EDUCATIONAL IMPLICATIONS OF DAMMING THE CHALIMBANA RIVER IN CHONGWE DISTRICT OF ZAMBIA

BY

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CERTIFICATE OF APPROVAL

The University of Zambia approves this dissertation of MUMBA MAKUMBA DARIUS as fulfilling part of the requirements for the award of the Degree of Master of Education in Environmental Education.

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DECLARATION

I, Mumba Darius Makumba, do hereby declare that the work presented in this dissertation for the Degree of Master of Education in Environmental Education is my own work and has not been presented either wholly or in part for any other degree at any other university.

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ABSTRACT

Water is a scarce and finite resource with no substitute. All life on earth depends on water. The challenges of water resource management anywhere need concerted efforts by various players such as government, the community or dam owners.

This study was aimed at evaluating and describing educational implications of damming the Chalimbana River in Chongwe District of Zambia. In this regard, the study investigated the social impacts of damming the river on the local people. The views and experiences of local people along the Chalimbana River were solicited. Through this study, it is hoped that the source of conflict over the waters of the Chalimbana catchment area would be understood. The study further aimed at designing a proposed educational programme to address conflicts arising from the damming of the same River. This is in view of the fact that education can be used to address human environmental conflicts.

The study was both qualitative and quantitative in nature as it captured views and experiences of respondents from which numerical figures were derived. The content analysis method was used to analyse data. In order to achieve the above stated objectives, respondents were purposively sampled and were drawn from the lower Chalimbana River Catchment.

Primary information was gathered using separate questionnaires for each of the ten groups of respondents who were: teachers, local people, pupils, agriculturalists, dam owners, forestry officers, water board officials, social workers, the Royal Establishment (Nkomeshya) and headmen.

The study found that the major conflicts in the study area arising from the damming of the Chalimbana River were brought about by the following trigger factors:

(i) lower catchment areas dried up in the dry season months from August to December of each year.

(ii)local people broke dam embankments illegally in order to supply water to their gardens.

(iii)over exploitation of water as a common resource by dam owners.

With regard to educational implications of damming the Chalimbana River, this study established that topics and issues which needed to be covered should focus on positive and negative aspects of damming the river with emphasis on the sustainability of the river.

This study also established that social impacts of damming the river were many, such as the displacement of local people, which led to migration to other areas in search of water as a resource. Arising from the findings of this study, various recommendations have been made, amongst which is the need for a localised environmental education programme to educate people along the Chalimbana River regarding the damming of the river and its sustainability.

DEDICATION

I would like to dedicate this dissertation to my late father, Edward Mwansa Mumba, who was put to rest on 1 November 2007. My mother, Samfolosa Mubanga, my wife, Fanny Chali Mumba, my five children namely, Makumba, Mulenga, Katongo, Mubanga and Naomi. I am also greatly indebted to God who has preserved my life to date. I thank the entire family for their prayers and encouragement.

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I wish to pay tribute to the head teachers, teachers and pupils of Chongwe Boys High school, Mukamambo Girls High school, Chalimbana Basic School and Bimbe Basic School. I wish to further pay tribute to Mr. Muzumara, the Principal of NISTCOL, for his professional contributions in editing and formatting the work.

Appreciation also goes to Mr. Phillip Kapini who assisted me to collect data from the field as a research assistant, Ms Kalwani who helped in the typing of the work, Mr. Swazi, Mr. Edgar Zulu and Ms Lois Mvula who assisted me with the drawing of diagrams. Last but not least, I wish to express my hearty appreciation to my wife Fanny Chali, and our lovely children, Makumba, Mulenga Mubanga, Katongo and Naomi for their support. I thank my Lord for allowing me to do the course.

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List of Acronyms used

CDC	-	Curriculum Development Centre
ECZ	-	Environmental Council of Zambia
E E		Environmental Education
FAO	-	World Food Agricultural Organisation
GWP	-	Global Water Partnership
IUCN		International Union for the Conservation of Nature
IWRM	-	Integrated Water Resource Management
MOE	-	Ministry of Education
NISTCOL		National in Service Teachers College
PAWD	-	Partnership for Africa's Water Development
SADC	-	Southern African Development Community
TAC	-	Technical Advisory Committee
UNCED		United Nations Conference on Environment and Development
WCD	-	World Commission on Dams
WHO		World health Organisation
ZWP	-	Zambia Water Partnership.

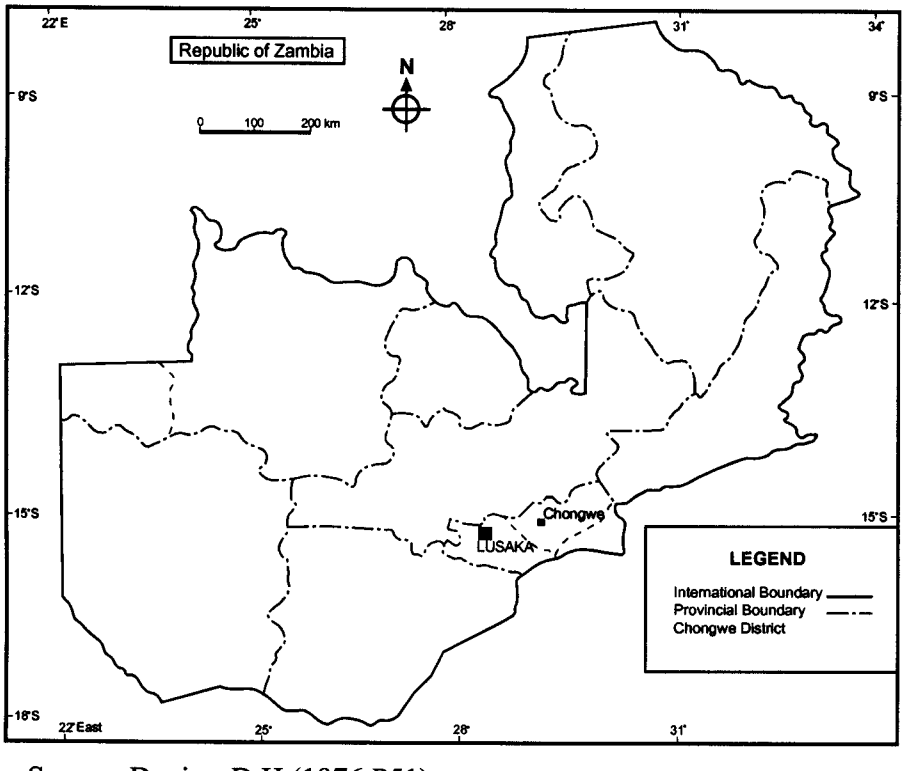
CHAPTER ONE

BACKGROUND TO THE STUDY

1.1 Introduction

The main purpose of this study was to find out educational implications of damming the Chalimbana River in Chongwe District. Figures 1 and 2 depict the location of Chongwe and Chalimbana River respectively. This research starts by looking at the historical importance of the river. The land near the river was never given out for human settlement. It was a known fact that the trees on the land held underground aquifers. In 1950, the colonial government created reserves in response to white-settlers pressures on the government to alienate land for European occupation. This led to the removal of Africans from their traditional land and their subsequent resettlement in new areas. These areas were often unsuitable for human habitation. In 1964 when Zambian got its Independence, many white settlers left the country for Europe leaving many farms unattended to. This led to the Zambian Government to give out this land as farms.

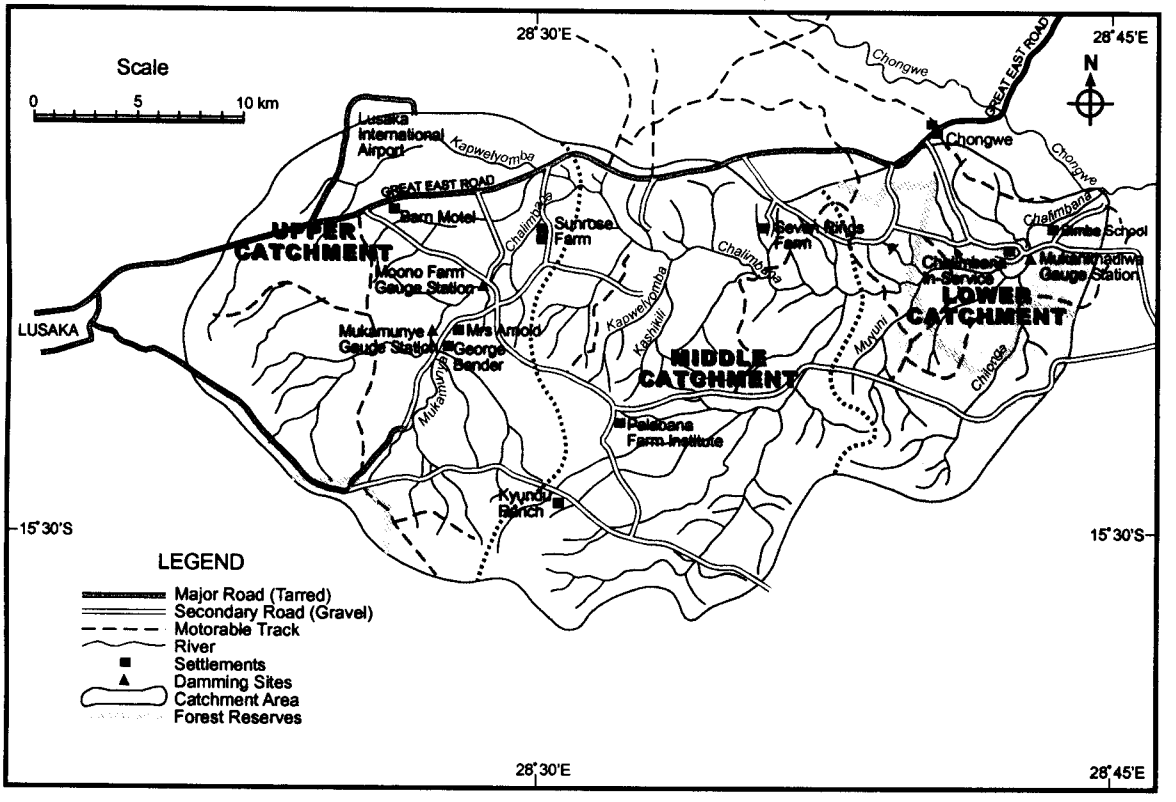
Figure 1: Location map of Chongwe District



Source: Davies .D.H (1976.P51)

The enormous increase in the number of people over the past decades in the Chalimbana area and the climatic changes in the Southern African region have impacted negatively on the environment. The impacts are reflected on the use of natural resources such as land and water. The two natural resources are driven by economic and political structures existing in the country as well social values and norms of society. Many developmental projects depend on water. Water can provide electrical power for industry. It also enables crops to grow. Rivers can provide water but sometimes rivers dry up in drought seasons. At times water rushes out to sea and it is wasted. Agriculture as an activity heavily depends on water, usually rain water and its absence makes farmers resort to irrigation. Irrigation water can be from the rivers or under ground. It was noted that not all white settlers left for Europe. Some, like Mr. Bender, remained and have lived in the Chalimbana River Catchment area since 1957.

Figure 2: Map showing the Upper, Middle and Lower Catchments of the Chalimbana River



Source: 1:250,000 Topographical Maps SD–35–15 and SD-35-16 ZS edition 1

Land issue in the Chalimbana area can be traced back to the 1946 Land Commission of Northern Rhodesia. This commission agreed that the land reservation policy was a disaster since it impacted negatively on both the people and the environment. The proximity of Chalimbana area to Lusaka made the colonial government to alienate the land as crown land. This meant that this land was held on behalf of the queen of England. The presence of water in the Chalimbana River attracted many white farmers in the area. Chalimbana area has a high concentration of white farmers to date because most land was on title since colonial rule.

The most appropriate solution to irrigation was damming. Dams bring benefits but they also bring problems. Perhaps the Zambian Government had a role in harnessing the conflict which has surrounded the Chalimbana River basin. In 1992, the Zambian government degazetted Forest reserves Number 27, which covers an area of 1 764 hectares. The land was apportioned for development to Makeni Ecumenical Centre and Sulmach group of companies belonging to Safari International. This forest resource, which acted as a watershed, was depleted to pave way for development. The developmental projects impacted negatively in the discharge of water in the Chalimbana basin. It was further compounded by erratic rainfall with the average annual rainfall being 800mm.

The Chalimbana River Catchment area has an undulating altitude ranging from 1 160m to 1 342m above sea level east of Lusaka town. The catchment basin covers a surface area of 520 square kilometres in extent. The length of the river itself is about 37km flowing eastwards from Ibex Extension on the out skirts of Lusaka running almost parallel to the Great East road to join the Chongwe River. The river has six tributaries namely; Mukamunya stream, Kapwelyomba, Kashilili, Nyalukuba, Muyuni and Chilanga. The source of the river is in Chilanga near Shimabala hills. The river runs through Forest Reserves numbers 26, 27 and 55, which cover an area of 1 764 hectares. The forest acts as a natural watershed for the river and hence the Chalimbana river system has enough water for both agricultural and domestic purposes. Most of the water is surface water, which is yielded through seasonal rainfall in the months between November and April. The water table is at 15m below the surface in the rainy season and about 35m during the

dry season. The river used to be a perennial river before damming in 1991. It has nine (9) dams which have reduced the flow of water in the river's lower catchment area.

1.2 Statement of the Problem

The Chalimbana lower catchment area in Chongwe district is experiencing a scarcity of water due to the damming of the river by Commercial farmers in the middle catchment area. This situation is due to inconsistence in the manner the water policy has been handled by government. This has caused uncoordinated damming of the Chalimbana River, especially in the middle catchment for agricultural irrigation. The damming projects have generated conflict in the lower catchment of the Chalimbana River. Therefore, there is a need to investigate how education could help in resolving conflicts about water. At the time of this report, there was inadequate documented information about conflict resolution concerning the damming of the Chalimbana River. It was for the same reason that the study was initiated.

1.3 Research Questions

The general problem noted above was tackled by addressing the following specific research questions:

(i) What conflicts in the local area arise from the damming of the Chalimbana River?

(ii) What educational programme can be designed to address conflicts arising from the damming of the Chalimbana River?

1.4 General Objective of the Study

The objectives of this study were to critically analyse the conflicts brought about by damming the Chalimbana River, especially in the lower catchment area. The focus was on designing an educational programme with the help of the affected people. Those affected are the Royal Establishment, Nkomeshya, teachers and pupils from the four lower catchment schools namely; Mukamambo II Girls High school, Chalimbana basic, Bimbe middle basic and Chongwe High school, local people, dam owners, forestry officers, Agricultural extension officers, Social officers, Environmental Council officers and Water Board officials.

1.4.1 Specific Objectives

These were:

(i) To describe conflicts in the local area arising from the damming of Chalimbana River.

(ii) To design an appropriate educational programme to address conflicts arising from the damming of the Chalimbana River.

1.5 Significance of the Study

It is hoped that this study may provide relevant information on the effects of the earth dams on the local environments with a view to conflict management. Furthermore, results of this study may contribute to finding an environmental solution, which government and the local people in the area would use. The study may provide a means for geography teachers, parents, pupils and the royal establishment to contribute to the development of a local curriculum to be taught to pupils in the lower catchment area of the river on the effects of damming on the environment. For policy makers, this study may help in revisiting the water rights in order to attain equity to access of water as well as an integrated management of water resources in the Chalimbana River Catchment. It is hoped that this study has contributed to the field of environmental education in Chongwe and the nation as a whole. The study has yielded insights of damming, a tool for development and also the social impacts damming has on people. It has also shown the responsibility the state, the royal establishment, local government dam developers and the local people have in order to achieve integrated water resource management in any area. It is also hoped that this study has provided information which can be used by Ministries of Education, Energy and Water Development and Local Government to co-ordinate each time there are developmental projects such as damming.

1.6 Delimitation

The study was restricted to analysis of conflicts and designing of an educational programme for both pupils and local people. The views and experiences of people in the middle and lower catchment areas of the river were of use to this study. Information was

triangulated on the following people: Agricultural extension, forestry, Social Welfare, Water Board officials and Environmental Council of Zambia officers.

1.7 Limitations

The area was too vast to be covered on foot as some parts of the area have no good roads. The study was focused only on four schools of the lower catchment of the Chalimbana River. The results, may, therefore, not be generalised to other areas with dams and schools located in their vicinity, though the results may be referred to for other comparative studies on integrated water resource management. There was resistance from some of the research respondents as they demanded payment before getting any information from them.

CHAPTER TWO

LITERATURE REVIEW

2.1 Dams and their Controversies

The principal sources of water for human use are lakes, rivers, soil moisture and relatively shallow ground water aquifers. Dam construction has always been a human initiative in order to improve life on earth. Dams have been built for thousands of years to manage flood waters, to harness water for hydropower, to supply water for drinking or for industry or to irrigate fields. By 1950, governments, or in some countries, the private sector were building a number of dams as the human population increased and national economies grew.

Half of the world's large dams were built exclusively or primarily for irrigation. Some 30-40% of the 271 million hectares irrigated world-wide rely on dams. Dams have been promoted as an important means of meeting perceived needs for water and energy services and as long term strategic investments with the ability to deliver multiple benefits. Opponents of damming point to the adverse impacts of dams, such as debt burden, cost overruns, displacement and impoverishment of people, destruction of important ecosystems and fishery resources and the inequitable sharing of costs and benefits. Dialogue exhibited from discussions of damming encompassing views for and against as identified by Salman and Bradlow (2006) could lead to justifiable key points such as:

- Dams made an important and significant contribution to human development and the benefits derived from them have been considerable.
- In too many cases an unacceptable and often unnecessary price had been paid to secure those benefits, especially in social and environmental terms, by people displaced, by communities downstream, by taxpayers and the natural environment.

- Lack of equity in the distribution of benefits has called into question the value of many dams in meeting water and energy development needs when compared with the alternatives.
- By bringing to the table all those whose rights are involved and who bear the risks associated with different options of water and energy resources development, the conditions for a positive resolution of competing interests and conflicts are created.
- Negotiating outcomes would greatly improve the development effectiveness of water and energy projects by eliminating unfavourable projects at an early stage and by offering as a choice only those options that key stakeholders agree represent the best ones to meet the needs in question. One of the greatest challenges facing the world in this new century is rethinking the management of fresh water resources. Fresh water is that which is harvested from lakes, rivers and underground aquifers. Total annual fresh water withdrawals today are estimated at 3 800 cubic kilometres – twice as much as fifty years ago. The growing populations and economies have increased demand on water. This increased demand has resulted in depleted ground water, reduced water quality and consequently, severe limits to surface water extraction.

These pressures on water pose a wide range of threats, but they also generate the momentum for new opportunities and policy changes. Societies have now moved from seeing water as a free commodity to viewing it as a limited natural resource and an economic asset as well as a human right. Thus water is recognised as a scarce natural resource which gives rise to equity considerations in its allocation. Water use per individual according to experts is fifty litres per person per day, enough to cover basic human requirements for drinking, sanitation, bathing and cooking.

Though consumption of water is influenced by climate and culture, research evidence has shown that, agriculture consumes 67%, industries 19% and municipal/residential consumption, 9%. This scenario perhaps explains why dams have been constructed in the Chalimbana River Catchment where commercial farmers have monopolised the use of water. World Commission on dams (2000) suggests that irrigation alone may require an increase in water supplies in the range of 15-20% by 2025 to meet food and rural

development. Another vision is that, by 2025 there will be a total of 3.5 billion people living in water-stressed countries. Empirical evidence suggests that limited water supplies, combined with current agricultural practices and population growth are a barrier to meeting the goal of food self-sufficiency in more and more countries, increasing the attention paid to food security and other environmental resources.

In terms of the social impacts of dams, Pearce and War ford (1993) state that, the negative effects were frequently neither adequately assessed nor accounted for. The impacts are substantial. They include the lives of people, their livelihoods and the health of the communities dependent on the riverine environment. Most often, people are displaced by dams world-wide. Among the affected people in the community are women, children and the aged who walk long distances in search of water in the dry season. The social costs are not shared evenly as they are discriminated against by the able men who usurp the benefits. Therefore, it is important that considerations are made before designing a damming project. This has to be done to mitigate the impact of damming on the people as well as the environment.

The World Commission on Dams (2000:8) suggests that there are three components namely; financial and economic performance, ecosystem and climate impacts, social impacts and the distribution of project gains and losses. Secondly, an assessment of the alternatives to dams, the opportunities they provide and the obstacles they face and lastly an analysis of planning, decision-making and compliance issues that underpin the selection, design, construction, operation and decommissioning of dams.

Salman and Bradlow (2006) acknowledged that, the affected people are beneficiaries of a project such as a dam and as such there should be legally enforceable mitigation measures that recognise entitlements that improve livelihoods and quality of life of people in a particular community. This is upheld by fundamental commitments and responsibilities of the state and the developer. They bear the onus to satisfy all the people who are affected by the dam construction.

In Nigeria, there was a study undertaken in a drought-prone rural community where there was a conflict over crucial resources such as water and forestry. The study aimed at mitigation of conflicts to sustain social order. This was achieved by communities

networking of activities, voluntary participation, co-operation and collaborative problem solving (Fiki and Lee 2004). The above study was similar to my study though it had two variables to address, water and forestry.

In the Cape Province in South Africa, a dam was built across the Orange River called the Verwoed Dam in 1971. This part of South Africa was very dry because of low rain fall but the land was fertile. The South African government allowed individual farmers to draw water from the dam using canals for irrigation of crops. This generated conflicts over the use of water. Salman and Bradlow (2006) acknowledged that because of conflicts generated over water in South Africa, the government had to enact a law in their constitution. This law regulated the ownership of water and establishment of water rights. It also gave guidelines on the transfer of water rights and river basin authorities. These were later transformed into the River Catchment law, which was enforced by a water tribunal that settled disputes. The Verwoed case study helps to enhance my study that dams at times can be built for the sole purpose of irrigation of crops like is the case in the Taliban River Catchment.

In Zambia the construction of the Kariba dam in 1957 altered the lives of 60 000 Tonga people in the Gwembe valley. The dam was constructed across the Zambezi River. The objectives of the damming of the river were to provide electricity to the mines on the Copper belt and other industries in both Zambia and Zimbabwe, to promote tourism, to create a valuable commercial fishing industry and to provide water for irrigation (Chidumayo 1979). Studies done on the Kariba dam have concentrated on the impact of the dam on the people.

Colson (1971) observes that massive technological development hurts. She further contends that this is a fact largely ignored by economic planners, technicians and political leaders. She argues that the construction of the Kariba Dam drastically altered the environment and uprooted population whereby making the Gwembe Tonga to be relocated in new settlement areas. This caused loss of property, key personnel who migrated to the Copper belt in search of jobs and much prized livestock through influenza. Planners in this case counted only the engineering costs but not the social costs.

The Gwembe Tonga became victims of forced change.

Government and its officials when planning to construct the dam ruled more openly by force and less by consent. This led to people to resist the new innovation of a dam construction because of the three following reasons: it threatened their basic securities; they did not understand the technical facts on which it was based; it came to them as a command from outside. This proves that the decision to build Kariba dam was made in the context of political and economic forces, many of them international in scope, with less consideration of the Gwembe Tonga. The following should have been considered before dam construction and the resettlement programme was commenced:

1.People were not given a choice to move to places of their own choice.

2.Compensation should have been paid to the local Authority to cover general losses and individuals to cover personal losses.

3.Government should have allowed the people to continue with their old agricultural methods rather than demanding them to change.

4.Food should have been supplied to those who were going to leave their garden to open new land.

The above challenges were so important to have been met by government before any disturbance to the Gwembe Tonga. Government realised its mistake 42 years later when it came up with the programme to cushion the Gwembe Tonga under Zambia Electricity Corporation (ZESCO) dabbed Gwembe Tonga Rural Development Fund. This programme was put in place to mitigate the impact of Kariba Dam Construction. The funds have been used to build the following infrastructure such as: schools, palaces for chiefs, rural health centres, animal restocking and rural electrification of Gwembe valley area. The Kariba dam project was one major development for our country. The information obtained from the Kariba dam experiences will help enhance my study on the benefits and shortcomings of damming the Chalimbana River. The satisfaction of the affected people by a particular damming project is cardinal. This should take into account impact assessment which includes all people in the reservoir, upstream and catchment areas whose properties, livelihoods and non-material resources are affected. It also includes those affected by dam-related resettlement development. Benefit-sharing for the affected people in a particular River Catchment where a dam has been constructed is appreciated through ensuring public trust and confidence. The government, developers, regulators and operators should meet all commitments agreed upon at planning,

implementation and operation of a dam. This calls for total compliance through laid down procedures. A clear, consistent and common set of criteria and guidelines to ensure compliance should be adopted and must be subjected to an independent and transparent review. The genetic nature of impacts of dams on ecosystem, biodiversity and downstream livelihoods is increasingly well known. World Commission on Dams (2000) Suggests that dams cause the following:

- The loss of forests and wildlife habitat, the loss of species populations and the degradation of upstream catchment areas due to inundation of the reservoir area;
- The loss of aquatic biodiversity of upstream and downstream fisheries and of the services of downstream flood plains, wetlands and riverine estuarine and adjacent marine ecosystems; and
- Cumulative impacts on water quality, natural flooding and species composition where a number of dams are sited on the same river.

Scarcity of fresh water worldwide has become one of the chief issues leading to controversies and at times causing conflicts. WHO (1996) asserts that water availability is severely limited in many regions of the world and this condition worsens as the population grows. Over 20 per cent of the world's population presently lacks access to clean water supply. Although agriculture is by far the largest consumer of water, the growth in demand is occurring in all sectors at a rapid rate. In many countries, competition among water users is increasing and conflicts among various groups, especially in drought prone areas is high. Conflicts over water are not restricted to developing countries. Developed countries experiencing problems of water supply include the UK, Belgium, Poland and Singapore. But the greatest concern with respect to water scarcity is in the Middle East and Africa. Conflicts over water have also been reported in India over the Narmada dam project which was first envisaged by Jawaharlal Nehru. Diehl and Gleditsh (2001) assert that the dam was part of a vision for development, but several legal and logistical arguments between various Indian states delayed the announcement of the project until 1979. Some people opposed its construction because more than 2000 000 people were to be displaced apart from damaging the fragile ecology of the region. Other reasons put forward by the activist for opposing the dam were such as submerging forest farmlands, disruption of downstream

fisheries and a possible inundation and salination of the land along the canals. The maintenance of the dam was equally going to be a problem. In what was seen as a major victory for the anti-dam activists, the World Bank withdrew from the Narmada project in 1993. Several other international financial institutions also pulled out, citing human and environmental concerns. The case was later resumed in a new twist with court proceedings which went up to the Supreme Court. The controversy over large dams on the Narmada River symbolises the struggle for a just and equitable society in India. The Narmada case study is similar to my study regarding damming of the Chalimbana River in Chongwe district. There are lessons which would be replicated to the damming of the Chalimbana River.

Vandana Shiva in Gresh (2006) affirms that, irrespective of where in the world an emergence occurs, if water is diverted from sources outside the settlement, the availability of water for the local population will be affected. Further contends that, water withdrawals at one location in a catchment will affect its availability to downstream users. In regions where water is scarce, conflicts may arise. Serious conflicts may likewise occur over the land that water engineers have to occupy in order to install, for example, dams, tanks, pipelines, defecation fields and water-harvesting catchments. Gresh (2006:12) adds that;

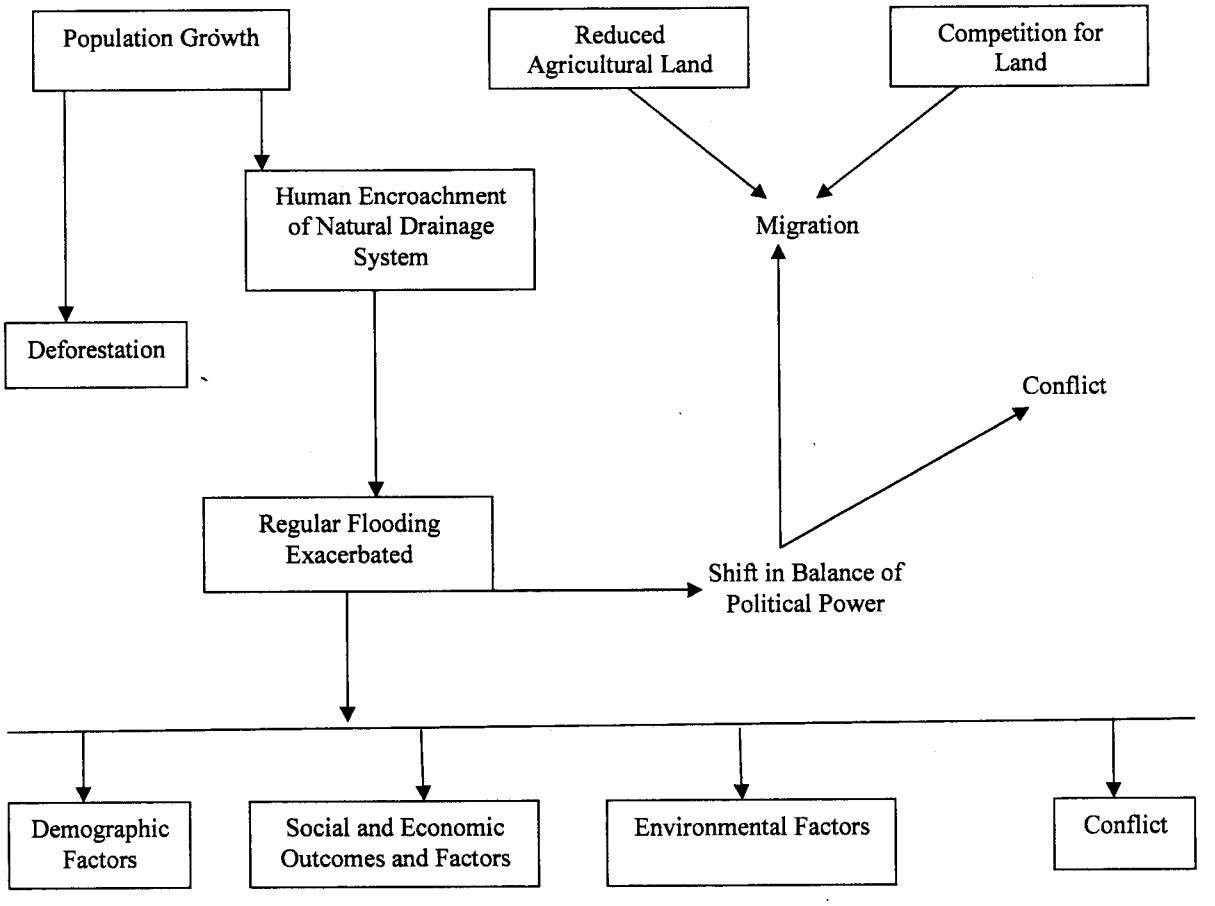
> Despite the international community's commitments many people still do not enjoy the right of access to clean water and half the world's population is in danger of running short of this vital commodity in 309 years.

From the above quote, it is clear that water is an important resource which ought to be well managed to cater for the world's growing population. This study was undertaken to show the importance of water in the Chalimbana lower catchment as well as ascertaining the conflicts which have arisen over its usage.

Environmental conflicts arise due to the complex relationships between human societies and the natural environment, largely through the exploitation of natural resources such as rearing of animals, clearing of vegetation to grow crops and human settlement. Population pressures usually cause an impact on the environment, though the extent of this impact depends on the needs, the technology and the perception of a particular

society. This perception is influenced by the economic, political and social systems within society. Figure 3 below illustrates a case in point in India. An inference can be drawn to the current problem being experienced in the Chalimbana lower catchment conflict over water management on the river course.

Figure 3: Flow Chart of Environmental Conflicts: A Case Study of India



Source: Suresh (2006)

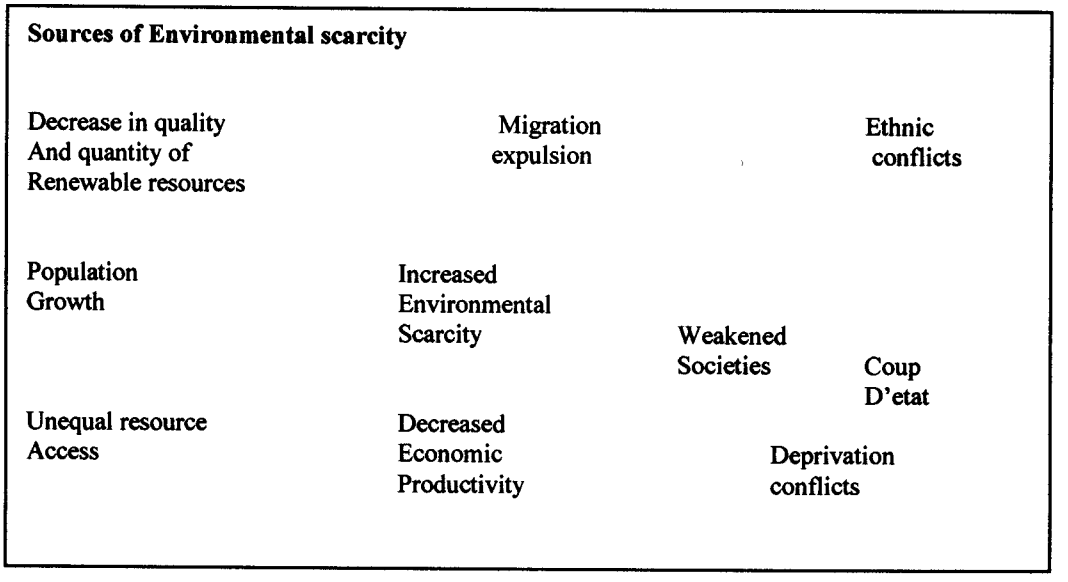
After a close look at the above figure, I concluded that there were some similarities in factors that were envisaged to trigger conflicts over the usage of water in the Chalimbana River Catchment. The figure highlighted variables such as deforestation, migration and human encroachment on natural drainage as factors that might be a source of conflict in the Chalimbana River Catchment and are also important as they influence decisions political leaders make on the usage of resources, such as water. The extent and degree of population pressure also affects people's appreciation of the environment.

2.2 Links between Population Growth, Environmental Scarcity and Violent Conflict

Giedistch and Udarl (2001) observed that Homer Dixon like other Neo-Malthusian scholars focused on population variables to explain environmental scarcity and violent conflicts between nations. Homer-Dixon viewed population pressure as closely linked to the potential scarcity of renewable resources. He added that demand-induced scarcity was primarily caused by population growth. He further contended that, if a resource base remained constant, the availability of that particular resource per person diminishes as the number of persons sharing it increases. There is also structural scarcity which applies only to certain groups, relative to other groups, who are excluded from equal access to particular resources. This was the case of Chalimbana River where water surface abstraction was dominated by commercial farmers at the expense of the local people. Such unequal social distribution of a resource does not pre-suppose actual scarcity if the resource were to be distributed evenly. The population in the catchment seem to have increased and, hence, the environmental scarcity, though violence has never been experienced in the Chalimbana basin.

On the next page, a figure is provided to show how environmental scarcity caused by population variables could be traced to social effects arising from this scarcity, such as poverty, rural-urban migration and the declining participation of the local stakeholders in management of a common resource such as water.

Figure 4: Sources and Consequences of Environmental Scarcity



Source: Homer-Dixon and BLitt (1999:50)

From the figure above, one can conclude that sources of environmental scarcity are many. But large populations in many developing countries have been cited by many scholars as being highly dependent on four key resources that are crucial to food production: fresh water, cropland, forests and fisheries. The availability of these resources determines people's well-being. The scarcity of these resources could lead to conflicts. These sources of environmental scarcity are also common in the Taliban River basin, especially the unequal resource access of river water.

Accessibility of a common resource such as water is very important in a community. But if institutions tasked to look into people's grievances become unresponsive to the needs of the community and fail to address the increasing demands of local residents, then scarcity might result into a conflict.

2.3 From Scarcity to Conflict

If the political structure fails to give the local people in the Chalimbana River basin a platform to express their grievances peacefully, then conflict is likely to occur. Water scarcity in the Chalimbana lower catchment is the main problem that could lead to a

violent conflict among water users if not treated with caution by government. Scarcity of water in the Chalimbana lower catchment was found to be a problem among the Soli Royal Establishment in Chongwe and the dam owners, hence this study. The above situation has led to some local people to adapt to this scarcity of water.

2.3.1 Humanity can Adapt to Scarcity

Homer-Dixon and other Neo-Malthusian theorists have been criticised for being too pessimistic about the relationship between population and natural resources. For example Pearce, Warford and Gresh are some of the critiques who argue that, humans have the ability to overcome resource scarcity through technology and the application of knowledge. In some cases, scarcity was attributed to social inability to utilise the full potential of the available natural resources.

The Chalimbana River damming therefore, was seen as an unequal distribution of natural resources resulting in resource scarcity. Structural differences in resource access should be viewed as a potential source of distributional conflict rather than an issue of scarcity. In certain instances, a society would enjoy a great abundance of natural resources but still face enormous inequalities. This perhaps could be the case of Chalimbana. There is abundant water in dams and if it was left to flow downstream, nobody could complain of water shortage in the lower catchment of the river. It should therefore, be noted that uneven distribution never acts on its own; its impact was always a function of its interaction with resource supply and demand.

Homer-Dixon (1999) predicted that greater resource scarcity tend to have social effects that increased the likelihood of internal conflicts. Resource scarcities could lead to constrained agricultural and economic productivity, causing widespread poverty.

Migration could be one of the solutions to resource scarcity. Migration could also be caused by the quality of the habitat as it becomes unproductive to the migrants' economic activities. This was the case with the Chalimbana lower catchment area where many people had moved to Chief Bunda-Bunda's area which had fewer commercial farmers who abstracted the surface water from rivers. It follows therefore, that if groups of people are ecologically marginalised because they are denied access to rich natural resources,

they thus exhaust a more marginal habitat. It would be argued that the actual problem lies in unequal distribution rather than availability of natural resources. This could be the case of people who have settled along the Chalimbana River especially those in the lower catchment area, who have been relocated due to damming. But it is not known whether the indigenous people who were displaced by damming were compensated. It could be argued really that benefits from environmental programmes vary from one location to another. This may lead to acknowledging objective deprivation as the case might be with the Chalimbana River damming.

2.3.2 Acknowledging Objective Deprivation

The mere fact that people are poor seldom produces strong grievances especially if they do not have strong representation as is the case of Chalimbana River damming conflict. This may lead to objective deprivation as contended by Homer-Dixon and BLitt who assume the presence of two other factors. First, the aggrieved individuals must participate in some sort of collective capable action against the authorities such as ethnicity, religion and class. People must feel the relevance of their group identity to their grievances – that they are aggrieved as a group. Cheret` (2000) observed that in the Valencia Valley in Spain, a special court was set up in the Middle Ages to settle disputes between water users and it proved its efficiency and is still operating.

Furthermore, Cheret (2000) argued that there was a link between water rights to land ownership. He suggested that the Roman law instituted this and that it was still the principle behind many laws in force today. For instance, in France the owner of a piece of land may use and abuse the rain which falls on the estate. But the water users in the upper reach should not use all the water. They should think of other users downstream. This was still the challenge being faced by Chalimbana River Catchment water users. Some commercial farmers in the middle catchment of the river may be abusing the water on their estates. Secondly the estate owners were allowed to use the water from the bordering stream to irrigate the estate provided the flow returns to the river after use. But after irrigation no water returns to Chalimbana River.

In France navigable rivers were made part of the public domain because of this link between water rights and land ownership which were limited. In Eastern European countries all the waters were part of the public "domain". However, this administrative command was a failure. It was clear that no conventional methods offer a solution that was truly adapted to modern times when not only is the demand for water close to the available resources but is changing rapidly with technical revolution. In fact no law related to water prevents the owner from choosing, alone, how to use his/her land. This is natural, but the change in land use often dramatically changes the fate of the rain that falls on the earth and thus the water resources.

In recent years the gist of modern thinking was laid down by two International Conferences in Dublin and Rio de Janeiro in 1992. One of the principles adopted in Dublin states that water is an economic good. Many economists are in favour of the market approach for water allocation and even for pollution licensing. This market mechanism is applicable to industries and municipalities in some instances, and more than doubtful for other users, notably in agriculture. Hence, the market alone cannot be the solution worldwide. This was why at the Rio Conference, it was stated that water is also a social good. This means that many people are entitled to use water when they cannot afford to pay the price. This could be managed through a "socially acceptable" way such as a central water authority. This was as noted by Cheret (2000) by delivering individual licenses when people are better informed and educated, so that they would only be frustrated if they were not allowed to take their decisions locally or participate in the national decision making process. It is therefore, important to understand the extra ordinary characteristics of water. These are:

- water is essential for life as we know it.
- water is the symbol of purity in all the religions and is present as such in people's minds.
- water is the last resort, the last pure resort in case of illness.
- water is a renewable resource but not in the same way as other renewable resources. Water does not disappear when it is used, it may evaporate, it may flow further, it may get polluted, but the same molecule of water still exists and eventually comes back through the water cycle mechanism.

Agriculture is cited by World Commission on Dams (2000) and Salman and Brad low (2006) as the largest user of water since all plant life, needs great quantities of water. This water leaves for the atmosphere through evaporation and transpiration. The same authors argue that when water is taken from a river in order to irrigate some land, practically no water returns immediately to the river.

Furthermore, Salman and Bradlow (2006) stated that, irrigation schemes located upstream from a residential area would leave no water available for the residents downstream. This was exactly the case of Chalimbana lower catchment area, which needs concerted efforts of all stakeholders along the River Catchment to avoid conflicts. This would be done by spelling out the goals of water in meeting human needs. If we consider a given river or an aquifer, what basic goals would we assign to it?

1. Generally speaking a river has to exist all year round, every year, which means that it has to offer in each stretch of its course a minimum flow. This is the first goal.
2. A river has to live and offer to its habitat and its users a minimum quality. This means that pollution has to be abated.
3. A river should not present too many high risks for its habitat and the people who live along its banks. This speaks about protection against floods and droughts.
4. Of course, similar considerations apply to the ground water aquifers which represent a fundamental resource that has to be cared for. These goals mentioned were all present when the Chalimbana River was perennial but now absent due to damming. It should also be noted that these goals would lead to a conflict if not properly harnessed.

2.3.3 Conflict Management

Conflict could be present when two or more parties perceive that their interests are incompatible, express hostile attitudes, or pursue their interests through actions that damage the other parties. Interests could differ over access to and distribution of resources, for example, energy sources such as water, petroleum and wind. Secondly,

interests could differ over control of power and participation in political decision making. Thirdly, it could be over identity. This includes cultural, social and political communities. Fourthly, it could be over status, particularly those embodied in systems of government, religion or ideology. (Schmidt 1998). Conflict could also be over the management regimes found in a range of common property resources; Forests, pastures, wildlife, fisheries, water, protected areas where access among competing users can be difficult. Natural resources are increasingly subject to intense competition. In most cases, several factors are responsible for this, including; demographic change which is compounded by population growth, migration and urbanisation. Market pressures are created by increased commercialisation, intensification and privatisation of local economies, growing integration of national and global economies as well as economic reforms. Environmental changes that force people to alter their livelihood strategies in times of floods, recurrent droughts, altered river flows due to damming and changes in wildlife migration.

These forces push people to exceed the sustainable harvesting limits of renewable natural resources such as forests and water bodies. In areas where the numbers of people were more like in the Chalimbana River Catchment, resources often needed to be shared among more users with different interests. These users range from farmers seeking access to agricultural land and water, pastoralists requiring pasture resources for livestock and city dwellers requiring more meat, fish and cereals. Securing access to resources would become people's greatest concern when those resources are scarce. Water scarcity in Chalimbana River lower catchment was a key example.

FAO (2005) argued that there are four important conditions which influence access to resources. These are: the scarcity of a natural resource; the extent to which the supply is shared by two or more groups, the relative power of those groups, the degree of dependence on this particular resource, or the ease of access to alternative sources. However, the four conditions mentioned which are usually contested on are brought about by new policies of decentralisation, devolution and increased decision making power of certain communities. But FAO (2005) furthermore, argued that, policies, programmes and projects were by themselves sources or areas of conflict, even though their intention was to reduce conflict or improve livelihoods of people.

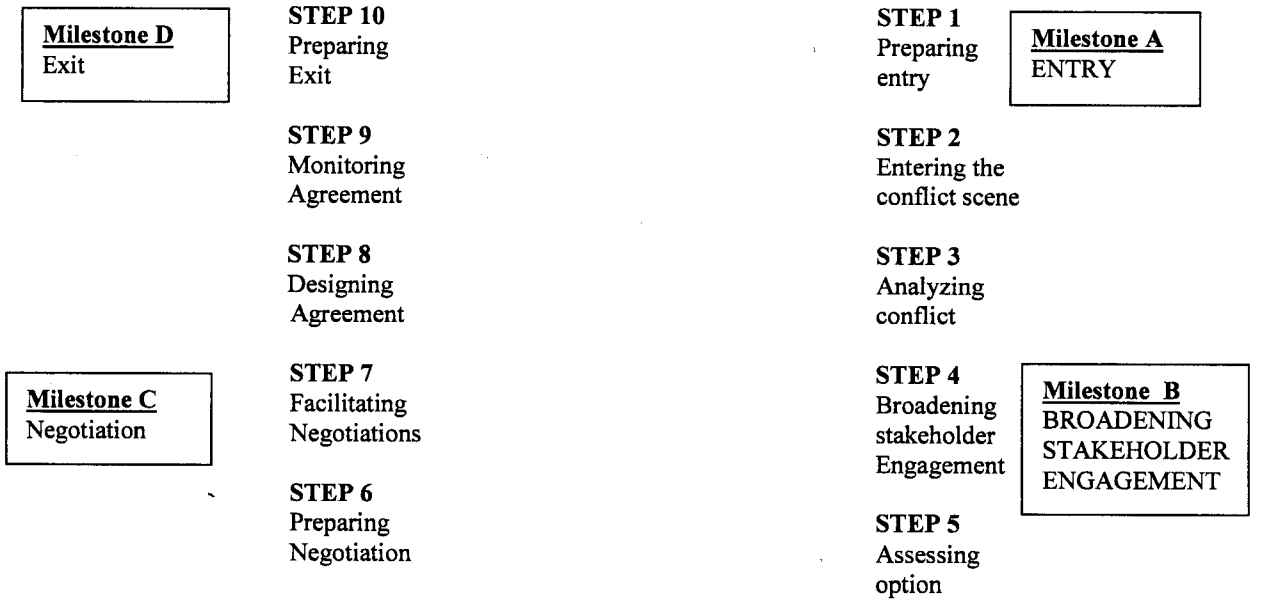
2.3.5 Policies Imposed without Local Participation

Natural resource policies and interventions are often made without the active participation of communities and local resource users. These are a followed centralised management strategies controlled by administrative units and technical experts. These often fail to take account of local natural resources rights and practices.

- Poor stakeholder identification and consultation: Stakeholders are people or groups who possess an interest in, or influence over, a resource. Conflicts can occur because planners and managers identify stakeholders inadequately, or fail to acknowledge a group's interest in a resource.
- Uncoordinated planning: Many government and other agencies still relied on sectoral approaches with limited cross-sectoral planning and co-ordination.
- Inadequate or poor information sharing: Effective sharing of information on policies, laws, procedures and objectives could improve the success of programmes and reduce the likelihood of conflicts. In contrast, lack of information on the planning agencies' intensions may lead to suspicion and mistrust.
- Limited institutional capacity: Conflicts rose when government and other organisations lack the capacity to engage unsustainable natural resource management. Not only do organisations face financial constraints for staff and equipment, but they also often lack the expertise to anticipate conflicts, or to handle conflicts that arise in the course of their activities.
- Inadequate monitoring and evaluation of programmes: Programmes and priorities are often designed without clearly defined monitoring and evaluation components, especially regarding natural resource conflicts. When there is no systematic monitoring and evaluation of natural resource management activities, it is more difficult to identify and address conflict.
- Lack of effective mechanisms for conflict management: For natural resource management programmes to be effective, mechanisms for participatory conflict management need to be incorporated into their design and implementation. These should ensure that open or latent conflicts are constructively dealt with to reduce the chances of conflict escalation.

Conflict management can be summarised by a flow chart showing the process map to conflict resolution.

Figure 5: The Process Map involving Ten Steps of Conflict Management



Source: FAO (2005:67)

The above figure would be of use if all stakeholders understand conflict resolution so that water distribution of a river is equitably done like in the Chalimbana lower catchment. Integrated water resources management is of primary concern to many conservationists and environmentalists. This is explained in detail in the next sub-section.

2.4 Managing Water Resources in an Integrated Way

As observed by many scholars there is no universally valid acceptable way to manage water resources. Each country has to adapt itself to the evolving realities, taking into account culture, existing structures, development goals and human and financial needs. Integrated Water Resources Management as explained by Cheret (2000) is a process that promoted the coordinated development and management of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.

This meant that there should be dialogue between all the stakeholders to define a possible future given the state of the water resources of a country. This would enable the people concerned to see the reality of the needs and that making the required changes was unavoidable. This also helped in examining the existing problems posed by an important resource such as water and to devise new ways of solving the problems. One way of moving along this path for instance, was to create or reactivate consultative meetings where all the stakeholders could be represented. The stakeholders include farmers (subsistence and commercial), industry managers, mayors, councillors, agriculturists and local traditional leaders with various academic and practical backgrounds. The Technical Advisory Committee (TAC) Paper (2000) defines Integrated Water Resources Management (IWRM) as a process which could assist countries in their endeavour to deal with water issues in a cost-effective and sustainable way. This was propagated by Global water partnership(GWP) to facilitate the sustainable management of water resources by fostering information exchange and helping to match needs for solutions of water problems with available tools, assistance and resources.

Integrated Water Resources Management outlines the guidelines of how the world's fresh water resources can be well looked after and distributed equitably. Water governance problems could be addressed by sectoral approaches and these have dominated the water resources management and have prevailed. The problems could have led at times to fragmented and uncoordinated development and management of the resource. Water management was usually left to top-down institutions in the country such as Water Board and Environment Council of Zambia. The overall problem was caused both by inefficient governance and increased competition for the finite resource.

According to the Global Water Partnership Paper (2000), population projections indicated that over the next twenty-five years, food would be required for another 2-3 billion people. Water was increasingly seen as a key constraint on food production, if not more crucial than land scarcity. The same paper further articulated that irrigated agriculture was already responsible for more than 70% of all water withdrawals (more than 90% of all consumptive use of water). Even with an estimated need for additional 15-20% of irrigation water over the next twenty-five years (which is probably on the low

side), serious conflicts are likely to arise between water for irrigated agriculture and water for other human and ecosystem uses.

Rivers are quite important because they protect vital ecosystems. Terrestrial ecosystems in the upstream areas of a basin are important for rainwater, infiltration, groundwater recharge and river flow regimes. Aquatic ecosystems such as the Chalimbana River basin produce a range of economic benefits, including products such as timber, fuel wood and medicinal plants and they also provide wildlife habitats and spawning grounds. The ecosystems depend on water flows, seasonality and water table fluctuations and have water quality as a fundamental determinant. Land and water resources management must ensure that vital ecosystems are maintained and that adverse effects on the other natural resources are considered and where possible ameliorated when development and management decisions are made. Almost all the fresh water available for human use originates from precipitation, which varies immensely over time and space. Most tropical and sub-tropical regions of the world are characterised by huge seasonal and annual variations in rainfall, often compounded by erratic short-term variations. Such manifold increased the demand for infrastructure development and the need to manage water demand and supply. Managing water availability in the poorest countries with the least financial and human resources was clearly the greatest challenge to cope with the problem. The effects of global climate change may add further to this challenge.

Dam building, therefore, was the answer to rainfall variability as water was stored for both domestic and industrial use. Public awareness was needed in order to mobilise effective support for sustainable water management and induced changes in behaviour and action required to achieve this. Additionally, public awareness and subsequent pressure for action was vital in fostering the political will to act. This posed a major challenge on water resources management. To strike a balance between the uses of the resources as a basis for livelihood of the world's increasing population and the protection and conservation of the resource to sustain its functions and characteristics led to challenges of water resources management.

2.5 The Challenge of Water Resource Management

The traditional sectoral and fragmented approach to water resources management has often led to governing bodies representing conflicting interests. Policy objectives have been set without consideration of the implications for other water users and without consultation across sectoral and institutions found in the catchment area. This can be likened to what has happened to Chalimbana River Catchment. Government and other interested parties are trying to address the conflicts now when water as a resource has become scarce. The International Conference on Water and the Environment in Dublin, 1992 came up with four principles which acted as a guide to Integrated Water Resources Management (IWRM) as follows:

(i) Fresh water is a finite and vulnerable resource essential to sustain life, development and the environment.

(ii) Water development and management should be based on participatory approach; involving users' participation is an instrument that can be used to pursue an appropriate balance between a top-down and a bottom-up approach to Integrated Water Resource Management.

(iii) Involvement of women in decision-making; women's participation as decision-makers is interwoven with gender hierarchies and roles within different cultures leading to the existence of communities that ignore or impede women's participation in water management. It is widely acknowledged that women play a key role in the collection and safeguarding of water for domestic and in many cases agricultural use. However, they have a less influential role than men in management of water as a resource. Therefore, there is need to increase women's access to decision-making and widening the spectrum of activities through which women can participate in Integrated Water Resources Management (IWRM).

(iii)Water has value as an economic good; many past failures in water resources management are attributed to the fact that water has been and is still viewed s a free good, or at least that the full value of water has not been recognised. In a situation of competition for scarce water resources, such a notion may lead to water being allocated to low-value uses and provides no incentives to treat water as a limited asset. Maximum benefits from the available water resources can only be attractive if there is change to perceptions about the value of water by

recognising the opportunity costs. The demands of downstream users to share the available water resources and the usability of the resource are very critical. Excessive consumptive use or pollution of water by upstream users may deprive the downstream users of their legitimate use of the shared resource. This clearly implies that dialogue or conflict resolution mechanisms are needed in order to reconcile the needs of upstream and downstream users.

2.5.1 Participatory Approach to Water Management

Water as a resource calls for real participation. Water is a subject in which everyone is a stakeholder. Real participation only takes place when stakeholders are part of the decision-making process. Local communities should come together to make water supply choices in the presence of management. Democratically elected representatives should represent stakeholders groups in the decision-making process. Participation should be in form of a stakeholder meeting drawn from all levels of the social structure to have an impact on decisions made. This is always done to defuse political opposition or delay in the implementation of measures, which could adversely impinge upon powerful interest groups. Participatory approach achieves long-lasting consensus and common agreement. Participation is about taking responsibility, recognising the effects of sectoral actions on other water users and aquatic ecosystems and accepting the need to change to improve efficiency of water use and allow the sustainable development of the resource.

Planners and policy-makers at all levels should be consulted to achieve consensus.
Women play a central part in the provision, management and safeguarding of water as such they should be major stakeholders if any project has to succeed. Water has an economic value which all its competing users should recognise to attain its full economic good.

2.5.2 Water as a Finite and Vulnerable Resource

For this principle to be achieved there is need for a holistic approach to management, recognising all the characteristics of the hydrological cycle and its interaction with other natural resources and ecosystems. Secondly, the principle also suggests that fresh water

resource may be regarded as a natural capital asset, which needs to be maintained to ensure that the desired services it provides are sustained. This principle conforms to the reasons for this study whose sole aim was sustainability of the river.

The water as a vulnerable resource is greatly affected by human activities. These reduce the productivity, availability and quality of water. Actions such as mining of ground water, polluting surface and ground water and changing land use (aforestation, deforestation, and urbanisation) alter flow regimes within surface water systems. The aforesaid actions are further compounded by upstream-downstream user relations. Human activities lead to the need for recognition of linkages between upstream and downstream users of water. The effects of these human activities by upstream users at times legitimise the current problem of water scarcity in lower catchment of the river.

Zambia has an estimated annual rainfall of between 100mm in the south and 1 400mm in the north, with an extensive river network, lakes and a number of aquifers in various parts of the country. The irony is that these water resources are not properly managed. The management of these resources is critical if equitable access by competing needs particularly the vulnerable poor, women and children were to be considered.

In addition, there are significant variations across the country with strong seasonal distribution leading to water deficits in specific localities. In certain areas, competition for available water resources has already manifested itself such as among the farming community in the Chalimbana River Catchment area, east of Lusaka. Conflict over water was likely to increase with the economic development in the country. Adam Hussein, the Partnership for Africa's Water Development (PAWD) Chairman noted that people need water and action should be taken to create access to safe, consumable water to the people of Chalimbana catchment because it was not only a basic human need but a human right. He argued that our goal was to raise money for the construction and maintenance of clean water including dams in the area.

The unspoiled forests that covered the catchment to protect the headwaters and recharge areas have continued to diminish due to deforestation leaving the area bare in many

places. This has led to increased run off and erosion. This has eventually led to the current worrying situation of the river and reduced base flows. Population and settlement patterns have also increased overtime and water use activities have developed with many commercial interests. Consequently, water has become inadequate for the various users with some of them going without water as the river flows continue to decline with some parts of the river drying up during the dry season.

It was clear that the situation was getting desperate and needed a new approach to address these issues. The Zambia Daily Mail (2007, 21st May) observed that economic development in general had been slow in the region because of a wide range of factors-lack of water being probably the main contributing factor. An activist, Kunda Chimambo, a community teacher in Zambia's Chalimbana River Catchment area east of Lusaka, made a passionate appeal to the Zambian government to protect water recharge areas in forests so that there is a continuous flow of water to rural communities. Chimambo (in Zambia Daily Mail (2007, 21 st May) charged that,

> if recharge areas are degraded, the poor become more vulnerable and this complicates their livelihoods because the quality and quantity of water become scarcer. The main challenge of our generation is to help the poorest of the poor to escape the misery of extreme poverty so that they begin their own ascent up the ladder of economic development.

SADC recognises that water is the engine for economic growth and that member states have adopted Integrated Water Resource Management (IWRM) as a fundamental approach to water resources management to ensure that water is adequately contributing to poverty eradication, regional integration and socio-economic development in a sustainable manner. Zambia's Permanent Secretary for Economic Planning in the Ministry of Finance and National Planning, James Mulungushi, as quoted in Zambia Daily Mail (2007) at the same meeting said that water was a cross cutting issue in all sectors of economic development, like gender and environment. There was need for all actors in the planning process to involve all stakeholders and not only water engineers and natural resource conservationists. He charged that there was need to make different

sectors appreciate the role of water and to ensure that there was bottom-up and top-down planning. Mr. Mulungushi said if water was a key ingredient in economic development, there was need to conserve it and use it in a sustainable way. He further added that this called for collaboration by all stakeholders at all levels including the catchment areas.

Mr. Makumbe, the SADC Director of Infrastructure and Services, said SADC was addressing the water management challenges in the region through a number of programmes and projects that form part of the Regional Strategic Action Plan for Integrated Water Resources Development and Management, which was a component of the Regional Indicative Strategic Development Plan, (Zambia Daily Mail, 21 st may, 2007).

The above instruments do provide a framework for sustainable, integrated and coordinated development, utilisation, protection and control of national and trans-boundary water resources in the SADC region for the promotion of socio-economic development, regional integration and improvement of the quality of life to all people in the region. Arising from the above concerns, there was a need to consider designing an education programme for the residents of Chalimbana River Catchment area.

2.6 The Role of Environmental Education in Development

Environmental issues can arise from economic and developmental projects such as the damming of the Chalimbana River. Environmental Education (EE) World-wide has shaped responses to environmental issues and risks in a contextual approach such as the implementation of various strategies which include community based Natural resources Management, Eco-Tourism and Agro-Forestry. According to (IUCN:1971), Environmental Education is the process of recognising values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relatedness among human beings, their culture and their biophysical surroundings. Environmental Education also entails practice in decision-making and self-formulating of a code of behaviour about issues concerning the quality of the environment. This definition becomes the basis for adopting other environmental frameworks such as the Tbilisi Inter-Governmental Conference on Environmental in Russia in 1971 and the

Agenda 21 which was 'born' in 1992 at United Nations Conference on Environment and Development (UNCED) in Brazil.

The two conferences recognised education as a process by which human beings and societies could reach their fullest potential. Furthermore, education was given high recognition as it is critical for promoting sustainable development and improving the capacity of people to address environmental and developmental issues (MOE: 2006).

In line with the above recognition of education, it could also lead us to observe some of the education implications of dam developments such as the Chalimbana River damming and also raise questions about sustainable development. It could also help to critically review some widely held assumptions about development and the orientation to development widely practised in Zambia.

Education is indispensable to changing people's attitudes towards sustainable development concerns. Education promotes values and attitudes, skills and behaviour consistent with sustainable development and allows effective public participation in decision-making. Environmental education could in this regard help to bring out the perceived conflicts that arise from damming of the Chalimbana River, which reduces access to and use of the natural resources such as water and thereafter raise questions about sustainable development. This would provide us with the opportunity to critically review the rote of environmental education processes in development. Palmer (1998) contends that to fully understand the rote of environmental education on development, we should follow the Tbilisi report which states state that Environmental Education:

- is a life – long process;
- is inter- disciplinary and holistic in nature and application;
- is an approach to education as a whole, rather than a subject;
- concerns the inter-relationship and inter-connectedness between human and natural systems;
- views the environment in its technological, moral, aesthetic and spiritual aspects;
- recognises that energy and material resources both present and limit possibilities
- encourages participation in the learning experiences;

- emphasises active responsibility;
- uses a broad range of teaching and learning techniques, with stress on practical activities and firsthand experience;
- is concerned with local to global dimensions, and past/ present/ future dimensions;
- should be enhanced and supported by the organisation and structure of the learning situation and institution as a whole;
- encourages the clarifications of values and the development of values sensitive to the environment;
- encourages the development of sensitivity, awareness, understanding, critical thinking and problem solving skills; and
- is concerned with the building of an environmental ethic.

These principles have become the cornerstone of each and every developmental plan in the world. Therefore, environmental education would be of use in understanding the nature and magnitude of water resource management in the Chalimbana River Catchment. It would also support the development of appropriate curriculum to be taught to the residents of Chalimbana.

2.7 Localisation of Curriculum

Zelinsky (1973) suggested that there was need to apply geographic knowledge and expertise to the solving of future problems in conjunction with a necessary transition of society. Luangala and Simuchimba (2002) revealed that teachers' views on the local curriculum in Mumbwa were important as it would energise local development activities. In the case of Mumbwa, teachers cited farming first and foremost. Poaching was also to be included on the curriculum as it was becoming too worrisome.

The local curriculum in this regard should be envisaged as a vehicle, which would link formal education to their day to day life. Wickenberg *et al.*, (2004), suggested that in order to motivate pupils to learn about how to care for their environment, it was necessary to start with experiencing their natural environment. McGiven (1993)

suggested that the opportunity of knowledge to understanding and appreciating of principles relates to the following:

(i) the basic character of pupils' local environment.

(ii) the 'home' area as part of a more general study of the wider region of which the 'home' area is a part.

(iii) major problems of a geographical nature arising from man's relationship with his or her environment.

This was the type of environmental education that was needed in formal education to relate environmental problems and the school curriculum. Lawton (1983), observes that effective teaching and learning as well as understanding environmental concerns most often starts from a home. It was for this reason that, the local curriculum concerning the damming of the Chalimbana River of Chongwe was to be considered as a priority in resolving the conflicts concerning the usage of water in the river.

Wickenberg *et al.*, (2004), further subscribe to this school of thought, which considers environmental education for school children to be local, specific, practical and activity based, including both the ecosystem and a social entity, as an appropriate starting point. MOE (2000), stated that the Ministry of Education also placed great emphasis on reforming the education system, making it more relevant and effective for society as well as for individual educational needs. This was the basis on which this study was undertaken. The Ministry of Education defines the school curriculum as a specification of the desired knowledge, competencies, skills, values and attitudes which school children in Zambia need to achieve. All this pointed at children in the study to be of keen interest to come up with a localised curriculum.

Furthermore, MOE (2000) suggested that a curriculum was a much wider concept of development of the knowledge, competencies, skills, attitudes and values of the child. Actually, the entire personality of the learner was the target of teaching, not only the traditional academic skills. It also was noted that learning influenced attitudes, affects changes in behaviour and development of emotional, spiritual and physical aspects of the pupils. Educating Our Future (1996:29) states that:

> Formal education must provide for all categories of learners; Basic education aims at providing each pupil with a solid academic and practical foundation that will serve as the basis for a fulfilling life and that will equip each one with the pre-requisites needed for working life, various forms of training or the continuation of school education.

The MOE (2000:17) argues:

> Each school is encouraged and expected to add to develop a localised curriculum to be designed by the school head and the teaching staff, in consultation with the local education authority, e.g. Education Board and the District Education Board Secretary.

MOE (2000), further states that the curriculum could be localised in terms of content, methods, materials and time allocation. MOE (2000) observed that the school was not required to have its localised curriculum approved centrally but it cautioned against deviating from the policy principles and the learning objectives stated in the "Educating Our Future". The local curriculum provides freedom to add content of particular relevance to the school and also to use teaching approaches and materials which are linked to the local conditions. The intended effect of localised curriculum policy was to achieve increased teaching and learning, inherent in the adaptation to the local environment.

Curriculum studies have certain laid down procedures from which this study borrowed ideas concerning a localised curriculum. Urevbu (1985) observed that there are four central questions of curriculum namely:

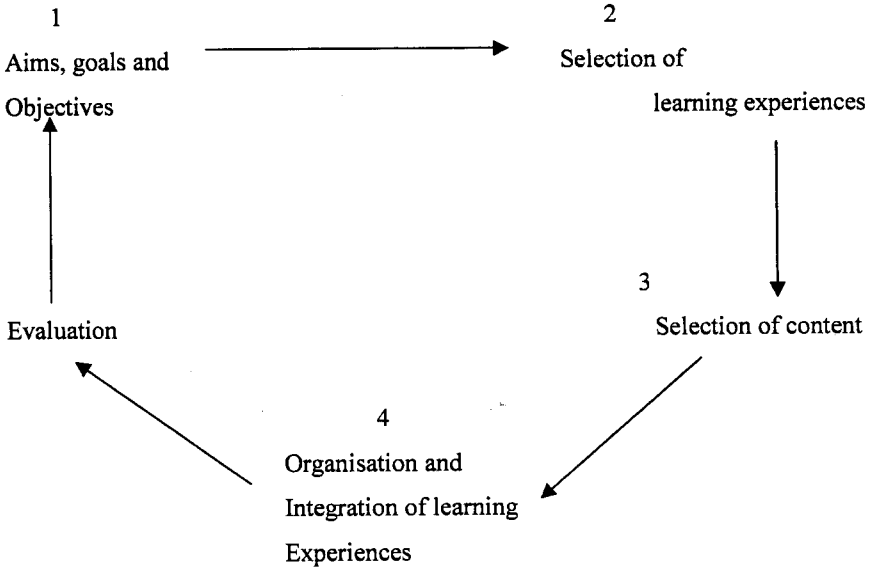
1. Epistemological (what should be construed as school knowledge, or simply what should we teach?)
2. Political (who should control its selection and distribution and which groups of population gets taught what?)
3. Technical (how shall curricula knowledge be made accessible to students, or simply how should it be taught?)

4. How should the various components of the curriculum be organised to form a coherent whole?

The content which was included in the localised curriculum was greatly influenced by the knowledge of the local people. The participation of the stakeholders in the selection of what was to be taught was also of great importance as this gave direction to the curriculum. Stakeholder's accessibility to knowledge in this study was cardinal as it influenced the management of water as a resource.

Wheeler's model is commonly used by educationist and it helped the researcher to draw up the curriculum using the local environment. This model emphasises what goes on in a learning process, where the teacher uses aims, goals, and objectives to determine learning outcomes. The model was used as a guide in drawing up the curriculum of Chalimbana lower catchment area. The model suited well with the pupils' and teachers' views on what were to be included in the curriculum. The wheeler model is illustrated in Figure 6.

Figure 6: Wheeler's curriculum model



Source: Urevbu (1985 p22)

Figure 6 shows the supposed sequence in the implementation of a curriculum. It was partly in view of this general context that the development of a local curriculum of the Chalimbana lower catchment was necessary. This leads to critical issues in modern

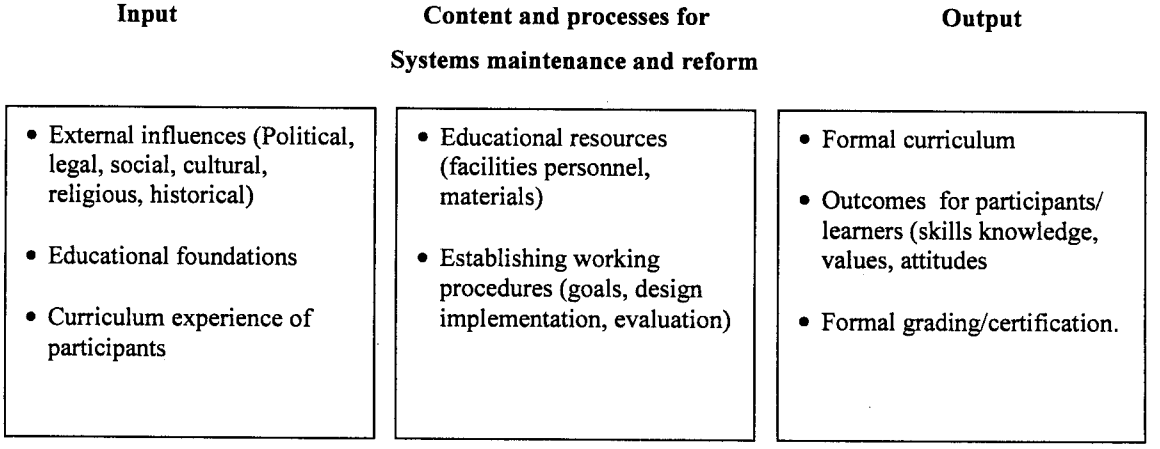
education to be considered whenever a local curriculum has to be designed in subjects in the social sciences.

2.8 Critical Issues in Modern Education

Curriculum development in recent years has taken a new dimension in Geography and Environmental Education. An individual's influence on the environment and actions taken to change the earth's surface tend to direct the sequencing and presentation of the content of curriculum. The rationale for curriculum changes in Africa, to a large extent, is determined by the socio-political education of the people and economic development of the countries (Dekker and Mtemmer, 1993).

There are different theoretical approaches which have been used in research or in implementing educational change and curriculum reconstruction. One is the technicist approach which is often reported in literature as systems approach. Systems approach analyses curriculum change in terms of inputs, processes and outputs/outcomes. The systems approach was used in the Chalimbana lower catchment basin because social, cultural and historical influences as well as the experience of stakeholders were exploited to come up with the curriculum. Below is a figure that could help understand the systems approach to curriculum change.

Figure 7: A systems approach Model



Source: Beauchamp and Beauchamp (1972: 5)

The systems approach can also be used in coming up with a new curriculum as it calls for certain factors or indicators which make a demand on what is being taught to be changed. These indicators include economic realities or political changes in society or that

particular structure of the education system. In Zambia's Education for Development proposal of 1976, it was suggested that there should be no rigid, hierarchical difference in terms of primary, secondary and higher education and that productive work should be incorporated with the rest of the curriculum.

Lulat (1982) suggested that although some radical proposals were made with regard to the curriculum system and curriculum content, these never moved beyond the drawing board. Lulat (1982) further observed that this could be cited as one of the major disadvantage of centralised reform and curriculum reconstruction. This study used modern methodologies in drawing the curriculum which are based on the following principles:

(i) The role of curriculum in non-formal and formal education.

(ii) At what level does curriculum change take place, the macro-level (National) or the Micro-level (school, classroom?)

(iii)Is the restructuring limited to the education system or does it coincide with the major social, political or economic transformations?

(iv)Who benefits most from the curriculum changes, pupils, teachers, education departments, politicians, industrialists or the masses?

It was viewed that both school going children and residents of the Chalimbana lower catchment basin would benefit from a localised curriculum. This research has attempted to incorporate the teachers at curriculum planning level in the Chalimbana catchment area. Beauchamp and Beauchamp (1972) affirmed that the more removed the curriculum planning function was from the classroom teachers, the more restrictive the curriculum was upon the professional judgment of teachers. This problem could also have contributed to the failure of the Zambian reform proposals of 1976. Only certain sections of the population were consulted before hand, not using the existing part structures with grassroots cells. In this regards teachers, students and communities should be consulted before hand. They then should be asked for voluntary participation and sustained commitment after implementation of the curriculum. Thus, in turn people would be delegated with responsibilities as well as provided with resources to develop their own skills and capabilities.

CHAPTER THREE

METHODOLOGY

3.1 My Interest in the Research Subject

I became interested in water related research when I was given the responsibility for water and sanitation by National In-service Teachers' College (NISTCOL) administration while lecturing at the college. I am also a member of the Environmental Education Committee at the same institution under the Primary Teachers Diploma by Distance Learning.

The college had been pumping water from the Chalimbana River to the main tank since 1965. In 1982 the Chalimbana river lower catchment dried up for the first time forcing people to use other sources of water. The college decided to sink the first borehole in 1985 near the Chalimbana Bridge on the road to Lwimba. In 1990, when I went to Chalimbana to study, I found the water problem in the Chalimbana lower catchment area. In 2002, I was appointed senior lecturer at the same institution and found that the water problem had continued. I thus developed an interest to undertake this study. The research sought to find out the educational implications of damming the Chalimbana River.

3.2 Why Lower Chalimbana Catchment as an Area of Focus

Taliban lower catchment experiences water scarcity in the dry seasons. The researcher is a resident in the lower catchment familiar with the problem. The study had support and funding of the local community and the National Institute for Scientific and Industrial Research.

Secondly, there has been a lot of controversy regarding water resource management, especially dam development in Chongwe district. The choice of this area was due to the suffering experienced by local people and their animals during the dry season. Perhaps this draws attention from donors and policy makers to come up with an Integrated Water

Resources Management programme in the country. Thirdly, this study indirectly provides a challenge to leaders and pupils in the lower catchment of Chalimbana River to contribute to the scientific research. It also gives them a chance to help in the designing of an educational programme which will be localised to avert conflicts on water in the near future.

3.3 Study Design

The methodology used in this research was evaluative and descriptive. To some extent, comparative studies within Africa and other continents were done in order to come up with informed decisions on how water resources are governed elsewhere. The research examined the history and frequency of conflicts over water as a resource in other parts of the world from time immemorial.

3.3.1. Sources of Data

The data was collected from primary and secondary sources.

Secondary Data

The researcher used a variety of literature. The most helpful were the publications by World Commission on Dams, and the water policy document produced by Ministry of Energy and Water Development in Zambia. These publications gave the researcher an insight into damming problems and conflicts related to water in general. World Bank regulatory frameworks for water resources management publication also helped in making a comparative study on water at continental and regional levels.

Primary Data

Another dimension of the study was to come up with the source of conflict. This involved getting views of dam owners, water board officials, agriculturalists, local farmers and Her Royal Highness Chieftains Nkomeshya Mukamambo II. In depth individual interviews as well as administering of questionnaires and data recorded from observations was used to come up with informed decisions about water management.

Key Informants

These included dam owners, water board officials, social welfare officer,2 village head men in the Chalimbana river lower catchment area, teachers, pupil's, agriculturalists, local people and Her Royal Highness Nkomeshya.

Group Interviews

This was a good source of information since focus group discussions were used to collect data. The discussants were grouped according to their gender. This made the discussants free in their deliberations. This was to asses which gender was more responsive to water related problems in the Chalimbana lower catchment.

The study was descriptive in the sense that it involved bringing out and documentation of experiences of people found in the catchment area. These included teachers, pupils, dam owners' water board officials and the domain or location of the conflict. The overall dimension of the study is to help come up with an educational programme designed to address conflicts arising from the damming of Chalimbana River. This led the researcher to ask for suggestions from teachers, parents, pupils and other educationists on the content of the Geography and Environmental Education curriculum for Grades 8 and 9.

The study was also both qualitative and quantitative in design. It was qualitative in that subjective views of teachers, pupils, local farmers, dam owners, water board officials and Her Royal Highness Nkomeshya were captured. These included experiences, views, challenges and opportunities. The study also sought to establish a variety of responses to various themes that were coming out from the content. Hence, certain responses were quantified into percentages. This made the study a quantitative design.

3.4 Qualitative and Quantitative Techniques of the Study

3.4.1 Research Instruments

This research employed separate questionnaires for the different stakeholders. These have been appended as proof for obtaining primary data. Interviews and focused group discussions were conducted in Nyanja and Soli languages, which are commonly spoken

in the Chalimbana River Catchment area. This was facilitated by one research assistant who is a native in the area, chosen on the basis of his ability to speak and write English. This reduced the risk of misrepresentation, problems of communication and time spent on the research methodology.

3.4.2 Study Population

The study population included all Geography teachers in the three selected schools in the lower Chalimbana catchment area of Chongwe district, all Grades 8, 9, 10 and 12 pupils taking Geography, dam owners, local farmers, the Royal Establishment of Nkomeshya Mukamambo II, water board officials, agricultural officers, and social welfare officers.

3.4.3 Study Sample and Sampling Procedure

The sample cònsisted of thirty Geography teachers who were teaching Grades 8-12 at the three schools in the lower Chalimbana River Catchment area namely; Chongwe High School, Mukamambo II Girls High School and Chalimbana Basic School. Sixty pupils (thirty boys and thirty girls), thirty local farmers, two village headmen, one dam owner, one forester, one social worker, two agricultural officers, two water board officials and the Royal Establishment of Chieftainess Nkomeshya. The total sample came to 130. Purposeful sampling technique was used to elicit the data from key informants. It is also important that manageable samples in a qualitative study give an in depth study of the community under study.

3.4.4 Procedure of Data Collection

I was assisted in data collection by a research assistant. The research assistant was a local person who was conversant in both Soli and Cinyanja, languages spoken in the Chalimbana area. The sampling frame for Chalimbana Basic School was arrived at by selecting twenty pupils randomly. These pupils were in Grades 8 and 9. They were selected on account of their having stayed long at the school (From Grade 1). For Chongwe High School, the same method was used. Only Grades 11 and 12 pupils were picked. The Geography teachers assisted in picking pupils, who were categorised in low, average and above average performers. Most respondents volunteered to be part of the sample. This was also the case of Mukamambo Girls High school.

Local farmers interviewed or given questionnaires are those who do bank farming of gardens along the Chalimbana River. Others were pastoral farmers whose animals depend on river water for drinking. Other key informants were picked on the basis of their roles in the Chalimbana River Catchment area. Examples of such key informants are water board officials representing the Ministry of Energy and water Development.

The Chieftainess and village headmen are custodians of the land. Dam owners who are settled in the middle catchment of Chalimbana River are key stakeholders who divert the water, which is a source of conflict between the middle and lower catchment users. For informants who could be grouped, discussion was used i.e. pupils, teachers and farmers. All the informants in this study have information which can lead to conflict resolution and drawing up of an educational programme to avert future conflicts on water resource management, especially the young generation who will be future leaders of the nation and Chongwe district in particular.

3.5 Data Processing and Analysis

Data was analysed qualitatively and quantitatively. Interview notes were transcribed by writing into readable notes. Content analysis of the responses was done whilst in the field. The responses from the respondents were then categorised under themes such as Educational Implications of Damming the Chalimbana River, Source of Conflicts, Policy, Integrated Water Resource Management, Conflicts Resolution and Ecological Benefits of Damming. The researcher came up with simple tables, graphs, charts and percentages for the responses given. Secondary data in this study was used to confirm the primary data given by the respondents in the field by either agreeing or contradicting it.

This study had challenges such as language, which was not so familiar to the principal researcher, since he does not hail from this area. This meant a lot of time to translate questions into soli and cinyanja. The purpose of this chapter was to describe the methodology used in the research. The next chapter presents the findings of the study.

CHAPTER FOUR

RESEARCH FINDINGS

This chapter presents the findings. The presentation is structured according to the data collected, i.e., local people, the teachers, pupils, dam owners, agricultural officers, social workers, water board officials, the Royal Establishment and Environmental Council of Zambia officials. The study focused on capturing views, experiences and opinions of key informants in the Chalimbana River Catchment.

4.1 Characteristics of Respondents

The table below shows the age groups as well as the professional qualifications which influenced the views concerning damming of the Chalimbana River.

4.1.1 Distribution of Sample by Age Group

Table 1: Ages of the Respondents

Age Group	Local people	Royal Establishment	Teacher	Pupil	Dam owner	Water Officials	Social Worker	ECZ Official	Agric Officers
10-21	0	0	0	55					
21-30	5	0	10	5					
31-40	5	0	20						
41-50	20	0	0						
51-60		2	0		1	2	1	2	2
60/over									

The table shows that most respondents were the youths (pupils). This was followed by the local people who were middle aged and the oldest were members of the Royal Establishment. This information gives the description (age) of the stakeholders who were involved in conflict management. Their views were important in coming up with a local educational curriculum.

4.1.2 Qualifications of Respondents

Table 2: Qualifications of Respondents

	Local people		Royal Establishment		Teachers		Dam Owners		Water Board		Social Workers		ECZ		Agric	
Certificate	28		2													
Diploma	2		0		25						1				2	
Degree	0		0		5		1		2				2			
Other	0		0													
Gender	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
	20	10	1	1	15	15	1	0	2	0	0	1	1	1	1	1

The table shows that most of the respondents were diploma holders. These were followed by certificate holders and the least of the respondents were degree holders. Pupils' qualifications were ignored.

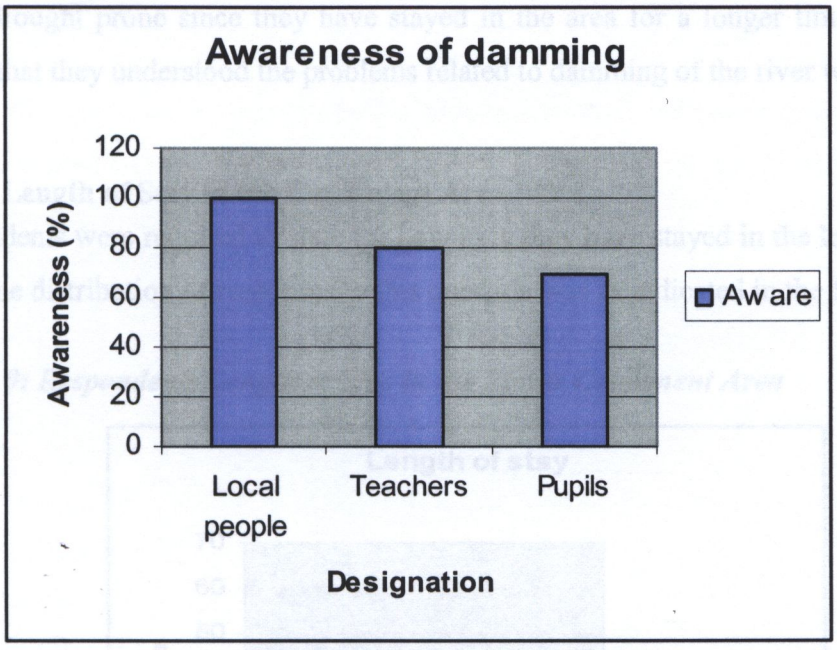
4.2 Perceived Problems about Damming of the River

Dams hold back water for various uses and usually it is for economic purposes. The problems created thereafter are difficult to resolve. But here are some of the articulated problems as viewed by the respondents in the field.

4.2.1 Awareness of Damming Chalimbana River

In response to the question of whether the respondents were aware of the damming of the Chalimbana River, responses are summarised in Figure 8 On the next page.

Figure 8: Respondents Awareness about Damming of the River



Source :(Field data, 2008)

Figure 8 shows that all the local people interviewed were aware of the damming. 80% of the teachers were aware. Of the pupils, 70% were aware of the damming.

4.2.2 Incidence of Drought

Respondents were asked to state whether or not the study area was prone to drought and their responses are represented in Table 3.

Table 3: Awareness of Drought among the Respondents

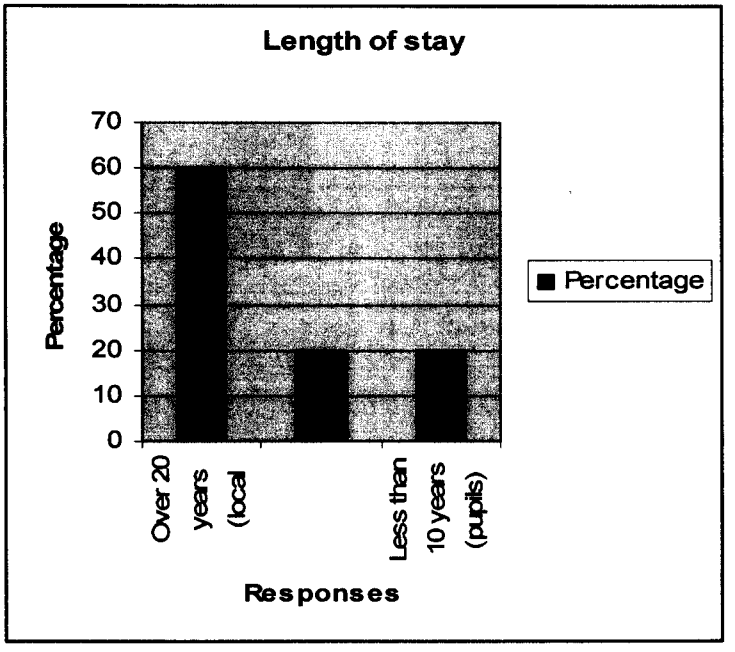
Respondents	No. of Respondents	Percentage
Local People	30	38.55
Pupils	26	33.73
Teachers	20	24.09
Dam Owners	1	1.20
Royal Establishment	2	2.4
Total	**83**	**100**

Table 3 reveals that the local people were the most aware regarding the area being drought prone (38%), followed by pupil's (33.73%) and then teachers (24%). The least aware were the dam owners (1.2%). The local people were the most aware of the area being drought prone since they have stayed in the area for a longer time. It is for this reason that they understood the problems related to damming of the river well.

4.2.3 Length of Stay in the Catchment Area

Respondents were required to state for how long they have stayed in the lower catchment area. The distribution of responses to this question was as indicated in the figure below.

Figure 9: Respondents Length of Stay in the Lower Catchment Area



Source :(Field data, 2008)

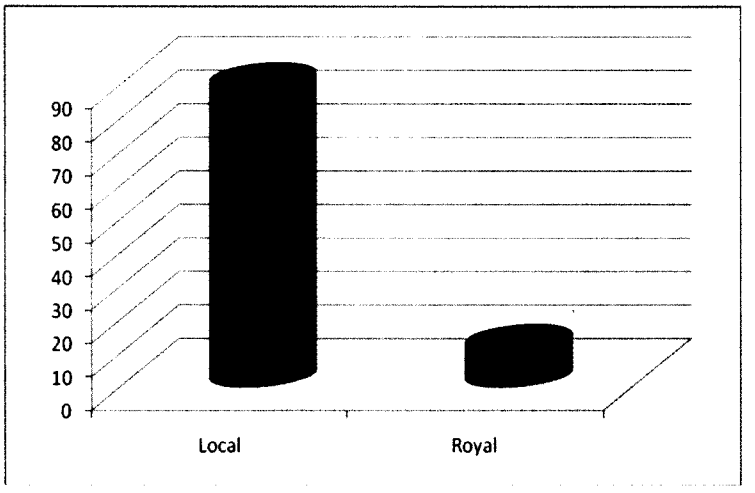
Figure 9 above shows the majority of respondents, who were local people (60%), said they had stayed in the lower catchment area for over twenty years. Some teachers and pupils (20%) both said they had stayed in the area for less than ten years. The highest responses came from the local people. This finding helped in the description of the conflicts generated by the damming of the river.

4.2.4 Consultation before the Damming of the River

Respondents were asked to explain whether they were consulted before damming the river. The responses are represented in Figure 10 below.

Figure 10: Respondents' Views about Consultations before Damming of the River

The figure below reviews the 'No' responses given by the local people and the Royal Establishment on the damming of the river.



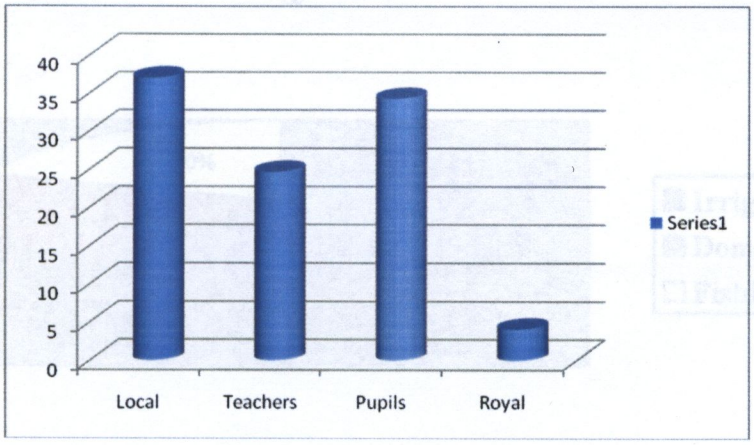
Source:(Field data, 2008)

Figure 10 reveals that most of the local people (90%) denied being consulted before damming the river. The Royal Establishment equally denied being consulted (10%). These findings confirm the outcome of the investigation on the conflict arising from damming of the Chalimbana River.

4.2.5 Problems Concerning the Damming of the River

The respondents were asked to mention whether or not they were problems concerning the damming of the river. The distribution of responses to this question was as indicated as on the next page.

Figure 11: Problems Identified by Respondents Concerning the Damming of the River



Source:(Field data,2008)

The figure above shows that the local people were the most aware regarding problems concerning the damming of the river (35%), followed by Pupils (33%), Teachers (23%) and the Royal Establishment were the least (3 %). This finding helped to ascertain that there was really a problem concerning the damming of the Chalimbana River and that the conflict over the management of water was unavoidable.

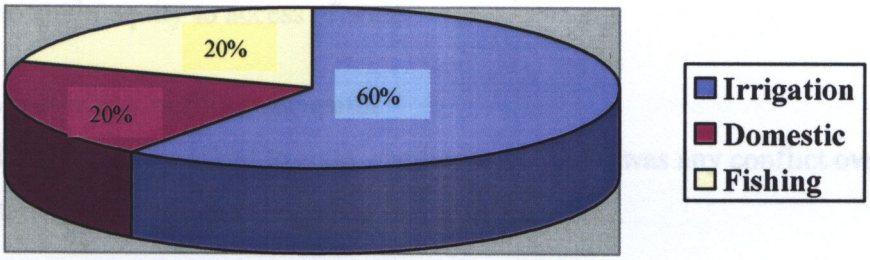
4.3 Economic Activities Related to Damming of the Chalimbana River

The economic activities that people involve themselves in can sometimes have a direct effect on them. The effect can either be negative or positive on the environment as well as the people themselves. Chalimbana people engage themselves in different economic activities.

4.3.1 Positive Effects of Damming the River

The respondents were asked to state whether there were positive effects of damming the Chalimbana River. The distribution of the responses is indicated in Figure 12 on the next page.

Figure 12: Positive effects of Damming the River as Identified by the Respondents



Source :(Field data, 2008)

Figure 12 above shows that the most favoured positive effect was irrigation (60%), then domestic (20%) as well as fishing (20%). This finding was relevant to the research and its objectives because it gave a base of the source of the conflict, which was irrigation. Irrigation was the major reason for damming the river by commercial farmers, who are also the dam owners in most cases.

4.3.2 Negative Effects of Damming the Chalimbana River

The respondents interviewed gave the following as the negatives results of damming the river:

- the local people (60%) said that some people have migrated from the lower Chalimbana due to scarcity of water.
- Most respondents said that dams at times would be sources of water-borne diseases.
- 30% of the teachers and pupils said that damming causes land degradation at excavation stage as well as claiming useful land for cultivation which is immersed under water.
- the Royal Establishment attributed the drying up of the lower catchment area of the Chalimbana River due to damming.
- the local people have not been oriented on the importance of damming the river

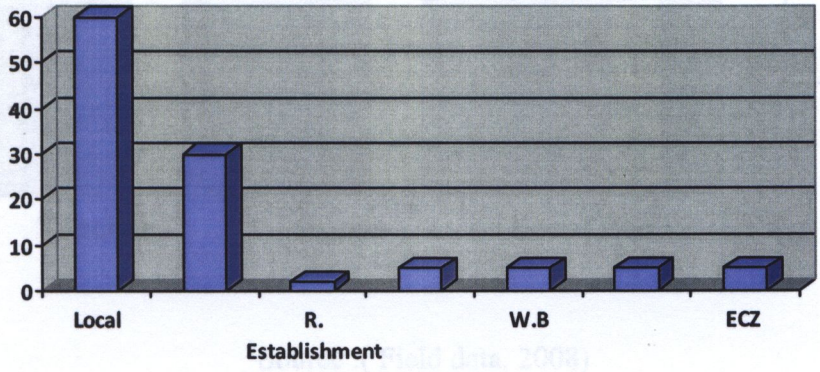
4.4 Resolving and Managing Conflict in the Study Area

Access to and control of resources might generate conflict if equity in access is not well addressed. The people of Chalimbana expressed their views on the conflict which need to be resolved to attain equity to access of water.

4.4.1 Awareness of Conflict over water

The respondents were also asked to state whether or not there was any conflict over the usage of water. Their responses are shown in Figure 13 below.

Figure 13: Awareness of Conflict over Water by Respondents



Source :(Field data, 2008)

The figure above shows that the local people were the most aware about the conflict over the use of water in the Chalimbana area (60%). 30% of the teachers and 5% of the pupils also indicated that they were aware of the conflict. 5% of the Water Board officials and Agricultural Extension officers were also aware. The awareness on the part of the local people was quite a significant figure and this finding was very relevant with what this study was trying to address.

4.4.2 Nature of Conflicts

An open ended question asked respondents to describe the nature of conflicts in the area. The following responses were given:

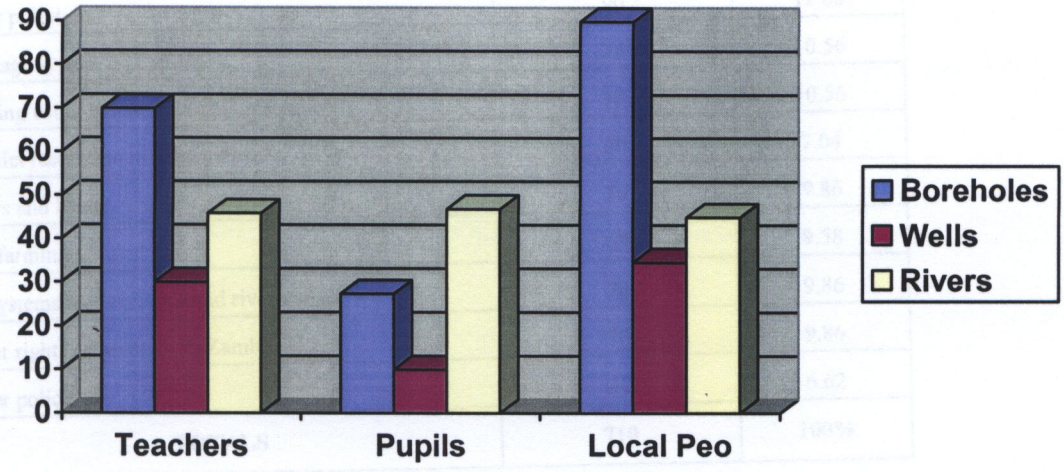
- Breaking of dam walls illegally by local people.
- arresting anyone found fishing in the dam.
- Scarcity friction downstream leading to environmental stress.

- Social friction arising from destroying customs concerning the river.

4.4.3 Sources of Water in the Lower Catchment

The respondents were as well asked to state their sources of water. Their responses were as shown in Figure 14.

Figure 14: Respondents Sources of Water in the Lower Catchment



Source :(Field data, 2008)

The above figure shows that most of the respondents use borehole water. Wells and river water are rarely used by all the respondents in the lower Chalimbana River Catchment. This finding helped the researcher to identify alternative sources of water in the area. The finding also reveals that river water is rarely used for domestic purposes.

4.5 Education about Damming of the River

The second objective was to design an educational programme to address conflicts arising from the damming of the Chalimbana River. This was done through a lot of options in terms of topics suggested by the respondents in the area.

4.5.1 Preferred Topics on the Damming of Chalimbana River

Respondents were asked to suggest topics and issues to be covered arising from what was observed in Part A in connection with the damming of the Chalimbana River.

Table 4: Preferred Topics on Damming

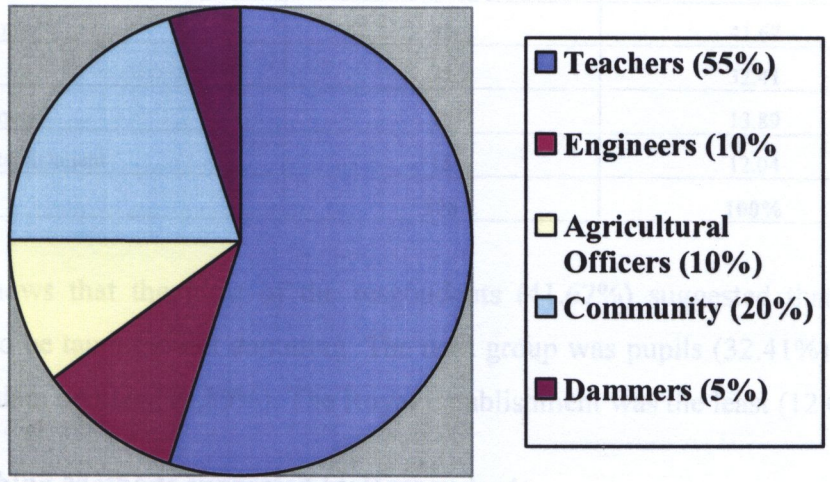
Preferred Topic	Number of Responses	%
Positive and negative aspects of damming	95	13.38
Water pollution	90	12.68
Drainage system of Zambia	75	10.56
Farming using irrigation along river banks	75	10.56
Conflict resolution management	50	7.04
Rivers and Dams	70	9.86
Fish farming	68	9.58
Ecosystems management and river conservation	70	9.86
Water rights acquisition in Zambia	70	9.86
Water policy	47	6.62
TOTALS	**710**	**100%**

Table 4 reveals that most responses in the study area preferred positive and negative aspects of damming (13.38%). The second preferred topic was water pollution (12.68%), irrigation came next with 10.56%. Water rights acquisition in the Chalimbana river basin together with ecosystems management conservation was also among the topics to be taught (9.86%). The least appealing to the respondents was water policy (6.62%). These findings were really in line with the second objective which was to design an educational programme to address conflicts from the damming of the Chalimbana River.

4.5.2 Providers of Education on Damming

The respondents were asked on who should provide education about damming of the Chalimbana River. The distribution of responses to this question was summarised in the figure15 on the next page.

Figure 15: Providers of Education about Damming as Identified by the Respondents



Source :(Field data, 2008)

The figure shows that the majority of the respondents felt that teachers (55%) were well placed to teach about damming of the Chalimbana River. Others favoured the community adult educators (20%). 10% each preferred engineers and agricultural officers. The least favoured were the dam owners (5%). This finding shows that there was really need for education to be provided about damming since the providers were identified by the respondents. This then led to identify who should be taught about damming of the Chalimbana River.

4.5.3 Who should be taught about Damming?

All respondents in this study were asked to state who should be taught about the damming of the Chalimbana River. Their responses are summarised in the table on the next page.

Table 5: People to be taught about Damming

People to be Taught	Number of Responses	%
Local People	45	41.67
Pupils	35	32.41
Dam Owners	15	13.89
Royal Establishment	15	12.04
Total	**108**	**100%**

The table shows that the most of the respondents (41.67%) suggested that the local people should be taught about damming. The next group was pupils (32.41%). This was followed by dam owners (13.89%). The Royal Establishment was the least (12.04%).

4.5.4 Teaching Methods suggested by Respondents

Respondents were asked to state the teaching methods which would be more appropriate for such type of education and their views are given below.

Table 6: Favoured Teaching Methods by Respondents

Item	No. of Responses	%
Drama	27	30
Dance	9	10
Poems	5	5
Face to face	36	40
Seminar	9	10
Song	5	5
Total	**91**	**100%**

According to Table 6, the majority of the respondents (40%) indicated face-to-face teaching methodologies, whilst drama was another method favoured (30%). The least method (5%) was that of using songs and poems.

4.5.5 Preferred Methods of Evaluating the Provided Education

Respondents were also asked to suggest evaluation tools to be used for such type of education. Their responses are presented in the table below.

Table 7: Evaluation methods for the success (or not) of Education

Item	No. of Responses	%
Interviews	25	23.18
Questionnaires	10	9.26
Teacher, Test Exam	45	41.68
Problem solving	5	4.63
Demonstration activity	9	8.33
Monitoring Sessions	14	12.96
Total	**108**	**100**

As shown above, the most favoured mode of evaluation was tests/exams (30%), followed by problem solving and demonstration activity (20%). The least preferred method was monitoring sessions (5%). This led to the respondents to identify some of the teaching resources.

4.5.6 Learning and Teaching Resources

Respondents finally were asked to indicate the teaching and learning resources to be used in educating people about damming of the Chalimbana River. The overall distribution of the responses on teaching resources is shown in Table 8

Table 8: Teaching and Learning Resources on Damming of Chalimbana River

Item	No. of responses	%
Books	20	18.5
Charts	10	9
Posters	20	18.5
Transport	4	3.7
Pamphlets	20	18.5
Drums	10	9
Projector/Screen	15	13.88
Chalk board	4	3.7
Pens	5	4.6
Total	**108**	**100**

According to Table 8, the majority of the respondents indicated books, pamphlets, posters, projector screens to be given a priority. This is followed by charts, drums and pens which should be used equally and the least favoured are the chalk board and chalk.

CHAPTER FIVE

DISCUSSION OF THE FINDINGS

This chapter presents interpretations of the study. The discussion is based on the objectives of the dissertation which were to describe conflicts in the Chalimbana River Catchment arising from damming. This was Part A of the research presentation. The second objective was to design an appropriate educational programme to address the conflicts arising from the damming of the Chalimbana River.

Characteristics of the Respondents

The research presented biographical data which helped in the categorisation of the respondents in terms of their sex and qualifications. Data indicates that there were more males than females. It also indicates that there more diploma holders interviewed amongst the adult respondents. Pupils' qualifications are not included since they are still at school.

Part A: General Views on the Damming of Chalimbana River

5.1 Perceived Problems about Damming of the Chalimbana River

The main objective of this sub-section was to ascertain and measure the conflict arising from damming of the Chalimbana River. The first step was to find out if the residents were aware about the damming of the river.

5.1.1 Awareness of Damming

This was measured using two variables, Yes and No. The majority of the local people indicated that they are aware of the damming. Teachers, pupils, the Royal Establishment, the village head men consented to being aware of the damming of the river.

5.1.2 Consultations before Damming

It was also found that stakeholders in the river catchment area were not consulted before the damming of the river. The Royal Establishment of Chieftainess Nkomeshya and her subjects denied being consulted. They disclosed that the first dam to be constructed on

the river was in 1956 by Mr. Bender a white farmer. The Royal Establishment indicated that that it was perhaps because most land was under title, giving the farm owners absolute powers over the Chalimbana River stretch passing through their farms. It follows then that consultation was not required on the part of the commercial farmers.

5.1.3 Area Prone to Drought

It was observed that the majority of the people indicated that the area was prone to drought. Drought could be one of the reasons for damming of the Chalimbana. Irrigation was found to be one way for commercial farmers to guarantee themselves a good harvest. It also acted as protection against the climatic uncertainties inherent in growing rain fed crops. The research established that cutting down of trees in the upper catchment area contributed to the reduction in the amount of rainfall and water supply in the Chalimbana River. Therefore, damming of the river is justified since the area is prone to drought.

5.1.4 Sources of Water for Local People in the Lower Chalimbana River Basin

In a situation where supply of water was not guaranteed, the local people have found alternative sources of water. Borehole water was the most common alternative source of water for the residents. The research also established that some residents used wells as their source of water. This confirmed that the people no longer relied on the river for drinking water. The water in the Chalimbana River thus becomes a source of worry, as it cannot be used by the people all year round. The above revelations could lead to a conflict if not handled properly.

5.2 Resolving and Managing Environmental Conflicts in the Study Area

5.2.1 Awareness of Conflicts over the Usage of Water in the River

The research established that all the respondents resident in the Chalimbana catchment were aware of the conflict. However, some pupils were not aware, especially those who had lived in the Chalimbana River lower catchment for less than five years. Research also found that the respondents resident in Chalimbana River Catchment argued with each other over the usage of water. For instance, the Royal Establishment accused dam owners of denying others water by completely closing the course of the river with sand bags.

This led to drying out of the lower catchment area of the Chalimbana River. Dam owners equally blamed the local people for breaking dam walls illegally to irrigate their gardens. However, Water Board officials claimed that the conflict over damming of the Chalimbana River stemmed from failure of dam owners to fulfil commitments made. They further, observed that statutory regulations and guidelines agreed upon by government and dam owners to sustain the river catchment were not abided to. Many respondents indicated that the incidents of conflicts in this area hinged on water scarcity in the lower catchment of the river and the effects of drought.

Research also established that the majority of the local people were not aware of the water policy governing the damming of a river. In this case, the local people confirmed that they had never seen a water policy. Furthermore, they requested government to make available the policy and that it should be translated into local languages for it to be understood. It is, therefore, useful to examine how conflicts can be addressed in the Chalimbana basin. The first principle should solve timing of water use among competing groups, allowing contenders to access and use water during their allotted time so that water use is prioritised according to need. The timing principle performs three functions. Firstly, it guarantees accessibility to water for everyone's needs, demonstrating a form of equality in access. Secondly, it enables water sources to recover from previous exploitation. During times of scarcity due to the low regenerative capacity of the ecology and the pressure of demand, water sources require a substantial length of time to regenerate for further usage. Lastly, it helps in mitigation of conflict among competing users in the resources sites.

5.3 Implications of Damming the Chalimbana River on the people

5.3.1 Positive Effects of Damming of the Chalimbana River

The research found that positive effects of damming of the Chalimbana River accrued to all groups involved. Respondents cited water for irrigation as being available all year round for growing of either vegetables or field crops. Another positive aspect was fishing, which provided relish to the local people as well as dam owners. One focused group talked to by the researcher had this to say: "We have been helped by these dams because they provide relish inform of fish as well as income when we sell the fish". This

indicated some good relationship between the dam owners and the local people. Dam owners claimed that the dams acted as a reservoir for water in the dry season. World Commission on Dams (2000) affirms that dams act as underground boosters for aquifers and thereby regulating the river flow in times of drought. Some respondents acknowledged that animals such as cattle, goats and sheep benefited from dam water in the dry season. The above cited effects underscored the damming of the Chalimbana River.

5.3.2 Negative Effects of Damming the Chalimbana River

Despite the above positive effects of damming the river, sixty per cent of the local people stated that some people had migrated from the Chalimbana lower catchment area due to scarcity of water. One headman of the Chalimbana river lower catchment area had this to say;

> Some of my subjects have crossed the Chongwe River to chief Bunda-Bunda's especially in 1992 when there was a severe drought in search of water. Crops failed to grow and animals also died from a mysterious disease.

These people according to the headman were environmental refugees because the environment no longer supported them. Most teachers and pupils indicated that dams at times would be bleeding places for certain diseases such as malaria, cholera, dysentery and typhoid. They also cited land degradation at the excavation stage of the dam. They observed that dams if big claimed useful land for cultivation through flooding. The Royal Establishment observed that the major negative effect of damming the Chalimbana was the conflict which had arisen amongst competing parties in the River Catchment. This was attributed to the lower course of the river drying up every dry season between August and November.

Agricultural Extension officers and Environmental Council officers noted that local people with gardens along the river banks made the river shallow at some points due to siltation brought about by floods in the rain season.

Part B: Proposed Educational Components Based on Damming of Chalimbana River

The second objective of the study was to investigate educational implications of damming the Chalimbana River. The goal was to design an appropriate educational programme to address conflicts arising from the damming of the Chalimbana River. The aim was to come up with a localised curriculum for the Chalimbana area. Next I start by highlighting educational dimension to be considered on the subject.

5.4 Dimensions to be considered

5.4.1 Topics and Issues to be Covered on Damming of the Chalimbana River

The research established that positive and negative aspects of damming were highly favoured by the pupils as potential topics for a localised curriculum, but less favoured by the local people and teachers. Water pollution was equally favoured by pupils as a topic. Local people favoured farming or irrigation methods using dammed water as well as conflict resolution. Conflict management would help to improve the usage of water and the relationship between the dam owners and the local people in the Chalimbana lower catchment area. Teachers and local people indicated that rivers and dams needed to be taught to stakeholders of the Chalimbana River basin. The implications of such are that education was a key to conflict resolution if integrated resource management of water was to be attained in the Chalimbana area.

5.4.2 Fish Farming

Fish farming according to the research findings was highly favoured by the local people. This would improve the economic base of the local people. A part from fish farming ecosystem management and river conservation was identified by both teachers and local people to be of great importance. The rewards of these management practices would be to sustain the river from drying in the dry season of each year. The research established that the majority of the respondents were not aware of how water rights are acquired in Zambia. This was confirmed by the respondents who said that they had not seen the water policy before. Water Board officials were prompted to suggest an integrated water resources management as a solution to resolving the conflicts over usage of water in the Chalimbana River Catchment basin.

5.4.3 Provision of Education about Damming

The research established that the majority of the people favoured the effects of damming on both the environment and the people. But most of the local people indicated that they wanted to be taught conflict management. The research findings confirmed that there were conflicts about the use of water in Chalimbana. Rivers and Dams were also cited to be of value to the people of Chalimbana area. At the time of conducting this research, local people confirmed that there was a project which was to be undertaken by Global Water Partnership under the auspices of the school of Mines at the University of Zambia. The local people confirmed that they appreciated the education being offered by the Global Water Partnership. But they noted that the time was not enough as they were taught once in four months and only for two hours. The implications of such findings were that education about damming the Chalimbana River was really a need. The people also needed to be educated on water rights and the water policy. It was found that most local people were neither aware of the water rights nor the water policy. The Royal Establishment also confirmed that people did not know about water rights and the water policy. She appealed for the water policy to be translated from English to Soli and Cinyanja, the two local languages spoken in the area. The Royal Establishment noted that more females should be educated about the environment. This need is affirmed by Pearce *et al.*, (1973) who states that females interact with the environment to a large extent especially in the utilisation of basic environmental resources such as water, wood and wild foodstuffs. However, the analysis of the scores attained by the research showed that more male respondents are more involved in the environmental issues of concern.

5.4.4 Educational Providers on Damming of the Chalimbana River

The study revealed that teachers were favoured by the majority of the respondents to provide the necessary education about the damming of the river. These findings relate to what Hinzen (2007:7) says that, "teaching is a preserve of teachers because they have the methodology of how to impact knowledge to the learners". But for this teaching to be effective, it requires the informed and effective participation of women and men in every sphere of life if humanity was to survive and meet the challenges of the future. The research also revealed that the provision of education to Chalimbana residents did not rest

on the teachers alone but other technocrats who had information on dam construction such as engineers, dam owners and agricultural officers.

5.4.5 People to be Taught about Damming of the Chalimbana River

The research findings revealed that the local people were highly favoured to be educated about the damming of the Chalimbana. This was also supported by expressions from Agricultural Extension officers in the Chalimbana River Catchment area as indicated below:

- Government does not recognise the rights we have and risks we undergo as residents in the Chalimbana lower catchment area. As stakeholders, we should have joint negotiations to mitigate the impact of damming through education so that development related decision-making can be achieved.
- In this regard, education is the only key which enables the vulnerable and disadvantaged stakeholder groups such as local people in the Chalimbana River to participate in an informed manner. Furthermore, if we can use education as a tool of empowerment, it will avail us the chance to see who shares the costs and benefits of the damming of the Chalimbana River.
- Education promotes open and meaningful participation to all players involved in the damming of the river at planning and implementation stage leading to negotiated outcomes (March-April 2007).

Verbatim expressions from the Royal Establishment also added to the voice of the agricultural extension officers. The education needed is about concerted efforts of all the people in the river catchment. Forestry officers should teach people the importance of trees near the river. The dam owners should be educated on the importance of sharing the water as water is a finite commodity. The dam owners should not completely block the water as the local people also need the same water for various activities such as domestic use as well as irrigation for farming.

The implications are that there is need for concerted efforts if such education about damming has to be offered. Many people were still not aware of their constitution rights about the most important resource, water. In a similar manner teaching methods should be scrutinised to attain high education levels about damming of the Chalimbana River.

5.4.6 Teaching Methods on the Damming of Chalimbana River

The research findings revealed that face-to-face contact was most favoured by the majority of the respondents. This is because the learners are given examples and teaching aids are used. This can also be attributed to active participation of learners since the teacher would be able to vary the methodologies and approaches each time the learners are met. Other methods included drama and dance. These could be of value if they are role played as they depict real life situations and would help the stakeholders to change their attitudes on the damming of the Chalimbana River. This research finding has indeed confirmed that education was needed about the damming of the Chalimbana River. But if this type of education is not evaluated, the providers may not know their short comings, hence an evaluation would be important to direct the way forward.

5.4.7 Evaluation of Education on Damming of Chalimbana River

The main objective of evaluation in any learning process is to find out how effective the instruction given to the learners has been. The methodology to be used was to adapt learners to practical skills such as problem solving. This could only be evaluated by finding a solution to the problem of damming the Chalimbana River. Secondly, people in the area advised that they should be given projects to run, such as digging of the dams in the lower basin of the river through a demonstration method and thereafter be made to manage the dams themselves. But most respondents favoured school based type of tests which could either be oral or written depending on the age of the learners. Others challenged this idea as it does not describe the conflicts which arose from damming of the Chalimbana River. It was thought that in a test, conflicts could not be well articulated as opposed to actual writing which was descriptive in nature. Furthermore, the efficiency of any educational programme is not about learners passing an exam but acquiring knowledge about a certain concept. The sole objective about this research was to integrate the people into water resources management as a tool of conflict resolution.

5.4.8 Teaching and Learning Resources on Damming of Chalimbana River

The research findings revealed that books which had dams or integrated water resource management should be used to help in the teaching of the local people about damming. Admittedly, the required posters, which carried information on damming to be used in the

sensitisation of the people on the subject of damming were lacking. Pamphlets on damming should be used, but the people demanded that such information should be translated into local languages for people to understand them better.

Documentaries about the negative and positive effects of damming, especially those from third world countries should be shown on national television and film projector slides. Education is the key in disseminating information about the implications of damming the Chalimbana River.

Respondents had the opportunity to elaborate on issues from a personal point of view. They were allowed to give their own opinions as individual responses were of utmost importance to understand the damming of the river. There is need to state that responses to some open questions revealed information related to conflict resolution such as the formation of a water advisory committee to enhance integrated water resource management in the Chalimbana River Catchment. Secondly, government should construct at least three dams in the Chalimbana lower catchment area to alleviate the drying of the river in the dry season. The government should establishment a water tribunal to settle disputes on the Chalimbana River Catchment. The membership of this tribunal was to be appointed by the Minister of Energy and Natural Resources.

5.5 Proposed Curriculum for the Chalimbana Lower Catchment Community

The aim of proposing this curriculum matrix came as a result of what the respondents suggested as topics to be taught to the local people and the pupils at grades 8 and 9 in schools. This section will review the National Education Policy, 'Educating Our Future', which was launched in 1996. The basic principles it advocates are liberalisation, decentralisation, curriculum relevance and diversification, cost sharing, partnerships, access, equity and quality education. This section will dwell on the decentralisation policy, which empowers the local people to participate in governance of local institutions, by strengthening the provision of educational services and making the local people more accountable to delivery of public services as a basis of decentralisation.

According to CDC (2000), the Ministry of Education developed a policy of decentralisation through localisation of the curriculum. This decentralised education delivery from national and provincial headquarters to points of delivery, the districts, colleges and schools. Ministry of Education (2005) sums up the goals for decentralisation as follows:

- It promotes community participation in all matters related to national development.
- Enhance coordination of development efforts.
- Alleviate poverty through the introduction of a localised syllabus with relevant practical life skills.

The above goals have been underscored to be of vital importance in coming up with a local curriculum for the Chalimbana lower catchment people. It is envisaged that the damming of the Chalimbana River can take a u-turn towards devolution of administrative and political authority to the local level in Chongwe district. Secondly, it would also bring integration of government agencies at the district, zone and ward levels into one administrative unit. Above all, the localisation of the curriculum would promote the popular participation at all decision-making levels.

Respondents in this study have made suggestions to benefit the localisation of the curriculum in the Chalimbana River Catchment, such as;

- Matching the curriculum content to local needs. Damming to be explained so as to attain integrated water resource management.
- Improving the quality of inputs to education since more people will be involved in the provision of this education.
- Widening of access to quality education, especially for historically, economically and geographically disadvantaged communities such as those in the Chalimbana River Catchment. By and large the approach would increase innovativeness of educational programmes as well as increasing the output of schooling.

The curriculum will address both the old and young residents who are found in the Chalimbana River Catchment area. This approach can either be taught using Geography

as a subject to school children or environmental education to adults. The main objectives of the curriculum will be to show the relationship between development and the environment.

The curriculum on the Chalimbana Catchment Area could be designed using the active learning approach which uses a matrix curriculum (Namafe, 2005). This methodology sees a pupil or an adult as an active thinker in constructing ideas which depict real problems found in the environment. Slater in Namafe (2005) suggests that pupils are presented with resources, ideas and evidence that help to move thinking from questioning to reaching an understanding of the question, issue, problem or opportunity to reach a decision.

Attitudes and values inherent in ideas and resources presented should be appreciated in order to arrive at answers or chosen solutions to particular problems and opportunities. Learning experiences are organised to reinforce the already known knowledge to produce a cumulative effect. The knowledge learnt can be in cognitive or affective domain. The affective domain equips learners with values, attitudes, appreciation of the environment and creation of new patterns of behaviour among individuals, groups and society as a whole towards the environment.

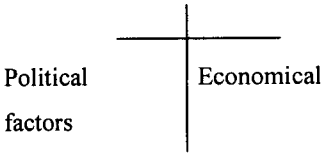
In fulfilling or meeting the 2015 Millennium Development Goals, the Zambian water policy advocates a better understanding of the interactions between water management and society. It has become evident that the past focus on developing infrastructure overlooked the need for a strong knowledge base and capacity to plan, manage the infrastructure and ensure proper governance of the water sector. Besides the data collected about the damming of the Chalimbana River and the conflicts arising from damming of the river, there is an urgent need for applied research to generate knowledge on the current challenges facing the water sector and to collect and share the existing experiences of the Chalimbana community as they develop capacity. Because the knowledge base must also address the socio-cultural and economic processes that feed into levels of capacity, factors related to collective learning processes, and democratic participation and empowerment must also be taken into account. This requires knowledge acquisition covering areas far beyond those concerned solely with the state of the

resource. It was against the above reasons that the elements in the following curriculum matrix such as water and development in the Chalimbana River, water rights and entrepreneurship were included. The curriculum matrix below has similarities especially on theoretical issues which concern both the pupil and the local residents of the Chalimbana river lower catchment area. However, there are also differences between the school curriculum and local people's curriculum when it comes to practical lessons on what the local people have to do especially when it concerns entrepreneurship. Local people go into details of how certain projects can be achieved. The other difference comes in from the way lessons will be delivered. For local people, classroom teaching situation will be avoided, thereby encouraging methods like group discussion, role play, demonstrations and interactive radio instruction (IRI) which are adult learning friendly. Below is a matrix to explain how the proposed curriculum will be implemented.

Table 9: Curriculum Matrix

SCHOOL CURRICULUM	LOCAL PEOPLE'S CURRICULUM
Water and Development in Chalimbana River Catchment	**Water and Development in Chalimbana River Catchment**
Role of water in development of the Chalimbana River Catchment - water and food and agriculture - water and health - water and industry - water and energy - water and transportation - water, recreation and tourism	Role of water in the development of the Chalimbana River Catchment - water and food and agriculture - water and health - water and industry - water and energy - Water, recreation and tourism.
Learning outcomes	**Learning outcomes**
Learners should be able to: - explain the role of water in the development of the Chalimbana River Catchment - use a compass rose to relate development and environment	Learners should be able to: - explain the role of water in the development the Chalimbana River Catchment - use a compass rose to relate development and environment

Natural ecological factors



Social/cultural
Factors

Key questions

At the local level what controls the water links?

To what local water systems are these linkages related?

What social/cultural factors make water important?

What natural/Ecological factors affect water systems in Chalimbana river basin?

Why is water sustainability an environmental issue more than economical in the Chalimbana river basin?

Entrepreneurship through water

Learning outcomes

LSBAT:

- describe entrepreneurship of water in relation to school activities in the Chalimbana river basin
- Identify school activities which depend on water in the Chalimbana river basin
- explain how tourism is important to an individual in the Chalimbana river basin

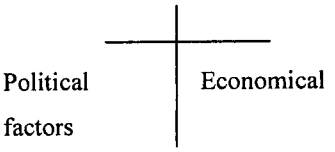
Water Rights

Learning outcomes

Learners should be able to:

- define river basins/catchment
- explain decentralisation as a tool of water resource management in Chalimbana area
- explain the principles and priorities in the Zambian constitution on how one can own

Natural ecological factors



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At the local level what controls the water links?

To what local water systems are these linkages related?

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What natural/Ecological factors affect water systems in the Chalimbana river basin?

Why is water sustainability an environmental issue more than economical in the Chalimbana river basin?

Entrepreneurship through water

Learning outcomes

LSBAT

- organise field days involving the benefit of water to human kind
- practice fish farming in their local areas
- demonstrate how to dig a fish pond
- apply water conservation method in their irrigation of crops
- utilise water for recreation

Water Rights

Learning outcomes

Learners should be able to:

- define River Catchment agencies
- decentralise water resource management to involve local communities in the management of water resources
- explain the underlying principles governing

water rights

ownership of water according to the Zambian constitution

- determine the transfer of water rights from the state to an individual in Chalimbana area

Key questions

What is a river authority?

How can the school management help to resolve conflict in a river basin like Chalimbana?

How can access to water be a right to school pupils?

Key questions

What is a River Catchment authority?

How can decentralisation of water resource management help to resolve conflict in a river basin?

What underlying principles in Zambia govern water ownership as enshrined in the constitution?

Conflict over water

- LSBAT describe conflict in their own understanding
- identify projects which have caused conflicts elsewhere in the country
- dramatise issues that might cause conflict over water in the Chalimbana area

Conflict over water

LSBAT:

- define how conflict over water is brought about in the Chalimbana River Catchment
- identify damming projects that caused conflict in the Chalimbana area
- suggest alternative solutions to conflicts over water in Chalimbana area.
- state some natural resource conflicts in their local area
- list the conflict stages
- explain the steps towards managing conflict

Key questions

What is entrepreneurship?

What school activities depend on water in Chalimbana River Catchment?

What are some of the effects of global warming on entrepreneurships through water?

Key questions

What is fish farming?

How does fish farming improve the farmer's income?

What methods of irrigation conserve water?

How can you effectively use water for recreation in your area?

People and Dams in the Chalimbana River Catchment Area

Learning outcomes

Learners should be able to:

- Identify the social impacts of dams (livelihoods

People and Dams in the Chalimbana River Catchment Area

Learning outcomes

Learners should be able to:

- Identify the social impacts of dams on the

and health on school communities

- Identify the conflicts related to a dam once it is constructed
- explain the sustainability of rivers on which dams are constructed
- explain the environmental impact assessment

Key questions

What social impacts do dams have on the pupils in the Chalimbana area?

What conflicts arise when a dam is constructed along the Chalimbana River?

How can Chalimbana river be sustained with many dams on it?

What is environmental impact assessment?

Key questions

What is conflict?

Which projects in the country have caused conflict which the pupils of Chalimbana river lower catchment would learn from?

What natural resource in Chalimbana area has caused conflict over its use?

What does the case teach you for other conflict cases in future in the Chalimbana area?

Chalimbana people

- Identify the conflicts related to dams once they are constructed
- explain sustainability of the Chalimbana river on which dams are constructed
- explain environmental impact assessment as related to dam construction in the Chalimbana area
- determine the role of planning and decision-making before a dam is constructed in the Chalimbana area

Key questions

What effects does a dam have on the local people?

What misunderstandings does it bring between the dam owners and local people?

What protection measures should be put in place so that the river does not dry especially in the dry season?

What resources are impacted upon when a dam is constructed in the Chalimbana river catchment basin?

What role do you play in the damming a river as in the damming of a river in Chalimbana as a local person?

Key questions

What is conflict?

Which projects in the country have caused conflict which the Chalimbana people would learn from?

What is the history of the conflict in the Chalimbana river lower catchment area?

What natural resource in Chalimbana area has caused conflict over its use?

What are some of the steps which would help to manage a conflict?

What does the case teach you for other conflict cases to come in future in Chalimbana area?

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

This study has brought up different important points concerning the damming of the Chalimbana River in the Chongwe district. The educational implications were used as a device to understand issues in the Chalimbana River Catchment.

The study has shown that many people in the Chalimbana River Catchment are aware of the damming of the river. But they deny having been consulted at the planning stage or participating in decision-making. Chieftainess Nkomeshya as the custodian of the land is one of the most aggrieved over the damming of the river. This situation, therefore, leads to the conclusion that the stakeholders should be revisited so that they are oriented over the importance of damming the Chalimbana River. This study has also shown that most dams constructed on the river are on titled land. This makes it difficult for the commercial farmers to consult anyone about the development of their private property. The conclusion arising from here is that commercial farmers who are the dam owners at the same time hold title to their land along the Chalimbana River, do not see any importance of consulting the local people as well as the royal establishment over the damming of the Chalimbana River.

The study has also revealed that dams have both negative and positive effects such as boosting the underground aquifers which regulate the river flow in times of drought. Local people cited water being available for irrigation all year round. This leads to the conclusion that, despite the local people not appreciating the damming of the Chalimbana River, they have come to realise some benefits. For example, the water table has risen near dams, making irrigation possible throughout the year.

The study also underscored the need for government to avail the water policy in local languages since most people have either not heard about it or seen it before. It is acknowledged that people in the Chalimbana catchment area need education to understand pertinent issues concerning the damming of the river. The study has thus proposed a localised curriculum which can be used by the local community radio station in Chongwe to propagate the ideas on damming of the Chalimbana River. The study has revealed that conflict over water is present and that the local people lack skills of how to settle disputes. Conflicts identified cannot be reported anywhere since there is no tribunal instituted by government to oversee such conflicts in the nation. This leads to the conclusion that there is need to identify local leaders such as village headmen, politicians like councillors and local people who do gardening along the Chalimbana river to be educated on the water rights enshrined in the water policy, through workshops. These stakeholders once enlightened on water policy and conflict management will help to settle conflicts arising from damming of the Chalimbana River.

6.2 Recommendations

This subsection provides recommendations and suggestions on how the impact arising from Chalimbana river damming could be ameliorated. The study identified weaknesses and challenges of damming the Chalimbana River which should be addressed through the following recommendations:

- Since 90% of the royal establishment and 60% of the local people claimed to have not been consulted at planning stage of damming the river, it is recommended that in future when such developmental projects are being undertaken all stakeholders should be consulted to avoid conflicts over water.
- Since the lower Chalimbana River dries up every dry season, it is recommended that government should construct at least three dams in the lower course of the river as a way of improving water storage for domestic use as well as irrigation or sink more boreholes in the lower course of the river.
- The other thing to be considered is the formation of a water advisory committee to enhance integrated water resource management in the Chalimbana River Catchment.
- Since the local people along the Chalimbana River Catchment have not been educated about the importance of damming of the river, there is need to design a

localised curriculum to teach pupils and the local community about the sustainability of the river and other resources related to it once it is dammed.

- Since there was a conflict as indicated by most respondents in the study between the local people and the commercial farmers with title deeds, there is need to have the water rights bill or policy revisited to accommodate the interests of the local people in the distribution of the water as a common resource in the Chalimbana River Catchment.
- In addition to the water policy being revisited, there is need to set up a water tribunal to settle disputes arising from the damming of the Chalimbana river since most respondents said that there was nowhere to report disputes concerning the damming of the river. Members of this tribunal should be appointed by the Minister of Energy and Natural resources.
- Since the dammed water was deemed to be a source of water borne diseases such malaria, dysentery, cholera, bilharzias and typhoid, there is need for government to establish a monitoring system for water resources. This system must provide for the collection of data necessary to assess the quality and quantity of water in rivers. It can also appoint a specialised inspector of water resources who could have powers to stop water related activities that may cause serious harm to water resources.

6.3 Future Research

In line with the findings of this study, the following areas of future research are suggested:

(a) A study on a similar topic could take a comparative approach on damming such as real and perceived effects of damming the Chalimbana River and another river in another drought prone area in the country.

(b) Future research could also compare conflict resolutions of dams constructed in drought prone areas and their educational implications.

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APPENDICES

APPENDIX 1

TITLE OF RESEARCH:

EDUCATIONAL IMPLICATIONS OF DAMMING THE CHALIMBANA RIVER IN CHONGWE DISTRICT OF ZAMBIA

QUESTIONNAIRE FOR THE ROYAL ESTABLISHMENT IN CHONGWE

I am a Post-graduate student in the School of Education conducting a survey on Educational Implications of Damming the Chalimbana River in Chongwe District of Zambia. Your Royal Establishment is hereby, kindly and respectfully, being requested for information concerning damming of the Chalimbana river.

The response you provide will be treated as confidential information and will be used purely for academic purposes only.

PERSONAL INFORMATION:

(Kindly, tick or fill in the spaces provided).

1. **Gender:** Male ( ) Female ( )

2. How long have you lived in the Chalimbana River Catchment area?

   0 – 5 years ( )
   5 – 10 years ( )
   10 - 15 years ( )
   15 + years ( )

3. Kindly, give a brief history of the river in the past before damming. ---
   ---

   ---

4. What cultural importance does the river play in Soli customs?

---

5. When did damming of the river occur? ----------

6. Was your Establishment consulted before the damming of the river?

YES ☐ NO ☐

Kindly, give reasons for your response ----------

---

7. Are there any problems concerning the damming of the river?

YES ☐ NO ☐

Kindly, explain further. ----------

---

8. Are there any positive effects of damming the Chalimbana river?

YES ☐ NO ☐

Kindly, give details. ----------

Educational Implications of Damming the Chalimbana River

In your view,

10. What type of education (i.e. topics and issues to be covered) should be provided in connection with the damming of Chalimbana river? ----------

11. **Who should provide** such education? ----------

---

12. Who **should be taught** about such type of education? ----------
---

13. What **methods of teaching** would be best for such type of education?

---

14. What would be the best way of **evaluating** the achievements of such type of education?----------
---

15. What type of **teaching resources** are needed in order to make this type of education successful? ----------
---

16. What activities take place in your kingdom which directly depends on Chalimbana water? ----------
---
---

17. Are there any conflicts linked to damming concerning the use of water in the Chalimbana area? YES ☐ NO ☐

Kindly, give details. ----------

---

18. In your own opinion, what would be the best way to resolve conflicts over the usage of water in the Chalimbana River?

---

19. Any relevant view not covered above?----------

END

Thank you for your co-operation.

APPENDIX 2

TITLE OF RESEARCH:

EDUCATIONAL IMPLICATIONS OF DAMMING THE CHALIMBANA RIVER IN CHONGWE DISTRICT OF ZAMBIA

QUESTIONNAIRE FOR LOCAL PEOPLE IN THE CHALIMBANA CATCHMENT AREA:

I am a Post-graduate student in the School of Education conducting a survey on Educational Implications of Damming the Chalimbana River in Chongwe District of Zambia.

You are kindly requested to answer the questionnaire diligently. Note that your response will be treated as confidential information and will be used for academic purposes only.

SECTION A: PERSONAL INFORMATION

INSTRUCTIONS:

Please answer by ticking and filling in the spaces provided.

1. Gender: Male ( ) Female ( )

2. How long have you lived in this catchment area?

   0 - 5 years ( )

   6 – 10 years ( )

   11 – 15 years ( )

   16+ years ( )

3. Marital Status:

   Married ☐

   Single ☐

   Widow ☐

   Widower ☐

Other (please, specify) ----------

4. Educational Qualifications attained:
   - Primary Education Grades 1 – 7 ( )
   - Secondary Education Grades 8 – 12 ( )
   - Diploma in Education ( )
   - Degree ( )
   - Higher Degree ( )

- Other (please, specify) ----------

SECTION B:

BACKGROUND TO CHALIMBANA CATCHMENT AREA

4. When was Chalimbana river first dammed? ----------

5. Who was the first owner of the dam (s)? ----------

6. Were you consulted before damming as a resident? YES ( ) No ( )

   Please, give reasons for your response ----------

   ---

7. What are the main sources of water in your area apart from the river?

   Wells ( ) Boreholes ( ) other (specify) ----------

8. Is the area prone to droughts? YES ( ) NO ( )

   If YES what are some of the causes of such drought? ----------

   ---

9. What are some of the positive effects of damming the Chalimbana River?

   ---

10. What are some of the negative effects of damming the Chalimbana River?

    ---

11. Are there any conflicts over water in the Chalimbana River?
    YES ( ) NO ( )

    (Please, give reasons for your response)----------

Educational Implications of Damming the Chalimbana River

12. In your view, what type of education (i.e. topics and issues to be covered) should be provided in connection with the damming of Chalimbana River?

---

13. **Who should provide** such education? ----------

---

14. Who **should be taught** about such type of education? ----------

---

15. What **methods of teaching** would be best for such type of education?

---

16. What would be the best way of **evaluating** the achievements of such type of education?----------

---

17. What type of **teaching resources** are needed in order to make this type of education successful? ----------

---

18. Are there economic activities in the area which depend on water?
YES ( ) NO ( )
If YES list some below: ----------

19. What farming practices are common in your area? ----------

---

---

20. Briefly describe the community relationship with the dam owners. ----------

---

21. Are you aware of the water policy concerning the damming of rivers?
YES ( ) NO ( )
If YES, explain ----------

---

22. What are your recommendations that would help to resolve the conflict over the usage of water in the Chalimbana River? ----------

APPENDIX 3

TITLE OF RESEARCH:

EDUCATIONAL IMPLICATIONS OF DAMMING THE CHALIMBANA RIVER IN CHONGWE DISTRICT OF ZAMBIA

QUESTIONNAIRE FOR DAM OWNERS

I am a Post-graduate student in the School of Education conducting a survey on Educational Implications of Damming the Chalimbana River in Chongwe District of Zambia.

You are kindly requested to answer the questionnaire diligently. Note that your response will be treated as confidential information and will be used for academic purposes only.

PERSONAL INFORMATION

1. Gender: Male ( ) Female ( )

2. Age: 20 - 30 years ☐

30 - 40 years ☐

40 - 50 years ☐

50 - 60 years ☐

60+ years ☐

3. Qualification:
Certificate ☐
Diploma ☐
Degree ☐
Higher Degree ☐

Other (pleas, specify) ----------

4. How long have you lived in the Chalimbana River Catchment area?
0 – 5 years ( )
5 – 10 years ( )
10 – 15 years ( )
15 + years ( )

5. What economic activity are you involved in linked to the Chalimbana river water? ----------

6. Do you have a dam? YES ( ) NO ( )

If YES, when was it constructed? ----------

7. What type of dam is it? ----------

8. Was any Environmental impact assessment conducted before damming the Chalimbana River?
Yes ( ) NO ( )

If YES, kindly provide a summary of the report ----------

9. Kindly, do you have water rights for the dam? ----------

10. What were the main objectives for damming the Chalimbana river?

---

11. What plans do you have for the local community through damming of The Chalimbana River? ----------
---

12. Kindly, describe your relationship with the local people over the damming?

Educational Implications of Damming the Chalimbana River

In your view,

13. What type of education (i.e. topics and issues to be covered) should be provided in connection with the damming of Chalimbana River? ----------
---

14 **Who should provide** such education? ----------
---

15. Who **should be taught** about such type of education? ----------
---

16. What **methods of teaching** would be best for such type of education?

---

17. What would be the best way of **evaluating** the achievements of such type of education?----------
---

18. What type of **teaching resources** are needed in order to make this type of education successful? ----------
---

19. Do you have instruments for collecting rainfall data or any other relevant weather data? YES ( ) NO ( )

Please, give details ----------

---

20. Are there any conflicts over use of the dammed water?
YES ( ) NO ( )

If YES, kindly explain the nature of the conflicts ----------
---

---

21. What recommendation would you make to resolve the conflicts?

---

22. Any relevant views not covered above? ----------

END

Thank you very much for your co-operation.

APPENDIX 4

TITLE OF RESEARCH:

EDUCATIONAL IMPLICATIONS OF DAMMING THE CHALIMBANA RIVER IN CHONGWE DISTRICT OF ZAMBIA

I am a Post-graduate student in the School of Education, conducting a survey on Educational Implications of Damming the Chalimbana River in Chongwe District of Zambia.

You are kindly requested to answer the questionnaire diligently. The response will be treated as confidential information and be used purely for academic purposes only.

QUESTIONNAIRE FOR WATERBOARD OFFICIALS

INSTRUCTIONS: (TICK AND FILL IN THE SPACES PROVIDED)

PERSONAL INFORMATION:

1. Gender: Male ( ) Female ( )
2. Qualification: Certificate ☐ Diploma ☐ Degree ☐

   Other (specify) ----------
3. How long have you worked for this institution? ----------
4. Have ever been involved in giving water rights to individuals?
   YES ( ) NO ( )

   If YES please, explain your role ----------

POLICY AND WATER RIGHTS ISSUES

4. Who owns absolute powers over water rights in Zambia? ----------

---

---

5. Briefly explain what the water policy state about damming of rivers such as the Chalimbana.

---

6. When was Chalimbana River first dammed? ----------

7. What was the purpose of damming the river? ----------

---

8. What type of dam was constructed on the Chalimbana River? ----------

---

9. Was there any public hearing before a dam is constructed?
   YES ( ) NO ( )

   Please, explain your response ----------

---

10. Was there any Environmental Impact Assessment done before the Chalimbana dam was constructed? YES ( ) NO ( )

    Please, explain your response. ----------

---

11. Does the board have any weather or climatic data on Chalimbana Catchment area?

    If NO what plans do you have to have such data ----------

---

---

12. What benefits are derived from damming the river?----------

---

---

13. As a statutory board of the government are you aware of conflicts concerning the utilisation of water in the Chalimbana catchment area?

YES ( ) NO ( )

If YES, what are the conflicts ----------

---

14. What plans do you have to resolve the conflicts? ----------

---

---

15. What new things would you recommend to be included in the next water rights bill in connection with the Chalimbana issue? ----------

---

Educational Implications of Damming the Chalimbana River

In your view,

16. What type of education (i.e. topics and issues to be covered) should be provided in connection with the damming of Chalimbana River? ----------

---

17. **Who should provide** such education? ----------

---

18. Who **should be taught** about such type of education? ----------

---

19. What **methods of teaching** would be best for such type of education?

---

20. What would be the best way of **evaluating** the achievements of such type of education?----------

---

21. What types of teaching resources are needed in order to make this type of education successful? ----------

---

22. Any relevant view not covered above?----------

APPENDIX 5

TITLE OF RESEARCH:

EDUCATIONAL IMPLICATIONS OF DAMMING THE CHALIMBANA RIVER IN CHONGWE DISTRICT OF ZAMBIA

I am a Post-graduate student in the School of Education conducting a survey on Educational Implications of Damming the Chalimbana River in Chongwe District of Zambia.

You are kindly requested to answer the questionnaire diligently. Note that your response will be treated as confidential information and will be used for academic purposes only.

QUESTIONNAIRE FOR TEACHERS

NAME OF SCHOOL: ---------- DISTRICT: ----------

TYPE OF SCHOOL: (TICK AND FILL IN THE BLANK SPACES PROVIDED).

(a) (i) Boarding ( )
(ii) Day school ( )
(iii) Weekly ( )

(b) Gender of pupils at school
(i) Boys ( )
(ii) Girls ( )
(iii) Boys and Girls ( )

PERSONAL INFORMATION

1. Education Qualifications
   - Certificate ( )
   - Diploma ( )
   - Degree ( )
   - Other specify ( )

2. Marital Status
   - Married ( )
   - Single ( )
   - Divorced ( )
   - Widow ( )
   - Widowed ( )
   - Other specify ( )

3. Gender of Respondent: Male ( ) Female ( )

4. Teaching experience of Geography: ( )

5. What are the sources of water in this area? ----------

6. Are you aware of the damming of the Chalimbana River?
   YES ( ) NO ( )

   If your response to Question 5 was YES what are some of the positive effects of damming the river? ----------

   ---

Educational Implications of Damming the Chalimbana River

7. In your view, what type of education (i.e. topics and issues to be covered) should be provided in connection with the damming of Chalimbana River?

   ---

8 **Who should provide** such education? ----------

   ---

9. Who **should be taught** about such type of education? ----------

---

10. What **methods of teaching** would be best for such type of education?

---

11. What would be the best way of **evaluating** the achievements of such type of education?----------

---

12. What type of **teaching resources** are needed in order to make this type of education successful? ----------

---

13. What are some of the negative effects of damming? ----------

---

---

14. Suggest topics to teach the local people of Chalimbana about damming?

---

15. As a pupil of Geography in Chalimbana catchment area, what do you want taught about damming of the Chalimbana River? ----------

---

16. How does the Chalimbana River affect you as an individual? ----------

---

---

17. Are there any conflicts concerning the use of water in the Chalimbana area? YES ( ) NO ( )

Please, give details ----------

---

18. What recommendations can you give in resolving the Chalimbana damming conflict? ----------

---

19. Any relevant views not covered above?----------

Thank you for sparing your most valuable time and for your willing participation particularly in this research.

APPENDIX.6

TITLE OF RESEARCH:

EDUCATIONAL IMPLICATIONS OF DAMMING THE CHALIMBANA RIVER IN CHONGWE DISTRICT OF ZAMBIA

I am a Post-graduate student in the School of Education conducting a survey on Education Implications of Damming the Chalimbana River in Chongwe District of Zambia.

You are kindly requested to answer the questionnaire diligently. Note that your response will be treated as confidential information and will be used for academic purposes only.

QUESTIONNAIRE FOR PUPILS

NAME OF SCHOOL: ---------- DISTRICT: ----------

TYPE OF SCHOOL: (TICK AND FILL IN THE BLANK SPACES PROVIED).

(a) (i) Boarding ( )
(ii) Day school ( )
(iv) Weekly ( )

(b) Gender of pupils at school
(I) Boys ( )
(ii) Girls ( )
(iv) Boys and Girls ( )

1. Gender of Respondent: Male ( ) Female ( )

2. Grade ---------- Class: ---------- Age: ----------

3. Have you been learning at this school since Grade 1? YES ( ) NO ( )

4. What are the sources of water in this area? ----------

5. Are you aware of the damming of the Chalimbana River?
YES ( ) NO ( )

If your response to Question 5 was YES what are some of the positive effects of damming the river? ----------

---

Educational Implications of Damming the Chalimbana River

6. In your view, what type of education (i.e. topics and issues to be covered) should be provided in connection with the damming of Chalimbana River?

---

7 **Who should provide** such education? ----------

---

8. Who **should be taught** about such type of education? ----------

---

9. What **methods of teaching** would be best for such type of education?

---

10. What would be the best way of **evaluating** the achievements of such type of education?----------

---

11. What type of **teaching resources** are needed in order to make this type of education successful? ----------

---

12. What are some of the negative effects of damming? ----------

---

---

13. Suggest topics to teach the local people of Chalimbana about damming?

---

14. As a pupil of Geography in Chalimbana catchment area, what do you want taught about damming of the Chalimbana River? ----------

---

15. How does the Chalimbana River affect you as an individual? ----------

---

---

16. Are there any conflicts concerning the use of water in the Chalimbana area? YES ( ) NO ( )

Please, give details ----------

---

17. What recommendations can you give in resolving the Chalimbana damming conflict? ----------

---

18. Any relevant views not covered above?----------

Thank you for sparing your most valuable time and for your willing particular in this research.