initial measure which would avoid delay in the project implementation.

The Resettlement Office created by VRA decided to organize the work by using specialist technical agencies of government to undertake as much of the work as was possible. . The overall policy, financing, construction, supply of clearing equipment, and infrastructure development were handled directly by VRA.

Because of time constraint it was impractical to establish a new organization to carry out the required work for resettlement.

Under the circumstance, VRA considered that as many government departments and agencies as possible which had the necessary capacity and skills should be involved in the project. To get the work started immediately, it was necessary to get the government agencies to start on those tasks they were capable of handling.

The most dramatic impact of the Volta hydro project is socio-economic, arising from the resettlement of about 80,000 people from about 740 villages. The resettlement effort represented a formidable and physically challenging task due to the nature of the basin that was inundated. The basin was not only large with severe access limitations, but it was also unhealthy with insect-borne diseases like malaria, river blindness and trypanosomiasis.

The different ethnic and linguistic diversity of the people living within the flood basin also compounded the problems of resettlement. For instance in one small area alone, it was found out that about 8 languages were spoken.

The VRA Act also provided that up to £3.5m only be charged to the project. Beyond that the Government assumed responsibility. This is because only Government could take responsibility for the standard of living of the settlers. Actual financial costs incurred on the resettlement program up to 1968 is estimated at £13million at 1968 prices. This includes about £2.5 million incurred on the agricultural component.*

2.2 GUIDING PRINCIPLES AND POLICIES

In spite of the time constraint, the VRA resettlement organization together with the various technical and governmental officials participating in the program adopted some guiding principles. The key ones were as follows:

- Resettlement should be used as an opportunity to enhance the social and economic condition of the people.
- Compensation be paid in cash to those who would opt to receive cash.
- The settlements should be planned and located in a rational manner so that the flood victims as well as others in the areas of impact could derive maximum benefit from the Akosombo hydro development.
- The agricultural system should be improved to enable the people to move from subsistence to a cash economy.
- People who opt to be settled should build their own houses only after they have been evacuated to settlements of their choice and allocated a resettlement house as compensation in kind. Purely due to time constraints it was considered impractical to undertake the resettlement program using the self-help approach which had been recommended by previous studies. The VRA party therefore rejected the self-help approach for housing.

* See Introduction by Robert Chambers in "The Volta Resettlement Experience " published by Pall Maul Press Ltd (1970)

3. ACTUAL EXECUTION OF RESETTLEMENT PROGRAM

With basic policies in place on housing and farming, actual execution of the resettlement program was conceived to take the form of surveys and field studies, planning, development of townships, construction of houses preparations for farming and evacuation. In practice, however, for much of the time, all resettlement activities were taking place simultaneously. These were surveys, field studies, planning, roads construction, land clearing for townships and farms, housing construction and establishment of crop and livestock farms. Eventually even evacuation was added to this mix.

3.1. Valuing Economic Assets

To establish compensation entitlements, housing structures, farms, crops, and perennial trees of economic value were described and valued. Land was not valued. It was considered that most of the land would have little economic value. So it was left to individual claimants to establish their rights at the Lands Department and to seek compensation. The decision on what to value and the method of valuation was left to the Lands Department to determine. As noted elsewhere, valuation data submission was delayed so much that it was impossible to analyse the total compensation burden let alone relate compensation in kind to entitlements.

People affected were given the choice between receiving cash compensation and relocating themselves, or be resettled, i.e. receiving compensation in kind, by joining a centrally planned resettlement program. Nearly 90% chose to be resettled. In either case compensation was based on valuation of housing, farms and other properties. The valuation was done independently by a government agency, the Lands Department. This valuation arrangement delayed delivery of critical information on compensation entitlement of affected people compelling us to adopt the nuclear house idea. This provided for each settler a one-unit house to be completed into a house with two bedrooms and a porch which was intended to be expanded later gradually into a traditional Ghanaian compound house. This approach became a source of complaint about inadequacy of coverage and pricing of properties. The biggest complaint was about land not having been compensated for.

There were different perspectives on compensation. One was to pay what was legally due in respect of land, houses, farms and tree crops and accept no further commitments. This was considered unacceptable under the circumstances where a large number of villages had to be flooded out within a short time.

3.2. Social Surveys

Elaborate social surveys were undertaken with assistance from sociologists of the two universities, University of Ghana and Kwame Nkrumah University of Science and Technology. First there was a detailed qualitative survey in areas expected to be flooded. These surveys described the history of the villages, social and political organizations, the ways they recruited leaders, their property rights and customs of marriages, descent, inheritance and burial, religious beliefs and attitudes to resettlement, which villages wanted to be grouped with which and why. The objective was to understand the social structure so as to create policies to cause minimum disturbances to their culture.

A second social survey was a more comprehensive census type on the whole flood area. This enabled an accurate count of the population to be effected. The data included an ethnic breakdown and number of villages, a breakdown into families on a village and community basis, occupational structures, identifying the numerical strength of farmers, fishermen and artisans; preferences for people for sites for relocation and where they would be prepared to join other communities to form larger groups.

The major social survey was conducted from July 1962 to October 1962. By early 1963, the initial village list and population figures had been drawn up. The population recorded was approximately 78,300 from 740 villages of which 69,250 or about 90% in 12,800 households opted to be resettled and 9,050 in 1,860 households chose to make their own arrangements. These figures continued to be reviewed and analysed over the next few years right up to the time of lake fill. The total population increased a little and some families which had chosen self-help changed their minds and joined the group to be centrally resettled. While the list of flood villages and their groupings were produced on time, and proved of great value, other results of analyses came too late to be used for planning.

3.3. Consolidating Villages Into Larger Settlements

The seven hundred and forty (740) scattered affected communities were consolidated into a smaller number of larger and more compact communities which could be provided with basic physical and social infrastructures as well as plots of land for development into farms. A typical settlement was sized for about 1300 people. The largest was for some 5000 settlers and the smallest for about 130 people. Sites were selected on the basis of wishes expressed during consultations with both communities to be affected and potential hosts. Potential sites selected by officials or suggested by local communities would first have been checked for capability of available land to take on more farmers and feasibility of providing necessities like water and access roads. They were sited some distance from the reservoir to protect the reservoir from contamination.

Selection of town sites was mainly a question of achieving a satisfactory compromise between a variety of requirements springing from conflicting social, economic and physical factors. The VRA's social workers clearly encouraged the people in the flood areas to join larger settlements which could support a wider range of services and facilities. But the choice was for each house-hold to indicate its preference. The villagers were given full opportunity to select where their new settlements should be sited and which groups should be pooled at which site. This freedom resulted in groupings along ethnic lines. Sites proposed by the people were subjected to technical tests for ease of access, potential water supply and capability of the land to support the expected population. Alternative sites in the neighbourhood were proposed when a site was considered not feasible. People were reluctant to settle in unfamiliar surroundings away from the traditional homes of their kinsfolk. Where settlers had to be settled on land belonging to people of other ethnic groups, compromises had to be found which satisfied fears of insecurity of tenure, need for farming land, loss of identity, fear of chiefs losing jurisdiction over their subjects, fear of becoming subordinate to others and fears arising out of beliefs in ill-omen.

When a settlement area had been agreed, the final choice of a town site within it depended on physical planning factors and development potentials. Wherever possible, new settlements were planned as extensions of existing villages. In this way settlers could benefit by being absorbed into a functioning community and the hosts in turn could benefit from new facilities and services, as well as join the new farming arrangements.

3.4. Constructing Nuclear/Core Housing

Resettlement as a centralized major operation to re-establish the affected people in settlement communities was not the favoured approach. This was because allowances could not be made for individual differences in customs, houses and preferences. In the light of the severe time constraints facing the resettlement programme however, the strategy adopted was to use a centralised organisation to provide core houses which would be completed after evacuation by self help with technical assistance and supply of materials.

The policy was to construct core houses for completion with self-help labour. Non-availability of property valuation details identifying settlers' compensation entitlements before detailed planning of housing requirements compelled adoption of standardised uniform housing types. It was not possible to match housing types to compensation entitlements. Uniform housing designs were, therefore, developed for all the communities to be resettled.. The core home came with concrete floor and aluminium roof provided ready for 2 rooms, a cooking porch and a sitting porch but with walls completed for only one room. The rest of the house was left to be developed by the resettled communities on self-help basis. The other walls were to be constructed through aided self-help after settlement. The houses were designed for further expansion.

Even though construction materials, doors and windows, and technical assistance were provided, many settlers took an inordinately long time to complete their houses. Some never completed them and constitute a permanent discredit to the Authority's efforts. We do not recommend self-help housing construction for such circumstances. Relocated people are too dispirited to generate necessary energy immediately for critical work.

These houses were to be in permanent villages, well sited, properly laid out and provided with certain minimum facilities such as good drinking water, latrines, streets, schools, cemeteries and markets. The villagers were to have room for expansion to accommodate immigrants and natural population increases. A study of the Volta Basin from a Regional Planning perspective also informed the siting of new townships to enable them benefit from some services of existing towns or where the surroundings could benefit from services of the new settlements.

3.5. Engineering Works

Engineering construction works accomplished by 1965 covered construction and upgrading of some 800 km of road often through heavy forest, clearing of some 7,000 acres for townships and 13,500 acres for farms out of 54,000 acres in the first phase of the agricultural program. In addition, 12,500 houses were constructed on 52 sites around the lake and provided with water supplies, schools, latrines and markets, and in some places with clinics. A specialized VRA Engineering and Construction group directly undertook the engineering activities. The construction crew at peak was about 18,000. This crew carried out its activities partially independently like contractors, but depended on the Resettlement office for co-ordination and for services for accounting, payroll and purchasing.

For clearing, heaving equipment promised by a government sponsored agency, the United Ghana Farmers Co-operative Council did not materialize. VRA went ahead to buy 19 D8 Caterpillar tractors. Each could clear 2 acres of heavy forest per each 12 hour day or 4 acres of light forest per day. Two tree crushers (a special equipment made by Le Tourneau) purchased at £40,000 each in 1963 prices, were procured. Each would fell 2 ½ acres of heavy forest in 1 hour. The felling work by each tree crusher was complemented by two or three caterpillar tractors piling up the trees. Even with all this heavy assemblage of clearing equipment, out of the initial farming requirement of 54,000 acres only a third of the agricultural initial requirement was cleared at the time of evacuation.

Housing construction was organized in-house instead of by contract. By buying materials in bulk, VRA avoided cost mark-up on materials by the contractors. Also, the contractors had no capital to pre-finance construction and had to rely on VRA. Since materials constituted the largest component of housing cost, direct construction led to a substantial saving. The cost of the Resettlement home came to be established at £370 per home.

3.6. Evacuation

According to the social survey carried out on the Volta flood area, only one town, Kete Krachi had a population of 4000. As many as 600 out of the 740 villages had populations less than 100. The rest fell in between these numbers. Most of the villages were located along the edges of the Volta and could be accessed by boat since there were no roads. Some, further inland, were accessible, neither by road nor water. Preparatory work for

evacuation took the form of cutting temporary evacuation roads, assembling boats, making reconnaissance surveys by water and warning the people. The whole move was broken into phases geared to the lake-rise schedule. The first phase was the area below elevation 100, the second below elevation 150, the third for the area below elevation 200 and the last stage above elevation 200. Special teams were organized in anticipation of the rises.

Arrangements were made for provisioning the evacuation teams. The evacuation officers were Social Welfare officers who had already worked in the areas concerned and were known to the villagers. After schedules for evacuation were agreed, the social welfare officers went ahead to warn their villagers about evacuation. On the day of evacuation for each village, a dispatch team went ahead with transport and assisted people to pack up and load the transport. The people had to be transported with their chattel. Each family was issued a householder's identification card and social workers travelled with the evacuees to their destination. Where the journey was long, half-way camps were available where they would be given food in the form of hot milk, biscuits, canned fish and canned meat. On arrival, a reception team of social workers with pre-determined allocation plans would conduct evacuees to their houses, issue them with ration cards for World Food Programme food and stay on with the evacuees to attend to their needs. The fact that there were no dramatic occurrences of resistance is a testimony to the careful arrangements made for evacuation. By the end of 1963, 1,106 of approximately 15,000 families had been evacuated. By end of 1964, 10,200 families had been evacuated.

3.7. Resettlement Agriculture

The Resettlement Programme's approach to agriculture was to provide for the settlers to enhance their income generating capabilities by undertaking modern scientific commercial farming or animal husbandry through settler co-operatives. The VRA accepted Ministry of Agriculture proposal to settle the flood victims in settled permanent farms employing modern scientific techniques. This system of scientific farming was intended to minimize amount of land needed as land available would be insufficient for the traditional shifting cultivation to be practiced by the large influx of people from the flooded areas. Besides, individual compensation would be inadequate for the people to purchase farms and make a reasonable income using traditional agricultural practices. The farmers would own their farm plots but co-operatives would service the farm with equipment and marketing. The

mechanization process included tractors and ploughs for the initial opening up of the soil, mechanized planting, spraying and fertilizer application. This grant to the farmer was to be used in other chores like weeding and thinning. The Agricultural experts placed faith in the farmers' capability to adapt to new techniques. The VRA would provide them with heavy equipment to clear the land and the Ministry of Agric would provide the tractors and other farming equipment.

This approach was advised by the Ministry of Agriculture, anxious to have the settlers grasp the opportunity to move away from traditional subsistence farming practices to modern practices. This meant partial mechanisation (at least) and extensive clearing. Instead of the one-and-a-half (1½) to two (2) acres cultivated typically by each farm group, provision of thirty (30) acres was made for each arable farmer. A start was to be made with twelve (12) acres under each mechanised farming. Tree crop farmers were to get a minimum of five (5) acres and a maximum for fifteen (15) acres; intensive livestock farmers were to get a minimum of three (3) acres while pastoral farmers were to get thirty (30) acres each as minimum. The above allocations are additional to half (½) acre granted to each farmer for subsistence farming.

The programme which was designed and financed by the Ministry of Agriculture failed because the land clearing requirements turned out to be too ambitious to achieve, equipment was slow in arrival, skilled manpower to run the equipment took time to train and the farmers did not prove as adaptable as expected. From hindsight we see it was impractical to attempt to change farming culture from traditional to modern scientific commercial methods within a very short period.

It was not until 1963, after a few hundred acres had been cleared that actual farming work began. Three towns Nkwakubew, Bomoden and Vakpo were developed as experimental farms and also partly as beginnings of permanent farms. By end of 1964 farms had began in only 8 out of 52 settlements. Because of delays in the clearing and in procurement of equipment and technical staff, the acreage to be allotted to each family was reduced from 30 acres to an initial 12 acres and comparable reduction made in land allocation for livestock and tree crops. To enable the settlers acquire some vegetables for their immediate use, each settler was granted a half acre plot for a start whilst waiting for the main land entitlement to be allocated.

4. ACHIEVEMENTS, COSTS AND MITIGATIVE MEASURES

4.1. Environmental Impacts

During the planning stage of the Volta river development, a full-scale examination was carried out on the potentials of the Volta basin and the impact of Volta development on the environment. The objective was to find ways to enhance the favourable impacts and to control unfavourable ones. These studies did not stop at the planning stage but were intensified during construction.

a) Impact on Plants and Animals

In addition to social impacts the creation of the Lake and the regulation of the floodwaters of the Volta River brought in its wake changes in the natural environment, in plants, animals, insects and other living organisms, on the atmosphere and in the chemistry of the water. These environmental changes created negative as well as positive impacts on the lives of the communities living upstream and downstream. The negative ones include the increased incidence of water borne diseases like bilharzia, malaria and hookworm. Positive impacts were, for example in navigation and fisheries and in the eradication of or reduction in river blindness and sleeping sickness.

During the pre-impoundment period a host of local and international multi-disciplinary research workers from academic and specialist institutions carried out studies on the human population in the areas to be flooded and in downstream areas. They studied the impact of the reservoir on agriculture, fisheries, public health and on conservation of biodiversity. Detailed biological studies covered aquatic plants, disease vectors and fisheries. Other studies covered geology, topography, and meteorology of the reservoir area.

b) Aquatic Weeds

The Volta Lake, like other tropical man made lakes, has been characterised by growth of aquatic weeds. The Volta did not experience that short lived but sudden explosion of floating weeds which populated Kariba immediately after impoundment. The weeds, which occurred, are longer lasting. Among the important ones are Pistia, Vossia spp. Ceratophyllum. Pistia is flood resistant. Vossia spp, which is resistant to wave and wind action, is also resistant to herbicides. It has needle-like hairs, which make it unsuitable neither for grazing nor for manual cutting. It creates a good habitat for fish. Ceratophyllum's submerged beds house large populations of Bulinus snails the vector of Schistosomiasis.

Attempts to control Schistosomiasis by controlling Ceratophyllum, which creates a favourable habitat for the vector, have failed. So far, we are not aware of any satisfactory means of controlling this weed.

After 35 years of operation, water hyacinth has become a problem on one of the arms of the Volta River. This dangerous weed was initially observed in some of the tributaries in Burkina Faso feeding into the Black Volta and Oti arms of the reservoir. Efforts made by VRA and Ghanaian scientists in collaboration with counterparts in Burkina Faso have not prevented the gradual drift of the weeds into Ghana on the Oti. If the continuous drift southward is not checked, it will threaten the main reservoir, increase evapo-transpiration extinguish oxygen supply into the lake and substantially reduce the fishery potential and create poverty among the lake-side dwellers including the settlers. Why is this coming at this time? What has changed? Further research is needed to explain this phenomenon.

Now that a Water Resource Commission (WRC) has been created in Ghana, this is the type of problem they should study in collaboration with neighbouring countries. In addition WRC should be in a position to prioritise and coordinate claims on the use of water for power generation, navigation, irrigation, flood control, water supply services, etc. For proper management by WRC and development agencies such as VRA and the irrigation authorities, all the parties must undertake a continuous and in-depth study of the reservoir as it relates to their work and exchange the information with others. There is the need for International cooperation in stopping the invasion of dangerous waterweeds like water hyacinth.

c) Impacts on the Health of the Population

The health impact of the reservoir includes an increase in some water borne diseases such as bilharzia and malaria, and reduction and elimination of other diseases such as river blindness (onchocerciasis) in some areas. Malaria is endemic in Ghana and the mosquito vector breeds in the lake shores. No effective control is available. Another important disease found in the area before inundation is Sleeping Sickness or Trypanosomiasis whose vector is the tsetse fly. With the flooding of the forest habitat of the Tsetse fly, the vector of this disease, the problem of Sleeping Sickness has been substantially reduced

Control possibilities have been continuously studied on the water borne diseases which have emerged as a result of the creation of the reservoir. The negative health impacts are being mitigated through programs such as a co-ordinated health educational program.

The construction of the Kpong Dam resulted in the Senchi and Kpong rapids downstream Akosombo being completely submerged. This successfully eliminated the principal breeding grounds of the *Simulium damnosum* fly responsible for River Blindness (onchocerciasis).

Based on the resettlement experience of the Akosombo Development, the Kpong Resettlement Scheme covering a population of 8,000 persons was planned early and designed to suit more the original lifestyles of the communities resettled. However, a negative environmental impact of the Kpong Hydroelectric development is the increase in the incidence of bilharzia and hookworm. This is due to a combination of factors. These include population concentration in the restricted Kpong area, the intense fishing activity of the population and increased incidence of weeds due to the heavy farming activity in the area and the use of fertilizers. In spite of planning precautions taken to locate the new townships away from the lake, most of the fishermen resettled themselves back near the lakeside. VRA is currently carrying out a number of mitigation measures including massive public education, provision of sanitary facilities like urinals, and latrines and control of the snail vectors by manual and mechanical weeding.

4.2. The Positive Impacts of Volta Development

a) Electricity Supply

The main product from Volta project is generation of electricity from the Akosombo project. For several years after construction of the facilities, electricity has been supplied to mining areas and urban Industries, businesses and households. Rural areas including those in the reservoir areas and communities in the impact areas were initially not covered. It was thought at that time to be too expensive to extend grid supply to the settlements and that they would not have the financial resources to meet the cost of investment in other forms of supply. Over time however, access to electricity kept increasing in the country generally and the prospects for the settlements also improved. Today, about 43% of Ghana's population has access to electricity. This includes all the ten Regional capitals and all one hundred and thirty district capitals. The VRA Resettlement Trust Fund mounted a program to extend electricity to all 52 settlements. That program was completed in the year 2003.

b) Health

A positive health impact is the eradication of sleeping sickness (trypanosomiasis) and river blindness (onchocerciasis) caused by the *simulium* fly associated with fast flowing water.

c) Fishing

At the early stages of lake fill, the fish population exploded. The highest estimate of fish catch before impoundment was 18,000 tonnes a year. However, in 1969, after impoundment, the catch peaked at about 62,000 tonnes. It dropped later to about 35,000 to 40,000 tonnes a year. Some have estimated a sustainable yield at about 40,000 metric tonnes a year. To boost the fishing industry, the VRA has gone ahead to build landing sites for fishing vessels. At Kpandu, VRA has developed facilities for fish processing and marketing. At Akosombo the Council for Scientific and Industrial Research and the University of Ghana, with the help of VRA, have set up a Fisheries Research Centre. The findings of the centre have been of immense importance to the lake fishing industry.

d) Navigation , Roads and other Infrastructure

Access roads have been built to some major towns to ease transportation in the resettlement areas. Other infrastructural developments such as markets, health centres and schools have improved the conditions in the resettlements. Another positive impact has been the creation of opportunities for the development of extensive navigation on the reservoir. This links the various communities around the lake which is located in the middle of Ghana. It also links the agricultural north to the industrial and commercial south of Ghana.

e) Regional Cooperation

The Volta River Development has contributed to promotion of regional cooperation in the Western Africa Region due to the international nature of the Volta Basin, which is shared by Ghana with five other countries viz. Mali, Burkina Faso, Togo, Benin and Cote d'Ivoire. Developments have been carried out taking into consideration the needs of other riparian states. Major benefits in the form of electricity have been shared with Ghana's neighbours through transmission interconnections to meet power supply deficits and exchange as necessary. Presently there is an interconnection between Ghana and Togo-Benin and Ghana and Cote d'Ivoire. Some towns in Burkina Faso are also supplied with power from Ghana. Plans have been developed for a power pool in West Africa to incorporate the interconnected grids and draw on the experience gained.

4.3 Mitigative Measures

a) Addressing Erosion and Preserving the Integrity of the Reservoir

It was not possible to clear the two million acres before impoundment. It was simply too expensive. In fact we estimated at the time that it would cost as much investment as the dam. For ecological purposes and to prevent erosion, the area bordering the reservoir has had to be managed carefully. Initially, farmers in the flat areas adjoining the lake were taught methods to farm the land exposed in the draw-down areas by the fluctuations in the water level. Later excessive tree cutting for fish smoking and farming led to erosion especially in the steeper areas. Restrictions were therefore placed on farming and tree cutting in order to protect the natural environment. This was done in collaboration with the local authorities adjoining the lake and with local chiefs and community leaders. To preserve the integrity of the reservoir a shoreline management programme has to be implemented. Drawing on the expertise and resources of the Forestry Department, afforestation has been started using special trees with capacity to prevent soil erosion.

b) Arresting the Decline of Resettlements and Host Communities: The VRA Resettlement Trust Fund.

Thirty years after the displaced population had been settled in resettlement towns it was found that most of these towns had in fact deteriorated. There was the feeling among settlers and host communities that they had become worse off. Accordingly, Government and VRA set up a VRA Resettlement Trust Fund in 1996 to help improve conditions in the settlement towns and enhance the standard of living of the settler communities. The Fund which VRA feeds with annual contributions of US\$ 500,000.00 is required to mobilise additional resources from governmental, international and NGO sources for improving the living standards and welfare of the settlers.

The Fund is managed by an independent set of Trustees set up by a Trust Deed. The Trustees comprise a Chairman and one other person appointed by the Minister of Energy, ten (10) members of Parliament in whose constituencies the settlements are located, three (3) officials from the Ministry of Energy and two (2) officials from VRA. The Trustees drawn from fourteen (14) Administrative Districts spread in four (4) regions, emphasize strong participation by the communities in planning and implementing programmes to enhance their own welfare. Projects undertaken over the eight (8) years of the Fund's existence

include electrification of the settlements, provision of drinking water and modern sanitation facilities, education, health services, rebuilding of township streets and access roads.

5. Lessons from Akosombo Experience

From VRA's experience in assessing and managing the social and environmental impacts of the Akosombo dam certain lessons emerged. Some of these are the need for detailed and timely information on the local communities and on the natural environment. Secondly, it is important to ensure that public awareness programs are mounted on dam projects and local communities participate actively in the planning of such projects.

a) The need for Detailed and Extensive Studies

There is a need for detailed and extensive studies during the planning phase long before implementation time. These studies will have to be intensified during implementation and the results used to modify the plans. With environmental data gathered during the construction and filling stage, it was possible to plan mitigation and eradication measures to monitor and assess changes in the ecosystem. Similarly social data gathered during the construction period helped in refining arrangements for resettlement of affected people. So planning should not be static but be adjusted as new conditions arise. This was the approach taken on the Volta development. And yet when it came to actual implementation the information available was found to be inadequate. This is how we found ourselves having to provide to settlers uniform core houses not related to the value of their properties affected or having to leave in the reservoir area trees whose stumps have now created serious hazards to navigation causing loss of many lives annually.

b) The timeliness and quality of information on socio-economic conditions of affected communities is critical for effective interventions.

The timeliness and quality of information on the socio-economic conditions and resources of communities and families which includes land, buildings, farms, crops and perennial trees is critical. The skills of resident social and community workers and sociologists proved very useful in this regard.

c) Property Assessments by independent consultants is vital

In relation to properties to be flooded, it is important to contract independent professional consultants to prepare and price the inventories of all properties. Property owners should be made aware of the value of their properties before evacuation and type of resettlement property granted to each person as compensation in kind should be related to the value of their properties and they should have a right to challenge the valuation.

d) The need to appreciate the long-term nature of engagement with problems of affected communities

One observation today is that at about forty years after relocation, the settler population, adjacent communities in which the settlers were relocated and downstream communities in the lower Volta, are, by and large dissatisfied. They feel that urban communities and industries have taken more of the project benefits in the form of cheap electricity while they the locals are left with the bane of public health problems, and inadequate compensation. Some have suffered reduced farm incomes and others reduced fishing incomes. For a long time electricity was not extended to the settlers. A program started in 1998 to extend supply to all resettlement towns has been successfully accomplished by the VRA Resettlement Trust Fund. Efforts now focus on productive use and conservation of electricity in the settlements.

Efforts were made to enhance public awareness in the project and involve local communities in aspects, which affect them. These were done partly through discussions at the legislature, at special purpose committees, incorporating as many stakeholders and interested participants as possible, and through public education campaigns in the local communities. In spite of all these preparations and efforts, people relocated still feel that they have not been adequately provided for. It looks like once people have been subjected to involuntary resettlement they never feel satisfied.

Fortunately, in the Volta case, the Authority continues to maintain an interest and contact with the resettlement towns and adjoining communities and communities downstream. Research institutions have been contracted to evaluate the condition of affected communities and submit recommendations on how their condition of life can be improved. Right now for example the Authority is carrying out a dredging activity in the estuary to improve the environmental conditions there. Sanitary facilities are being provided for and public health campaigns are being undertaken in some of the downstream communities.

The Authority is managing implementation of a program to remove navigation obstructions in the reservoir. The Authority is also implementing an afforestation program around the reservoir.

e) The need to provide credit to support fishing and farming activities of resettlers.

Income generating activities in the settlements turned out to be poor. The farms failed. Some of the population migrated back to the lake-side for fishing. We should have given them credit to buy boats and nets for fishing and simple farm tools and implements.

f) The need to provide Resettlers with Legal ownership of housing and farming plots

A programme to give legal ownership or occupancy to those allocated housing and farming plots started but was not pursued. An effort was made to integrate settlers in the local and community administration. Partial success was achieved in some areas but difficulties arose in other areas. Government agencies providing technical support in the rural areas were courted to extend services and facilities to the settlements. These local management units were themselves so weak that they have not supported the settlements adequately. Settlers should be given the legal documents, validating their occupancy and granting them the right to pass property on to their successors.

g. While self-help as an approach to housing is desirable, it is not a practical option in the face of severe time constraints on resettlement.

In relation to housing people displaced by dam construction, an approach which enables people to apply self-help in building their houses and farms is considered desirable. However, when dealing with large numbers of people who have to be relocated within a short time period, a self-help approach is not very practical. Relocated people are too dispirited to generate the necessary energy immediately for such critical work.