*ejpmr, 2017,4(11), 10-15*

SJIF Impact Factor 4.161

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

# AN ASSESSMENT OF THE HEALTH IMPACTS OF THE CONSTRUCTION OF SIYA DAM IN THE MAZUNGUNYE AREA OF BIKITA DISTRICT, ZIMBABWE

**[1]Boycen Kumira Mudzengi. and [2]*Evans Chazireni**

[1,2]Great Zimbabwe University, Masvingo, Zimbabwe.

***Corresponding Author: Dr. Evans Chazireni**

Great Zimbabwe University, Masvingo, Zimbabwe.

**Article Received on 27/08/2017** **Article Revised on 17/09/2017** **Article Accepted on 07/10/2017**

## ABSTRACT

Water resources projects such as dams can cause significant health impacts on communities. This research assessed the health impacts of the construction of Siya Dam in the Mazungunye area. Research methods included key informant interviews and a questionnaire survey. The results from the study showed that Siya Dam has both positive and negative impacts on community health in the Mazungunye Area. Fish resources from the dam can be used to augment dietary protein requirements thereby ensuring community health and contributing to local villagers having balanced diets. The construction of the dam also ensured that livestock in the Mazungunye area did not suffer from water shortage thereby guaranteeing meat protein supply to the community. On the negative side the construction of Siya Dam resulted in the increased incidence of water-borne and vector-borne diseases such as malaria and schistosomiasis in the Mazungunye area. Incidences of stress resulting from being displaced by the construction of Siya Dam were also noted. The study recommended that funds should be availed for the development of irrigation schemes in Mazungunye area so as to boost agricultural production. This will enhance food security and ensure people have balanced diets thereby resulting in health benefits to the community. The development of irrigation schemes is also an important mitigation measure against climate change which is expected to result in increased occurrence of droughts in Zimbabwe and the shrinking of the maize belt. Local villagers should also not practice streambank cultivation and cause deforestation as this will result in the siltation of the dam thereby minimizing benefits accruing to them.

**KEYWORDS:** dam, health impacts, water-borne diseases, dietary protein, sustainable, irrigation.

## INTRODUCTION

Dams are large socio-economic investments built to fulfill such purposes as domestic and industrial water supply, energy production, irrigation and flood control. Water resources projects such as dams represent large-scale engineering works or activities that can cause significant health impacts (Canter, 1985; Mudzengi, 2012). Bond and Manyanya (2002) note that the construction of Kariba Dam caused devastating disease and loss of livelihoods among the Tonga. The growing worldwide environmental awareness has increased attention on the impacts of dams on communities (Canter, 1985). Church (1968) states that few of humans' modifications of the landscape can initiate such profound changes as dams. This suggests the need for a better understanding of the health impacts of dam construction. The main objective of this study is to assess the health impacts of the construction of Siya Dam in the Mazungunye area. This research will also recommend preventive and remedial measures that may minimize adverse health impacts and enhance the beneficial health impacts of dam construction.

Siya Dam was built during the colonial era in Zimbabwe. The colonial authorities made little effort to assess the health impacts of dam construction in the former reserves, now communal lands that were reserved for the indigenous African population. In fact the indigenous people were mostly neglected and ignored in development planning during the colonial era (Auret, 1990). There was also no attempt that was made to carry out an Environmental Impact Assessment (EIA) prior to the development of such dams as Siya (Mudzengi, 2012). It is hoped the study will result in the sustainable use of Siya Dam in order to promote community health. The results from this study might also have a wider application beyond the immediate study area in order to enhance the positive health impacts and mitigate the negative health impacts of water resource development projects.

### Health Impacts of Dam Construction Cited in the Literature

Dam construction projects have both positive and negative impacts on community health. On the positive side dams can provide increased fish resources to communities. These fish resources can be used to

augment dietary protein requirements thereby improving community health. Fishing is enhanced by dam construction. Zimbabwean dams like Kariba, Mutirikwe, Manyame, Chivero, Mazvikadei and Mayfair are used for fishing (Chenje, Sola and Paleczny, 1998). In fact a large number of Zimbabwean dams have been stocked with fish and are being fished (Chimbuya and Shoniwa, 1988). Volta Lake fish are also a major source of protein in Ghana. The fishing industry rates as one of the most significant benefits of the dam to the Ghanaian economy (Adams, 1992). Fishing and aquaculture also provide food and livelihoods for millions of resource-poor people in Southern Africa, and may become even more important to regional food security as the climate changes and other sources of food increasingly become less reliable (Makungwa, 2010). Food security is important as it ensures that communities have balanced diets and therefore less vulnerable to diseases caused by food deficiency.

Dams also provide a constant supply of water for irrigation purposes thereby guaranteeing stable yields. Auret (1990) states that the need for irrigation development in Zimbabwean communal areas is vitally necessary to supplement dryland cropping and to provide food security in grain deficient areas. Irrigation development is of great significance in the face of climate change and the associated increased frequencies of extreme climatic events, particularly El Nino and related droughts. Further, dams provide a constant supply of water for livestock even during drought years thereby ensuring supply of meat protein to communities. This is important given that the incidences of drought are increasing in the face of global climate change. Droughts result in the death of livestock due to shortage of water and pasture. For example, the Zimbabwean drought of 1991/1992 resulted in the death of an estimated 423 000 cattle out of 4.4 million and the doubling of the normal off-take (Yanda, 2010).

Dams also ensure a constant supply of water for domestic purposes. Dams provide a balanced supply of water for all seasons and conditions (Ministry of Water Development, 1973). Dam construction is of great significance as most parts of Southern Africa have relatively undeveloped surface water, while most of the population lacks access to improved water supply. In fact forty percent (40%) of the population in Southern Africa has no access to clean potable water (Mazvimavi, 2010). Lack of access to clean water increases the incidences of diseases.

On the negative side water resources projects such as large dams often lead to the spread of malaria and schistosomiasis as well as other communicable diseases. Newson (1997) notes that devastating water-borne and vector-borne diseases are introduced by reservoirs and their associated irrigation works. Furthermore, Newson (1997) argues that dams have reduced the quality of drinking water for millions of people. Clarke (1991) states that when large new volumes of water are created, the risk of disease in tropical countries rises sharply. The diseases associated with dams include malaria, schistosomiasis, yellow fever, river blindness and liverfluke infections. Although water-borne and vector-borne diseases are widespread in African floodplains, dam construction can increase their prevalence (Adams, 1992). According to Newson (1997) water resource development projects create additional habitats for disease vectors beyond those already present. Water-borne diseases lead to debilitation and vulnerability to other diseases. This results in working hours being lost due to illness and medical costs increasing (Clarke, 1991).

The Kariba Dam caused devastating diseases among the Tonga people (Bond and Manyanya, 2002). The Gezira Irrigation Scheme in Sudan increased the prevalence of schistosomiasis, malaria and yellow fever in the region (Canter, 1985). Moreover, Clarke (1991) notes that a survey after the construction of the dam to create Lake Volta showed that the incidence of infection with schistosomiasis among children under 16 years in the resettled areas rose from 3 to 37 percent in just one year.

Further, as dams result in the resettlement of displaced people there is also the human cost of the stress caused by uprooting (Adams, 1992; Scudder, 2005). The resettled people may be angry over having had to leave their old lands (Brokensha and Scudder, 1968). Further, people displaced by dam construction maybe moved to land claimed by others. Friction can occur, arising from the resentment felt by the original owners of the land towards the newcomers who have been foisted on them (Brokensha and Scudder, 1968). Stress may also result from disruption of transport and communication. Canter (1985) notes that a dam can be a barrier leading to the disruption of transport and communication. This results from the replacement of a relatively narrow river by a wide dam.

Dam construction projects can also lead to noise and visual pollution. Noise is generated at the impoundment construction site during the construction phase (Canter, 1985). Noise can be defined as objectionable sound. Complaints of noise nuisance generally arise when a noise interferes with work, communication, recreation or sleep. Damming can also adversely affect the visual quality of an area. Furthermore, it can result in the water resource producing a bad odour (Mudzengi, 2012). This reduces the attractiveness of the area to recreationists (Canter, 1985). Preservationists argue that free-flowing rivers should be left intact in order to avoid spoiling the beauty of the landscape (Henwood and Coop, 1973).

## RESEARCH METHODS AND MATERIALS

Research techniques for this study included key informant interviews and a questionnaire survey. Key informant interviews were carried out with the Agricultural and Rural Extension Officer for

Mazungunye area to obtain data on the impacts of Siya Dam construction on crop growing and livestock rearing and the Health Officer at Ngorima Clinic to obtain statistics on the health impacts of Siya Dam construction. Key informant interviews were also carried out with the Zimbabwe National Water Authority (ZINWA) Siya Dam Manager to obtain data on the management of the dam and the Zimbabwe Parks and Wildlife Management Authority based in Masvingo City to obtain data on the fishing activities being done at Siya Dam. Other key informants were headmasters of Mazungunye Primary and Secondary Schools, Bengura, Njaravani and Ngorima Primary Schools who provided data on how schooling is being affected by the incidence of water-borne diseases in the community.

A questionnaire survey was also carried out with 30 villagers in the Mazungunye area to obtain data on how their health is being impacted by the construction of Siya Dam. Survey questionnaires were targeted at household heads. The stratified random sampling method was used to select households to take part in the questionnaire survey. The households were first stratified according to village boundaries in the study area. Random sampling was then used in each stratum to select the households where questionnaires were to be administered.

**Area of Study**

Siya Dam is located in the Mazungunye area of Bikita District, Masvingo Province. The dam was constructed between 1974 and 1977 on Turwi River mainly to provide irrigation water to the sugar-cane and citrus plantations in the South-East Lowveld of Zimbabwe. The dam flooded 810 hectares of land. The dam is managed by the ZINWA on behalf of the Zimbabwean government.

Mazungunye lies in Zimbabwean Agro-ecological Region 4. This is a semi-intensive farming region experiencing a mean annual rainfall between 300-600mm with a 40-45 percent coefficient of variation. It is subject to periodic seasonal droughts and prolonged dry spells during the rainy season. Mean annual temperature is between 25-27.5 degrees Celsius (Chenje, Sola & Paleczny, 1998).

The study area is made up of 6 villages which are Bengura, Marufu, Jere, Ngorima, Njaravani and Chiwawa. The majority of people in the study area are peasant farmers practicing farming based on growing crops and livestock rearing. The crops grown include maize, groundnuts, roundnuts, sweet potatoes, rapoko and sorghum. The livestock raised include cattle, goats, pigs and sheep. The other economic activity of the people in the study area is fishing. Fishing cooperatives and individual fishers do the fish harvesting. The Zimbabwe Parks and Wildlife Management Authority manages and controls the fishing (Mudzengi, 2012).

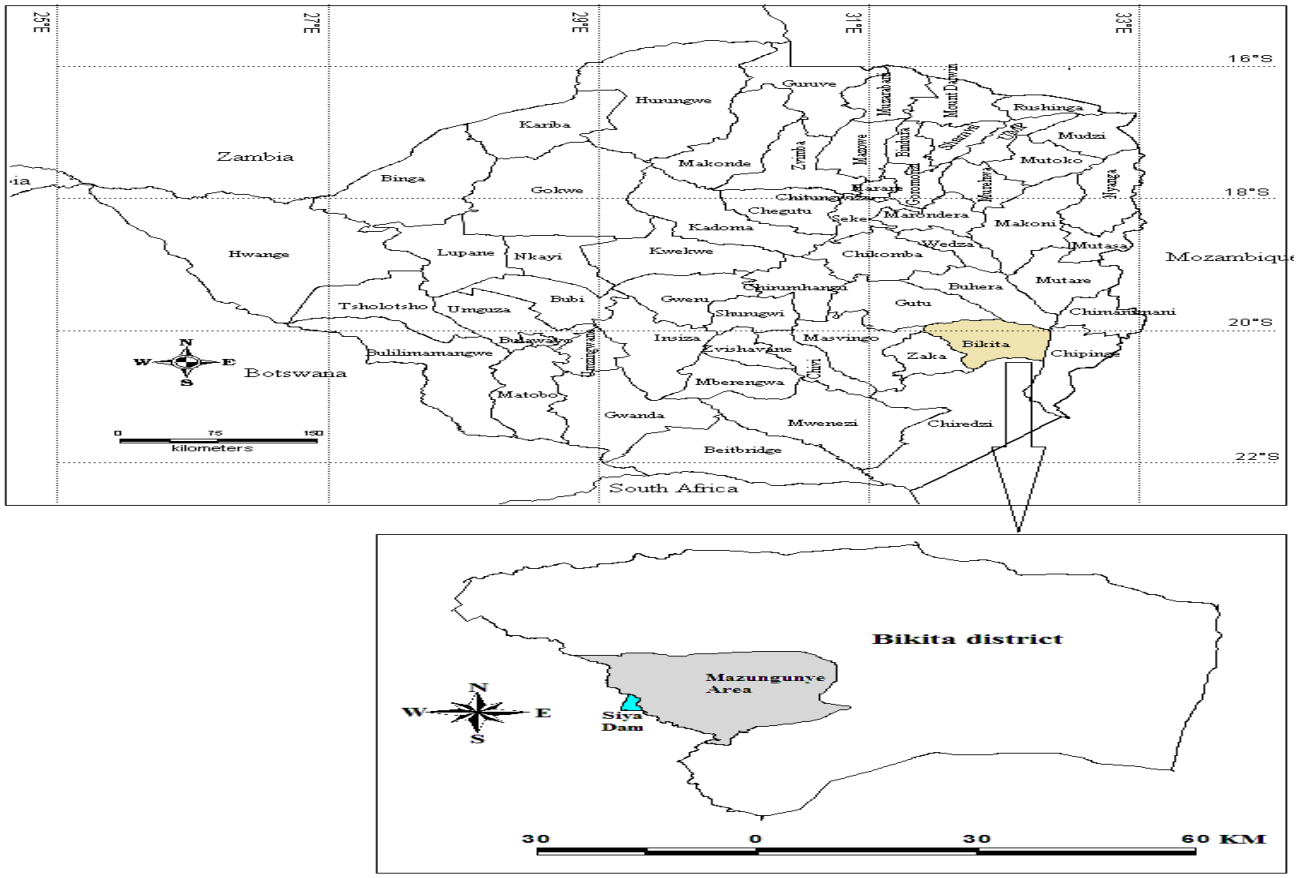


**Figure 1: The location of Siya Dam in Bikita district, Zimbabwe.**

## RESULTS AND DISCUSSIONS

### Positive Health Impacts of the Construction of Siya Dam

The construction of Siya Dam has increased access to fish protein for the Mazungunye community. Ninety eighty (98%) of the respondents felt that increased provision of fish protein was of great importance. Fish protein contributes to boost the diet of local residents. Fishing cooperatives and individual fishers do the fish harvesting either for marketing or own consumption. The types of fishing boats used range from dug-out canoes to wooden boats. Most of the fishing is with gillnets. 3.5 inch mesh sizes are allowed. The managing authorities face the problem of fishers who use wire traps and hessian sacks as the use of these results in unsustainable fishing. However, to enhance fishing in the dam and maximize community health benefits from fish protein fishers should be provided with increased access to capital resources in order for them to purchase modern fishing gear. The modern fishing gear will also help reduce the incidences of drowning and being attacked by crocodiles among fishers. Increased access to capital resources will also help fishers in processing and marketing their products. Further, aquaculture should be developed as a way of increasing access to fish protein in the study area.

Siya Dam construction ensured that livestock in the Mazungunye area did not suffer from water shortage thereby guaranteeing meat protein supply to the community. The percentage of respondents in all the strata who own some livestock is ninety two percent (92%). Ninety five percent (95%) of the questionnaire respondents from Bengura, Marufu and Jere Villages ranked constant supply of water for livestock by the dam as of great importance. These are the villages located closest to the dam. However, the importance of constant supply of water for livestock decreases as the distance of village location from the dam increases as only twenty two (22%) of the questionnaire respondents from Ngorima and Njaravani Villages ranked the benefit as of great importance. This is largely due to the fact that these two villages are the furthest away from the dam and therefore villagers are less likely to use the dam as a source of water for livestock. Thus, the livestock from these villages rarely drink from the dam. It is only during drought years when nearer shallower livestock watering points run dry that villagers from Ngorima and Njaravani are willing to move their livestock to go and drink water from Siya Dam. Water from Siya Dam can also be used to irrigate pastures and other fodder crops like lucerne thereby enhancing the benefits of the reservoir to livestock production.

Siya Dam can also provide clean potable and drinking water to the community provided resources are made available. The provision of clean potable water will improve water supply, sanitation and hygiene in the community of Mazungunye area.

### Negative Health Impacts of the Construction of Siya Dam

The construction of Siya Dam has resulted in the increased incidence of water-borne and vector-borne diseases such as malaria and schistosomiasis in the Mazungunye area. Ninety nine percent (99%) of the questionnaire respondents rank the incidence of malaria as of significance. Ninety percent (90%) also rank the incidence of schistosomiasis as of significance. The study area is also often affected by cholera which usually has its origins outside the area. Cholera often originates from other countries such as Mozambique then spread into Zimbabwe. It also sometimes spread from large cities of Zimbabwe such as Harare to the study area. However, Siya Dam can exacerbate its incidence in the Mazungunye area. The incidences of river blindness, liver fluke and yellow fever are less. These water-borne and vector-borne diseases result in increased incidences of absenteeism from school. Four percent (4%) of the questionnaire respondents also felt that financial costs of hospitalization due to water-borne and vector-borne diseases introduced by the dam were of great significance. Furthermore, two percent (2%) of the respondents felt loss of working hours due to debilitation caused by water-borne and vector-borne diseases was of great significance.

The Health Officer at Ngorima Clinic note that the incidence of infection with malaria in the study area rose from twenty two percent (22%) for the period 1971-1975 to thirty percent (30%) for the period 1976-1980. The incidence then declined reaching seven percent (7%) for the period 2001-2005 before increasing slightly to eight percent (8%) for the period 2006-2010. The incidence of schistosomiasis among the local community rose from eleven percent (11%) for the period 1971-1975 to fourteen percent (14%) for the period 1976-1980. The incidence then declined reaching less than one percent (1%) for the periods 2001-2005 and 2006-2010.

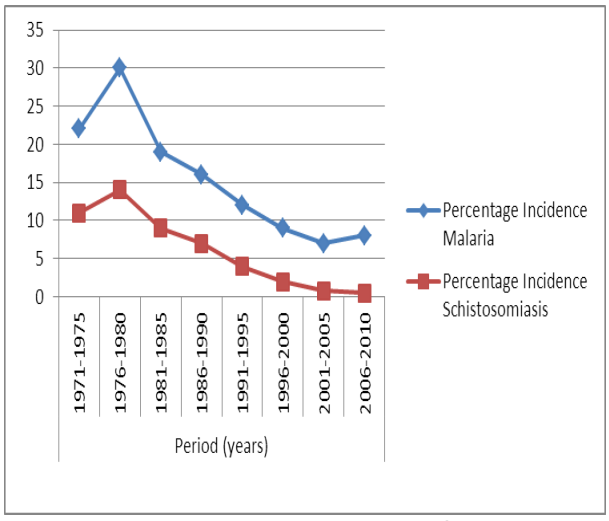


**Figure 5: Percentage incidences of malaria and schistosomiasis in the study area for the period 1971-2010 (Source: Field data from clinics).**

The increase in percentage incidences of both malaria and schistosomiasis for the period 1976-1980 is largely attributable to the construction of the dam although the intensification of the liberation war also played a negative role in facilitating health provision. Siya Dam construction ended in 1976. The decrease in percentage incidences of these water-borne and vector-borne diseases from 1981 is greatly attributed to increased use of prevention measures. Schools also intensified their awareness campaigns aimed at reducing incidences of these diseases among pupils and their parents (Mudzengi, 2012). The slight increase in the incidence of malaria from 2001 to 2010 is in line with the increase in malarial cases countrywide since 1996. Currently in 2017 Zimbabwe is recording a marked increase in malaria cases and deaths due to the increased rains received during the 2016- 2017 agricultural season.

Incidences of stress resulting from being displaced by the construction of Siya Dam were difficult to investigate as the generation which was affected is becoming fewer as they die. However, seventy four percent (74%) of the questionnaire respondents felt the inundation of settled areas was a disruption of great significance. The majority of people whose settlements were inundated by the dam were resettled in Ngorima Village. The resettlement of these villagers resulted in the occurrence of social conflicts between the resettled people and those already residing in Ngorima Village. Nine percent (9%) of the respondents rank stress caused by uprooting as of great importance. Eight percent (8%) of the respondents felt disruption of transport and communication is of great significance. This was the result of the replacement of the relatively narrow Turwi River by the dam. The villagers now find it difficult to communicate with their relatives and friends across the dam.

## CONCLUSION AND POLICY RECOMMENDATIONS

The study has revealed that Siya Dam has both positive and negative health impacts in the Mazungunye area. However, there is need to enhance the beneficial health impacts and minimize the adverse impacts of the dam.

The beneficial health impacts of Siya Dam can be enhanced by developing local irrigation schemes. These irrigation schemes will be used to water vegetable gardens, crop fields and livestock pastures and other fodder crops. Lack of capital is the major hindrance to the development of the schemes. Funds should be made available for this purpose. Irrigation has the potential to boost local agricultural production through insuring constant supply of water for crops throughout the year. Improved agricultural production will enhance food security and ensure people have balanced diets thereby resulting in health benefits to the community. The development of irrigation schemes is also an important mitigation measure against climate change which is expected to result in increased occurrence of droughts in Zimbabwe and the shrinking of the maize belt. The contraction of the maize belt has significant negative health impacts as maize is the staple food crop. Thus, irrigation projects can ensure that agriculture continues to be viable in the face of climate change. In fact Zimbabwe is expected to have a warmer and drier climate by 2075 with some areas ceasing to be suitable for maize production (UNEP and ICRAF, 2006). Resources should also be made available to ensure Siya Dam provides clean potable water to the residents of Mazungunye area. This will improve the water, sanitation and hygiene (WASH) status of the community.

The Zimbabwe Parks and Wildlife Management Authority should also effectively control and monitor fishing in Siya Dam to ensure sustainable fishing. The sustainable fishing will ensure that positive health benefits in the form of fish protein continue to accrue to the community. To this end fishers should use nets with the recommended mesh sizes. Efficient and effective monitoring and policy enforcement should be put in place to ensure that fishers do not use illegal fishing gear like wire traps and hessian sacks. This will prevent overfishing and promote sustainable fishing (Mudzengi, 2012). ZINWA should also ensure that the local communities do not practice streambank cultivation and cause deforestation as this will result in the siltation of the dam.

Further, aquaculture should be developed in the Mazungunye area as a way of increasing access to fish protein by the community. The Zimbabwe Parks and Wildlife Management Authority should also restock Siya Dam with various fish breeds in order to increase fish availability to the community. To this end the National Command Fisheries Programme of 2017 aimed at increasing fish harvesting throughout the country initiated by the Authority should be commended.

Health officials should also ensure that the incidences of malaria and schistosomiasis in Mazungunye area are further reduced to very low levels. In fact no one should be infected with schistosomiasis in this day and age. To control the spread of schistosomiasis aquatic vegetation should be cleared to limit the shelter available to the vector snails. People should also always wear shoes when travelling and walking around as schistosomiasis is also passed through the human excreta. Health officials can further increase community awareness on the preventive measures to reduce risk of malaria infection. Preventive measures that can be put forward include the application of chemical mosquito repellents to the body, covering (clothing) the body, use of mosquito nets, prophylaxis treatment with chloroquine and chemical spraying of houses and water bodies with anti-mosquito pesticides. Regulating the dam water by regular flushing and vegetation clearing also act as malaria prevention measures. Other preventive mesures such as the growing of plant species that act as mosquito repellents and cattle dung burning are much cheaper and not dependent on costly inputs.

Local communities in the study area should also actively participate in water resource development planning. This empowers local people so that they regard the development projects as their own. The Mazungunye area community did not actively participate in the development planning of Siya Dam. This has largely contributed to failure by authorities to ensure the local communities reap maximum benefits from the dam. Community involvement in dam construction also reduces the impact of uncertainties and stress caused by uprooting and resettlement (Mudzengi, 2012). Thus, bottom up and participatory planning is necessary for the achievement of sustainable development in water resources projects. To this end it is critical that an updated and integrated Environmental Management Plan be in place to ensure the long term conservation of the dam and its surrounding environments. The Environmental Management Plan will also enable local communities to maximize benefits accruing to them due to their proximity to the dam. The maximization of benefits to local villagers will enable them to play a stewardship role towards socio-economic and biophysical resources thereby contributing to sustainable development.

**REFERENCES**


1. Adams, W.M. (1992) *Wasting the rain: Rivers, people and planning in Africa*, Earthscan Publications, London.
2. Auret, D. (1990) *A Decade of Development: Zimbabwe 1980-1990*, Mambo Press, Gweru.
3. Bond, P. & Manyanya, M. (2002) *Zimbabwe's Plunge: Exhausted Nationalism, Neoliberalism and the search for Social Justice*, Weaver Press Limited, Harare.
4. Brokensha, D. & Scudder, T. (1968) 'Resettlement', In Rubin, N. and Warren, W.M. (Eds.) *Dams in Africa: An Inter-disciplinary Study of Man-made Lakes in Africa*, pp. 20-62, Frank Cass and Company Limited, London.
5. Canter, L. (1985) *Environmental Impact of Water Resources Projects*, Lewis Publishers, Michigan.
6. Chenje, M., Sola, L. and Paleczny, D. (1998) *The State of Zimbabwe's Environment 1998*, Ministry of Mines, Environment and Tourism, Harare.
7. Church, R.J.H. (1968) 'A geographical view', In Rubin, N. and Warren, W.M. (Eds.) *Dams in Africa: An Inter-disciplinary Study of Man-made Lakes in Africa*, pp. 1-12, Frank Cass and Company Limited, London.
8. Chimbuya, S. and Shoniwa, E.T. (1988) *Aquaculture and Rural Development in Zimbabwe*, Food and Agricultural Organization, Rome.
9. Clarke, R. (1991) *Water: The International Crisis*, Earthscan Publications Limited, London.
10. Henwood, K. and Coop, C. (1973) 'Impact analysis and the planning process,' In Goldman, C.R., McEvoy, J. and Richerson, P.J. (Eds.) *Environmental Quality Water Development*, pp. 170-182, W.H. Freeman and Company, San Francisco.
11. Makungwa, S. (2010) 'Adaptation, Agriculture and Food Security', In Kotecha, P. (Ed.) *Climate Change, Adaptation and Higher Education: Securing our Future: SARUA Leadership Dialogue Series Volume 2 Number 4*, pp. 68-80, SARUA, Wits.
12. Newson, M. (1997) *Land, Water and development: Sustainable Management of river basin systems*, Frank Cass and Company, London.
13. Mazvimavi, D. (2010). 'Climate Change, Water Availability and Supply', In Kotecha, P. (Ed.) *Climate Change, Adaptation and Higher Education: Securing our Future: SARUA Leadership Dialogue Series Volume 2 Number 4*, pp. 81-100, SARUA, Wits.
14. Ministry of Water Development. (1973) *Rhodesia's Dams*, Government Printers, Salisbury.
15. Mudzengi, B.K. (2012) 'An Assessment of the Socio-Economic Impacts of the Construction of Siya Dam in the Mazungunye Area: Bikita District of Zimbabwe', *Journal of Sustainable Development in Africa*, 14(4): 1-17.
16. Scudder, T. (2005) *The Future of Large Dams: dealing with Social, Environmental, Institutional and Political Costs*, Earthscan, London.
17. UNEP and ICRAF. (2006) *Climate Change and Variability: Impacts and Adaptation Strategies*, UNEP and ICRAF.
18. Yanda, P.Z. (2010) 'Climate Change Impacts, Vulnerability and Adaptation in Southern Africa', In Kotecha, P. (Ed.) *Climate Change, Adaptation and Higher Education: Securing our Future: SARUA Leadership Dialogue Series Volume 2 Number 4*, pp. 11-45, SARUA, Wits.