SOCIO-ECONOMIC EFFECTS OF PANGANI RIVER BASIN ON COMMUNITY`S LIVELIHOODS IN KOROGWE TOWN COUNCIL, TANGA REGION

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A DISSSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN ENVIRONMENTAL AND NATURAL RESOURCE ECONOMICS OF SOKOINE UNIVERSITY OF AGRICULTURE. MOROGORO, TANZANIA.

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ABSTRACT

River basin`s resources are vital to basic livelihoods improvement and to the economy growth of the World. Despite the significant role played by river basins to Tanzania`s economic growth, little information is known on the socio-economic effects of river basin in urban areas than in rural areas. To address the information gap, this study was conducted purposely to: identify socio-economic activities undertaken by urban community along Pangani river basin, analyse gross profit from identified socio-economic activities and analyse factors influencing urban community`s dependency on river basin. Purposive sampling was used to select three wards among seven wards crossed by river basin. A cross-sectional research design was adopted where a total number of 90 respondents were randomly selected and interviewed using household questionnaire. Key informant's informations were collected and three focus group discussions comprising 6-10 people were carried out using a developed checklist. Data were analysed using statistical package for social science (SPSS), gross margin analysis and multiple regression model. The findings revealed that, 33.3% of the respondents were conducting gardening activities, 26.7% crop cultivation, 26.7% brick making, 8.9% sand mining and 4.4% car wash activity. The overall gross profit was found to be TZS 5 263 736.00 per household/year which is higher than that recorded in previous researches conducted in rural areas. Soil fertility, water availability, land availability, access to market, conducive climatic condition and vicinity to new construction area were found to be significant factors influencing urban community to depend on river basin at a 5% probability level ($p < 0.05$). Generally, the result prevail that, there is high utilisation of river basin resources in urban than in rural areas. The study recommends strengthening of

community participation and awareness in conserving the river resources and further study on investigating economic efficiency of socio-economic activities.

DECLARATION

I, Emmanuel Komba do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work done within the period of registration and that it has neither been submitted nor being concurrently submitted in any other institution.

_____ _____

Emmanuel Komba Date

(MSc. ENAREC)

The above declaration is confirmed by:

_____ _____

Dr. Lusambo L. P. Date

(Supervisor)

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DEDICATION

This work is dedicated to my beloved father Mr.William N. Komba who laid the foundation and inspiration of my education. The work is also dedicated to my beloved mother who passed away when I was two years old.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

AUWASA	Arusha Urban Water Supply and Sanitation Authority
B/C	Benefit-Cost ratio
FAO	Food and Agriculture Organization of the United Nations
FGD	Focus Group Discussion
GDP	Gross Domestic Product
GIS	Geographic information system
GM	Gross Margin
GMA	Gross Margin Analysis
IRR	Internal Rate of Return
IUCN	International Union for Nature Conservation
Kg	Kilogram
Lt	Litre
M	Metre
m^3	Cubic metre
m.a.s.l	Metres above sea level
MDG	Millenium Development Goal
MM	Marketing Margin
MS Excel	Microsoft office Excel
MUVI-SIDO	"Muunganisho Ujasiriamali Vijijini" under Small Industries Development Organisation
MW	Megawatt
NGOs	Non-Governmental Organisation
NPR	Nepalese Rupee

PRB	Pangani River Basin
PWBO	Pangani Water Basin Office
ROI	Return on investment
SPSS	Statistical Package for Social Science
TFS	Tanzania Forest Services Agency
TR	Total revenue
TVC	Total variable cost
TZS	Tanzanian shillings
UDSM	University of Dar Es Salaam
UN	United Nations
UNEP	United Nations Environment Programme
URT	United Republic of Tanzania
USD	United State Dollar

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background information

River basin refers to the portion of land drained by a river and its tributaries. In Africa, the world`s second driest continent, the availability and access to water is more crucial to existence than it is almost anywhere else on the Earth (UNEP, 2010). The establishment of transboundary river basin organizations for many of Africa`s large basins provide a powerful opportunity to sustainable management and utilization of the resources in contributing to economic growth of respective countries and people`s livelihoods. Examples of African`s transboundary river basins includes Congo river basin, Nile river basin, Niger river basin, Limpopo river basin, Senegal river basin, Volta river basin and Zambezi river basin.

Tanzania is divided into nine hydrological zones or water basins for the purpose of water resources management. These basins are: Pangani water basin, Rufiji river, Lake Nyasa, Wami/Ruvu river, Ruvuma and Southern coast, Lake Rukwa, Lake Tanganyika, Lake Victoria water basins, and the Internal drainage basins of Lake Eyasi, Manyara and Bubu depression (URT, 2002). The Pangani water basin is comprised of five sub basins: Pangani river (43 650 km^2), Umba river (8 070 km^2), Msangazi river (5 030 km^2), Zigi and Coastal rivers including Mkulumuzi (2 080 km^2) which all independent drain to the Indian Ocean (PBWO, 2015).

The Pangani River Basin (PRB) plays a significant role on the economic growth of the country, as it provides a lifeline for biodiversity, domestic and industrial use in

Tanzania. The basin hosts an estimated 3.7 million people, 80% of whom rely directly or indirectly on irrigated agriculture for their livelihoods (Ngereza, 2005). Immigration of people to a particular area depends among other factors, the availability of water, therefore water resources plays as key factor for urbanization. Over the past 15 years these demands have intensified with the increase in population and concurrent growth of economic activities requiring water as an input such as in hydropower generation, irrigated agriculture, industries, tourism, mining, livestock keeping, domestic, fisheries, wildlife and forestry activities (URT, 2002).

As people migrate to urban areas, the demand for water in urban areas increases rapidly for both domestic and industrial activities. For example, water demand in Arusha city is about 93 270 m^3/day while the water production ranges between 35 000 and 45 000m^3/day depending on season either dry or rainy season (AUWSA, 2015). Consequently, water pollution increases as the urban areas grow and as farmers use more chemical inputs to grow enough food to feed the fast-growing population (Mbonile, 2012). Due to the socio-economic services provided by the river basin to the economy growth, conservation strategies are more vital in order to safeguard the ecological and socio-economic functions of the river basin.

1.2 Problem statement and Justification of the study

1.2.1 Problem statement

Despite the significant role played by various river basins to Tanzania`s economic growth and community`s livelihoods in general, more information have been well documented for rural areas on the effects of river basin on socio-economic activities

undertaken along the river basins, but for urban areas little information is known. Knowing the impact of river basin in urban areas is vital and inevitable so as to plan for sustainable utilisation of the river basin`s resources. The previous research on the socio-economic role of river system in household livelihoods along the Pangani river basin was done mainly comprising those people living in rural areas close to river, lakes, wetlands or estuary (Turpie *et al*., 2007) and through these studies conducted, there is no estimation of average gross profit from different activities. Moreover, PBWO/IUCN (2008) recommended for further studies on macroeconomic analysis that can provide a detailed overview of the water related economy of the Pangani river basin, and the contribution that it makes to the national economy. Therefore, the information available from the previous studies have not captured the socio-economic impacts of river basin particularly to urban residents, who may also use river basin for extracting resources or for recreational or other purposes in sustaining their daily needs.

1.2.2 Justification of the study

1.2.2.1 Significance of the study findings

The study was primarily designed to come up with the unavailable data on the socio-economic effects of river basin to livelihoods of urban communities. The findings will benefits the Tanzania Forest Service (TFS) Agency which has a mandate on conserving catchment forest which are sources of water, also Ministry of water and irrigation, the Pangani river basin management and Korogwe township councils so as consider economic perspective of the river basin to urban community`s livelihoods during decision making. Also the findings will raise awareness to urban communities

on the socio-economic value of river basin as a result being highly motivated and become willing to conserve while utilising the recourses in a sustainable manner.

1.2.2.2 Why study in Pangani river basin?

This study area has been selected purposively as a case study area of this research with consideration that, it is among the river basin which crosses various township areas like Korogwe town council. Moreover, Pangani river basin is one of Tanzania's most productive areas, with nationally important agricultural outputs and hydropower production (95 MW, 17% of Tanzania's national power grid capacity) as well as globally important forest and biodiversity resources (Ngereza, 2005).

1.2.2.3 Why study in Korogwe township council?

Previous research on the socio-economic role of river system in household livelihoods along the Pangani river basin was done mainly comprising rural areas close to river, wetlands or estuary excluding the urban areas where the river basin crosses as it is in Korogwe town council. Therefore, in this study Korogwe urban area with a population of 68 308 people (URT, 2012) has been selected purposively to represent other urban areas along the Pangani river basin eg. Pangani town as well as other urban areas in the rest of river basins in Tanzania.

1.3 OBJECTIVES OF THE STUDY

1.3.1 Main objective

The overall objective of this study was to analyse the socio-economic effects of river basin to livelihoods of the urban communities with a case study of Pangani river basin which crosses at Korogwe town council in Tanga Region.

1.3.2 Specific objectives

The specific objectives of the study were to:

(i) identify the socio-economic activities undertaken by urban community along the Pangani river basin;

(ii) analyse the gross profit obtained from identified socio-economic activities; and

(iii) analyse factors influencing urban community`s dependency on Pangani river basin.

1.3.3 Research questions

The study aimed at answering the following questions.

i. What kind of socio-economic activities are being conducted along the Pangani river basin?

ii. What are the costs associated with the operation of the activities?

iii. How much output/harvest/earning (in terms of quantity and cash) are obtained from each identified activities per month or year?

iv. Which factors influenced community to conduct activities along the river basin and not somewhere else?

1.4 Possible limitations of the study

During data collection, it was observed that most of the respondents were not keeping record of the important past informations pertaining to their activities. This caused the information collected to be based on the memory of the respondent. Due to this challenge, there was a possibility for respondents to underestimate or overestimate their variable costs and revenue for the past years. In order to avoid this, a detailed interview which goes with the repetition of the same question using different words together with the use of secondary information to complement primary data was adopted.

1.5 Conceptual framework of the study

This study was based on neo-classical theory of environmental economics which considers the environment as a commodity where the economists can be in a position of advising the policy makers (decision makers) and other stakeholders on how to utilise the environmental resources in a sustainable manner. The conceptual frame work (Figure 1) illustrates the relationship between river basin resources as a stock of drivers on people to depend on it and its contribution to the livelihoods improvements. At heart, the neoclassical approach, to the environmental economics has one aim: to turn the environment into commodity which can be analysed just like other commodities (Jacobs, 1994). The development through conservation approach seeks to reconcile conservation with community economic and socio-cultural aspirations, the argument being that win–win outcomes are not only possible but also necessary for the achievement of successful conservation outcomes (BorriniFeyerabend, Kothari and Oviedo, 2004; Bushell and Eagles, 2007; Roe and Elliot, 2010; Nathans *et al.*, 2013).

The river basin as an environmental resource has a multiplier effect on the economic growth of the communities along the river basin. Various socio economic activities depend on river basin giving an economic opportunity for local communities to sustain their life. Availability of rainfall, sufficient land, soil fertility, and mining opportunity are among the factors that influences people to conduct their activities along the river basin in order to improve their income.

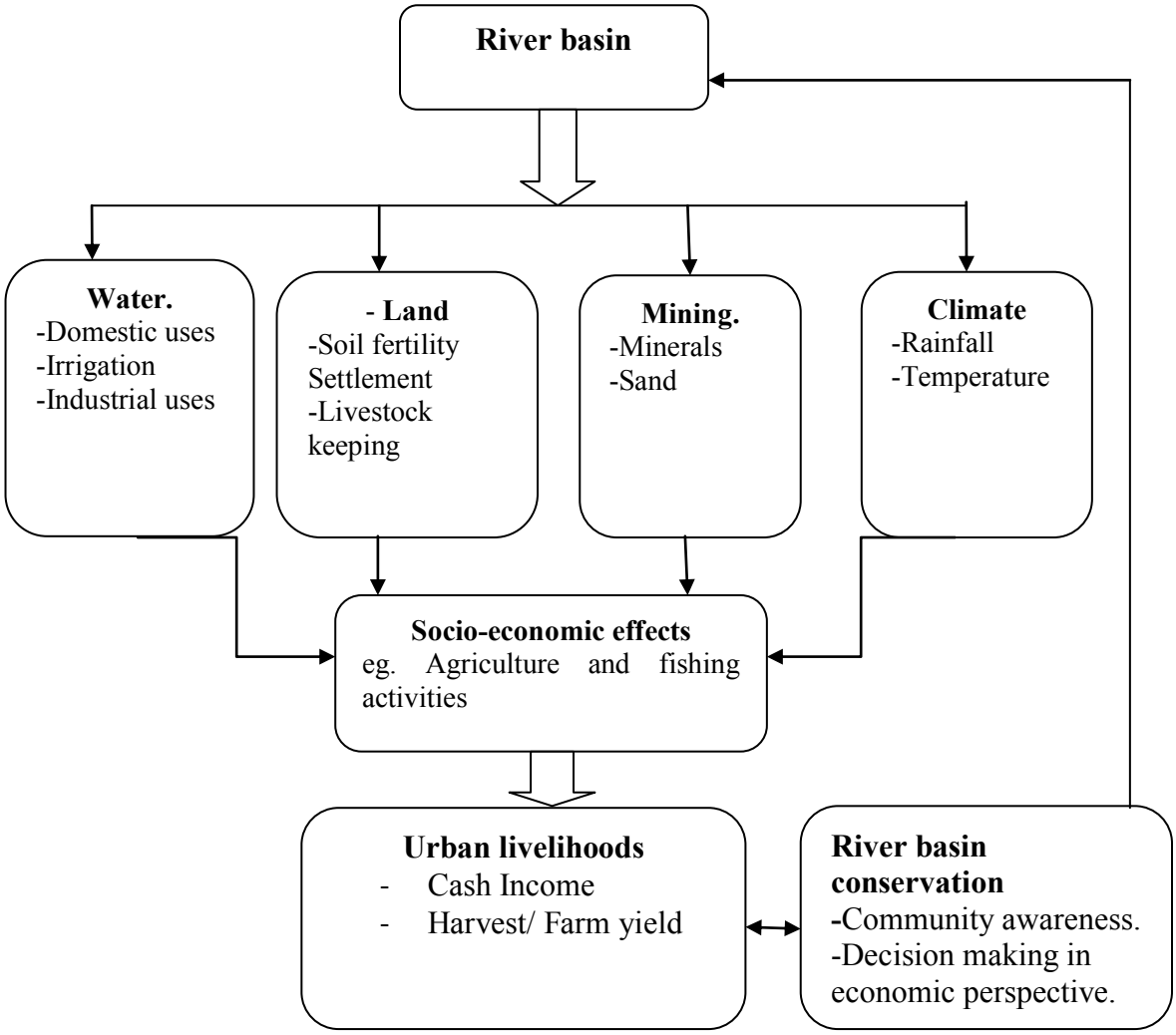

Figure 1: The conceptual framework of the study

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Sustainable livelihoods framework

Livelihoods comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the long and short term (Chambers and Conway, 1992). The concept of "livelihoods" provides important informations to the development sectors to understand and analyse problems, demand and potentials with a household centered view and thus derive holistic approaches to address these issues. Majale (2002) has defined the term "sustainable livelihoods approach" as a holistic approach that tries to capture, and provide a means of understanding, the fundamental causes and dimensions of poverty without collapsing the focus onto just a few factors (e.g. economic issues, food security, etc.).

According to Morse *et al*. (2009) five principal assets (or capitals) are suggested as important to livelihoods development, these are: Natural capital (eg. soil, water, air), social capital (eg. networks, social claims, social relations, affiliations, associations), human capital (eg. skills, knowledge, labour), physical capital (eg.Infrastructure, production equipment and technologies) and economic or financial capital (eg. cash, credit/debt, savings, and other economic assets). For livelihoods development to be

achieved along the river basin, it is important to consider the concept of sustainable livelihoods in which river basin is categorised as a natural capital. The conceptual frame (Fig. 1) explain how the five principals works together in order to attain sustainable livelihoods development. When natural, social, human, physical and financial capitals are all considered equally by a particular development sector eg. Agriculture, under livelihoods strategies it is possible to achieve the sustainable livelihoods otherwise it will end up to vulnerability situation.

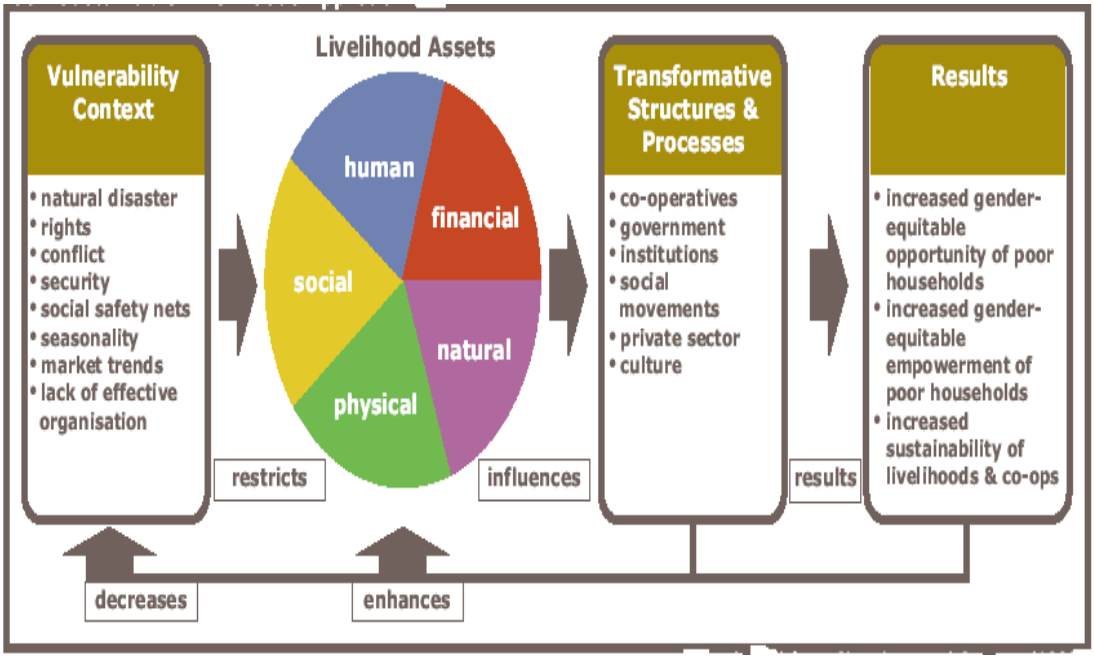

Figure 2: Sustainable livelihoods framework

Source: Ferguson (2012) adapted from Chambers and Conway (1992).

2.2 Global importance of river basins

River basin`s resources are vital to basic livelihoods improvements and to the World economy growth in general. Through the global strategy of eradicating poverty by

2025, the seventh millennium development goal (MDG No.7) was formulated by the United Nations (UN) which emphasize on environmental resources sustainability including conservation and sustainable utilization of water sources including river basins. Therefore, river basin`s resources have been recognised as among the fundamental factor for the growth of economic activities like agriculture and industry. Although there is not yet a global water shortage, about 2.8 billion people, representing more than 40% of the world's population, live in river basins with some form of water scarcity (UN, 2008).

Due to the global importance of river basin`s resources various researchers have recommended on efficiency, equity, sustainability and security of water supply. Many of today`s seemingly local water issues carry a (sub)continental or even global dimension, which urges for a governance approach that comprises institutional arrangements at a level beyond that of the river basin (Hoekstra, 2010). Increase in water resource demand from both agriculture and other sectors leads to apparent competition of water, resulting in environmental stress and socio-economic tension. Worldwide, the poorest have the least access to land and water, and are locked in a poverty trap of small farms with poor-quality soils and high vulnerability to land degradation and climatic uncertainty (FAO, 2011).

2.3 Role of river basin in Africa`s economy

Africa is endowed with large and often under-utilised aquifer resources that contain excellent quality water and could provide water security in times of drough (UNEP, 2010). Socio-economic development processes are closely related to the river basin`s resources because of the diverse range of interactions between water

and human activities. Africa has 63 shared basins covering about 64% of the continental area (UNEP, 2005 cited by UNEP, 2010). Some of the river basins found in Africa includes: Congo river basin, Nile river basin, Niger river basin, Limpopo river basin, Senegal river basin, Volta river basin and Zambezi river basin. The major transboundary basins of Africa create various opportunities to the people and countries who share them. For example, Congo river basin which is shared by 11 countries is an enormous resource for transportation, power generation and have high productive in fisheries and potential for irrigation.

2.4 Contribution of river basin on Tanzania`s economy

According to the National water policy of 2002, Tanzania is divided into nine hydrological zones or river basins for purposes of water resources management, these basins are: Pangani, Wami/Ruvu, Rufiji, Ruvuma and Southern Coast, all of which drain into the Indian Ocean, and Lake Nyasa, Lake Rukwa, Lake Tanganyika, Lake Victoria, and the Internal drainage basins of Lake Eyasi, Manyara and Bubu depression. Tanzania has committed itself to attain MDG in order to implement the poverty reduction strategy and plans to transform itself into a middle-income country by 2025. Thus, many economic potential areas for production like river basins are the most important areas to enable the country to achieve its social, economic and environmental development vision and objectives, such as eradicating poverty, attaining water and food security, sustaining biodiversity and sensitive ecosystems.

In addition, the URT (2013) reported that, during the year 2012, gross domestic product (GDP) grew by 6.9 % in real terms, which was higher than the target of 6.8 % and growth of 6.4 % recorded in 2011; the growth was due to favourable weather

and timely supply of subsidized agricultural inputs that boosted agriculture production; as well as increased reliability of power generation which increased industrial production. Therefore, river basin being the sources of water for hydro power generation, irrigation, domestic uses and other industrial uses as an input resource, plays a big role to the Tanzania`s economy growth which in other hand it needs more attention on utilizing them in a sustainable way.

2.5 Socio-economic activities undertaken along river basins

Socio-economic development processes are closely related to the river basin`s resources because of the diverse range of interactions between water resource and human activities. According to the National water policy of 2002, water is fundamental for food security, domestic – urban and rural water use, livestock development, hydropower production, industrial production, fisheries and for wildlife water use, and for the sustenance of ecosystems. The study conducted by UDSM in 2006 in Rufiji river basin, it identified various activities being conducted along the river basin, these includes: Domestic water use, irrigation, navigation (ferries and boats), hydropower (at Mtera-Kidatu system, and Kihansi hydropower station), and few mining and industries operation. Also the study conducted by Turpie *et al.* (2007) in Pangani river basin identified agriculture, forestry, fisheries, mining, hydroelectric power supply, tourism, industries (eg. sisal processing industries) as the main socio-economic activities being conducted along the river basin particularly in rural areas.

2.6 Contribution of socio-economic activities to household income

The National water policy of 2002 and various researches have revealed that, river basin resources make appreciable contribution to community`s livelihoods in terms of direct cash income and contribution to food security. According to PBWO/IUCN (2007), households in the Pangani river basin that live within 10 km of rivers derive up to 21% of their total income from river systems. As a source of natural capital, water in adequate quantity and quality is a primary input for a whole array of productive activities (URT, 2002). Also according to Munishi *et al.* (2011) wetland based socio-economic activities carried out in valley bottoms commonly known by local people as *vinyungu* contribute about 15% of household food and 55 - 95% of household income annually, equivalent to Tanzanian shillings (TZS) 3 234 721 (US$ 2 588) whereby the total use value of productive activities carried out in upland and valley bottom wetlands TZS 3 415 458 (US$ 2 732) per year per household.

2.7 Selection of variables used in Multiple regression model

Selection of variables used in the multiple regression model was based on literature review and field observations. Through literature review and field observations, a theory of sustainability and growth in economic perspective was taken into account. Theoretical analysis of sustainability and growth begins with the proposition that, the interests of future generations should be given equal weight with our own in making decisions affecting the long term future. This proposition was taken as axiomatic by Ramsey (1928) in deriving his savings rule, but was dropped in most of the literature on ‘old growth theory’ (Quiggin, 2000). In 1987 the United Nations World Commission on environment and development (the Bruntland commission) had

defined the term sustainability as the development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Theory of sustainability and growth in economics perspective have considered that, sustainability can be attained by preserving the total stock of capital which is the productive base that provides the opportunities from which wellbeing is ultimately derived. The total stock of capital includes; physical capital (roads, buildings, machinery), natural capital (rivers, minerals, fossil fuels), human capital (education, skills, knowledge, health) and social capital (institutions and relationships that govern interactions between people). When natural capital is depleted, other forms of capital can be increased to restore the total capital stock, and hence maintain per person consumption (or wellbeing), this situation is termed as `weak sustainability`. However, `strong sustainability' dismisses the idea of substitution on the premise that natural capital is complementary to other forms of capital, including social capital, and is therefore largely 'non-substitutable'.

According to Solow (1974) as cited by Markulev and Long (2013), under certain conditions, constant wellbeing over time can be achieved by maintaining the total stock of capital that is, the depletion of natural capital can be off-set by investment in manufactured capital, or other types of capital. Therefore, maintaining the river basin condition improves the long term availability of water, soil fertility, conducive climatic condition and land availability.

In addition, unlike biodiversity and primary productivity, which are generally correlated to rainfall availability, the distribution of people in Africa is influenced by many natural and human induced factors that include availability of land for agricultural activities, the prevalence of natural disasters and disease, conflicts over natural resources, and historical reasons, among others (UNEP, 2010). According to PBWO/IUCN (2007), land use in the Pangani river basin is governed primarily by rainfall but also by slope, soil fertility and availability of surface water.

The existence of natural thresholds beyond which environmental damage is irreversible, means there may be limits to the substitutability of natural capital. Thus, improving our understanding of the effects of using up a particular resource (for example, water and land) on the functioning of ecological systems would be beneficial, both from the perspective of governments making environmental conservation decisions, and also to improve accounting of natural capital (Markulev and Long, 2013). Therefore, this study has considered the variables such as water, soil condition, land and climatic condition as important variables to be included in a model.

2.8 Application of gross margin analysis (GMA) in calculating gross profit

There are various measures of profitability of the enterprises including, Gross Margin (GM), Return on Investment (ROI), Benefit-Cost ratio (B/C), Internal rate of return (IRR) and Marketing Margin (MM) (Turuka, 2000). Despite of the various mentioned measurements of profit, gross margin analysis has been pointed by different researchers as a best method to be used in gross profit calculation in the

small and medium enterprises while others are suitable for long-term business project such as forestry.

Gross margin analysis is mostly used to calculate the gross profit (economic benefits). The gross margin reveals the amount that an entity earns from the sale of its products and services, before deduction of any selling and administrative costs (Steven, 2012). Gross margin consists of total revenues earned in the given period less total expenses incurred to generate the revenues in the given period (Wilkinson, 2013). When revenues exceed expenses, there is a net profit but when the expenses exceed revenues, there is a net loss. In organic systems gross margins are also useful for farm planning and for making comparisons of enterprises, on the same farm, between organic holdings, or between conventional and organic enterprises (Lampkin, 2001 cited by Firth, 2002).

2.8.1 Advantages of using gross margin analysis

Gross margin is useful in decision making because is the logical and systematic way of assessing each activity including inputs such as water, fertilizer, labour and yields or market prices (Kristen, 2011). Moreover, it shows the effect on enterprise income on the change of yields, prices or cultivation methods (Michel *et al.*, 1991). The most strength of this method is that, it helps to identify all costs involved in a particular enterprise.

2.8.2 Challenges of using gross margin analysis

Gross margin is used to compare cost and returns for different crops provided that the overheads are similar (Michel *et al.*, 1991). In other hand, it does not take into

account the overheads, capital investment, or cost of borrowed capital (fixed cost). Such approach is adopted because small-scale farmers/ enterprises do not often incur much of these costs and partly because such information is often difficult to obtain (MUVI-SIDO, 2012).

2.9 Multiple regression model

Multiple regression is a statistical technique for examining the relationship between one variable, called the dependent or outcome variable, and more than one independent variables. Thus, the regression analysis is a statistical method to deal with the formulation of mathematical model depicting relationship amongst variables which can be used for the purpose of prediction of the values of dependent variable, given the values of the independent variable (Kothari, 2004). Moreover, the equation describing such relationship is termed as the multiple regression equation.

This study has involved analysis of various factors (variables) which influence urban community to depend on Pangani river basin for their socio-economic activities. The gross profit generated from socio-economic activities has been treated as dependent variable while availability of water, soil fertility, availability of land, access to means of transport, favorable climatic condition, vicinity to construction areas and market access have been treated as independent variables. Therefore, this relationship enable to determine the level of community dependence on river basin and predict the future situation on sustainability of income gained from various activities along the river basin.

2.9.1 Advantages of using multiple regression model

Multiple regression is a very useful extension of simple linear regression in that, we use several variables rather than just one to predict a value on a quantitatively measured criterion variable and it has become a very popular technique to employ in behavioral research (Meyers *et al.*, 2005). Also regression technique can also guide researchers toward explaining the dynamics underlying a particular situation by indicating which variables in combination might be more strongly associated with it, in this sense, the model that emerges from the analysis can serve an explanatory purpose as well as a predictive purpose.

2.9.2 Challenges of using multiple regression analysis and how to overcome them

Despite of various researches to recommend on the advantages of using multiple regression models, several challenges have been observed when creating a model with more than one explanatory variable, among them being choosing the irrelevant variables. In some cases, independent variables interact and the regression equation will not be accurate unless this interaction is taken into account (James, 2011). The best way to overcome this challenge is to select which variables to include in a model by referring to previous researches where relevant empirical and theoretical work will give you a good idea about which variables to include and which are irrelevant (Steele, 2008).

Another problem is correlation between explanatory variables. When there is correlation between two or more explanatory variables it can be unclear how much of the variance in the outcome is being explained by each. It is difficult to ascertain

which variable is foremost in accounting for this shared variance because the two explanatory variables are themselves correlated. If the model is created in steps we can better estimate which of the variables predicts the largest change in the outcome where changes in r^2 can be observed after each step to find out how much the predictive power of the model improves after each new explanatory variable is added (Steele, 2008).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Description of the study area

3.1.1 Location

The Pangani river basin (PRB) is located in the north-east of Tanzania and covers a total area of 43 650 km^2, about 3 900 km^2 of which is in Kenya. The PRB together with other sub basins which are; Umba riv er (8 070 km^2), Msangazi river (5 030 km^2), Zigi and Coastal rivers including Mkulumuzi (2 080 km^2) forms the Pangani water basin which is under management of Pangani Basin Water Office (PBWO) where it`s head quarter is based in Kilimanjaro region. The Pangani river basin covers parts of Kilimanjaro, Manyara, Arusha and Tanga Regions and it crosses through 14 Districts.

Plate 1: Pangani river as seen at railway bridge, Majengo ward.

Photo by: Emmanuel Komba Date taken: 15 February, 2016

The study was conducted at Korogwe town council which is crossed by Pangani river basin in Tanga Region located at latitude 4º15' and 5º15' South, and in the longitudes 38º0 and 38º45' East (Fig. 2). According to the population and household census of 2012, Korogwe town council has a population of 68 308 people with an average household size of 4.4.

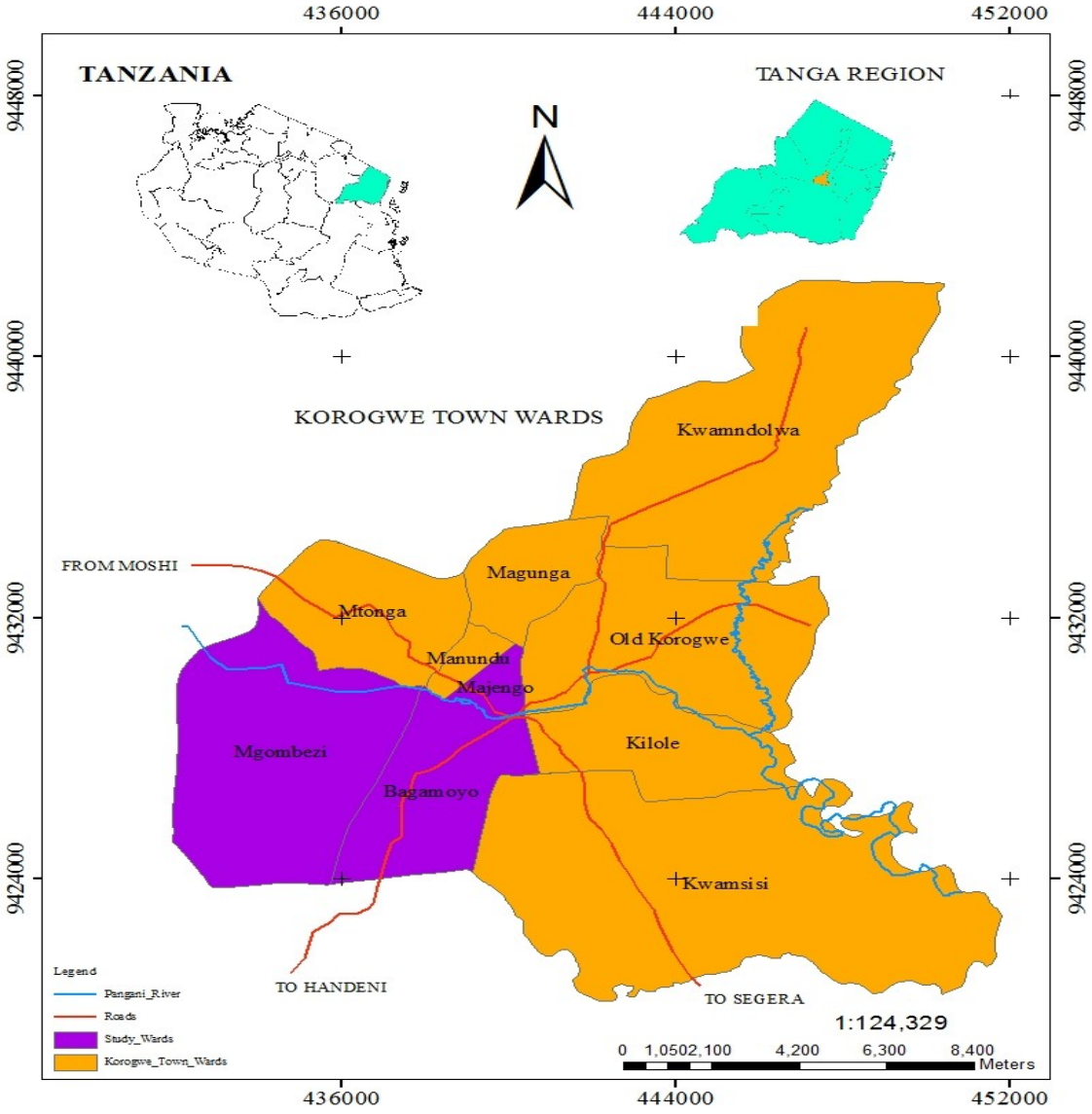

Figure 3: Map of a study area

Source: Survey and GIS unit- Korogwe Town Council.

3.1.2 Climate

Korogwe town council is characterised by the two rainfall seasons; the long rainfall which usually takes place during February to May and the short rain fall during September to November. The climate in the region is closely influenced by the topography and ranges from tropical to sub tropical with a mean annual rainfall range of 900mm to 1 300mm. The average temperature during the hot month (October – March) ranges from 29^0C to 32^0C and during the cold season (May – October) the average temperature ranges from 23^0C to 28^0C.

3.1.3 Topography, geology and hydrology

The topography of Korogwe town council is characterized by lowland and mountainous areas with altitude ranging between 500 and 1 000 meters above sea level. The district is drained by Pangani river, Lwengera tributaries and other small tributaries which flow from the mountains. The geological formations of Korogwe town council is mainly dominated by the red clay loam soils in the mountainous zone and brown sandy soils in the dry plain zone (URT, 2008).

3.1.4 Economic activities at Korogwe town council

The economic activities at Korogwe town council are largely based on agriculture, wholesale and retail business, animal husbandry and employment opportunity from government and private organisations. Different varieties of crops like maize, paddy, cassava, beans, banana, sisal, mango and oranges are produced: and animals like goats, sheep, cattle, pigs and chicken are kept. Due to shortage of land, intensified farming which has resulted into land deterioration is evident along the Pangani river basin and in other parts of the urban area.

3.2 Research design

A cross-sectional research design was adopted during data collection. This is due to the fact that this method allows collection of data at one point in time and is the most appropriate method in social studies facing limited time and little budget.

3.3 Reconnaissance survey

The reconnaissance survey was conducted at Mgombezi, Majengo and Bagamoyo wards with a purpose of testing a validity and reliability of the questionnaire by conducting face to face interview that included 10 respondents. Few and minor challenges was observed which resulted to modification of some questions in order to collect the appropriate data from the existing situation.

3.4 Sampling procedure and sample size determination

Purposive sampling was used to selected three wards out of seven wards crossed by Pangani river among 10 wards present in the study area. These wards are: Mgombezi, Majengo and Bagamoyo. The target population was number of households in the selected wards and specifically in the selected "mtaa" namely; Mgombezi (Mgombezi ward), Memba (Majengo ward) and Kwanduli (Bagamoyo ward). The total number of households in the three selected "mtaa" under study were 1 720. The provided list of household from "mtaa" offices who conducts their socio-economic activities along the river basin was used in sampling frame.

The study used the sample size determination as guided by Bailey (1994) and Yurdugul (2008) who argued that, 30 respondents per case are minimum number

recommended to represent a population under study. Random sampling method was used to select the samples from sampling frame by using a random number table in MS Excel. A total number of 90 households were randomly selected, one member from each household was interviewed as shown in Table 1.

Table 1: Total number of sampled households

Name of Ward	Name of "Mtaa"	Number of Residents	Total Number of Household (N)	Number of Sampled households (n)
Mgombezi	Mgombezi	4 293	1 020	30
Majengo	Memba	1 692	200	30
Bagamoyo	Kwanduli	1 143	500	30
Total		**7 128**	**1 720**	**90**

3.5 Data collection

3.5.1 Primary data

Primary data were collected using semi-structured questionnaire, focus group discussions (FGDs) and key informant interviews by researcher through face to face interview with the respondents.

3.5.1.1 Household questionnaire survey

Both structured and unstructured questionnaires (closed and open ended questions) were adopted during primary data collection (Appendix 2). The questionnaire was designed in order to meet the specific objectives of this study by collecting the appropriate socio-economic data.

3.5.1.2 Key informants interview

Key informants interview is a qualitative in-depth interview with people who know what is going on in the community and have a wide knowledge about the topic in question. This face-to-face interview was done purposely in order to collect information from a wide range of people having knowledge and understanding of the subject in research. This included "mtaa" excutive officers from Kwanduli, Mgombezi and Memba, Pangani basin water office and township officer from department of environment and sanitation, water and irrigation and department of planning and economics.

The key informant's information was collected by using closed and open ended questionnaire having nine questions (Appendix 3). The questions on population distribution, socio-economic activities along river basin and their economic contribution at "mtaa" and council level were asked. Also factors influencing people`s dependence on river basin resources for their livelihoods improvement were assessed as well as the recommendations for solving the challenges were recorded.

3.5.1.3 Focus group discussion (FGD)

The focus group discussion (FGD) is a rapid assessment, semi-structured data gathering method in which a purposively selected set of participants gather to discuss issues and concerns based on a list of key themes drawn up by the researcher/facilitator (Kumar, 1987 cited by Escalada *et al*., 2009). Three focus group discussions comprising 6-10 people were carried out in the three selected "mtaa" by using checklist of four questions which were developed by a researcher

(Appendix 4). The number of participants in FGD was adopted from Lusambo (2009) and in addition, Liamputtong (2011) recommended that, methodologically, focus group interviews involve a group of 6–8 people who come from similar social and cultural backgrounds or who have similar experiences or concerns, where they gather together to discuss a specific issue with the help of a moderator in a particular setting where participants feel comfortable enough to engage in a dynamic discussion for one or two hours. This approach have been more popular and encourages a range of responses which provide a greater understanding of the attitudes, behaviour, opinions or perceptions of participants on the research issues (Hennink, 2007).

3.5.1.4 Researcher`s field observations

Field observation was done by the researcher and the trained researcher assistants during data collection. The observation was mostly based on how people are involved in various socio-economic activities, how do they operate their activities along the river basin and which technology is used in irrigation, brick making and agriculture practice. The relevant observations were photographed.

Plate 2: **The use of Green house in tomato gardening as observed at Mgombezi**

Photo by: Research team member. Date taken: 17 February, 2016

3.5.2 Secondary data

Secondary data were collected from Pangani basin water office, Korogwe town council, wards and "mtaa" offices. Also relevant references on river basins eg. reports, thesis, dissertations and journals were used to gather the secondary data.

3.6 Data analysis

Data were analysed using statistical package for social science version 20.0 (SPSS), gross margin analysis (GMA) and multiple regression model.

Objective 1. ***To identify the socio-economic activities undertaken by urban community along the Pangani river basin***

The qualitative and quantitative data were collected from households, key informants and focus group discussion. The qualitative data were analysed by content analysis

method while quantitative data collected were coded and analysed using descriptive statistics. Content analysis is useful in analysing details of the components of verbal discussions to be held by key informants and focus group discussion (Kajembe, 1996 cited by Kijazi, 2006).

Objective 2. ***To analyse gross profit obtained from each identified socio-economic activities***

The collected quantitative data were coded and entered into MS Excel program. The data were checked for consistence and completeness before analysing using descriptive statistics. Descriptive statistics such as bar charts, pie charts and frequency tables have been used to present the results. Also gross margin analysis was used to calculate the gross profit obtained from each identified socio-economic activity.

Gross margin = Total revenue – Total Variable cost.

i.e GMA = TR - TV……...(1)

Where; GMA = Gross margin analysis (TZS/Kg or TZS/year)

TR = Total revenue (TZS/Kg or TZS/year)

TVC = Total variable cost (TZS/Kg or TZS/year).

Objective 3. ***To analyse factors influencing urban community`s dependency on river basin***

Various factors were identified during data collection and were analysed using multiple regression model in order to determine the drivers for urban community`s dependency on river basin resources. The following are the identified factors that

influence people to conduct their socio-economic activities along the Pangani river basin; Soil fertility, water availability, land availability, vicinity to district market, availability of transport, conducive climatic condition and vicinity to new construction areas (Table 2).

The multiple regression model was chosen because it is a statistical analysis technique popularly used by economists and other researchers in determining the relationship between independent and dependent variables and can be used to forecast future conditions. According to Nathans *et al.*, (2012) across behavioral science disciplines, multiple regression is a standard statistical technique in a researcher‘s toolbox.

The dependent variable is the gross profit obtained from socio-economic activities while the independent variables are environmental and socio-economic factors like soil fertility, availability of land, water availability, education, employment etc. The multiple regression model (equation 2) has been used in this study.

$$Y_i = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + ... + \beta_n X_n + e_i \quad \text{.....(2)}$$

Where;

Y_i = Dependent variable i.e gross profit from crop cultivation, gardening, brick making,

sand mining and car wash;

$X_1 ..... X_n$ =Independent variables i.e. X_1 = soil fertility, X_2 = water availability,

X_3= land availability, X_4 = access to market, X_5 = access to means of transport,

X_6 = Conducive climatic condition and X_7 = Vicinity to new construction area.

α= The intercept i.e. The value of the dependent variable when all of the independent variables = 0.

$\beta_1 \ldots\ldots \beta_n$ = Coefficient/ the slope i.e. The change in the dependent variable per unit change in the independent variable

e_i = Error term

Table 2: Variables used in multiple regression model

Variable symbol	Variable name	Explanations
Y_i	Gross profit	Gross profit from identified socio-economic activities
X_1	Soil fertility	*Dummy variable*; Fertile soil = 1, Not fertile = 0
X_2	Water availability	*Dummy variable*; Sufficient = 1, Insufficient = 0
X_3	Land availability	*Dummy variable;* Adequate = 1, Inadequate = 0
X_4	Access to market	*Dummy variable;* Accessible = 1, Inaccessible = 0
X_5	Access to means of Transport	*Dummy variable;* Accessible =1, Inaccessible = 0
X_6	Conducive climatic condition	*Dummy variable;* Conducive =1, Unconducive = 0
X_7	Vicinity to new construction areas	*Dummy variable*; Vicinity = 1, Not vicinity = 0

CHAPTER FOUR

4.0 RESULTS AND DISCUSSIONS

4.1Characteristics of the respondents

The characteristics of the respondents which were collected and analysed for discussion includes; gender (sex of the respondent), age, marital status, household size, education level, residing period at Korogwe town council, time period used to conduct activities along the PRB, distance from site of operation to Pangani river bank, ownership status of the area of operation, involvement of urban community in river basin conservation strategy, migration status of the river basin dependants, and livelihoods improvement from PRB.

4.1.1 Gender of the respondents

The result shows that 95.6 % of the respondents were men while only 4.4% of the respondents were females as shown in the Table 3. This is because the head of household were majority men and were the ones mostly found conducting their economic activities along the Pangani river basin. This result indicates that, females are not much involved themselves compared to men eg. in brick making and sand mining, this may be due to the nature of work as they consumes more energy where female cannot withstand and are not homestead based activities that do not provide more time to conduct domestic activities like fetching water and cooking. This result is supported by Manik *et al.* (2009) who conducted the research on the role of gender in economic activities and they found that, activities within the household were found to have a weak impact on women's empowerment were only 85% of men and only 6.3% of women over 14 years of age were engaged in rural economic activities in the year 2000.

Table 3: Gender distribution of the respondents

Gender	Frequency	Percentage
Male	86	95.6
Female	4	4.4
Total	**90**	**100.0**

4.1.2 Age of the respondents

The age distribution of the respondent where; 13.3 % were below 18 years, 76.7% were between 18-45 years and 10 % were between 46-60 years as shown in Table 4. This study has found that, at the age of 18-45 years many people have engaged themselves in conducting the socio-economic activities by 76.7% to sustain their life followed by the age of below 18 years and the age above 46-60 years. This can be explain by considering that, at the age of 18-45 years people have more energy to participate in hardship work. Also this implies that, the population of most beneficiaries along the Pangani river basin is between the ages of 18-45 years who are considered as youth. According to UN (2009), youth have high potentials in poverty alleviation and in the labour market. The results are in the line with the research done by Lamsal (2015) who concluded that, age of respondents positively and significantly affected the household wetland income and URT (2009) through the poverty and human development report indicated that, almost all people 15 years and older in Tanzania are working, and the central issue is not unemployment but the reliability, quality and productivity of employment.

Table 4: Age distribution of the respondents

Age category	Frequency	Percentage
< 18 yrs	12	13.3
18-45 yrs	69	76.7
46-60 yrs	9	10.0
Total	**90**	**100.0**

4.1.3 Marital status of the respondents

About 26.7% of the respondents were found to be single while 73.3% were found to be married. From this result, it shows that married respondents are highly beneficiaries of the PRB resources than the single respondents. This can be due to the fact that married people have many family responsibilities which need money than a single person. This is supported by Okayo *et al.* (2015) who commented that, it is inferred that the households that have families have huge responsibilities of taking care of other people, other household members (for example, children), or even property than a single or separated or divorced person.

4.1.4 Household size

The result presented in Table 5 shows the households size distribution in the study area in which the average household size is 4.5. The result is in line with the 2012 population and housing census for United Republic of Tanzania which was reported to be 4.4 at Korogwe town council. This implies that the sample taken from streets under study were good representative in all other streets and wards in general. The findings from Zidana *et al.* (2007) revealed a positive relation between wetland cultivation and household size in which the researcher commented that, it was

possibly caused by lack of access to land leading households with large family sizes to invade wetlands in search of land for cultivation.

Since the population of Korogwe town council is increasing, also there is significant increase of socio-economic activities along the along the Pangani river basin. This rapid population growth and high population density could help generate conflicts over natural resources as scarcity grows (Mbonile, 1999). More over Lamsal (2015), found that, family size positively and significantly affected the income that was earned from the lake resources where one additional family member increased the income from lake resources by NPR 239/yr ($3.4/yr USD). Therefore, need for proper planning in utilising the river basin resources by considering the population that depends on it is very important.

Table 5: Household size of the respondents in the study area

Number of people per household	Frequency	Percentage
1 – 3	48	53.3
4 – 6	42	46.7
Total	**90**	**100**

4.1.5 Education level of the respondents

The education level of the respondent as shown in the Table 6 shows that; 2.2% have not gone to school, 65.6 % have attended primary education, 28.9 % have attended secondary school while only 3.3% have attended college education. This result implies that most the respondents who have only attended primary and secondary

school education have highly engaged in the economic opportunity available along the river basin. This could be due to lack of chance to proceed with further studies and that is why they decided to employ themselves. Kajembe and Luoga (1996) commented that, education tends to increase awareness, positive attitudes, values and motivations where as Okayo *et al.* (2015) pointed that, education is a powerful driver of development and one of the strongest instruments for improving wellbeing. The level of education has a significant influence on improvement of productivity and adaption of new technology as supported by Turuvinga and Mushunje (2010) who argued that, a household head education has a positive impact on influencing households' participation in wetland cultivation hence increasing household income. From this observation, Pangani river basin plays as a source of employment and hence reduces unemployment crisis in urban areas leading to the improved house income.

Table 6: **Education level of the respondents**

Education level	**Frequency**	**Percentage**
Not gone to school	2	2.2
Primary school	59	65.6
Secondary school	26	28.9
College level	3	3.3
Total	**90**	**100**

4.1.6 Residence period of the respondents at Korogwe town council in relation to number of years used in conducting socio-economic activities along PRB

The results indicated that, the majority of the respondents about 46.7% have lived in Korogwe town council for more than 10 years, 37.8% have been living for 6-10 years, 13.3% for 3-5years while 2.2.% for 1-2 years. The result shows that, the residence period has an influence on decision making to engage in economic activities along the Pangani river basin. This may be due to the fact that staying longer in the same areas results into familiar with the economic opportunity available in specific area. Musamba *et al.* (2011) pointed out that, staying longer in the particular area it indicates that the respondents are knowledgeable enough in terms of time and have useful information with regard to the use of wetland resource in study area. These results are in line with Giliba *et al*. (2011) who emphasize that, people who live in a certain area for a longer period of time accumulate experience and knowledge, on various matters with regard to respective area of interest.

Moreover, the results showed that, 10% of the respondents have been conducting their socio-economic activities along the Pangani river basin at Korogwe town council for less than 12 months, 16.7% for 1-2 years, 48.9% for 3-5 years and 24.4% for 6-10 years. This result implies that, the residence period has a direct relationship with the number of years used to conduct socio-economic activities along the Pangani river basin (Fig. 3).

By considering the result of this study, it indicates that, in the recent years (1-5 years back), many people by 75.6% have been involved themselves in different activities along PRB. This may be due to the increase of employment opportunities in township areas thus people facing unemployment crisis in rural areas tend to migrates to urban areas seeking for jobs and they find PRB as among of their solution for employment opportunity. This finding is supported by a Pull and Push factor of migration as explained by Maruti, (2016) who pointed out that, under the capitalistic model of development, there is a tendency for large proportion of investments to concentrate in the urban centers which encourage people to move to urban areas in the expectation of higher paid jobs.

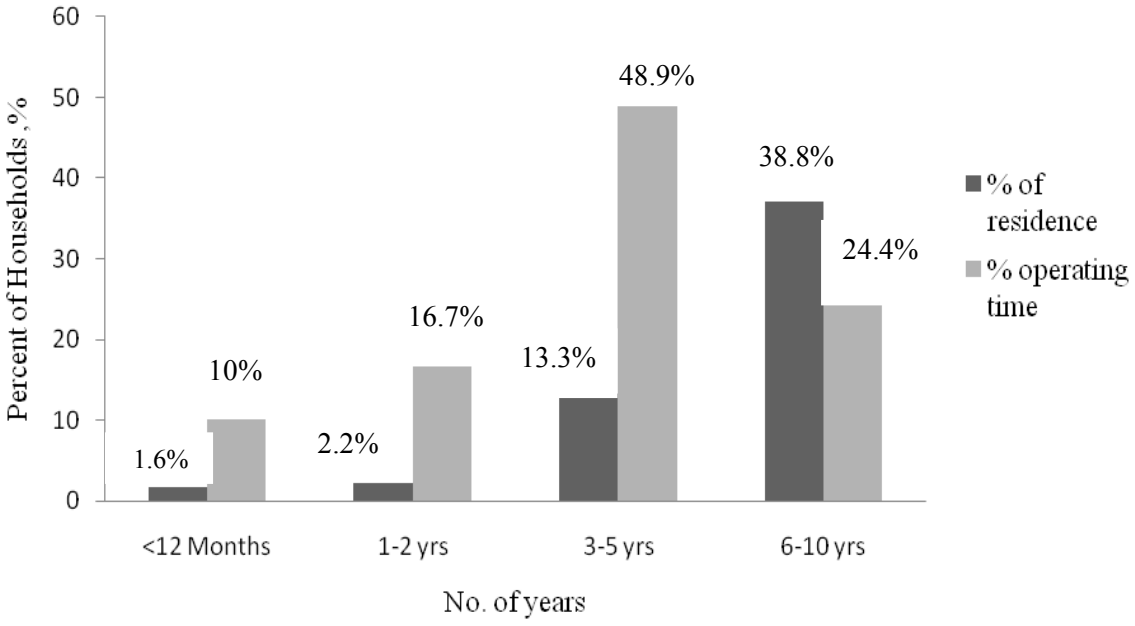

Figure 4: Residence period of the respondents at Korogwe town council and Number of years used to conducting socio-economic activities along PRB.

4.1.7 Distance of the site of operation to Pangani river bank

The result showed that 55.6% of the respondents are conducting their various socio-economic activities along the PRB within a distance of 60m, 37.7% between 61-120m and 6.7% between 121-200m. This implies that, the majority are conducting their socio-economic activities close to the river bank contrary to the environmental management Act No.20 of 2004 section 57, which stipulate that within the distance of 60m there should be no any human activities from the river bank for the purpose of conservation and management of rivers, river banks, lakes or lake shore and shore-lines. In addition, it has been recognised that there is low implementation of this law at Korogwe township area due to inefficient supervision and monitoring of all activities along the river basin with regards to river resources conservation.

4.1.8 Involvement of urban community in conserving the Pangani river basin

This study has revealed that, only 13.3% of the respondents have been involved in various conservation activities along the Pangani river basin, and a large percentage of 86.7% of the respondent have never been involved in any of the conservation activities despite of their readiness to participate. The result has shown a low level of participation by local communities in the conservation and awareness program along the Pangani river basin at Korogwe urban. During the focus group discussion and key informant interview, it was noted that Korogwe town council and Pangani river basin, have been involving the urban community occasionally in tree planting and proper practice of conservation agriculture along the river basin.

Due to low participation of community in conserving the river basin, there is a high chance of law violation and hence unsustainable utilization of river resources which may lead to environmental degradation. The positive attitudes and perceptions are a good indicator that if some conservation initiative is taken, for example, a community-based conservation approach, there is a greater possibility of increased participation of local people in the conservation activities (Lamsal, 2015). Also several previous studies such as Munishi *et al*. (2011), Mehta and Heinen (2001), Andrianandrasana *et al.* (2005), Bajracharya *et al*. (2006) have proposed a community-based conservation approach for better wetland resource use and conservation.

4.1.9 Migration status of the respondents

In trying to find the immigration status along the river basin, whether the respondent conducted his/her activities in other areas before migrating to Pangani river basin at Korogwe urban area, the study found that, 42.2% of the respondents have been conducting their similar activities in other areas while 57.8% of the respondents have not been conducting their activities in other areas because some are typical residence at the study area. From this finding, it indicates that there is significant immigration of the people along the river basin finding the economic opportunity particularly at Korogwe town area. This concur with the research done by Mbonille (2012) who commented that; new developments within the basin such as the lower Moshi irrigation scheme, new towns, and tanzanite mines have attracted migrants from more distant regions. Moreover, Maruti (2016) pointed out that, the non-availability of alternative sources of income (non-agricultural activities) in rural areas is also important factor for migration.

4.1.10 Average farm size of the household

The distribution of farm size of the respondents in the study area (Fig.4) indicates that, 33.3.% were found to have a farm size of 0.26-0.5 acre, followed by 27.8% having 0.6-1 acre and 26.7% having less than 0.25 acre where above 1.1 acre are 12.2%. This result is in line with the findings obtained by Mwamfupe (2001) cited by Turpie *et al.* (2005) who found that, along the Pangani river basin, small-scale farmers have plot sizes of between 0.1 and 0.2 ha (equivalent to 0.25- 0.5 acre). The land availability per household, however, has declined by almost half from 0.7 ha per person in the 1990s to 0.4 ha per person in the 2000s in the region (FAO, 2008).

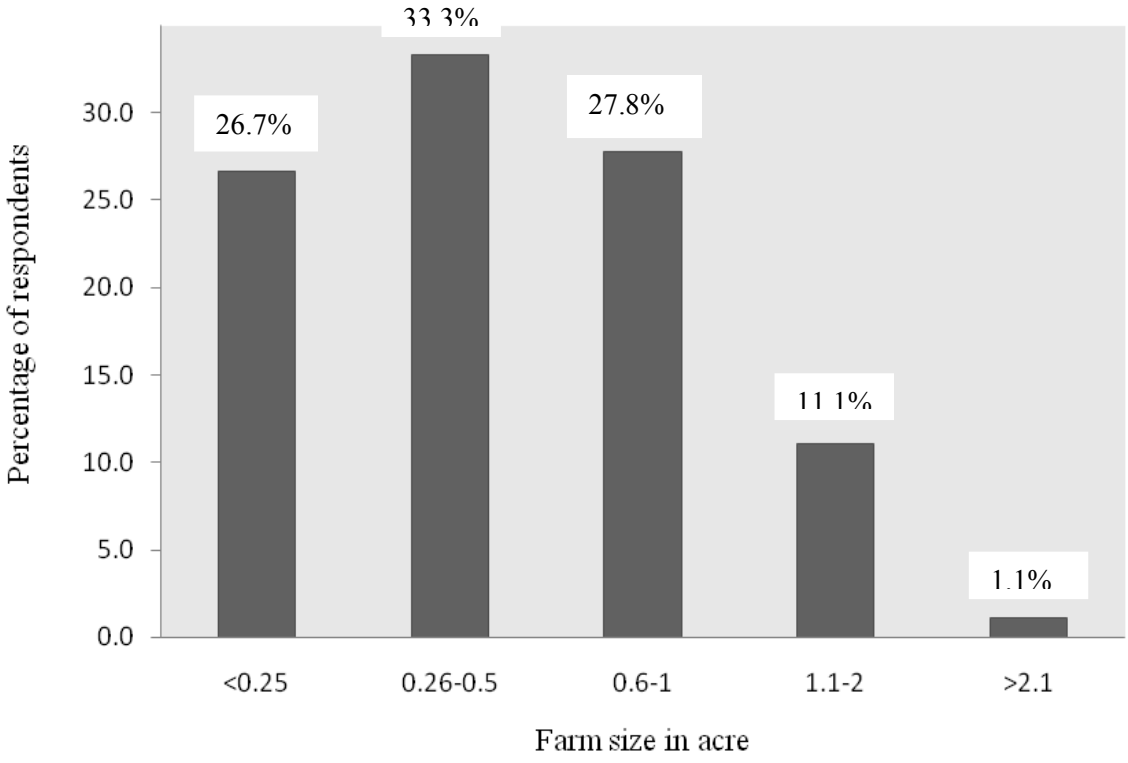

Figure 5: Farm size of the respondents in the study area

The farm size has an effect on household income generated from river basin. This finding concur with the results obtained by Fadipe (2014) and Safa (2005) who did the research on determinant of household income and they came to conclude that, farm size has positive significant related to farmers' income. Among other factor, the larger the farm size, the higher the harvest and vice versa. Since the majorities have farm size ranging from 0-1 acre, this implies that their harvests are at moderate level resulting to medium household income, this is why the majority (62.2%) have confirmed that their livelihoods have moderately improved due to the income obtained along the Pangani river basin at Korogwe town area.

Plate 3: Garden activity along Pangani river basin at Korogwe town council

Photo; Emmanuel Komba Date taken: 16 February, 2016

4.1.11 Livelihoods improvement due to utilisation of PRB resources

The finding from this study shows that, 27.8% of the respondent have ranked their livelihoods to be highly improved due to the presence of Pangani river basin at Korogwe urban, 62.2% of the respondents have medium livelihoods improvement while 10.0 % have low livelihoods improvement. The majority of the respondents (about 62.2%) have responded to be medium livelihoods improved and not high livelihoods improved; this could be due to the fact, the majority of respondents have small farm size (less than 1 acre) which results to low harvest. By considering these percentages on how the river basin contributes to livelihoods improvement, with regardless of farm size, it is generally clear that the contribution of Pangani river basin to livelihoods improvement is significant. It has been argued that wetlands make appreciable contribution to rural livelihoods in terms of direct cash income and contribution to food security (Mkavidanda and Kaswamila, 2001; Munishi and Halima 2004; Munishi *et al.,*2011), and many households that live close to wetland ecosystems in Tanzania and elsewhere utilise wetlands in coping strategies during times of drought and food scarcity.

4.2 Identified socio-economic activities along the PRB

Various socio-economic activities have been identified to be conducted along the PRB at Korogwe town council (Table 7). The results indicates that, 33.3% of the respondents are conducting gardening activities along the PRB, 26.7% of the respondents are conducting crop cultivation eg. maize, 26.7% brick making, 8.9% sand mining and 4.4% deals with car wash activity. The result has shown that in township areas, there is a high diverse utilisation of Pangani river basin than in rural

areas where the dominant activity is agriculture. Turpie *et al.* (2007) have concluded that, rural households in the Pangani river basin are highly dependent on agriculture. Also Munishi *et al.* (2011) found that, wetland based socio-economic activities included agricultural production (farming) practiced by over 98% of the population in Great Ruaha river basin followed by livestock grazing and fishing. All these activities contribute to livelihoods improvement.

Table 7: **Identified Socio-economic activities along the PRB**

S/No	Name of Street	Socio-economic activities along Pangani RB					Total
		Crop cultivation	Sand mining	Brick making	Car wash	Gardening	
1	Kwanduli	10	4	12	2	10	38
2	Majengo	5	0	3	2	4	14
3	Mgombezi	9	4	9	0	16	38
	Total	**24**	**8**	**24**	**4**	**30**	**90**
	%	**26.7**	**8.9**	**26.7**	**4.4**	**33.3**	**100.0**

4.3 Gross profit obtained from socio-economic activities conducted along PRB

The research has revealed that, people have engaged to various socio-economic activities along the Pangani river basin due to the economic benefits they obtain from various activities. The calculated gross profit from each identified socio-economic activities has shown that, Pangani river basin plays an economic role as a source of household income. The results shows that; Gardening has an average gross profit of TZS 14 108 340.00 per year, brick making TZS 4 665 000.00 per year, crop cultivation TZS 1 581 340.00 per year, sand mining TZS 1 404 000.00 per year and car wash TZS 4 560 000.00 per year as shown in Table 8. The overall average gross

profit per household/year is TZS 5 263 736.00 which is higher than that recorded in previous research conducted in rural areas. The previous records of income along river basin is by Turpie *et al.* (2007) who observed that income from dryland farming along the Pangani river basin in rural areas was about TZS 200 000.00 to 300 000.00 per household apart from the northern highlands, where an average of over TZS 600 000.00 was recorded. Also Munishi *et al*. (2011) observed that, wetland based socio-economic activities carried out in valley bottoms commonly known by local people as *vinyungu* contribute about 15% of household food and 55 - 95% of household income annually, equivalent to TZS 3 234 721.00

These results have revealed that, it is more profitable to engage in various socio-economic activities along the Pangani river basin in township areas than in rural areas which have been contributed by the easy access to District markets, availability of means of transport and adaptation of new agriculture technology eg. use of green house, improved seed and use of herbicides and pesticides.

Table 8: Gross profit obtained from each identified socio-economic activities

S/No.	Activity	Total revenue, TR	Total variable cost, TVC	Gross profit, TZS/year
1	Crop cultivation	1 790 660.00	209 320.00	1 581 340.00
2	Gardening	14 365 780.00	257 440.00	14 108 340.00
3	Brick making	4 960 000.00	295 000.00	4 665 000.00
4	Sand mining	1 404 000.00	0	1 404 000.00
5	Car wash	6 120 000.00	1 560 000.00	4 560 000.00

Gardening activity has been identified as a leading activity of getting high gross profit followed by brick making and car wash (Fig. 5). This is due to the fact that, in urban areas the population is high and this leads to high consumption of gardening products eg.Green vegetables, tomatoes, water melon, sweet pepper and okra. Also construction of new houses and high vehicle ownership status have caused more income to be obtained from brick making and car wash activity respectively at Korogwe town council along the Pangani river basin when compared to rural areas. In addition, it has been observed that, sand mining has no variable cost due to the fact that working gears such as spade and hoes are purchased once and therefore have been treated as fixed cost.

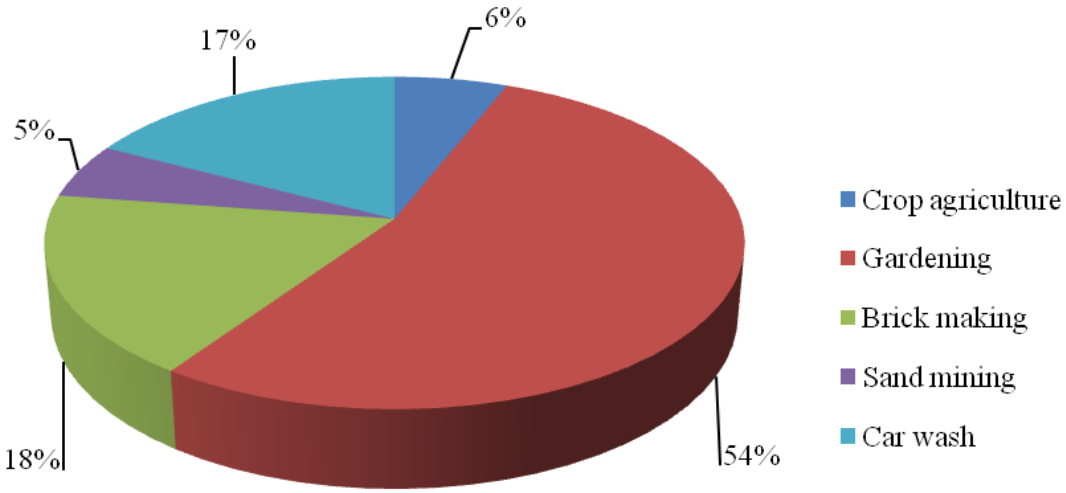

Figure 6: Gross profit from each identified socio-economic activity

4.4 Factors influencing urban community`s dependency on Pangani river basin

The factors influencing dependency of urban community to PRB were examined using multiple regression model. The results are as shown in Table 9.

Table 9: Factors influencing dependency of urban community to PRB

Factors	β	t-value	p-value
Constant	2.83	3.959	0.05
Soil fertility	0.28	2.956	0.004**
Water potential	0.26	-3.022	0.003**
Land availability	0.19	2.21	0.03*
Access to Market	0.09	1.077	0.01*
Access to means of Transport	0.02	0.228	0.82
Conducive climatic condition	-0.264	-3.011	0.003**
Vicinity to new construction area	-0.204	-2.054	0.043*

Key; Number of cases, n = 90

β = regression coefficients

Figure with * and ** are statistically significant at 5% and 1% probability levels respectively.

In general, six explanatory (independent variables) factors; Soil fertility, water availability, land availability, access to market, conducive climatic condition and vicinity to new construction area were found to be significant variables influencing community dependence on Pangani river basin whereas access to means of transport has been observed as insignificant variables at 5% level of probability.

4.4.1 Soil fertility

The result shows that, soil fertility is strongly positive significant influencing the urban community at 5% level of probability ($p < 0.05$) to depend on river basin as a result the majority of the respondent are dependant on farming related activities (crop cultivation 26.7 %, and gardening 33.3%). The finding concurs with the result obtained by Yomana *et al.* (2009) who conducted the research on associations of soil fertility and market access with household income and they found that, soil fertility is positively associated with crop income. Moreover, Ochilo *et al.* (2013) found that, improved soil fertility influences crop yield even for legumes such as beans. Therefore, soil fertility has a positive association with the livelihood improvement due to high farm yields.

4.4.2 Water availability

From the finding it has observed that, water availability throughout the year at Pangani river basin is positive significant influencing the urban community at 5% probability level ($p < 0.05$) to depend on the river resources. The URT (2002), have come to realise that, water is one of the most important agents to enable Tanzania achieve its development vision objectives (both social and economic), such as eradicating poverty, attaining water and food security, sustaining biodiversity and sensitive ecosystems. The availability of sufficient water throughout the year makes Pangani river basin to be a reliable source of various water based socio-economic activities.

4.4.3 Land availability

The result from this study has indicated a significant positive relationship between land availability and dependence of urban community along the Pangani river basin at 5% probability level ($p < 0.05$). This may be due to the fact that many activities observed during the field study depends direct to land for cultivation and brick making. According to Safa (2005), adequate land available is significantly related to farmers' income. Also Yomana *et al.* (2009), found that by holding the soil fertility constant, the land size is positively correlated with the crop income whereas land size is increased by one hectare, the crop income is 7.7% higher, which is about USD 29 because the average crop income is about USD 382.

4.4.4 Vicinity to District market

The finding from this study indicates that, vicinity to market has a positive significance influence on the dependence of urban community to Pangani river basin at 5% probability level ($p < 0.05$). Access to market enables the farm related products and other products along the river basin to be sold easily to customer. At Korogwe town council, the District market is close to the river basin, this causes easy access to the District market and to other markets found in Tanga city, Dar es Salaam, Kilimanjaro and Arusha Regions at a low transportation cost. Poor market access, for instance, increases input costs and reduces the selling prices of farm products and, hence, discourages farmers from participating in markets (de Jan-vry *et al.,* 1991).

4.4.5 Availability of transport

Availability of transport at Korogwe town along the Pangani river basin has been found to be insignificant influencing the urban community to depend on Pangani river basin at 5% probability level. This could be due to the fact that the transportation cost to the Korogwe market center and other areas within the council where they used to sell their product, is very low when compared with the remote area. Therefore, the respondents are not feeling any influence from availability of transport as their factor for dependency. This finding corresponds to the Yomana *et al.* (2009), where they came also to find that crop income is lower in remote areas, especially when the road quality is poor, than in areas close to urban centers.

4.4.6 Conducive climatic condition

The dependence of urban community to Pangani river basin has been found to be strong positive significant influenced by the conducive climatic condition at 5% probability level ($p < 0.05$). Favorable amount of rainfall and temperature have attracted people to engage in farm related socio-economic activities along the Pangani river basin. The result obtained by Molua *et al.* (2010) indicates that, there is a non-linear relationship between temperature and crop revenue on the one hand and between precipitation and crop revenue on the other and they hence suggested that, climate affects agricultural returns. This means that, under favorable climatic condition there is high yield, hence high household income.

4.4.7 Vicinity to new construction areas

Vicinity to new construction areas has been observed as positive significant factor influencing people to depend on river basin especially in brick making activities at 5% probability level ($p < 0.05$). Construction of new houses and rehabilitation of old buildings has made a demand on bricks. Generally, urbanisation results to more requirement of material required for construction for example water, sand and bricks. PBWO/IUCN (2007) have stated that, among other services provided by the Pangani river basin, it also used as source of building materials like thatch, sand and stones. Moreover, river basins provide river gravel, larger aggregates which are dredged from river bottoms, banks, and flood plains.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Pangani river basin has been found to be a source of various socio-economic activities where the community at Korogwe township council depends on it for income generation hence improving their livelihoods. The findings reveal that, 33.3% of the respondents are conducting gardening activities along the PRB, 26.7% crop cultivation eg. maize, 26.7% brick making, 8.9% sand mining and 4.4% deals with car wash activity. From this result it is evidence that, there is high utilisation of river basin resources in urban by conducting different activities than in rural areas.

The results shows that, gardening has an average gross profit of TZS 14 108 340.00 per year, brick making TZS 4 665 000.00 per year, crop cultivation TZS 1 581 340 per year, sand mining TZS 1 404 000.00 per year and car wash TZS 4 560 000.00 per year. The overall average gross profit per household/year is TZS 5 263 736.00 which is higher than that recorded in previous research conducted in rural areas. This calculated gross profit has revealed that, Pangani river basin plays an economic role in improving the community`s livelihoods where the majority of the respondents (about 62.2%) have replied to have medium livelihoods improvement.

Various factors have been found to be significantly influencing urban community to depend on river basin as their source of income at a 5% probability level, these are;

Soil fertility, water availability, land availability, access to market, conducive climatic condition and vicinity to new construction area.

5.2 Recommendations

From the conclusion of the this study, the following are recommended;

i. In order to maintain the multiplier effect of river basin, more efforts on raising community awareness and participation in conservation and utilisation of the river basin resources sustainably for today and future livelihoods improvement is recommended. Among other areas to deal with includes: Pest and diseases control, fake and expired seeds control, adoption of new technology eg.use of green house and drip irrigation technology.

ii. Based on the findings from this study, a further study is recommended to assess the economic efficiency of socio-economic activities along the river basin in order to find out the efficient allocation of material inputs against output hence resulting to production cost reduction while improving gross profit.

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APPENDICES.

Appendix 1: Sample of Household questionnaire

Tanzania Forest Services (TFS) Agency, Pangani Water Board Office (PWBO) and other stakeholders are putting a lot of efforts in conserving the Catchment forests and water bodies for the purpose of meeting the domestic & industrial water use for the economic growth of the country and livelihood income in general. The purpose of this study is to analyse the socio-economic effects of Pangani river basin to urban community livelihood with a case study of Korogwe town council in Tanga region.
You have been identified as a useful informant to assist us (Sokoine University of Agriculture) to gather relevant information/data. Your participation is voluntary and you are assured that the information you provide will be confidential and used for the sole purpose of research. Kindly respond to the questions below correctly.

Section A: General Information

Questionnaire serial number …… **Name of Enumerator**……

A.1 District ……
A.2 Division……
A.3 Ward ……
A.4 Street name……..
A.5 Date of interview ……

Section B: Household Characteristics

B.1 Gender of the household head; 1=Male, 2=Female [……]
B.2 Age of the respondent 1= < 18 yrs, 2= 18-45 yrs, 3= 46-60 yrs, 4= >60 yrs […….]

B.3 Marital Status; 1=Single, 2=Married, 3=Divorced, 4=Widowed […….]

B.4 How many people are being living and eating together in your household (Household size)?
Men [ ], Women [ ], Children [ ]. Total [……..] *(note: children are age <18 yrs)*

B.5 What is your education level? 1= Not gone to school, 2= primary, 3= secondary, 4= college, 5= university [……..]

B.6 What is your occupation? 1= Civil servant, 2= Farmer, 3=Livestock keeper, 4=Trader (Wholesaler/Retailer), 8= Others (*specify*)……. [……..]

B.7 For how long have you been residing in Korogwe town council? (Months/Years)
1= <12 Months , 2= 1-2 years, 3= 3-5 years, 4= 6-10 years, 5= >10 years [……..]

Section C. Socio-economic activit(ies) along the Pangani river basin

C.1 Which activities are you conducting along Pangani river basin?
(1) Agriculture [….] (2) Livestock keeping [….] (3) Sand Mining [….] (4) Brick making [….]

(5) Car washing [….] (6) Fishing [….] (7) Gardening [….] (8) Others (*specify*) …

C.2 What is the size of area of operation in Acre? (if the activity depends directly on land)
(1) < 0.25 acre (2) 0.26- 0.5 acre (3) 0.6- 1 acre (4) 1.1-2 acre (5) >2.1 acre […….]

C.3 What is the distance of the site of operation to the Pangani river bank in metres?
(1) <60 m (2) 61-120m (3) 121-200m (4) > 200m [……..]

C.4 Do you own the area of operation?

1=owned with title deed, 2=owned without title deed, 3= Rented , 4=owned by parents

5=Communal/ government/ cooperative 6. Other (*specify*) …..… […….]

C.5 If Rented, how much do you pay in TZS per year? ……

C.6 For how long have you been conducting your activit(ies) along PRB? (Months/Years)
1= <12 Months , 2= 1-2 year, 3= 3-5 years, 4= 6-10 years, 5= >10 years
[……..]

C.7 Since you started conducting your activities along the PRB, have you ever been involved in any conservation activities/program organised by Pangani river basin management or other stakeholders? 1=Yes 2 = No [……]

C.8 If the above answer is Yes, mention how did you involved? Eg.Training, Tree planting etc.

i……

ii…….……

iii…….

iv……..

v…….……..

v……

C.9 Do you pay any fee or Tax from your activitiy? 1= Yes, 2= No [……..]

C.10 If Yes, do you pay per month or per year? …….

C.11 How much do you pay in Tshs?.....

C.12 To which authority do you pay?.....

Section D. Gross profit from Socio-economic activities.

D.1 Cost incurred during conducting the activit(ies) (Variable cost only)

S/No.	Activity	Material inputs per season/month/year	Quantity (Kg,No.,Lts,m^3)	Cost per Input (TZS.)	Total (TZS.)
	Total variable cost, TVC				

D.2 Output/harvest/earning/Revenue (interms of quantity and Cash) from Socio-economic activities per **month or year?**

S/No.	Activity	Output per season/ Month/yr	Quantity (Kg,No.,Lts,m^3)	Cost per Output (TZS.)	Total (TZS.)
	Total Revenue,TR				

Gross profit = TR- TVC =…….

D.3 What were your harvest/earning for the last 3 years? (*If not documented, approximate them*)

Cost (TZS.)	**Year 2014**	**Year 2013**	**Year 2012**
Total revenue cost			
Total Variable cost			
Gross profit			

SECTION E. Factors influencing urban community to depend on Pangani river basin for their socio-economic activities.

E.1 Have you ever conducted the socio-economic activities somewhere else before coming to PRB?

1=Yes 2= No [……..]

E.2 Which factors influenced you to conduct activities along the river basin and not somewhere else?

i……..... ii…….....

iii…… iv……....

v……... vi…….....

vii……..... viii……..

ix …… x ……

E.3 To what extend has the PRB contributed to the improvement of your livelihood income? [……]

1= No improvement, 2= Low improvement, 3= Medium improvement, 4= High improvement.

E.4 What are the challenges facing your activities?

i…… ii…….

iii……. iv……

v……. iv……

E.4 What are your general comments to Pangani RB management and other stakeholders in conserving the river basin in order to have sustainable utilization of PRB resources?

i……

ii……

iii……

iv……

v……

Thank you for your participation.

Appendix 2: Sample of Key informants interview checklist

1. The Pangani River Basin (PRB) plays a significant role on the economy growth of the country, which activities are being conducted along Pangani river basin particulary at Korogwe town council?

   i…… ii…….

   iii…… iv……

   v…… vi……

   vii…… viii……..

   ix…… x……

2. Are these activities conducted legally? 1= Yes , 2= No [……..]
3. If No, what is your strategy?.....
4. How do you think on the effect of those activities on Pangani river basin?Are they destructive or Not destructive?

   …….

5. Do you collect any revenue from the activities done along PRB in order to support conservation activities? 1= Yes, 2 = No

   [……..]

6. If No, what is your strategy?.....
7. Is PRB among the factor for high growth of Korogwe township council?

   1= Yes, No= 2, How?

8. Do you involve local community in conserving PRB? 1= Yes, 2=No

   […..], If Yes, how? and if No,

   Why?……

9. Various researches have revealed that, human population is highly increasing in a river basin which in turn causes negative effects to conservation of river basin. In your opinion, what should be done to implement and improve the conservation initiative of Pangani river basin at Korogwe town council?

   ……

Thank you for your cooperation!

Appendix 3: **Sample of Focus group discussion checklist**

1. The Pangani River Basin (PRB) plays a significant role on the economic growth of the country. How does Pangani river basin influences economic growth of Korogwe township council?
2. For your opinion, do you think the utilization of Pangani river basin resources is done sustainably?
3. How does local community being involved in conserving the Pangani river basin?
4. Various researches have revealed that, human population is highly increasing in river basins which in turn causes negative effects to conservation of river basin. In your opinion, what should be done to implement and improve the conservation initiative of Pangani river basin at Korogwe town council?

Thank you for your cooperation!