

**Effects of national development projects on food security**

**A case of Tokwe-Mukosi dam**

**A dissertation submitted in partial fulfilment of the requirements for the Master of  
Science Degree in Food Security and Sustainable Agriculture  
(Production)**

**Bindura University of Science Education**



**Faculty of Agriculture and Environmental Science  
Department of Agricultural Economics, Education and Extension**

**Jerrphanos Masocha**

**B1234778**

**Name of Supervisor: Dr. G. Mabaya**

**June 2019**

**RELEASE FORM**

**Name of Candidate: Jerrphanos Masocha**

**Reg Number: B1234778**

**Degree: Master of Science Degree in Food Security and Sustainable Agriculture**

**Project Title: Effects of national development projects on food security - a case of Tokwe-Mukosi dam**

Permission is hereby granted to **Bindura University of Science Education Library** to produce a single copy of this dissertation and lend such copy for private, scholarly or scientific research only.

**Signed**.....

**Permanent Address: Number 1050 Chivi Growth point, Chivi**

## **APPROVAL FORM**

The undersigned certified that they have supervised and recommended to Bindura University of Science Education for acceptance of dissertation entitled '**Effects of national development projects on food security a case of Tokwe-Mukosi dam**' submitted in partial fulfillment of a Master of Science Degree in Food Security and Sustainable Agriculture.

**Name of supervisor:** Dr. G. Mabaya

**Signature:**

**Date:**

## **DECLARATION**

I hereby declare that the research project entitled “**Effects of national development projects on food security - a case of Tokwe-Mukosi dam**” submitted to Bindura University of Science Education, Faculty of Agriculture and Environmental Science, Department of Agricultural Economics, Education and Extension is a record of an original work done by me under the guidance and supervision of **Dr G. Mabaya** and this work is submitted in partial fulfilment of the requirements for the award of a Master of Science Degree in Food Security and Sustainable Agriculture. The results embodied in this thesis have not been submitted to any University or Institute for the award of any degree or diploma.

**Author:**                   **Jerrphanos Masocha**

**Reg. Number:**       **B1234778**

**Signature:**

**Date:**

## **DEDICATION**

I dedicate this work to my brother Solomon Masocha, my wife and the rest of my family

## **ACKNOWLEDGEMENTS**

I owe sincere gratitude to so many people who have contributed immensely towards my studies and, most importantly, to the production of this thesis. First and foremost, I am very grateful to my supervisor, Dr G. Mabaya, for his inspiration, strength, commitment and guidance. His contribution was critical for the success of this project. I am also deeply indebted to Dr Zivenge for his insights and direction.

I am grateful to the ministry of local government for approval of my study. In particular, I would like to thank district development coordinators for Chivi and Mwenezi districts, the provincial and national human resources staff for local government for facilitating the approval of the study data collection process.

This work was made possible with the logistical support from my sister, Ratidzo Masocha. May God bless you

## ABSTRACT

The study focuses on the effects of national development projects on food security in the context of local communities living adjacent to the development site. It focused on Tokwe-Mukosi Dam construction project in Masvingo province in Zimbabwe. The dam is the largest inland dam in the country. The dam project physically and economically displaced a significant proportion of people who lived in its basin. The study adopted the analytical descriptive approach to demonstrate the existence of socio-economic problems on livelihood and food security issues. These issues are explored in two papers in this thesis.

The first paper assesses the effect of dam construction on livelihoods of local communities. Specifically, the paper assesses livelihoods before and after dam Tokwe-Mukosi dam construction. Statistical significance of livelihoods before and after dam construction was justified by use of McNemar test for correlated proportions. The results show that there is a significant difference between livelihoods before and after the dam construction.

The second paper assesses the food security situation of households affected by the dam project. To achieve this objective, the paper used the Household Food Insecurity Access Scale tool for assessing food insecurity (access). Household Food Insecurity Access Scale prevalence calculated results show that the affected households were food insecure. A statistical test was then performed for independence between household settlement and food security status using Fisher's exact test for independence. Results have shown statistically significant difference of  $p < .01$  concluding that there is an association between respondent's settlement and his or her food security status.

The results of this study help to shed light on the link between national development projects and food security of the affected communities. It has been concluded that national development projects negatively affect livelihood strategies of local communities. There is therefore need to design policies that increase communities' adaptive capacity and increase local food production while providing food assistance as a stop gap measure.

**Keywords:** Livelihood, Community, Household, Development, food security

## **LIST OF ACRONYMS AND ABBREVIATIONS**

FAO	Food and Agriculture Organization
HFIAS	Household Food Insecurity Access Scale
NGO	Non-governmental Organization
UNDP	United Nation Development Programme

## Table of Contents

RELEASE FORM.....	i
APPROVAL FORM.....	ii
DECLARATION.....	iii
DEDICATION.....	iv
ACKNOWLEDGEMENTS.....	v
ABSTRACT.....	vi
LIST OF ACRONYMS AND ABBREVIATIONS.....	vii
LIST OF TABLES.....	xii
LIST OF FIGURES.....	xiii
LIST OF APPENDICES.....	xiv
CHAPTER 1.....	1
INTRODUCTION.....	1
1.1 Background of the study.....	1
1.2 Statement of the problem.....	2
1.3 Objectives of the study.....	3
1.3.1 Main Objective.....	3
1.3.2 Specific Study Objectives.....	3
1.4 Research questions.....	3
1.5 Research Hypothesis.....	<b>Error! Bookmark not defined.</b>
1.6 Justification.....	4
1.7 Scope / Delimitations and Limitation of the study.....	4
1.8 Outline of thesis.....	4
1.9 References.....	6
CHAPTER 2.....	8
LITERATURE REVIEW.....	8
2.1 Introduction.....	8

2.2 Human consequences of development projects .....	8
2.3 Impacts of large dam projects on food security: A tale of the Tonga people of the Zambezi valley .....	9
2.4 Contextualizing livelihood strategies .....	10
2. 4.1 Livelihood theories .....	11
2.5 Contextualizing Food Security .....	12
2.6 The study conceptual framework .....	15
2.7 Summary of literature review .....	16
2.8 References .....	17
CHAPTER 3 .....	19
METHODOLOGY .....	19
3.1 Introduction .....	19
3.2 Description of study sites .....	19
3.3 Research design.....	20
3.4 Sampling procedure.....	20
3.5 Data collection procedure.....	22
3.6 Data analysis procedure .....	23
3.7 Ethical considerations .....	24
3.8 Summary .....	25
3.9 References .....	26
CHAPTER 4 .....	27
Abstract .....	27
4.1 Introduction .....	27
4.2 Material and Methods.....	28
4.2.1 Description of study area.....	28
4.2.2 Research Design .....	28
4.2.3 Sampling procedure .....	28

4.2.4	Data collection procedure .....	29
4.2.5	Data analysis procedure .....	29
4.2.6	Challenges encountered during data collection .....	29
4.3	Households characteristics of the surrounding communities and those displaced during the construction of Tokwe-Mukosi Dam .....	29
4.3.1	Demographic characteristics of households .....	30
4.3.2	Socio-economic characteristics of sample households.....	31
4.4	Livelihoods before and after dam construction.....	37
4.5	Recommendations .....	42
4.6	Conclusion.....	42
4.7	References .....	44
CHAPTER 5	.....	45
Abstract	.....	45
5.1	Introduction .....	45
5.2	Material and Methods.....	46
5.2.1	Description of study area .....	46
5.2.2	Research Design .....	46
5.2.3	Sampling procedure .....	46
5.2.4	Data collection procedure .....	46
5.2.5	Data analysis procedure .....	47
5.2.6	Challenges encountered during data collect .....	47
5.3	Food security situation of affected households .....	47
5.3.1	Household Food Insecurity Access-related Conditions.....	47
5.3.2	Household Food Insecurity Access-related Domains.....	52
5.3.3	Household Food Insecurity Access Scale Score.....	52
5.3.4	Household Food Insecurity Access Prevalence.....	53
5.3.5	Fisher's exact test for a general r x c exact contingency table .....	54

5.4	Discussion .....	54
5.5	Recommendations .....	55
5.6	Conclusion.....	55
5.7	References .....	56
CHAPTER 6 .....		57
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.....		57
6.1	Introduction .....	57
6.2	Research summary .....	57
6.3	Conclusions .....	58
6.4	Policy implication and recommendations .....	58
6.5	Areas for further research.....	59
6.6	References .....	60

## LIST OF TABLES

<b>Table 4. 1</b>	Age distribution of households .....	30
<b>Table 4. 2</b>	Marital status of households.....	30
<b>Table 4. 3</b>	Household sizes.....	31
<b>Table 4. 4</b>	Household labour force .....	31
<b>Table 4. 5</b>	Literacy status of sample households.....	32
<b>Table 4. 6</b>	Land holding of sample households.....	33
<b>Table 4. 7</b>	Household membership to farmer and micro-finance groups.....	33
<b>Table 4. 8</b>	Household source of loan.....	34
<b>Table 4. 9</b>	Household source of agriculture inputs.....	34
<b>Table 4. 10</b>	Household cattle ownership .....	35
<b>Table 4. 11</b>	Goats ownership by households.....	35
<b>Table 4. 12</b>	Sample households markets for produce.....	36
<b>Table 4. 13</b>	Access to irrigation facilities and water source of households .....	36
<b>Table 4. 14</b>	Sample households' produce storage structures .....	37
<b>Table 4. 15</b>	Sample population receipt of grants.....	37
<b>Table 4. 16</b>	Households source of livelihoods before and after dam construction .....	38
<b>Table 5. 1</b>	Households worrying about not having enough food.....	48
<b>Table 5. 2</b>	Households not able to eat preferred foods.....	48
<b>Table 5. 3</b>	Households eating a few kinds of foods .....	49
<b>Table 5. 4</b>	Households eating foods that they really do not want to eat.....	49
<b>Table 5. 5</b>	Households eating smaller meals .....	50
<b>Table 5. 6</b>	Respondent households eating fewer meals in a day .....	50
<b>Table 5. 7</b>	Households having no food of any kind in the household.....	51
<b>Table 5. 8</b>	Households go to sleep hungry .....	51
<b>Table 5. 9</b>	Households going a whole day and night without eating .....	51
<b>Table 5. 10</b>	Percentage households and HFIAS related domains .....	52
<b>Table 5. 11</b>	Household Food Insecurity Access Scale Score .....	53
<b>Table 5. 12</b>	Household Food Insecurity Access Prevalence .....	54

## **LIST OF FIGURES**

Figure 2.1: Department for International Development livelihoods framework (Source: Owen et al, 2018) .....	12
Figure 2. 2 Food Security - A multi-dimensional phenomenon (Source: Matemilola & Elegbede, 2017) .....	14
Figure 2. 3 Conceptual framework of the study .....	16
Figure 3. 1 Study area.....	19

## LIST OF APPENDICES

Appendix A .....	64
<i>McNemar test for correlated proportions</i> .....	64
Appendix B .....	66
Chi-Square Tests.....	66
$r \times c$ Exact Contingency Table: Results .....	66
Appendix C .....	67
<i>Household questionnaire</i> .....	67
Appendix D .....	74
<i>Key informant interview guide</i> .....	74

# CHAPTER 1

## INTRODUCTION

### 1.1 Background of the study

National development projects such as dams, roads, reservoirs of oil, gas and mining projects are often undertaken by governments for national economic gains. National development as a goal of public policy aims at improving levels of well-being through enhancing productive capacity based on the premise that greater production and income will filter through the system to increase general patterns of consumption (Oliver-smith, 2005). Projects such as dam construction have been the core mechanism of human survival and economic development throughout the world. Dams are not simply for irrigating lands to increase land's productivity but also to control floods, to harness electricity and to cater for industry and municipality needs (Garada, 2015).

Robinson (2003) noted that, while such projects can bring enormous benefits to society, they also impose costs, which are often borne by its poorest and most marginalized members. Large-scale development of dams requires large tracts of land and this need can result in internal displacement of local communities. Poor, indigenous and marginalized groups are frequently displaced without consultation to make way for grant national projects. Globally, it is estimated that in the current decade 2010-2018, approximately 15 million people have been forced to leave their homes to give way for huge development projects (Aboda, Mugagga, Byakagaba, & Nabanoga, 2019). In Zimbabwe, the Kariba dam construction displaced approximately 57,000 people between 1957 and 1958 and these displaced communities severely suffered from famine and impoverishment (Soils Incorporated Pvt Ltd and Chalo Environmental and Sustainable Development Consultants, 2000). Even in situations where people are not required to physically move, the project may still impact on their livelihood or income generating activities either temporarily or permanently (UNDP, 2017). Unfortunately, much resettlement efforts have only been concerned with providing cash compensation or addressing the need for replacement housing, without giving adequate attention to all the other dimensions of livelihoods.

According to Debarre, Henry, & Rahmaty (2018), once people are displaced, they are most likely to continue facing displacement. This continuously disrupts local food systems and household livelihoods. In the case of the Tonga people of the Zambezi valley, the implementation of alternative livelihood plans has not been sufficient enough to ensure that affected households are not adversely impacted. As a result, since the construction of the Kariba dam, the Tonga people have been a food-deficit people (Bond & Manyanya, 2002).

According to UNDP (2017) displacement should be avoided whenever possible. When it has been identified as necessary, it must be pursued and performed in a manner that is consistent with international and national standards that improve standard of living of the displaced by increasing economic opportunities. Given the number of people displaced today, progress towards the United Nations (UN) Sustainable Development Goals (SDGs) will be hindered if participation of such populations to specific SDGs is not well documented. The UN's 2030 Agenda for Sustainable Development presents an opportunity to build on existing efforts and ensure that the plight of internally displaced persons (IDPs) is addressed in both the short and long term. 2030 Agenda includes seventeen SDGs and it pledges to leave no one behind. 2030 Agenda is therefore, key to the realization of durable solutions for IDPs because poverty, addressed in SDG 1, as well as hunger and food insecurity, addressed in SDG2, are often the result of, or exacerbated by displacement (Debarre, Henry & Rahmaty, 2018).

Those who remain around a major development project have to adapt to the transformed and changed land use. Studies conducted around development projects exploited a broader picture of socio-economic impacts of these projects (Cernea, 2008; Chazireni & Chigonda, 2018). However, it is still not clear as to how much these projects affect food security of the affected communities and their participation in ending hunger, achieving food security and improving nutrition. It is against this background that this study is designed to explore effects of a large development project particularly Tokwe-Mukosi Dam on food security.

## **1.2 Statement of the problem**

Following the completion of construction of the Tokwe-Mukosi dam, which is the largest inland dam in Zimbabwe in 2014, Chivi district was expected to have a new lease of life. In February 2014, approximately 20,000 people were evacuated from Tokwe-Mukosi basin to Chingwizi transit camp in Mwenezi in an emergency operation following a flood. They were

further relocated to Bongo and Nyoni sections of Nuanetsi Ranch in Mwenezi district in Masvingo Province in August of the same year. Therefore, the argument is that the perceived positive benefits of the dam are overstated and that the potential negative effects such as displacement of communities, dispossession of land and reduced access to reservoir were deliberately underestimated in favour of a national agenda. This study is undertaken to understand the food security situation of households affected by Tokwe-Mukosi dam construction and to understand their past and current livelihood strategies as influenced by the project.

### **1.3 Objectives of the study**

#### **1.3.1 Main Objective**

The main objective of this study is to assess the effects of Tokwe-Mukosi dam project on food security of local communities.

#### **1.3.2 Specific Study Objectives**

The specific objectives of this study are:

1. To characterize households surrounding and those displaced during the construction of Tokwe-Mukosi Dam.
2. To examine livelihood strategies adopted by people before and after Tokwe-Mukosi Dam construction.
3. To assess food security status of households around and those who were displaced from Tokwe-Mukosi Dam.

### **1.4 Research questions**

1. What are the characteristics of households surrounding and those displaced during the construction of Tokwe-Mukosi dam?
2. What livelihood strategies were adopted by people before and after Tokwe-Mukosi Dam construction?
3. What is the food security status of households around and those that were displaced from Tokwe-Mukosi Dam?

## **1.6 Justification**

This study on the effects of development projects on food security has multitude of importance. Firstly, it characterizes households that are either positively or negatively impacted by national development projects particularly large inland water bodies. Secondly, UN general assembly resolution 72/182 of December 2017 encourages governments, UN agencies and other stakeholders to promote an inclusive approach that addresses the needs of internally displaced persons by promoting self-sufficiency through income generating activities and sustainable livelihood opportunities.

The study ascertains the extent to which this resolution has been implemented and establishes the contribution of locals to the attainment of UN 2030 Agenda which pledges to leave no one behind. The study ascertains if removal of people from their habitual areas to distant territories giving way for development projects, affects their food security. This research project emphasizes the humanitarian-development nexus and is a complementary effort to increase humanitarian and development actors' knowledge to better respond to the needs of populations caught up in development related disturbances. It provides strategic information for livelihoods revival and development while contributing to monitoring of progress for UN Sustainable Development Goals among the affected communities.

## **1.7 Scope / Delimitations and Limitation of the study**

The study focus on smallholder farmers in villages around Tokwe-Mukosi dam who were not displaced but within walking distance from Tokwe-Mukosi dam and those displaced to Nuanetsi Ranch of Mwenzezi district. Financial and time constraints were the major limitations to research coverage.

## **1.8 Outline of thesis**

This research report covers six chapters.

Chapter one presents the introductory part of the study which comprises of the background information, problem statement, objectives, justification and scope of the study.

Chapter two provides a review of related literature pertaining to the problem under investigation. Various publications having diverging and converging views in different school of thought as well as empirical findings by other scholars that are pertinent to the

problem were critically read and presented. The conceptual framework of the study is also presented.

Chapter three presents research methodology. It carries the description of study sites, research design, sampling procedure, data collection procedure, data analysis procedure and the ethical considerations of the study.

Chapter four presents an assessment of livelihood strategies adopted by people before and after Tokwe-Mukosi Dam construction.

Chapter five presents of an assessment of food security of households that were physically displaced and those that were economically displaced.

Chapter six gives the research summary, conclusions, policy implementation and recommendations.

## 1.9 References

- Aboda, C., Mugagga, F., Byakagaba, P., & Nabanoga, G. (2019). Development Induced Displacement ; A Review of Risks Faced by Communities in Developing Countries, 7(2), 100–110. <https://doi.org/10.13189/sa.2019.070205>
- Bond, P., & Manyanya, M. (2002). *Zimbabwe's Plunge:Exhausted Nationalism, Neoliberalism and the search for Social Justice*, Weaver Press Limited, Harare.
- Cernea, M. M. (2008). Compensation and benefit sharing: Why resettlement policies and practices must be reformed. *Water Science and Engineering*, 1(1), 63–77. <https://doi.org/10.3882/j>
- Chazireni, E., & Chigonda, T. (2018). THE SOCIO-ECONOMIC IMPACTS OF DAM CONSTRUCTION : CASE OF TOKWE THE SOCIO-ECONOMIC IMPACTS OF DAM CONSTRUCTION : CASE OF TOKWE MUKOSI IN MASVINGO PROVINCE , ZIMBABWE, (October). <https://doi.org/10.5281/zenodo.1410616>
- Debarre, A., Henry, A., & Rahmaty, M. (2018). Reaching Internally Displaced Persons to Achieve the 2030 Agenda IDPs in the International Agenda, 182.
- Garada, R. (2015). Development Project Caused Resettlement and Rehabilitation Policy : Development Project Caused Resettlement and Rehabilitation Policy : Overviews on Dam Projects In Odisha ( India ), (March). <https://doi.org/10.9790/0837-20378997>
- HRW, (Human Rights Watch). (2015). World Report 2015 World Report 2015 Zimbabwe Human Rights Watch.
- Oliver-smith, A. (2005). Development & Dispossession 1, 3–23.
- Robinson, W. C. (2003). The Brookings Institution-SAIS Project on Internal Displacement Risks and Rights : The Causes , Consequences , and Challenges of Development-Induced Displacement Risks and Rights : The Causes , Consequences , and Challenges of Development-Induced Displace, (May).
- SICES, (Soils Incorporated Pvt Ltd and Chalo Environmental and Sustainable Development Consultants). (2000). Kariba Dam Case Study, prepared as an input to the World Commission on Dams, Cape Town, (November).
- UNDP. (2017). Guidance Note UNDP Social and Environmental Standards (SES) UNDP Guidance Notes on the Social and Environmental Standards (SES), (December).

Vanclay, F. (2017). Project-induced displacement and resettlement: from impoverishment risks to an opportunity for development? *Impact Assessment and Project Appraisal*, 35(1), 3–21. <https://doi.org/10.1080/14615517.2017.1278671>

## **CHAPTER 2: LITERATURE REVIEW**

### **2.1 Introduction**

This chapter reviews literature related to effects of development projects on food security. Various publications of diverging and converging views as well as empirical findings by other scholars that are pertinent to the problem are presented.

### **2.2 Human consequences of development projects**

When large development projects are undertaken, there is transformation and change of land use. Meyer (1996) described such environmental change as neither environmental improvement nor environmental degradation. He suggested that it is the characteristics of the society interacting with the physical phenomena that makes it to be either a resource or a hazard. Harper (2004) concurred by suggesting that the decision on how desirable or undesirable an environmental change is, is complicated by various factors. Firstly, a single environmental change may incur multitudes of impacts that require accurate data. Secondly, in one type of environmental change there are gainers and losers. Thirdly, intervention costs are to be borne by various losers and gainers with uncertainty. Lastly, the phenomena involve the presence of risk and blames.

Despite sharing many similarities, displacement caused by development projects differs in important ways from the dislocation experienced by participants in voluntary relocation schemes, victims of natural disasters, and refugees from civil and international conflicts. People in development-forced displacement and resettlement are pushed to move rather than pulled or attracted by better possibilities elsewhere. There is also no returning home after the situation has stabilized. For this reason, the solutions devised to meet the needs of development-forced displaces must be durable, not contingency-based emergency strategies to meet immediate needs until people can return home (Oliver-smith, 2005).

Many people displaced by development projects succumb to the impacts of dislocation or find themselves relegated to the margins of society and the economy. They are resettled to poor quality lands which prevent them from cultivating crops and where there are no existing local markets for selling cash crops (Vanclay, 2017). Although affected individuals are promised compensation prior to project commencement, funds are not distributed until

several years after project initiation. Alternative livelihood development plans for affected individuals are sometimes not implemented or insufficiently implemented because of poor funding (International River Network, 2008).

### **2.3 Impacts of large dam projects on food security: A tale of the Tonga people of the Zambezi valley**

Before dam construction and the subsequent resettlement of the Tonga people, the Tonga inhabited both banks of the middle Zambezi valley from Kariba dam to Mlibizi. Villages were situated along the Zambezi River and around the deltas of the tributaries. The main occupation of the people consisted of riverine and upland farming, livestock rearing, hunting, fishing and manufacturing. Riverine farming was based on recession agriculture, which depended on the flood regime of the river. Away from the flood plain, on the poorer soils of the upland valley area, shifting cultivation was practiced. Due to annual flooding of the Zambezi that fertilized the riverine gardens and deposited alluvial soils, the valley Tonga could harvest twice a year and were seldom victims of hunger and famine. The abundant flora of the valley provided many types of wild foods, which were an alternative during periodic food shortages. Livestock rearing and wildlife hunting were important activities and major sources of animal protein prior to the enactment of restrictive game laws introduced in Zimbabwe and Zambia.

In the 1950's government officials decided to flood the Tonga's lands to create a dam to produce hydro-electric power. Kariba dam was then constructed in 1955-59, with a storage capacity of 180km<sup>3</sup>, extending over a length of about 300km, and having a surface area of some 5500km<sup>2</sup> at full supply level, and is one of the largest dams in the world (SICES, 2000). The lives of the Tonga people then changed drastically, resulting in disruption of the socio-economic and food security of the Tonga people (Bond & Manyanya, 2002). 57 000 Tonga people were displaced from the river valley and relocated to the higher, dry country marred by low and erratic rainfall, poor rocky and sandy soils, and tsetsefly infested areas like Binga, Nyaminyami, Hwange and Gokwe in 1957 and 1958 (SICES, 2000). The Southern Rhodesia government demarcated a 5km wide buffer zone along the lakeshore, which was designated recreation land, and therefore was out of bounds for the relocated Tonga people. This buffer zone denied the Tonga access to water resources; and could not easily access the dam for fishing, recession agriculture and irrigation.

Some of the resettlement areas had prolific wildlife before resettlement took place. The resettlement of an essentially farming community caused a conflict with the wildlife in the area. Wild animals became a more serious problem. They threatened people's lives, preyed on livestock and wiped out crops in the fields and green vegetables in the winter gardens contributing in no small measure to poor harvest and starvation in the resettlement areas. The Tonga people also experienced very serious losses in livestock. Cattle, goats and sheep were lost in accidents while in transit to the areas of resettlement. Some were lost through predators, poisonous plants, lack of suitable and palatable browse, water shortages and epidemics that characterized the new areas.

When the people were relocated, the government promised to construct small dams in the new resettlement areas and pipelines from the Kariba reservoir to the new areas. However, no such developments took place (Minority voices newsroom, 2010). Consequently, the Tonga communities currently suffer from acute food and water shortages. They became a food deficit people who heavily rely on national and international food aid. Despite the tourism, and fishing opportunities of Lake Kariba, the Tonga community did not benefit from the construction of the Kariba dam and the five-star hotels, resorts, and safari camps that were built along the shores of Lake Kariba due to lack of capital, professional skills or education (SICES, 2000).

#### **2.4 Contextualizing livelihood strategies**

According to Owen *et al* (2018), livelihood strategies are the combination of activities and choices that people make or undertake in order to achieve their livelihood goals. At the basis of these choices lies the endowment of capital or assets, which determines the possibilities people have (van den Berg, 2010). Asset specificity may exclude some households from specific activities, thus causing differences in returns between activities and in standard of living between households. Exogenous shocks such as development-induced displacements affect the choices as well as the outcome of livelihood strategies. In other words, the strategy of a household at any given time is determined by its goals and aspirations, assets, and the constraints imposed or opportunities provided by prevailing policy and institutional structures. People tend to develop the most appropriate livelihood strategies possible to reach desired outcomes such as food security although unstable or unsatisfactory livelihood outcomes may be the result of several factors which often interact (FAO, 2009).

Households often have mixed livelihood portfolios that allow them to deal with the uncertainty and seasonality of rural economies (Owen *et al*, 2018). In a high risk environment, people may diversify or skew towards low-risk low-return activities to avoid losses (van den Berg, 2010). Following a displacement event, a component of the household's livelihood portfolio may cease to be viable and people may respond through either coping or adaptation strategies. When adaptation strategies are successful, households become less prone to crisis overtime and their capacity to resist shocks is improved. Over the longer term, households might choose to build up their assets, change their asset mix and diversify their income sources (Owen *et al*, 2018).

#### **2. 4.1 Livelihood theories**

The work of Chambers and Conway in the early 1990s helped defining livelihoods and the factors that make them sustainable (Owen *et al*, 2017). Numerous livelihood frameworks were then developed as a way of understanding how households derive their livelihoods by drawing on capabilities and assets to develop livelihood strategies composed of a range of activities by development practitioners. These approaches emphasize the importance of putting livelihoods in context where the relationship between households, assets, institutions and outcomes can be fully understood. Discussion of these approaches help to understand the complexities involved.

##### *The Department for International Development (DFID) livelihoods framework*

The DFID livelihoods framework as shown in Figure 2.1 is one of the most used frameworks. It sets out to conceptualize; how people operate within a vulnerability context that is shaped by different factors. These include shocks such as development-induced displacement. The DFID livelihoods framework conceptualizes how people draw on different types of livelihood assets in different combinations which are influenced by the vulnerability context, range of institutions and processes, and how they use their asset base to develop a range of livelihood strategies to achieve desired livelihood outcomes such as improved food security.

## The UNDP livelihoods Framework

The United Nation Development Programme (UNDP) understands livelihood as a means, activities, entitlements and assets by which people make a living. It employs an asset-based approach emphasizing the promotion of people's access to and sustainable use of the assets upon which they rely as central to poverty reduction. To that end, it stresses the need to understand the coping and adaptive strategies pursued by men and women. Coping strategies are short-term responses to a specific shock, while adaptive strategies entail long-term change in behaviour patterns as a result of a shock. Both are influenced by people's asset status but also have implications for the composition of the assets themselves, which could be depleted or regenerated. Moreover, UNDP specifically focuses on the importance of technological improvements as a means to help people rise out of poverty.

Other key emphases of the UNDP sustainable livelihoods approach are that; the focus should be on people's strengths as opposed to needs. Policy (micro, macro and sectorial policies that influence people's livelihood strategies) and governance issues as they impinge on people's livelihoods should be taken into consideration and addressed through specific actions and sustainability is constantly assessed and supported (Krantz, 2001).

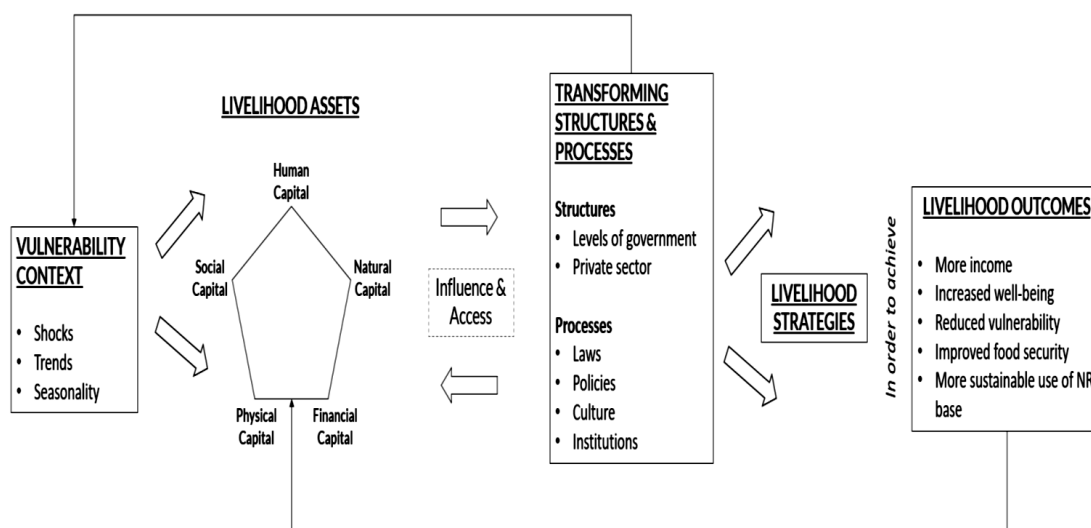


Figure 2.1: Department for International Development livelihoods framework (Source: Owen *et al*, 2018)

## 2.5 Contextualizing Food Security

The concept of food security emerged with the global food crisis of 1973-1974 (Upton *et al*, 2016). The most widely accepted definition of food security derives from the 1996 World

Food Summit Plan of Action, which describes food security as a situation that exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (Bach & Aborisade, 2014). Food security is anchored on four pillars which are; the physical availability of food in sufficient quantity, the possibility of people to access food economically and physically, food utilization, and an enabling socio-political environment which fosters the resilience of food systems against shocks and crisis, thus ensuring stability of food security over time (Upton *et al.*, 2016). Each of these factors depend on several other sub-factors or components which must all be taken into consideration in formulating a framework for sustainable food security (Bach & Aborisade, 2014).

Besides affecting people's dignity, food security is a central issue because of the significant number of problem areas that may be connected to it, both direct and indirectly (Berry *et al.*, 2015). According to Berry *et al* (2015), more recently, intergovernmental processes have emphasized the importance of sustainability to preserve the environment, natural resources and agro-ecosystems and thus the overlaying social system. Bach & Aborisade (2014), argued that, in order to comprehend the complexity of the issues of food security, a multi-dimensional approach must be utilized which takes into account various perspectives of the phenomenon, including; economy, environment, politics and society as illustrated in Figure 2.2

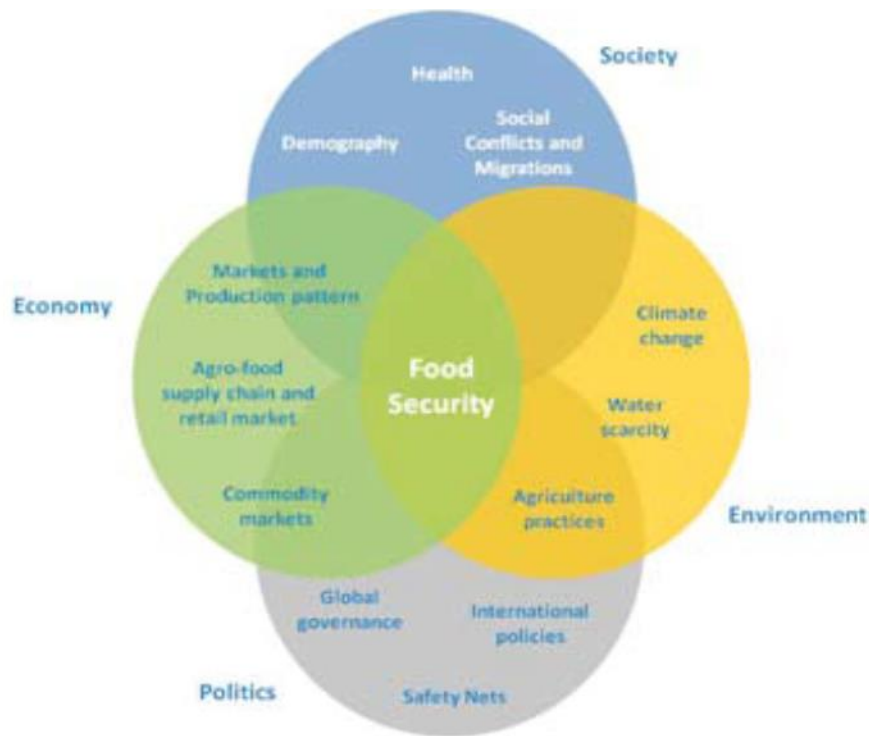


Figure 2. 2 Food Security - A multi-dimensional phenomenon (Source: Matemilola & Elegbede, 2017)

### 2.5.1 Economics

The physical and economic situation access to food largely depends on a functioning system of distribution and trade in local and regional markets that are accessible to all, access to knowledge and skill. The physical and economic access to food largely depends on a functioning system of distribution and trade in local and regional markets that are accessible to all, the access to knowledge and skill, and the existence of business and income opportunities (Berry *et al*, 2015). One of the major causes of hunger is poverty. For it to be eliminated it requires equitable and sustainable economic development especially in terms of agriculture. It is estimated that 75% of those under the poverty level live in rural communities and are primarily smallholder farmers (Matemilola & Elegbede, 2017).

### 2.5.2 Politics

The role of government and politics in identifying the causes and finding solutions to poverty and malnutrition in the world is, perhaps, the most important. Resolution of the determining factors which generate poverty and malnutrition pass through political management (Matemilola & Elegbede, 2017).

### *2.5.3 Environment and natural resources*

The availability of food essentially depends on people's access to productive resources like land, water, forests, biodiversity and capital. Availability also depends on the possibilities people have to preserve local natural resources and apply agro-ecological principles in diversified production systems which are based mainly on local renewable inputs (Berry *et al*, 2015). According to Bach & Aborisade, (2014), enhanced supply of resources is a source of income and prosperity for a society. However, it is estimated that the decline and conversion of croplands use could cause a reduction in cultivated land area of 8-20% by 2050 (Matemilola & Elegbede, 2017).

### *2.5.4 Society*

The societal aspects of food security can be summarized in areas of human health, demographics, and socio-political issues such as social conflict and migration phenomena. According to Bach & Aborisade, (2014), food utilization, reflects concerns about whether individuals and households make good use of the food to which they have access. It can be measured by the people's ability to make best and safe use of the available food resources.

Use of the available nutrients depends on diversity and the nutritive balance of the available food. For proper utilization of food, people should have access to safe drinking water and sanitation. Households should have access to health care, hygienic environment, knowledge on personal hygiene, knowledge of proper food care and feeding practices (Berry *et al*, 2015).

## **2.6 The study conceptual framework**

The coming of large development projects such as dam construction transforms and change land use. It divides the community into 2 groups, one for those that are physically displaced and the other for those that remain in the periphery of the project. Their livelihood strategies are directly and indirectly affected, they are either maintained, improved or weakened depending on geographical location, demographics, socio-economic status of the household and institutional support. Ultimately, food security is affected either positively or negatively as in Figure 2.3

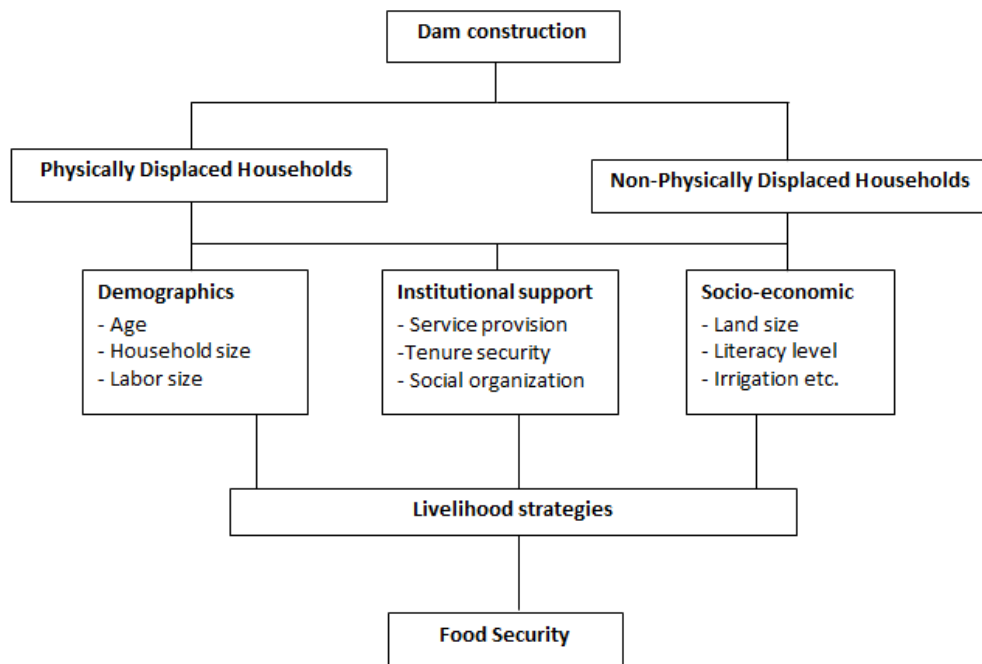


Figure 2. 3 Conceptual framework of the study

## 2.7 Summary of literature review

The chapter looked into human consequences of development projects using Kariba dam project as a case study to illustrate the impact of large dam projects on food security. The chapter discussed livelihood strategies and the associated frameworks that were developed by different development practitioners in trying to fully understand and promote livelihoods. Among several existing livelihood frameworks, the DFID and UNDP theoretical frameworks were discussed. It then covered issues of food security before concluding with the study conceptual framework.

## 2.8 References

- Bach, C., & Aborisade, B. (2014). Assessing the Pillars of Sustainable Food Security. *European International Journal of Science and Technology*, 3(4), 118–125.
- Berry, E. M., Dernini, S., Burlingame, B., Meybeck, A., & Conforti, P. (2015). Food security and sustainability: Can one exist without the other? *Public Health Nutrition*, 18(13), 2293–2302. <https://doi.org/10.1017/S136898001500021X>
- Bond, P., & Manyanya, M. (2002). *Zimbabwe's Plunge: Exhausted Nationalism, Neoliberalism and the search for Social Justice*, Weaver Press Limited, Harare.
- FAO. (2009). *The Livelihood Assessment Tool-kit. The effects of brief mindfulness intervention on acute pain experience: An examination of individual difference*. <https://doi.org/10.1017/CBO9781107415324.004>
- Harper, C.L. (2004). *Environment and Society: Human perspectives on Environmental Issues* (3<sup>rd</sup> Ed) New Jersey: Pearson Education Inc.
- IRN (International River Network), (2008). *Power surge: The impacts of hydro-development in Laos*. Berkeley, CA: International Rivers Network.
- Krantz, L. (2001). The sustainable livelihood approach to poverty reduction. *Swedish International Development Policy*, (Division for Policy and Socio-Economic Analysis), 44.
- Matemilola, S., & Elegbede, I. (2017). The Challenges of Food Security in Nigeria. *OALib*, 04(12), 1–22. <https://doi.org/10.4236/oalib.1104185>
- Meyer, W.B. (1996). *Human Impact on the Earth*. Cambridge: University Press.
- Minority voices newsroom. (2010). *The Tonga People in Zimbabwe: A forgotten People*. Available on [www.minorityvoices.org](http://www.minorityvoices.org). Accessed 17 February 2019
- Oliver-smith, A. (2005). *Development & Dispossession* 1, 3–23.
- Owen, J., Muriuki, G., and Kemp, D. (2008). *livelihoods, Food security and Mining-Induced Displacement and Resettlement*. Centre for Social Responsibility in Mining (CSR), The University of Queensland: Brisbane.
- SICES, (Soils Incorporated Pvt Ltd and Chalo Environmental and Sustainable Development Consultants). (2000). *Kariba Dam Case Study*, prepared as an input to the World Commission on Dams, Cape Town, (November).
- Upton, J. B., Cissé, J. D., & Barrett, C. B. (2016). Food security as resilience: Reconciling definition and measurement. *Agricultural Economics (United Kingdom)*, 47, 135–147. <https://doi.org/10.1111/agec.12305>

- van den Berg, M. (2010). Household income strategies and natural disasters: Dynamic livelihoods in rural Nicaragua. *Ecological Economics*, 69(3), 592–602. <https://doi.org/10.1016/j.ecolecon.2009.09.006>
- Vanclay, F. (2017). Project-induced displacement and resettlement: from impoverishment risks to an opportunity for development? *Impact Assessment and Project Appraisal*, 35(1), 3–21. <https://doi.org/10.1080/14615517.2017.1278671>
- Andrews, L., Higgins, A., Andrews, M. W., & Lalor, J. G. (2015). Andrews, L., Higgins, A., Waring, M., and Lalor, J., *Using Classic Grounded Theory to analyse secondary data : reality and reflections*, *Grounded Theory Review*, 11, *Classic Grounded Theory to Analyse Secondary Data : Reality and Reflections*. (January 2012), 11–26.
- Igwenagu, C. (2016). Fundamentals of research methodology and data collection. *Lambert Academic Publishing*, (June), 1–47. [https://doi.org/10.1007/978-3-658-19918-0\\_8](https://doi.org/10.1007/978-3-658-19918-0_8)
- Mohajan, H. (2017). *B 26 research approach*. (83457).
- Molenberghs, G. (2010). Survey methods and sampling techniques. *Interuniversity Institute for Biostatistics and Statistical Bioinformatics (I-BioStat)*. Retrieved from <http://soc.kuleuven.be/ceso/historischedemografie/resources/pdf/ML/survey10.pdf>
- Resnik, J., & David, B. (2015). What is Ethics in Research & Why is it Important? *National Institute of Environmental Health Sciences*, (January 2007), 1–10. Retrieved from <http://www.niehs.nih.gov/research/resources/bioethics/whatis/>
- Southern African Development Community. (2016). *South Africa Vulnerability Assessment Committee Results 2016*. Retrieved from [http://reliefweb.int/sites/reliefweb.int/files/resources/sadc\\_south\\_africa\\_2016.pdf](http://reliefweb.int/sites/reliefweb.int/files/resources/sadc_south_africa_2016.pdf)
- Taherdoost, H. (2017). Determining Sample Size; How to Calculate Survey Sample Size. *International Journal of Economics and Management Systems*, 2(February 2017), 236–239. <https://doi.org/https://www.researchgate.net/publication/322887480>

## CHAPTER 3: METHODOLOGY

### 3.1 Introduction

This chapter presents all tools and methods used in this study. It introduces the research design and empirical methods for the general approach, and specific techniques to address the objectives for this research. It also carries the description of study sites, sampling procedure, data collection procedure, data analysis procedure and the ethical considerations of the study. It provides the principles for organizing, planning, designing and conducting research.

### 3.2 Description of study sites

The study focused on Nuanetsi ranch settlement in Mwenezi district, Masvingo province in Zimbabwe as well as villages in wards 24 and 31 of Chivi district along Tokwe-Mukosi dam (20°34'40.05"S, 30°54'11.31"E) in Masvingo Province, Southern Zimbabwe as in Figure 3.1. Chivi and Mwenezi districts are in drier parts of the country classified into Agro-ecological Region V (ZIMVAC, 2010). Annual rainfall is around 500-600mm and the soils are poor and prone to erosion.

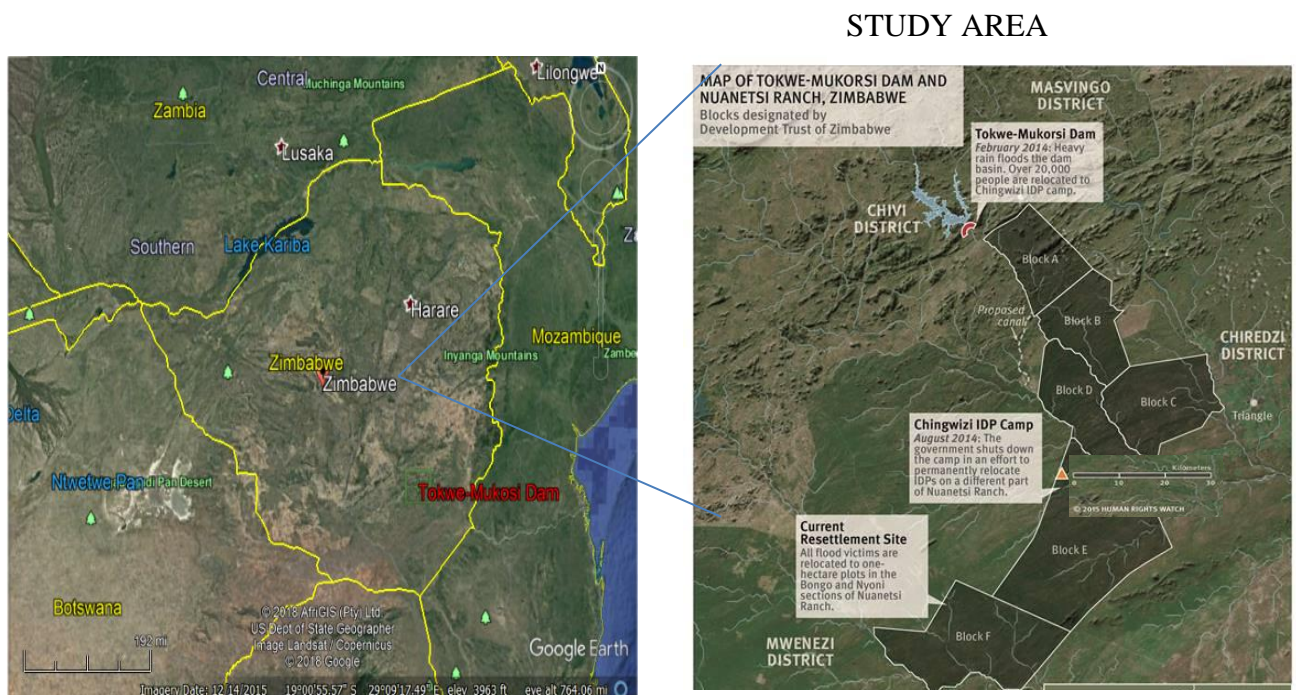


Figure 3. 1 Study area

### **3.3 Research design**

This study adopted the descriptive research design. Although some people dismisses descriptive research as mere description, good description is fundamental to the research enterprise and it has added immeasurably to our knowledge of the shape and nature of our society (Broadhurst, Holt, & Doherty, 2012). By demonstrating the existence of social problems, description can challenge accepted assumptions about the way things are and can provoke action. Descriptive research encompasses much of government sponsored research including the population census, economic information such as household expenditure patterns, employment and crime statistics.

In order to satisfy the objectives of the dissertation, both qualitative and quantitative methods of data collection were used. Household demographic and socio-economic characteristic data was collected using questionnaires with selected households from communities living around Tokwe-Mukosi Dam and those who were displaced during construction of the dam. Qualitative data was collected through interviews with selected key informants who include local community leaders and line ministries.

To understand the effects of dam construction on livelihood strategies, household livelihood strategies data was gathered for periods before and after the project for both the displaced and non-displaced populations. Household food security status was determined using data collected using the Household Food Insecurity Access Scale for households in both populations. Data was analyzed as per each given objective. Secondary data was also used to supplement findings by primary data.

### **3.4 Sampling procedure**

Ideally, all smallholder farmers around Tokwe-Mukosi dam and all those who were displaced to Nuanetsi Ranch in Mwenzi district were to be interviewed, but due to time, finance and logistical issues such coverage was not justifiable and manageable. Sampling was then done to overcome these challenges. According to (Molenberghs, 2010), sampling allows one to obtain a representative picture about the population without studying the entire population. In order to generalize from a random sample and avoid sampling errors or bias, a random

sample needs to be of adequate size. While the larger the sample the lesser the likelihood that findings will be biased does hold, diminishing returns can quickly set in when samples get over a specific size which need to be balanced against researcher's resources (Taherdoost, 2017). Overall sample size was determined by following standard procedure:

$$n = p (100-p) Z^2 / E^2$$

Where **n** = size of the sample

**P** = estimate of the population proportion affected by dam construction

**Z** = standard normal value of the desired confidence level

**E** = maximum accepted error margin

The sample size for the study was found to be 186. However, due to observed homogeneity in the background characteristics of the target population and considering resource constraints, only 159 households were considered as overall sample size for this study.

Selection of respondents for the study was done using multi-stage sampling procedure. Firstly, the entire population that surrounded Tokwe-Mukosi dam basin prior to project commencement was considered. Two subsets were then formulated; one for those settlements that are currently bordering Tokwe-Mukosi dam basin (socially and economically affected) differentiated from those that were physically displaced to Nuanetsi Ranch during dam construction. Two settlements were then randomly selected from each stratum for interview.

The random assignment of these 159 samples to each village was decided proportionally based on the size of total household numbers of the respective sample settlement. Thus 38 respondent households were assigned to Masangula resettlement, 46 to Chingwizi resettlement in Nuanetsi Ranch in Mwenezi while the remaining respondents were assigned to Zifunzi (44) and Zunga (31) communal areas in Chivi district.

The sample frame that constituted the names of the household heads in each settlement was obtained from their respective settlement heads and random numbers were assigned to each of them for selection. At the end, the interviewers were able to access 80 households in the two enumeration areas in Nuanetsi Ranch resettlements of Mwenezi district and 73 households in the other two enumeration areas in Chivi communal area settlements to make a

total of 153 respondent households. The remaining households did not turn up for interviews at the selected enumeration points.

### **3.5 Data collection procedure**

Data refer to raw facts without any processing, organizing or analysis, and hence they have little meaning and few benefits to the managers and decision –makers (Mohajan, 2017). Primary data originates from a study in which a researcher collects information to answer a particular research question (Andrews *et al*, 2015). Secondary data, on the other hand, is data that already exists.

For the purpose of this study, both primary and secondary data was used. Primary data collection included a structured household survey questionnaire (Appendix C) and a semi-structured questionnaire for in-depth interviews with key informants (Appendix D). Prior to generation of primary data, some processes were followed to get approval to undertake the proposed research. The first step involved application for approval to local government national office followed by stakeholder mapping to identify key stakeholders at regional and district levels. They were then notified of the intended study. At district level, key ministries and departments were contacted for interviews. At ward level, ward councillors and local government units were visited, during which the study team interacted with key staff and stakeholders including Agriculture technical extension (AGRITEX) officers and the local headmen so as to get acceptance of their participation in the research. These in turn mobilized selected respondent households to designated enumeration points.

Meetings were held with respondent households in May and June 2019 at respective enumeration points in communities living adjacent to Tokwe-Mukosi Dam (Zunga and Zifunzi communal areas), and at Nuanetsi Ranch resettlement areas of Masangula and Chingwizi where basin dwellers were resettled. In total 153 household interviews were conducted. Four key informant interviews with department of AGRITEX, Cottco, District Administrator’s office and local headmen were held to gain insight into perceptions, actions and policies currently employed by major actors in ensuring sustainable livelihoods and food security for those affected by the water body. These actors were interviewed on their roles, their memories of what communities around used to do in order to earn a living prior to

Tokwe-Mukosi Dam construction, livelihood strategies currently undertaken by communities with or without external support.

Besides, secondary data was also used to supplement findings by primary data. Desk review of relevant literature was done to obtain secondary data on objectives under study. Published data was collected from ZIMVAC reports and unpublished data were from government department reports.

### **3.6 Data analysis procedure**

Data from questionnaires and secondary sources were compiled, sorted, cleaned and coded into a coding sheet and was subjected to a computerized statistical package SPSS 23.0. Data was analyzed as per each given objective. Household demographic and socio-economic characteristics data was analyzed using descriptive statistics to describe and summarize gathered data.

Household strategies before and after Tokwe-Mukosi dam construction was summarized using descriptive statistics with the aim to focus attention on the salient feature and disregard the nonessential details.

#### *McNemar test of correlated proportions*

Livelihood strategies were tested using McNemar test of correlated proportions. The McNemar test is best described as a 2 x 2 cross classification of paired responses to a dichotomous item (Adedokun & Burgess, 2012). Since we were looking to test differences in proportions among matched pairs in a before and after scenario, an appropriate choice was the McNemar's test. In essence, it is a chi-square goodness of fit on the two discordant cells, with a null hypothesis stating that 50% of the changes go in each direction.

#### *Household Food Insecurity Access Scale (HFIAS) for measurement of food access*

Food security status of respondent households was estimated using the Household Food Insecurity Access scale (HFIAS) for measurement of food access. The HFIAS is an adaptation of the approach used to estimate the prevalence of food insecurity in the United States of America annually (Coates, Swindale, & Bilinsky, 2007). The method is based on the idea that the experience of food insecurity (access) causes predictable reactions and responses that can be captured and quantified through a survey and summarized in a scale. The Fisher's

exact test was then used to assess for independence between settlement and HFIAS prevalence. Fisher's exact test is practically applied in the analysis of small samples and or when more than 20% of cells have expected frequencies less than 5 because applying approximation method such as chi-square will be inadequate (Kim, 2017).

### **3.7 Ethical considerations**

Ethic is an important characteristic in any research. According to Resnik & David, (2015), ethics can be defined as norms for conduct that distinguishes between acceptable and unacceptable behavior. As such, the researcher considered the following ethical principles; honesty, objectivity, integrity, carefulness, respect for intellectual property, confidentiality and legality in carrying out his work. Participants in the study were fully informed and had a full consent before taking part in the study. They voluntarily took part in the process after being given full information about their participation rights and use of data.

#### **Honesty**

The researcher strived for honesty in all communications. Data, results, methods and procedures were honestly reported. No fabrication, falsifying or misrepresentation of data was done.

#### **Objectivity**

High levels of professionalism were maintained throughout the research process. Bias was avoided or minimized during data collection, analysis and data interpretation as the researcher had no personal or financial interests that might have affected the study.

#### **Integrity**

Considerations were also made to keeping all promises and agreements that were reached with people at all levels of the research. The researcher endeavored for consistency of thought and action throughout the project.

#### **Carefulness**

Every care was taken to avoid careless errors and negligence by both the researcher and the hired enumerator. Good records of research activities such as data collection and research

design were kept and holistically followed. No research documents were lost or destroyed in any way as a result of carelessness.

### **Respect for intellectual property**

Proper acknowledgement or credit of any contributions to this research has been done. Patents, copy rights and all other forms of intellectual rights have been honored.

### **Confidentiality**

Respondent information confidentiality was protected throughout the research process and respondents were reassured that their answers were treated as confidential and used only for academic purposes. No respondent names were matched to any given answers to the questions or conclusions drawn.

### **Legality**

All relevant laws, institutional and government policies were followed in carrying out this research work. The mandatory special permission requirement for the research project to progress within the targeted study sites was granted from the national office of local government while all protocols at field level were followed.

## **3.8 Summary**

This chapter has provided an outline and description of the research methodology undertaken in the dissertation, and how that is used to draw up the specific research plan for this study. It also described the research sites and gave an insight into the ethical considerations that were made in making this study a success.

### 3.9 References

- Adedokun, A. O., & Burgess, D. W. (2012). Analysis of Paired Dichotomous Data: A Gentle Introduction to the McNemar Test in SPSS. *MultiDisciplinary Evaluation*, 8.
- Andrews, L., Higgins, A., Andrews, M. W., & Lalor, J. G. (2015). Andrews, L., Higgins, A., Waring, M. and Lalor, J., Using Classic Grounded Theory to analyse secondary data : reality and reflections , *Grounded Theory Review* ,, 11 , Classic Grounded Theory to Analyse Secondary Data : Reality and Reflections, (January 2012), 11–26.
- Broadhurst, K., Holt, K., & Doherty, P. (2012). What is Research design? Explanatory/descriptive research. *Qualitative Social Work*, 11(5), 517–534. <https://doi.org/10.1177/1473325011401471>
- Coates, J., Swindale, A., & Bilinsky, P. (2007). USAID Food and Nutrition Technical Assistance: Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide. *Organization*, (August).
- Igwenagu, C. (2016). Fundamentals of research methodology and data collection. *Lambert Academic Publishing*, (June), 1–47. [https://doi.org/10.1007/978-3-658-19918-0\\_8](https://doi.org/10.1007/978-3-658-19918-0_8)
- Kim, H.-Y. (2017). Statistical notes for clinical researchers: Chi-squared test and Fisher's exact test. *Restorative Dentistry & Endodontics*, 42(2), 152. <https://doi.org/10.5395/rde.2017.42.2.152>
- Mohajan, H. (2017). B 26 research approach, (83457).
- Molenberghs, G. (2010). Survey methods and sampling techniques. *Interuniversity Institute for Biostatistics and Statistical Bioinformatics (I-BioStat)*. Retrieved from <http://soc.kuleuven.be/ceso/historischedemografie/resources/pdf/ML/survey10.pdf>
- Resnik, J., & David, B. (2015). What is Ethics in Research & Why is it Important? *National Institute of Environmental Health Sciences*, (January 2007), 1–10. Retrieved from <http://www.niehs.nih.gov/research/resources/bioethics/whatis/>
- Taherdoost, H. (2017). Determining Sample Size; How to Calculate Survey Sample Size. *International Journal of Economics and Management Systems*, 2(February 2017), 236–239. <https://doi.org/https://www.researchgate.net/publication/322887480>
- ZIMVAC. (2010). Zimbabwe Livelihoods Zone Profiles, (February).

## CHAPTER 4

### Livelihoods before and after Tokwe-Mukosi Dam construction

#### Abstract

This study assessed livelihoods of local communities before and after Tokwe-Mukosi Dam construction. The study adopted the analytical descriptive approach, and it depended on household questionnaire and key informant interviews for primary data collection. Statistical significance of proportions was justified by using McNemar test for correlated proportions. Results obtained indicate that respondent households lost their traditional livelihood strategies and became more dependent on food assistance and gifts from well-wishers.

#### Keywords/terms

Tokwe-Mukosi Dam construction

Livelihoods

Analytical descriptive approach

McNemar test

Local community

#### 4.1 Introduction

Dams have been promoted as an important means of meeting perceived needs for water and energy and as long-term strategic investment, which have many additional benefits such as regional development, job creation, industrialization and agricultural development through irrigation (Yankson *et al*, 2018).

Tokwe-Mukosi Dam is located at the confluence of Tokwe and Mukosi rivers, about 72km south of the city of Masvingo, in Masvingo province, Zimbabwe. Following its commissioning in May 2017, government launched command fisheries programme with the aim of breeding fish for stocking in other small dams and water bodies across the province. According to Chivi district Administrator, the main purpose of the dam is to provide irrigation to the south-eastern low veld sugar plantation, generate hydropower and for recreational purposes. The dam has a surface area of 96.4km<sup>2</sup>, and thousands of families had to be evacuated from the dam basin in an emergency operation following a flood in 2014 to new resettlement areas of Masangula, Chingwizi, and Chisase. Chisase is located 50km from the dam while Masangula and Chingwizi are 150km away. To increase the dam's potential

and capacity for recreational and commercial fishing the current communities bordering the dam were earmarked for relocation to other areas to pave way for a game park.

According to Randell (2018), national development projects impact livelihoods of the local communities since the affected households are faced with new and often less favourable environmental, social and economic conditions. This chapter characterises the affected households and examines changing livelihood strategies. The main objective is to investigate the influence of Tokwe-Mukosi Dam project on livelihoods, focusing on livelihood changes as a result of dam construction.

## **4.2 Material and Methods**

### **4.2.1 Description of study area**

Fieldwork was conducted in four settlement areas two of which are in Chivi district settlement areas of Zunga and Zifunzi and the other two in Masangula and Chingwizi areas in Mwenzezi district as shown in Figure 3.1. Zunga and Zifunzi areas surround Tokwe-Mukosi Dam and Masangula and Chingwizi areas which are in Nuanetsi Ranch is where the displaced people were relocated.

### **4.2.2 Research Design**

Descriptive research design was adopted in this study. Both qualitative and quantitative methods of data collection were used. To understand the effects of dam construction on livelihood strategies, household livelihood strategies data was gathered for periods before and after the project for both the displaced and non-displaced populations.

### **4.2.3 Sampling procedure**

In order to draw sample households, multi-stage sampling procedure was employed. The sample size for the study was considered to be 159. The random assignment of these 159 samples to each village was decided proportionally based on the size of total household numbers of the respective sample settlement. Thus 38 respondent households were assigned to Masangula resettlement, 46 to Chingwizi resettlement in Nuanetsi Ranch in Mwenzezi while the remaining respondents were assigned to Zifunzi (44) and Zunga (31) communal areas in Chivi district.

#### **4.2.4 Data collection procedure**

In this study, both primary and secondary data was used. Primary data collection included a structured household survey questionnaire and a semi-structured questionnaire for in-depth interviews with key informants who include local community leaders and line ministries.

#### **4.2.5 Data analysis procedure**

Data for household strategies before and after Tokwe-Mukosi dam construction was subjected to descriptive statistics. Livelihood strategies were tested for differences in proportions among matched pairs using McNemar test.

#### **4.2.6 Challenges encountered during data collection**

The targeted population in the study was difficult to access and too reserved to discuss issues of their livelihoods and wellbeing after dam construction as they perceived their situation to be politically influenced. Some were forcibly moved from their traditional places of residence with unfulfilled promises. Others were also threatened by the anticipated establishment of a game park hence could not openly answer to questions as they thought their answers had a bearing on their future lives. In addition, survey commencement was delayed as approval was needed from the national local government authorities. The clearance costed a lot in terms of transport to and from the capital Harare. It as well took too long to be obtained. To speed up the process of data collection, more enumerators were needed to conduct interviews. This resulted in increased cost of transportation and allowances of the enumerators.

### **4.3 Households characteristics of the surrounding communities and those displaced during the construction of Tokwe-Mukosi Dam**

Demographic and socio-economic characteristics of the study population have important bearing on the way communities utilize their resources sustainably and align their livelihood strategies to changes in resource base. Evidence reveals that respondents in certain socio-economic group and with certain demographic characteristics are likely to respond to environmental changes than their counterparts (Montz *et al*, 2017).

### 4.3.1 Demographic characteristics of households

#### *Sex-Age composition of households*

Analyses of results have shown that 68.6 percent of respondents were male while the remaining 31.4 percent were females. Table 4.1 below shows the age composition of the sample household heads. Accordingly, respondents between the age of 36 and 60 (active group) made up the majority at 53.6 percent. Followed by the aged (those above 60) at 41.8 percent and the list, 4.6 percent are youths with ages between 19 and 35 years.

**Table4. 1** Age distribution of households

Age group	Frequency	Percent
19 to 35	7	4.6
36 to 60	82	53.6
61 and above	64	41.8
<b>Total</b>	<b>153</b>	<b>100.0</b>

#### *Marital status of the household heads*

Variations in marital status have an important bearing on the size and structure of households. Table 4.2 below presents data on marital status of the sample population. 66 percent of respondents were married and spouses were living together while the other 3.9 percent of the respondents were married but living apart from their spouses. 22.9 percent of the sample household heads were widowed.

**Table4. 2** Marital status of households

Marital status	Frequency	Percent
Married living together	101	66.0
Married living apart	6	3.9
Divorced or separated	8	5.2
Widow	35	22.9
Never married	3	2
<b>Total</b>	<b>153</b>	<b>100.0</b>

#### *Household sizes*

Household size is indicated in table 4.3. The mean household size is computed to be 6.1 and 54.2 percent of the affected households have at least 6 household members while 45.8 percent of the affected households had 5 members and below.

**Table4. 3** Household sizes

Household size	Frequency	Percent
1	4	2.6
2	5	3.3
3	9	5.9
4	26	17.0
5	26	17.0
6	25	16.3
7	20	13.1
8	15	9.8
9	11	7.2
10	5	3.3
11	1	.7
12	1	.7
13	1	.7
15	3	2.0
16	1	.7
<b>Total</b>	<b>153</b>	<b>100.0</b>

*Household labour force size*

Household labour force refers to number of household members who can lawfully and meaningfully contribute their labour towards enhancing household livelihood strategies. Households with one or none household labour providing members make up 3.9 percent of the sample households as indicated on table 4.4. Category of labour force 2 to 5 constituted the largest proportion of 77.8 percent of the sample population.

**Table4. 4** Household labour force

Labor force	Frequency	Percent
One and below	6	3.9
2 to 5	119	77.8
Above 5	28	18.3
<b>Total</b>	<b>153</b>	<b>100.0</b>

**4.3.2 Socio-economic characteristics of sample households**

Literacy status, land holding, possession of permanent crop land, membership to farmer and micro-finance groups, household sources of loan, cattle ownership, goats ownership, access to produce markets, postharvest technologies, access to grants for income generating

activities of respondents are some of the important socio-economic variables studied. These characteristics affect the household's ability to change livelihood strategies in response to changes in the environment.

*Literacy status of households*

A larger proportion of households (52.9 percent) were in the category of primary education level or below. 43.8 percent of respondents attained secondary school education level and the remaining 3.3 percent of the respondent households have tertiary level of education as indicated in table 4.5 below.

**Table4. 5** Literacy status of sample households

<b>Literacy status</b>	<b>Frequency</b>	<b>Percent</b>
Primary and below	81	52.9
Secondary	67	43.8
Tertiary	5	3.3
<b>Total</b>	<b>153</b>	<b>100.0</b>

*Land size*

Land is an essential production capital that has various elements in it. The land holding of households ranges from 0.4 hectares to 8 hectares with the average holding of 2.1 hectares per household whereas the median holding is 1.5 hectares. 37.9 percent of respondents (largest proportion) had a land holding of 1 hectare followed by those with a land holding of 4 hectares who constituted 21.6 percent of the sample households.

**Table4. 6** Land holding of sample households

Size of arable land (ha)	Frequency	Percent
0.40	1	0.7
0.50	4	2.6
0.60	3	2.0
0.70	1	0.7
0.80	3	2.0
1.00	58	37.9
1.20	2	1.3
1.40	2	1.3
1.50	9	5.9
1.80	1	.7
2.00	14	9.2
2.50	5	3.3
3.00	11	7.2
3.50	2	1.3
4.00	33	21.6
5.00	2	1.3
6.00	1	.7
8.00	1	.7
<b>Total</b>	<b>153</b>	<b>100.0</b>

*Membership to farmer and micro-finance groups*

Membership to farmer and or micro-finance groups helps smallholder farmers to cope with changing environment, expand their knowledge base and help diversify their livelihood strategies. For that reason, study results presented in table 4.7 reveals that 56.2 percent of sample households were members to agriculture extension groups and 43.8 percent were not affiliated to any farmer group or micro-finance group.

**Table4. 7** Household membership to farmer and micro-finance groups

Group membership	Frequency	Percent
Agriculture extension group	86	56.2
None	67	43.8
<b>Total</b>	<b>153</b>	<b>100.0</b>

### *Household source of loan*

It was established that 83.7 percent of households have no source of loan to fund their livelihood activities while 9.8 percent rely on their families and friends for loans. Only 6.4 percent of sample households depended on formal institutions such as banks and cooperatives for loans as shown in table 4.8.

**Table4. 8** Household source of loan

<b>Household source of loan</b>	<b>Frequency</b>	<b>Percent</b>
Family and friends	15	9.8
Cooperatives	2	1.3
Banks	8	5.2
None	128	83.7
<b>Total</b>	<b>153</b>	<b>100.0</b>

### *Household source of agricultural inputs*

Households that benefited from government input support scheme constituted 68.0 percent of sample households and was the main source of inputs for the sample population. On the other hand, the proportion of respondent households accessing inputs through purchase was at 23.5 percent whilst 7.2 percent of the sample population used retained inputs. 1.3 percent got inputs through private contractors such as the Cotton Company of Zimbabwe (Cottco).

**Table4. 9** Household source of agriculture inputs

<b>Source of agricultural inputs</b>	<b>Frequency</b>	<b>Percent</b>
Government	104	68.0
Purchase	36	23.5
Retained	11	7.2
Private contractors	2	1.3
<b>Total</b>	<b>153</b>	<b>100.0</b>

### *Household cattle ownership*

Key informant interviews brought to light the fact that cattle are a store of value, symbol of wealth, which can be converted at any time to obtain household needs, settle debts or act as collateral for securing loans. Cattle business can as well be a viable livelihood source especially for marginalized communities in areas of Chivi and Mwenezi districts where dry land crop production is a high risk venture due to erratic weather conditions experienced in the region. Table 4.10 reveals that 31.4 percent of sample households had herds of above 5

cattle. 27.5 percent of respondents had between one and three herd of cattle while 15.7 percent of respondents had 4 or 5 cattle. However, 25.5 percent of sample households had none.

**Table4. 10** Household cattle ownership

<b>Cattle ownership</b>	<b>Frequency</b>	<b>Percent</b>
0	39	25.5
1 to 3	42	27.5
4 to 5	24	15.7
Above 5	48	31.4
<b>Total</b>	<b>153</b>	<b>100.0</b>

*Goat ownership by households*

Goats are classified as small livestock. They are hard and tolerant to harsh conditions of high temperatures and limited feed availability. Goats are both grazers and browsers. They can thrive on grasses as well as tree leaves hence seldom victims of drought. They can as well be sold to earn money for starting other household projects especially under changed environment where traditional livelihoods cannot be continued. As indicated on table 4.11 the highest proportion, 29.4 percent of sample households do not own any goat. 24.2 percent own between one and three goats. The other 24.2 percent own between 4 and 5 goats while the remaining 22.2 percent own more than 5 goats per household.

**Table4. 11** Goats ownership by households

<b>Goats ownership</b>	<b>Frequency</b>	<b>Percent</b>
0	45	29.4
1 to 3	37	24.2
4 to 5	37	24.2
Above 5	34	22.2
<b>Total</b>	<b>153</b>	<b>100.0</b>

*Produce markets*

Market is one of the most important factors that influence livelihood options of a household. Table 4.12 indicates that the highest percentage of households, 39.9 percent, sell their products on local designated markets followed by 34 percent who sell their products to other households within the area. 7.8 percent trade with private traders and 8.5 percent take their

produce to the grain marketing board (GMB). 2 percent of sample households sell their products on mobile open markets by moving from place to place on specified dates.

**Table4. 12** Sample households markets for produce

<b>Produce market</b>	<b>Frequency</b>	<b>Percent</b>
Other households in the area	52	34.0
Private traders	12	7.8
GMB	13	8.5
Local markets	61	39.9
Local shops	2	1.3
Nothing to sale	10	6.5
Other	3	2.0
<b>Total</b>	<b>153</b>	<b>100.0</b>

#### *Irrigation facilities*

Access to irrigation facilities helps households define their livelihood strategies at a given time. When households have access to irrigation facilities they increase their production and produce products that are not available in some seasons of the year under dry land cultivation. A larger proportion of 91.5 percent of sample households had no access to irrigation facilities compared to only 8.5 percent who had access to at least an irrigation facility. 69.2 percent of those respondent households who had access to irrigation facilities obtain water for irrigation from dams while the other 15.4 percent uses water from their own boreholes. The other 15.4 irrigate their crops using domestic water harvesting techniques.

**Table4. 13** Access to irrigation facilities and water source of households

<b>Irrigation facilities</b>	<b>Frequency</b>	<b>Percent</b>
Yes	13	8.5
No	140	91.5
<b>Total</b>	<b>153</b>	<b>100</b>
<b>Source of irrigation water</b>		
Dam	9	69.2
Own borehole	2	15.4
Other	2	15.4
<b>Total</b>	<b>13</b>	<b>100.0</b>

#### *Availability of farm produces storage structures*

88.9 percent of respondents, which made up the majority, reportedly stored their harvested crops in ordinary rooms. Traditional granaries were the second most commonly used storage structure for storing harvested crops with 5.9 percent of sample households using them. Improved granaries were still used by a very small proportion of households (2 percent) indicated on table 4.14 below. The other 1.3 percent used bins or drums whilst the other 2 percent used the crib area to store their harvested crops.

**Table4. 14** Sample households' produce storage structures

<b>Structures for grain storage</b>	<b>Frequency</b>	<b>Percent</b>
Ordinary room	136	88.9
Traditional granary	9	5.9
Improved granary	3	2.0
Bin or drum	2	1.3
Crib	3	2.0
<b>Total</b>	<b>153</b>	<b>100.0</b>

#### *Sample household access to grants for income generation activities*

As indicated in table 4.15, only 2.6 percent of sample households received grants for income generating activities whilst the remaining 97.4 percent did not receive grants to fund their income generating activities. Households that receive donations from government and or development partners to start and improve their income generating activities are most likely to venture into diversified sustainable livelihood activities.

**Table4. 15** Sample population receipt of grants

<b>Grants received</b>	<b>Frequency</b>	<b>Percent</b>
Yes	4	2.6
No	149	97.4
<b>Total</b>	<b>153</b>	<b>100.0</b>

## **4.4 Livelihoods before and after dam construction**

### *Formal Employment*

The results in Table 4.17 show that 9.8 percent of households earned a living from a formal salary or wage before dam construction. After dam construction, 5.2 percent made a living through formal salary or wage. Statistical significance of these proportions was justified by

using McNemar test for correlated proportions. Thus the proportion of respondents who engaged in formal employment before and after dam construction was found to be statistically significant at 95 percent confident level. P value was found to be 0.016. Key informant interview with village headman confirmed that some people left their salary or wage earning jobs in the old settlement to join their families who were relocated to new settlement areas in Nuanetsi ranch, Mwenezi.

**Table4. 16** Households source of livelihoods before and after dam construction

Livelihood strategy	Before		After	
	Frequency	Percent	Frequency	Percent
Formal salary/wage	15	9.8	8	5.2
Casual labor	118	77.1	113	73.9
Food crop production/sales	128	83.7	102	66.7
Vegetable production/sales	118	77.1	46	30.1
Fruit production/sales	94	61.4	39	25.5
Livestock production/sales	90	58.8	69	45.1
Cash crop production	49	32.0	25	16.3
Fishing	64	41.8	44	28.8
Petty trade	64	41.8	58	37.9
Food assistance/cash transfer	67	43.8	114	74.5
Gathering natural products for sale	25	16.3	14	9.2
Gifts	4	2.6	44	28.8
Pension	11	7.2	13	8.5
Other	-	-	1	0.7

### *Casual Labour*

It was established that 77.1 percent of households were involved in casual labor provision prior to dam construction. This was the second most common activity after food crop production or sales. Before dam construction respondents used to provide casual labor to local better off households in their neighborhood in Chivi district. According to respondents, casual labor opportunities also arose when people provided labor to Salini Impregilo an Italian building contractor during preparation and construction of the dam. After dam construction casual labor provision remained the second most popular but this time following food assistance. 73.9 percent of respondent households reportedly made a living through provision of casual labor after dam construction. Statistical significance of these proportions were however, found to be statistically insignificant at 95 percent confident level  $p > 0.05$ . The

resettled respondents provided casual labor to low veld sugar plantations and large scale crocodile farming enterprise in Nuanetsi Ranch (Sabot) as a way of earning a living.

#### *Field crop production and sales*

Food crop production or sales constituted the highest percentage of 83.7 percent before dam construction. It was the main livelihood activity in the area before dam construction. Households used to plant crops like maize, sorghum, groundnuts and round nuts successfully though they faced some challenges of recurrent droughts. The livelihood strategy however, tumbled behind casual labor provision and food assistance with 66.7 percent of respondents involved in food crop production after dam construction. This was attributed to climatic and geographical conditions of new settlements in Mwenezi. P-value for the McNemar test  $p < 0.01$  indicate statistically significant difference between crop production or sales before and after dam construction at 99 percent confident level. Dam construction resulted in displacement and loss of land, and other important assets such as machinery and draft power which consequently affected farming activities.

#### *Horticultural crop production and sales*

Vegetable production was undertaken by 77.1 percent of sample households before dam construction. After dam construction, 30.1 percent of households engaged in the production and or sale of vegetables. McNemar test results for these proportions indicated that there was a significant difference between vegetable production before and after dam construction ( $p < 0.01$ ). Respondents attributed the down fall of this livelihood activity to loss of river side gardens that were inundated in the dam basin. Resettled respondents also bemoaned the serious irrigation water shortages and lack of reservoirs such as small dams for watering vegetable gardens as well as poor produce market in their new settlement.

#### *Fruit production and sales*

Fruit production and or sales were popular with respondent households before dam construction. 61.4 percent of respondents were involved in this activity prior to dam construction. The proportion of households involved in fruit production and sales decreased to 25.5 percent after dam construction. P-value for the test  $p < 0.01$  indicate statistically significant difference between fruit production before and after dam construction at 99 percent confident level. Due to inundation in the dam site area, some of the villagers have lost

valuable trees such as fruit trees. According to one newly resettled farmer who was affected by the dam project, it has become very difficult for him to re-establish fruit trees in resettlement areas because of the environmental conditions. He perceived his old settlement as more suitable for fruit production compared to the new settlement. He had inherited fruit trees from his great grandparents and seedlings for successive trees could just emerge on their own without even planning for them. In his own words he said; *‘Miti yacho kuno haibati. Isu taingoona miti yatomera yoga kubva mumhonzi dzemichero yataingodya pamusha ipapo yakasiwa nemadzitateguru edu’*

#### *Livestock production and sales*

58.8 percent of households were involved in livestock production and or sales before dam construction. The proportion moved down to 45.1 percent after dam construction. Results of the two related samples test for livestock production showed a statistically significant difference in livestock production before and after dam construction ( $p < 0.01$ ). According to (ZIMVAC 2010), the study area is better suited for animal husbandry but it is not an agro-pastoral zone.

Interview with the AGRITEX supervisor reviewed that some animals failed to acclimatize to the new environment when they were moved to Mwenezi hence died and the owners failed to restock. Resettled respondents attributed the decline in livestock production to a serious deterioration in grazing area since the fencing off of their newly found grazing area on adjacent farm owned by Green Fuel Company (Sabot), and continued disputes with long-established neighbors (the receiving community) that resulted in numerous cases of animal poisoning and wounding. Asset stripping involving the sale of assets such as livestock, household utensils and farming equipment or barter trading for food is rampant in the study area. UNDP (2017) noted that when households are faced by shocks, they reportedly strip their assets.

#### *Cash crop production*

Proportion of sample households that strived on cash crop production stood at 32 percent before dam construction and moved down by almost half to 16.3 percent after dam construction. Test results indicate significant difference before and after dam construction at 99 percent confident level. According to sample household interviews, cotton was the major

cash crop that was produced before dam construction. Due to its low prices on the market they abandoned its production in recent years. Newly resettled farmers in Chingwizi blamed land shortages to their failure to grow cash crops as they focus on food crop production on their one hectare plots for their food security. They are however, willing to shift to sugar cane production which needs the hardly accessed irrigation facilities once government fulfills its promises. Interviews with the headmen revealed that plans are underway for the construct of irrigation canals to Green Fuel farm where resettled farmers will be entitled to 3 hectares each of irrigated land for sugarcane production.

### *Fishing activities*

It was established that 41.8 percent of households were involved in fishing activities prior to dam construction. After dam construction, the percentage of sample households who make a living through fishing ironically decreased to 28.8 percent. P-value for the test  $p < 0.01$  indicate statistically significant difference between fishing activities before and after dam construction. According to respondents, fishing in such a large water body has become risky as dangerous animals are now roaming the waters. For safer and productive fishing, unaffordable sophisticated machinery and fishing skills are now needed. There are also restrictions to use of traditional ways of catching fish in the dam which contribute to a decline in fishing by respondents. During the interview, one villager lamented some destructive ways which were formally used by some villagers to catch fish including fish poisoning. Resettled respondents were also moved away from their traditional hunting grounds hence no longer considering fishing as part of their livelihood strategies.

### *Food Assistance*

Before dam construction 43.8 percent of households received food assistance or cash transfer from government or partner organizations (NGOs). The proportion then sharply increased to 74.5 percent after dam construction and became the most prominent way of life among respondent households. P-value for the test indicates statistically significant differences between food assistance before and after dam construction ( $P=0.000$ ). During an interview with Chivi district administrator, he agreed with opinions of respondents that because of unfulfilled government obligations to the resettled farmers, they were finding it very difficult to feed themselves. He further stated that food assistance through the department of social welfare has been increased towards the resettled households compared to the period before

dam construction. Each household got a monthly allocation of 1 by 50kg bag of maize. This however, according to respondents fell short of household needs as most households have more than five household members.

#### *Gathering natural products for sale*

16.3 percent of households earned a living through gathering of natural resources for sale before dam construction. After dam construction, 9.2 percent of sample households reportedly earned a living through the same activity. The test results showed a significant difference between natural resource gathering before and after dam construction at 95 percent confident level p-value is 0.035. Respondents who lived along Masvingo - Beitbridge road sold natural products like wild fruits and firewood to passersby along the highway. New settlements are now far from the highway hence low demand for such products.

#### *Donations and Gifts*

According to table 4.16, only 2.6 percent of households confirmed having made a living through gifts before dam construction. After dam construction, 28.8 percent of respondent households were gift recipients and look forward to earn a living through gifts. These proportions were also found to be statistically significant at 95 percent confident level  $p < 0.01$ . This dramatic increase in respondents who survive on gifts was attributed to household loss of sustainable livelihoods owing to untimely migration due to dam construction and failure to establish in new places of settlement as a result of harsh political and socio-economic conditions faced by respondents.

### **4.5 Conclusion**

Despite scholarly divide on the effect of dam construction on livelihoods of local communities, results of this chapter revealed that several livelihood strategies have been lost and much has to be done to overcome the shock imposed. Affected communities have become more dependent on food assistance and gifts. Increasing communities' adaptive capacity is crucial to enhancing the sustainability of their livelihoods.

### **4.6 Recommendations**

Government needs to fulfil its obligations to the affected communities by fully compensating them as per their promise and conclude the resettlement programme.

Results have shown that there are plenty of labour force in affected communities but of low literacy level. Government and its development partners should therefore assist building capacity of these communities for entrepreneurship and economic activities through trainings.

It is also important for the government to implement community livelihood support initiatives such as provision of support for agricultural improvements through sustainable land and natural resource management including conservation farming techniques, and establish a micro-credit fund to support livelihood diversification.

Marketing platforms must be created for the affected communities so as to try and direct their efforts towards attainment of sustainable livelihood activities.

Since the affected communities are in low agriculture potential areas, improving household access to irrigation facilities will enhance their productivity.

Extension information dissemination must be reinforced since these communities are learning and carry livelihood experiments within a new environment.

#### 4.7 References

- Montz, B. E., Tobin, G. A., III, H., & R., R. (2017). Risk Assessment. *Natural Hazards: Explanation and Integration*, 397–340.
- Randell, H. (2018). Forced Migration and Changing Livelihoods in the Brazilian Amazon, 82(3). <https://doi.org/10.1111/ruso.12144>.
- UNDP. (2017). Towards Building a Climate Resilient Nation.
- Yankson, P. W. K., Asiedu, A. B., Owusu, K., Urban, F., & Siciliano, G. (2018). The livelihood challenges of resettled communities of the Bui dam project in Ghana and the role of Chinese dam-builders. *Development Policy Review*, 36(April), O476–O494. <https://doi.org/10.1111/dpr.12259>
- ZIMVAC. (2010). Zimbabwe Livelihoods Zone Profiles, (February).

## CHAPTER 5

### **Food Security Situation of households around and those displaced from Tokwe-Mukosi Dam**

#### **Abstract**

The aim of the present study was to assess the food security situation of households around and those that were displaced from Tokwe-Mukosi Dam using Household Food Insecurity Access Scale (HFIAS). The results have shown that the affected households were food insecure. Statistical significance test for independence between household settlement and Household Food Insecurity Access Scale prevalence was performed using Fisher's exact test for independence. Results have shown statistically significant difference  $p < 0.01$  concluding that there is an association between settlement and HFIAS prevalence.

#### **Keywords/terms**

Food security situation

Tokwe-Mukosi Dam

Household Food Insecurity Access Scale (HFIAS)

Affected households

Fisher's exact test

#### **5.1 Introduction**

Large dam projects are generally controversial (Égré & Senécal, 2003). The issues generated by these projects are important and complex. On the social side, they include; resettlement of large numbers of people, disruption of traditional livelihood activities, fair compensation for lost assets and food security of households affected by the dam project. However, food security is generally overlooked when environmental impact assessments (EIAs) of such projects are carried out. EIAs usually assess a large range of human impacts than those related to the immediate food security situation of the affected population.

Food security is defined as a state in which all people at all times have both physical and economic access to sufficient nutritious food to meet their dietary needs for a productive and healthy life (Coates *et al*, 2007). This chapter establishes the food security status of households affected by Tokwe-Mukosi Dam construction in Chivi district of Masvingo

province in Zimbabwe. The food security situation of both households around and those displaced from Tokwe-Mukosi dam is assessed.

## **5.2 Material and Methods**

### **5.2.1 Description of study area**

Fieldwork was conducted in four settlement areas - two of which are in Chivi district settlement areas of Zunga and Zifunzi and the other two in Masangula and Chingwizi areas in Mwenezi district as shown in Figure 3.1. Zunga and Zifunzi areas surround Tokwe-Mukosi dam and Masangula and Chingwizi areas which are in Nuanetsi Ranch is where the displaced people were relocated

### **5.2.2 Research Design**

Descriptive research design was adopted in this study. Both qualitative and quantitative methods of data collection were used. To understand the effects of dam construction on food security, Household Food Insecurity Access Scale (HFIAS) was used to estimate the food security (access) of the study population.

### **5.2.3 Sampling procedure**

In order to draw sample households, multi-stage sampling procedure was employed. The sample size for the study was considered to be 159. The random assignment of these 159 samples to each village was decided proportionally based on the size of total household numbers of the respective sample settlement. Thus 38 respondent households were assigned to Masangula resettlement, 46 to Chingwizi resettlement in Nuanetsi Ranch in Mwenezi while the remaining respondents were assigned to Zifunzi (44) and Zunga (31) communal areas in Chivi district.

### **5.2.4 Data collection procedure**

In this study, both primary and secondary data was used. Primary data collection included a structured household survey questionnaire and a semi-structured questionnaire for in-depth interviews with key informants who include local community leaders and line ministries. The study used the Household Food Insecurity Access Scale (HFIAS) measurement tool to estimate the prevalence of food insecurity of households that were affected by the dam

project. The HFIAS questions have a recall period of the past four weeks or 30 days. The method is based on the idea that the experience of food insecurity (access) causes predictable reactions and responses can be captured and quantified through a survey and summarized in a scale. HFIAS consists of nine generic questions that were orally asked to respondents and their responses were recorded. The questions were directed to persons in household who were most involved with the food preparation and meals. Respondents answered on behalf of the household and all its members. Published data was also collected from the Zimbabwe Vulnerability Assessment Committee (ZIMVAC) reports to augment primary data findings.

### **5.2.5 Data analysis procedure**

Quantitative data from HFIAS measurement tool was subjected to descriptive statistics for analysis using a computerized statistical package SPSS 23.0 to create HFIAS indicators. The Fisher's exact test for a general  $r \times c$  contingency table was then used to assess for independence between settlement and HFIAS prevalence.

### **5.2.6 Challenges encountered during data collection**

To speed up the process of data collection, 6 enumerators were hired to conduct interviews basing on their competence. It however, took time to train these enumerators to be able to comprehend the questions and be able to probe for clarity before recording.

## **5.3 Food security situation of affected households**

The HFIAS module yielded information on food insecurity (access) at household level. Four types of indicators were calculated to help understand the characteristics of household food insecurity (access) in the surveyed population. These indicators provide summery information on; Household Food Insecurity Access-related conditions, Household Food Insecurity Access-related domains, Household Food Insecurity Access Scale Score and Household Food Insecurity Access Prevalence.

### **5.3.1 Household Food Insecurity Access-related Conditions**

These indicators provide specific, disaggregated information about the behaviors and perceptions of the surveyed households. The indicators present the percentage of households that responded positively to each question, regardless of the frequency of the experience.

Each indicator was then disaggregated to examine the frequency of experience of the condition across the surveyed households.

*Households worrying about not having enough food*

Table 5.1 below reveals that 96.1 percent of households were worried about not having enough food. 66 percent however, rarely worried about not having enough food and only 5.9 percent of households acknowledged to often worry about not having enough food.

**Table5. 1** Households worrying about not having enough food

<b>Worry about food occurrence</b>	<b>Frequency</b>	<b>Percent</b>
No	6	3.9
Yes	147	96.1
<b>Worry frequency of occurrence</b>	<b>Frequency</b>	<b>Percent</b>
No	6	3.9
Rarely	101	66.0
Sometimes	37	24.2
Often	9	5.9

*Households not able to eat preferred foods*

Table 5.2 below reveals that 95.4 percent of respondent households were not able to eat according to their preference due to lack of resources and 10.5 percent of the respondent households are often unable to eat food according to their preference.

**Table5. 2** Households not able to eat preferred foods

<b>Occurrence of not able to eat preferred foods</b>	<b>Frequency</b>	<b>Percent</b>
No	7	4.6
Yes	146	95.4
<b>Frequency of occurrence</b>	<b>Frequency</b>	<b>Percent</b>
No	7	4.6
Rare	90	58.8
Sometimes	40	26.1
Often	16	10.5

### *Households eating limited variety of foods*

Households amounting to 86.9 percent of sample households confirmed eating undesired monotonous diet due to lack of resources while 7.8 percent of respondent households often eat monotonous diet as shown in Table 5.3.

**Table5. 3** Households eating a few kinds of foods

<b>Eat limited variety of foods occurrence</b>	<b>Frequency</b>	<b>Percent</b>
No	20	13.1
Yes	133	86.9
<b>Frequency of occurrence</b>	<b>Frequency</b>	<b>Percent</b>
No	20	13.1
Rare	86	56.2
Sometimes	35	22.9
Often	12	7.8

### *Households eating unwanted foods*

Often there are foods or food preparations that are consumed only under hardships. Table 5.4 indicates that 62.1 percent of respondent households eat food that they found socially or personally undesirable due to lack of resources. 4.6 percent of respondents often eat foods or preparations that they really do not want.

**Table5. 4** Households eating foods that they really do not want to eat

<b>Eat unwanted foods occurrence</b>	<b>Frequency</b>	<b>Percent</b>
No	58	37.9
Yes	95	62.1
<b>Eat unwanted foods frequency of occurrence</b>	<b>Frequency</b>	<b>Percent</b>
No	58	37.9
Rare	77	50.3
Sometimes	11	7.2
Often	7	4.6

### *Households eating smaller meals*

Table 5.5 reveals that more than half of the respondent households (51.6 percent) felt that the amount of food ate was smaller than they felt they needed due to lack of resources. 5.2 percent of households often (more than ten times in a four week reference period) had to eat smaller meals than they felt they needed because there was not enough food.

**Table5. 5** Households eating smaller meals

<b>Eat smaller meal occurrence</b>	<b>Frequency</b>	<b>Percent</b>
No	74	48.4
Yes	79	51.6
<b>Eat smaller meal frequency of occurrence</b>	<b>Frequency</b>	<b>Percent</b>
No	74	48.4
Rare	49	32.0
Sometimes	22	14.4
Often	8	5.2

*Households eating fewer meals in a day*

Table 5.6 below shows that 45.1 percent of households had to eat fewer meals than the number typically eaten in the food secure households in the area. 3.3 percent of respondent households often ate fewer meals in a day because there was not enough food to eat.

**Table5. 6** Respondent households eating fewer meals in a day

<b>Eat fewer meals occurrence</b>	<b>Frequency</b>	<b>Percent</b>
No	84	54.9
Yes	69	45.1
<b>Eat fewer meals frequency of occurrence</b>	<b>Frequency</b>	<b>Percent</b>
.00	84	54.9
Rare	50	32.7
Sometimes	14	9.2
Often	5	3.3

*Households having no food of any kind in the household*

Households constituting 15.7 percent of households (as shown in table 5.7) had no food to eat of any kind in the home. 1.3 percent of households were often confronted by a situation where food was not available to household members through the households' usual means.

**Table5. 7** Households having no food of any kind in the household

<b>No food occurrence</b>	<b>Frequency</b>	<b>Percent</b>
No	129	84.3
Yes	24	15.7
<b>No food frequency of occurrence</b>	<b>Frequency</b>	<b>Percent</b>
.00	129	84.3
Rare	16	10.5
Sometimes	6	3.9
Often	2	1.3

*Households going to sleep hungry*

Table 5.8 indicates that 13.7 percent of respondent households felt hungry at bedtime because of lack of resources. They went to sleep without eating anything. 1.3 percent of respondents often go to sleep hungry.

**Table5. 8** Households go to sleep hungry

<b>Sleep hungry occurrence</b>	<b>Frequency</b>	<b>Percent</b>
No	132	86.3
Yes	21	13.7
<b>Sleep hungry frequency of occurrence</b>	<b>Frequency</b>	<b>Percent</b>
.00	132	86.3
Rare	17	11.1
Sometimes	2	1.3
Often	2	1.3

*Households spending a whole day and night without eating*

Table 5.9 reveals that 5.9 percent of households went a whole day and night without eating due to lack of resources. This however rarely occurred to 5.2 percent of the sample households.

**Table5. 9** Households going a whole day and night without eating

<b>Go day and night without eating occurrence</b>	<b>Frequency</b>	<b>Percent</b>
No	144	94.1
Yes	9	5.9
<b>Go day and night without eating frequency of occurrence</b>	<b>Frequency</b>	<b>Percent</b>
.00	144	94.1
Rare	8	5.2
Sometimes	1	.7

### 5.3.2 Household Food Insecurity Access-related Domains

The HFIAS occurrence questions relate to three different domains of food insecurity found to be common to the cultures examined in a cross-country literature review (Coates *et al*, 2007). The three domains under which questions are grouped are; Anxiety and uncertainty about the household food supply, Insufficient food quality including variety and insufficient food intake and its physical consequences. Households experiencing any of the conditions at any level of severity in each domain were computed. Computation results has shown that 96.1 percent of respondent households were anxious and uncertain about their household food supply as shown in table 5.10. 95.4 percent had insufficient food quality including monotonous diets. 51.6 percent of respondents experienced insufficient food intake in terms of quantity and its physical consequences such as eating smaller meals, eating fewer meals in a day or going to sleep at night hungry because there were not enough food.

**Table5. 10** Percentage households and HFIAS related domains

Domain	Frequency	Percent
Anxiety	147	96.1
Insufficient quality	146	95.4
Insufficient food	79	51.6

### 5.3.3 Household Food Insecurity Access Scale Score

The HFIAS Score is a continuous measure of the degree of food insecurity (access) in the household in the past 4 weeks. It is the sum of the frequency-of-occurrence during the past 4 weeks for the 9 food insecurity-related conditions of a particular household. The higher the score, the more food insecurity the household experienced. Table 5.11 shows that the highest score was 24 and the least score was 0. The average HFIAS Score was calculated to be 6.6.

**Table5. 11** Household Food Insecurity Access Scale Score

HFIAS score	Frequency	Percent
0	6	3.9
1	1	.7
2	8	5.2
3	25	16.3
4	17	11.1
5	11	7.2
6	20	13.1
7	14	9.2
8	15	9.8
9	9	5.9
10	6	3.9
11	5	3.3
12	4	2.6
13	1	.7
14	1	.7
15	1	.7
16	2	1.3
17	1	.7
18	1	.7
19	1	.7
20	1	.7
21	1	.7
23	1	.7
24	1	.7
<b>Total</b>	<b>153</b>	<b>100.0</b>

### 5.3.4 Household Food Insecurity Access Prevalence

The HFIAS Prevalence is a categorical indicator of food insecurity status which can be used to report household food insecurity (access) prevalence for use in geographical targeting decisions (Coates *et al*, 2018). This indicator categorizes households into 4 levels of household food insecurity (access): Food secure, mildly food insecure, moderately food insecure and severely food insecure as shown in the table below. Study results have shown that 15.7 percent of sample households affected by the dam project were severely food insecure, 37.9 percent were moderately food insecure and 41.8 percent were mildly food insecure. Only 4.6 percent of the sample population were food secure.

**Table5. 12** Household Food Insecurity Access Prevalence

HFIAS level	Frequency	Percent
Food secure	7	4.6
Mild food insecure	64	41.8
Moderate food insecure	58	37.9
Severely food insecure	24	15.7
<b>Total</b>	<b>153</b>	<b>100.0</b>

### 5.3.5 Fisher’s exact test for a general $r \times c$ exact contingency table

To assess for independence between settlement and HFIAS prevalence, a general  $r \times c$  exact contingency test was calculated using a web based calculator. The results of an exact contingency table test indicate a statistically significant difference between settlement and HFIAS prevalence at 99 percent confident level  $p < 0.01$  we therefore reject the null hypothesis of independence and conclude a significant association between respondent settlement and HFIAS prevalence.

## 5.4 Discussion

According to (Castell *et al*, 2015), food insecurity is defined as the limited or uncertain availability of nutritionally adequate and innocuous foods or the limited or uncertain capacity for acquiring adequate foods by socially acceptable means. The study results have shown that the majority of people affected by the dam project were worried about not having enough food. This is mainly attributed to their low productivity due to lack of capital and limited access to productive resources such as land and irrigation facilities. Affected households lacked in terms of food self-sufficiency. They relied on government handouts for their cereal demand. The food distribution dates were also not constant hence people always got worried about their food supply.

Low food security occurs when individuals experience a reduction in food quality, variety, desirability, and at times a reduction in food intake (Castell *et al.*, 2015). Very low food security disrupted eating patterns and reduced intake because of insufficient resources. UNDP (2017) noted that poor people without reserves face shocks and stresses and may adopt forms of adverse coping strategies which may support short term survival but undermine overall well-being in the medium to long term. Such adverse coping strategies can entail the reduction in food consumption in ways that have potentially irreversible welfare effects for example, eating small amounts and less nutritious food, especially for people living with HIV

and AIDS. In spite of varied healthy status of people affected by the dam project, people tend to eat reduced food quality, quantity or even limit number of meals as shown by study results. The results of an assessment of independence between settlement and HFIAS prevalence have shown that the settlement of a respondent had an association with his or her HFIAS category. People who resettled to new areas in Mwenezi lost their productive assets and plunge into transient or chronic poverty hence statistical test results showed an association between settlement and HFIAS.

### **5.5 Conclusion**

The aim of the present study was to assess the food security situation of households affected by dam project. Household Food Insecurity Access Scale prevalence calculation results have shown that the affected households were food insecure. Statistical test for independence between household settlement and Household Food Insecurity Access Scale Prevalence has shown statistically significant difference concluding that there is an association between settlement and HFIAS prevalence.

### **5.6 Recommendations**

- Food assistance serves as a vital safety net for people with limited livelihood alternatives and extreme vulnerability to changes in their environment hence it should be provided timeously to reduce incidences of food insecurity.
- The food basket should also be adequate in terms of quality and quantity.
- Government should support agricultural improvements through sustainable land and natural resource management including conservation farming techniques to promote food self-sufficiency on populations affected by the dam project as local production of food crops is an important step towards improved availability and access to food.
- To enable families to use local production potentials, they also need secured access to natural resources such as land, water and seeds; capital; appropriate equipment, and technical know-how.

## 5.7 References

- Castell, G. S., Rodrigo, C. P., de la Cruz, J. N., & Bartrina, J. A. (2015). Escalas de evaluación de la inseguridad alimentaria en el hogar. *Nutricion Hospitalaria*, *31*, 272–278. <https://doi.org/10.3305/nh.2015.31.sup3.8775>
- Coates, J., Swindale, A., & Bilinsky, P. (2007). USAID Food and Nutrition Technical Assistance: Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide. *Organization*, (August).
- Égré, D., & Senécal, P. (2003). Social impact assessments of large dams throughout the world: Lessons learned over two decades. *Impact Assessment and Project Appraisal*, *21*(3), 215–224. <https://doi.org/10.3152/147154603781766310>
- UNDP. (2017). Towards Building a Climate Resilient Nation, (2010).

## CHAPTER 6

### SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

#### 6.1 Introduction

This is the final chapter of the thesis. It presents the research summary, conclusions, policy implication and recommendations as well as identifies areas for further research.

#### 6.2 Research summary

This study draws on a case study from Tokwe-Mukosi dam in Zimbabwe. It examined the effects of national development projects on food security in the context of local communities living adjacent to the dam and those who were relocated to Mwenezi district in Zimbabwe to pave way for the project. The dam project brought several changes to the way people lived. The most notable being changes in livelihood strategies adopted as well as their food security status as illustrated by use of the Household Food Insecurity Access Scale prevalence.

The study contributes to the broad research agenda on the human-environment relationship by analysing the issues highlighted above in two separate papers each corresponding to a chapter. The first paper presented in chapter 4 analyses the effects of dam construction on livelihoods of local communities. The paper first characterizes the affected households to enhance our understanding of household demographic and socio-economic characteristics of people affected by the project. We then analyse livelihood strategies adopted before and after dam construction by the affected communities. The results show that several livelihood strategies have been lost and the affected communities have become more dependent on food assistance and gifts as ways of earning a living.

The McNemar test for correlated proportions used to test for statistical significance of livelihoods before and after dam construction show significant difference at 99 per cent confident level on livelihood strategies that include; food crop production or sales, vegetable production or sales, fruit production or sales, livestock production, cash crop production, fishing, food assistance and gifts. Formal employment and gathering of natural products for sale was statistically significant at 95 per cent confident level.

The second paper presented in chapter 5 analyses the food security situation of households affected by the dam project. The paper used the Household Food Insecurity Access Scale (HFIAS) to estimate the food security status of households and the Fisher's exact test was used to assess for independence between settlement and HFIAS prevalence. The results of the HFIAS prevalence tabulation show that households affected by the dam project were generally food insecure. The Fisher's exact test results then revealed an association between household settlement and its food security status. Thus displacing people from one settlement to another due to development projects affects their food security status.

### **6.3 Conclusions**

The analysis results show that the dam project has been more costly than beneficial to the local people. The creation of the dam provided an opportunity for enhanced livelihoods to those that remained around the water body especially in fishing but they do not have the necessary fishing equipment and skills to fish in this large water body. Investments on new opportunities by households living adjacent to the water body are also hindered by threats imposed by plans for the creation of a game park in areas surrounding the water body. Livelihood strategies are therefore in disarray.

The lack of access to adequate land in resettlement areas has greatly reduced the possibilities for enhanced food production, with serious implications for achieving food security. The untimed and inadequate food basket provided by the government through the department of social welfare creates anxiety within the assisted community hence becomes an imperfect safety net. The anticipated irrigation project promised to the resettled communities has also not yet materialized. The food security situation might deteriorate if no attention is given to the affected communities.

### **6.4 Policy implication and recommendations**

The results of this study help to shed light on the link between national development projects and food security of the affected communities. The intended beneficiaries of the study are local communities, development practitioners and policy makers who will acquire grounded evidence. The research findings will allow them to interrogate future development projects' design and policies while at the same time identifying areas for improvement.

*Effects of dam construction on livelihoods of local communities: Livelihoods before and after Tokwe-Mukosi Dam construction*

The main policy message in chapter 4 is that, national development projects have an important role in shaping the direction of livelihood strategies within the hosting community. There is therefore need to design policies that increase communities' adaptive capacity as this is crucial to enhancing sustainability of livelihoods. It is also important to note that land rights and land tenure affect farming methods and agricultural investment applied by households in livelihood activities. There should therefore be well-defined land rights and tenure systems for people affected by development projects to be able to invest in new opportunities. It is also important to implement community livelihood support initiatives in areas affected by national development projects. Considering that the primary livelihood source of the majority of Zimbabwean rural based people is smallholder farming, increasing on-farm income through improved agricultural practices can directly contribute to increased well-being of communities affected by development projects. Livelihood support initiatives should combine capacity building with implementation of income generating activities.

*Food Security Situation of households affected by dam projects*

A number of policy implications are in chapter 5. To begin with, food security is a right not a privilege. All people at all times have the right to adequate nutritious food including those that are affected by national development projects. People affected by national development projects should be accorded an enabling environment which positively shapes local food production and which is resilient to shocks as many will fail to adapt to new farming conditions. They should as well have the right to self-determination and independent decision making about their food resources. Food assistance is an important safety net for households affected by shocks. It is therefore important to establish an efficient and effective distribution system to provide nutritionally balanced food in right quantities at the right time.

## **6.5 Areas for further research**

The long-term impacts and livelihood dynamics and the determinants of such dynamism on the affected communities must be the theme of prominent interest for future studies.

## 6.6 References

- Aboda, C., Mugagga, F., Byakagaba, P., & Nabanoga, G. (2019). Development Induced Displacement ; A Review of Risks Faced by Communities in Developing Countries, 7(2), 100–110. <https://doi.org/10.13189/sa.2019.070205>
- Adedokun, A. O., & Burgess, D. W. (2012). Analysis of Paired Dichotomous Data: A Gentle Introduction to the McNemar Test in SPSS. *MultiDisciplinary Evaluation*, 8.
- Andrews, L., Higgins, A., Andrews, M. W., & Lalor, J. G. (2015). Andrews , L ., Higgins , A ., Waring , M . and Lalor , J , Using Classic Grounded Theory to analyse secondary data : reality and reflections , *Grounded Theory Review* ,, 11 , Classic Grounded Theory to Analyse Secondary Data : Reality and Reflections, (January 2012), 11–26.
- Bach, C., & Aborisade, B. (2014). Assessing the Pillars of Sustainable Food Security. *European International Journal of Science and Technology*, 3(4), 118–125.
- Berry, E. M., Dernini, S., Burlingame, B., Meybeck, A., & Conforti, P. (2015). Food security and sustainability: Can one exist without the other? *Public Health Nutrition*, 18(13), 2293–2302. <https://doi.org/10.1017/S136898001500021X>
- Bond, P., & Manyanya, M. (2002). *Zimbabwe's Plunge:Exhausted Nationalism, Neoliberalism and the search for Social Justice*, Weaver Press Limited, Harare.
- Broadhurst, K., Holt, K., & Doherty, P. (2012). What is Research design? Explanatory/descriptive research. *Qualitative Social Work*, 11(5), 517–534. <https://doi.org/10.1177/1473325011401471>
- Castell, G. S., Rodrigo, C. P., de la Cruz, J. N., & Bartrina, J. A. (2015). Escalas de evaluación de la inseguridad alimentaria en el hogar. *Nutricion Hospitalaria*, 31, 272–278. <https://doi.org/10.3305/nh.2015.31.sup3.8775>
- Cernea, M. M. (2008). Compansation and benefit sharing: Why resettlement policies and practices must be reformed. *Water Science and Engineering*, 1(1), 63–77. <https://doi.org/10.3882/j>
- Chazireni, E., & Chigonda, T. (2018). The Socio-economic Impact of Dam Construction : Case of Tokwe Mukosi in Masvingo Province , Zimbabwe, (October). <https://doi.org/10.5281/zenodo.1410616>
- Coates, J., Swindale, A., & Bilinsky, P. (2007). USAID Food and Nutrition Technical Assistance: Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide. *Organization*, (August).
- Debarre, A., Henry, A., & Rahmaty, M. (2018). Reaching Internally Displaced Persons to

- Achieve the 2030 Agenda IDPs in the International Agenda, 182.
- Égré, D., & Senécal, P. (2003). Social impact assessments of large dams throughout the world: Lessons learned over two decades. *Impact Assessment and Project Appraisal*, 21(3), 215–224. <https://doi.org/10.3152/147154603781766310>
- FAO. (2009). *The Livelihood Assessment Tool-kit. The effects of brief mindfulness intervention on acute pain experience: An examination of individual difference.* <https://doi.org/10.1017/CBO9781107415324.004>
- Garada, R. (2015). Development Project Caused Resettlement and Rehabilitation Policy : Development Project Caused Resettlement and Rehabilitation Policy : Overviews on Dam Projects In Odisha ( India ), (March). <https://doi.org/10.9790/0837-20378997>
- Harper, C.L. (2004). *Environment and Society: Human perspectives on Environmental Issues* (3<sup>rd</sup> Ed) New Jersey: Pearson Education Inc.
- HRW, (Human Rights Watch). (2015). World Report 2015 World Report 2015 Zimbabwe Human Rights Watch.
- Igwenagu, C. (2016). Fundamentals of research methodology and data collection. *Lambert Academic Publishing*, (June), 1–47. [https://doi.org/10.1007/978-3-658-19918-0\\_8](https://doi.org/10.1007/978-3-658-19918-0_8)
- IRN (International River Network), (2008). Power surge: The impacts of hudro-development in Laos. Berkeley, CA: International Rivers Network.
- Kim, H.-Y. (2017). Statistical notes for clinical researchers: Chi-squared test and Fisher's exact test. *Restorative Dentistry & Endodontics*, 42(2), 152. <https://doi.org/10.5395/rde.2017.42.2.152>
- Krantz, L. (2001). The sustainable livelihood approach to poverty reduction. *Swedish International Development Policy*, (Division for Policy and Socio-Economic ANalysis), 44.
- Matemilola, S., & Elegbede, I. (2017). The Challenges of Food Security in Nigeria. *OALib*, 04(12), 1–22. <https://doi.org/10.4236/oalib.1104185>
- Meyer, W.B. (1996). *Human Impact on the Earth*. Cambridge: University Press.
- Minority voices newsroom. (2010). The Tonga People in Zimbabwe: A forgotten People. Available on [www.minorityvoices.org](http://www.minorityvoices.org). Accessed 17 February 2019
- Mohajan, H. (2017). B 26 research approach, (83457).
- Molenberghs, G. (2010). Survey methods and sampling techniques. *Interuniversity Institute for Biostatistics and Statistical Bioinformatics (I-BioStat)*. Retrieved from <http://soc.kuleuven.be/ceso/historischedemografie/resources/pdf/ML/survey10.pdf>

- Oliver-smith, A. (2005). *Development & Dispossession* 1, 3–23.
- Owen, J., Muriuki, G., and Kemp, D. (2008). *livelihoods, Food security and Mining-Induced Displacement and Resettlement*. Centre for Social Responsibility in Mining (CSR), The University of Queensland: Brisbane.
- Randell, H. (2018). *Forced Migration and Changing Livelihoods in the Brazilian Amazon*, 82(3). <https://doi.org/10.1111/ruso.12144>.
- Resnik, J., & David, B. (2015). What is Ethics in Research & Why is it Important? *National Institute of Environmental Health Sciences*, (January 2007), 1–10. Retrieved from <http://www.niehs.nih.gov/research/resources/bioethics/whatis/>
- Robinson, W. C. (2003). *The Brookings Institution-SAIS Project on Internal Displacement Risks and Rights: The Causes, Consequences, and Challenges of Development-Induced Displacement Risks and Rights: The Causes, Consequences, and Challenges of Development-Induced Displacement*, (May).
- SICES, (Soils Incorporated Pvt Ltd and Chalo Environmental and Sustainable Development Consultants). (2000). *Kariba Dam Case Study*, prepared as an input to the World Commission on Dams, Cape Town, (November).
- Taherdoost, H. (2017). Determining Sample Size; How to Calculate Survey Sample Size. *International Journal of Economics and Management Systems*, 2(February 2017), 236–239. <https://doi.org/https://www.researchgate.net/publication/322887480>
- UNDP. (2017). *Guidance Note UNDP Social and Environmental Standards (SES) UNDP Guidance Notes on the Social and Environmental Standards (SES)*, (December).
- UNDP. (2017). *Towards Building a Climate Resilient Nation*.
- Upton, J. B., Cissé, J. D., & Barrett, C. B. (2016). Food security as resilience: Reconciling definition and measurement. *Agricultural Economics (United Kingdom)*, 47, 135–147. <https://doi.org/10.1111/agec.12305>
- van den Berg, M. (2010). Household income strategies and natural disasters: Dynamic livelihoods in rural Nicaragua. *Ecological Economics*, 69(3), 592–602. <https://doi.org/10.1016/j.ecolecon.2009.09.006>
- Vanclay, F. (2017). Project-induced displacement and resettlement: from impoverishment risks to an opportunity for development? *Impact Assessment and Project Appraisal*, 35(1), 3–21. <https://doi.org/10.1080/14615517.2017.1278671>
- Yankson, P. W. K., Asiedu, A. B., Owusu, K., Urban, F., & Siciliano, G. (2018). The livelihood challenges of resettled communities of the Bui dam project in Ghana and the

role of Chinese dam-builders. *Development Policy Review*, 36(April), O476–O494.

<https://doi.org/10.1111/dpr.12259>

ZIMVAC. (2010). Zimbabwe Livelihoods Zone Profiles, (February).

## 6.7 Appendices

### Appendix A

#### *McNemar test for correlated proportions*

Table A.1

Formal salary/wage before & Formal salary/wage after	
N	153
Exact Sig. (2-tailed)	.016 <sup>b</sup>
Casual labour before & Casual labour after	
N	153
Exact Sig. (2-tailed)	.405 <sup>b</sup>
Food crop production/sales before & Food crop production/sales after	
N	153
Chi-Square <sup>b</sup>	24.038
Asymp. Sig.	.000
Vegetable production/sales before & Vegetable production/sales after	
N	153
Chi-Square <sup>b</sup>	64.628
Asymp. Sig.	.000
Fruit production/sales before & Fruit production/sales after	
N	153
Chi-Square <sup>b</sup>	44.862
Asymp. Sig.	.000
Livestock production/sales & Livestock production/sales	
N	153
Chi-Square <sup>b</sup>	14.815
Asymp. Sig.	.000
Cash crop production before & Cash crop production after	
N	153
Chi-Square <sup>b</sup>	15.559
Asymp. Sig.	.000
Fishing before & Fishing after	
N	153

Chi-Square <sup>b</sup>	4.298
Asymp. Sig.	.038

---

Food assistance/cash transfer before & Food assistance/cash transfer after

---

N	153
Chi-Square <sup>b</sup>	41.490
Asymp. Sig.	.000

---

Gathering natural products for sale before & Gathering natural products for  
sale after

---

N	153
Exact Sig. (2-tailed)	.035 <sup>b</sup>

---

Gifts before & Gifts After

---

N	153
Chi-Square <sup>b</sup>	34.568
Asymp. Sig.	.000

---

## Appendix B

### Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2- sided)	Exact Sig. (1- sided)	Point Probability
Pearson Chi-Square	55.035 <sup>a</sup>	3	.000	.000		
Likelihood Ratio	61.969	3	.000	.000		
Fisher's Exact Test	59.697			.000		
Linear-by-Linear Association	40.078 <sup>b</sup>	1	.000	.000	.000	.000
N of Valid Cases	153					

a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is 3.34.

b. The standardized statistic is 6.331.

### r × c Exact Contingency Table: Results

The results of an exact contingency table test performed at 20:10 on 16-JUN-2019

data: contingency table

	A	B	C	D	
1	3	52	17	1	73
2	4	12	41	23	80
	7	64	58	24	153

expected: contingency table

	A	B	C	D
1	3.34	30.5	27.7	11.5
2	3.66	33.5	30.3	12.5

The given table has probability 8.7E-16

The sum of the probabilities of "unusual" tables finds  $p < .001$  i.e.,  $p = 1.4E-13$

## Appendix C

### Household questionnaire

**Bindura University of Science Education**  
**Faculty of Agriculture and Environmental Science**  
**Department of Agricultural Economics, Education and Extension**

The principle objective of this questionnaire is to investigate the effects of development projects, in particular, Tokwe-Mukosi Dam construction on food security of the surrounding community as well as the displaced persons. The study is meant for academic purpose hence the information provided by respondents is confidential and cannot be identified with the people who provide it.

#### I. Identification

Name of enumerator \_\_\_\_\_  
Date of interview \_\_\_\_\_  
Ward number \_\_\_\_\_  
Name of settlement \_\_\_\_\_  
Name of village \_\_\_\_\_

#### II. Household demographic characteristics

1. Age of household 1) Below 18years 2) 19 to 35yrs 3) 36 to 60yrs 4) 61yrs and above
2. Sex of household head 1) Male 2) Female
3. Marital status of household head: 1) Married living together 2) Married living apart 3) Divorced/separated 4) Widow/Widower 5) Never married
4. Household size \_\_\_\_\_
5. Household labor force size 1) 1 and below 2) 2 to 5 people 3) Above 5 people

#### III. Household socio-economic characteristics

6. Literacy status of respondent 1) Primary 2) Secondary 3) Tertiary
7. What is the size of your arable land \_\_\_\_\_ (ha)
8. Do you own a permanent crop land 1) Yes 2) No
9. What is your source of drinking water?
  1. Improved source (Piped, borehole, protected well, protected spring, rain water harvester, bottled, water trucking)

2. Unimproved source (unprotected well, unprotected spring, surface water)
10. What sanitation facilities do your household use?  
 1) Open defecation 2) Unimproved sanitation facility 3) Shared sanitation facility 4) Improved sanitation facility
11. Is your household a member to farmer and micro-finance groups  
 1) Commodity association 2) ISAL/SACCO 3) Agriculture extension group  
 4) none
12. Household source of loans 1) Family and friends 2) Traders 3) Contractors  
 4) Micro-finance institutions 5) Savings and credit groups 6) Cooperatives  
 7) Banks 8) none
13. How does your household get agricultural inputs 1) Government 2) Purchase 3) Retained 4) Remittances 5) NGO 6) Private contractors
14. Cattle ownership 1) 0 2) 1-3 3) 4-5 4) > 5
15. Goats ownership 1) 0 2) 1-3 3) 4-5 4) > 5
16. Where do you sale you produce? 1) Other households in the area 2) Private traders 3) GMB 4) local markets 5) local millers 6) Distant markets 7) Contracting companies 8) Local shops 9) Other (Specify)
- 
17. Do you own an irrigation facility 1) Yes 2) No
18. If yes, to 16 above, what is your source of irrigation water 1) Dam 2) River 3) Own borehole 4) Water harvesting 5) Other (Specify)
- 
19. What produce storage structures do you use 1) Ordinary room 2) Traditional granary 3) Improved granary 4) Bin/drum 5) Crib 6) Other (Specify)
- 
20. Do your household access small grants for income generating projects (IGPs) 1) Yes 2) No

**IV. Livelihood strategies before Tokwe-Mukosi dam construction**

- Formal salary/wage
- Casual labour
- Food crop production/sales
- Vegetable production/sales

- Fruit production/sales
- Livestock production/sales
- Cash crop production
- Fishing
- Petty trade
- Food assistance/cash transfer
- Gathering natural products for sale
- Gifts
- Pension
- Other

(Specify)

**V. Livelihood strategies after Tokwe-Mukosi dam construction**

- Formal salary/wage
- Casual labour
- Food crop production/sales
- Vegetable production/sales
- Fruit production/sales
- Livestock production/sales
- Cash crop production
- Fishing
- Petty trade
- Food assistance/cash transfer
- Gathering natural products for sale
- Gifts
- Pension
- Other

(Specify)

**VI. Household food security status**

N <sup>o</sup>	Question	Response option	code
1.	In the past four weeks, did you worry that your household would not have enough food?	0 = No (skip to Q2) 1 = Yes	_____
1.a	How often did this happen?	1 = Rarely (once or	

- twice in the past four \_\_\_\_\_  
weeks)
- 2 = Sometimes  
(three to ten times in  
the past four weeks)
- 3 = Often (more than  
ten times in the past  
four weeks)
2. In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources? 0 = No (skip to Q2)  
1 = Yes \_\_\_\_\_
- 2.a How often did this happen? 1 = Rarely (once or  
twice in the past four \_\_\_\_\_  
weeks)
- 2 = Sometimes  
(three to ten times in  
the past four weeks)
- 3 = Often (more than  
ten times in the past  
four weeks)
3. In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources? 0 = No (skip to Q2)  
1 = Yes \_\_\_\_\_
- 3.a How often did this happen? 1 = Rarely (once or  
twice in the past four \_\_\_\_\_  
weeks)
- 2 = Sometimes  
(three to ten times in  
the past four weeks)
- 3 = Often (more than  
ten times in the past

- four weeks)
4. In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food? 0 = No (skip to Q2) 1 = Yes \_\_\_\_\_
- 4.a How often did this happen? 1 = Rarely (once or twice in the past four weeks) \_\_\_\_\_  
2 = Sometimes (three to ten times in the past four weeks)  
3 = Often (more than ten times in the past four weeks)
5. In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food? 0 = No (skip to Q2) 1 = Yes \_\_\_\_\_
- 5.a How often did this happen? 1 = Rarely (once or twice in the past four weeks) \_\_\_\_\_  
2 = Sometimes (three to ten times in the past four weeks)  
3 = Often (more than ten times in the past four weeks)
6. In the past four weeks, did you or any household member have to eat fewer meals in a day because there

- was not enough food?
- 6.a How often did this happen? 1 = Rarely (once or twice in the past four weeks) \_\_\_\_\_  
2 = Sometimes (three to ten times in the past four weeks)  
3 = Often (more than ten times in the past four weeks)
7. In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food? 0 = No (skip to Q2)  
1 = Yes \_\_\_\_\_
- 7.a How often did this happen? 1 = Rarely (once or twice in the past four weeks) \_\_\_\_\_  
2 = Sometimes (three to ten times in the past four weeks)  
3 = Often (more than ten times in the past four weeks)
8. In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food? 0 = No (skip to Q2)  
1 = Yes \_\_\_\_\_
- 8.a How often did this happen? 1 = Rarely (once or twice in the past four weeks) \_\_\_\_\_  
2 = Sometimes (three to ten times in the past four weeks)

3 = Often (more than ten times in the past four weeks)

9. In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food? 0 = No (skip to Q2) 1 = Yes \_\_\_\_\_

9.a How often did this happen? 1 = Rarely (once or twice in the past four weeks) \_\_\_\_\_ 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)

**Appendix D**

*Key informant interview guide*

**Bindura University of Science Education**  
**Faculty of Agriculture and Environmental Science**  
**Department of Agricultural Economics, Education and Extension**

This study is meant for academic purpose and we are interviewing key informants around Tokwe-Mukosi Dam project as well as those that are in destination areas of those who were displaced by the project as part of an information gathering process. The themes that emerge from the interview process will inform stakeholders and contribute to academic circles; the interviews themselves will be confidential. I am an independent interviewer, MSc Food Security and Sustainable Agriculture student at Bindura University of Science Education and will interview you based on your knowledge of food security and livelihood strategies that were undertaken by people in this area before and after Tokwe-Mukosi Dam construction.

**VII. Identification**

Name of enumerator \_\_\_\_\_  
Date of interview \_\_\_\_\_  
Enumeration area \_\_\_\_\_

**VIII. Who**

1. Name and organization of key informant
2. For how long have you known or worked in this area?
3. What services do you provide?

---

---

---

---

**IX. Livelihood strategies**

4. Do you remember what communities around used to do in order to earn a living and to address food security challenges before Tokwe-Mukosi dam construction?

---

---

---

---

---

5. Now that the dam has been commissioned, what activities are they undertaking in order to earn a living and to address food security challenges?

---

---

---

---

6. Are communities receiving external assistance and in which activities?

---

---

---

---

---

---

**X. Food security**

7. In your view, did Tokwe-Mukosi dam project improve or diminish food security?

---

---

---

---

---

---

Thank you very much for your time. Your knowledge and insights will be very helpful to us. If the process is complete, we would be happy to share a summary of our findings.