EFFECT OF MILLENIUM DEVELOPMENT GOALS WATER PROJECTS ON SOCIO-ECONOMIC DEVELOPMENT OF KUDAN LOCAL GOVERNMENT AREA OFKADUNA STATE, NIGERIA

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A THESIS SUBMITTED TO THE SCHOOL OF POST GRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MASTERS DEGREE IN RURAL DEVELOPMENT DEPARTMENT OF GEOGRAPHY, FACULTY OF SCIENCE AHMADU BELLO UNIVERSITY ZARIA, NIGERIA

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Declaration

I hereby declare that the content of this thesis "Effect of millennium development goals water projects on socio-economic development of household in Kudan local government area of Kaduna state Nigeria" was developed by the researcher in the Department of Geography under the supervision of Professor J.A Ariyo and Dr. R.O Yusuf. The literature used has been properly acknowledged. Either part of this work has been presented for another degree or diploma in any institution, nor published as a book or a journal

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Binta Shehu Date

Certification

This thesis titled "Effect of Millennium Development Goals water projects on socio-economic development of household in Kudan Local Government Area of Kaduna state" meets the regulations governing the award of the degree of Masters in Rural Development in the Department of Geography of Ahmadu Bello University Zaria and is approved for its contribution to knowledge and literary use.

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Dedication

This thesis is dedicated to my parents Alhaji Shehu Mahmud and Hajia Huraira Muhammad and my mother-in-law late Hajia Khadijah Umar Sambo.

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All praise is Allah for giving me the ability, strength, health and wisdom to undertake this project work. I would like to offer my deep appreciation to my main supervisor Professor J.A Ariyo for his exemplary guidance, encouragement, patience and fatherly advice throughout the course of this thesis.

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LIST OF ACRONYMS

ADB	African Development Bank
ADPs	Agricultural Development Projects
AIDS	Acquire Immune Diseases
CBOs	Community Base Organization
CGS	Conditional Grants Scheme
DEFRA	Department of Environment, Food and Rural Affairs
DFRRI	Directorate of Food, Roads and Rural Infrastructures
EU	European Union
FAO	Food and Agricultural Organization
FMWR	Federal Ministry of Water Resources
GDP	Gross Domestic Product
HIV	Human Immune Deficiency
IDWSSD	International Drinking Water Supply and Sanitation Decade
JICA	Japan International Cooperation Agency
KADSEED	Kaduna State Economic and Empowerment Development
MDGs	Millennium Development Goals
NEC	National Economic Council
NEEDs	National Economic and Empowerment Development
NGOs	Non- Governmental Organization
NPA	National Programme Action
NWRI	National Water Resources Institute
PTF	Petroleum Trust Fund
RBDAs	River Basin and Rural Development Authorities
SEED	State Economic and Empowerment Development

SPSS Statistical Package for the Social Sciences

SWA State Water Agencies

UNDP United Nation Development Programme

UNICEF United Nation Children Education Fund

USAID United State Agency for International Development

VPF Virtual Poverty Fund

WHO World Health Organization

Abstracts

This research was carried to assess the effect of the Millennium Development Goals water projects on socio-economic development of household in Kudan Local Government Area of Kaduna State, Nigeria. The aim of this study was to examine the effect of MDGs rural water supply programme on the people in the study area. The objectives of the study are to: Characterized the sources of domestic water supply before and after the MDG projects, examined the level of accessibility to potable water in the study area before and after the execution of MDGs water projects, examine the socio-economic effect of MDGs rural water supply. The study made use of primary data collected from field observation, using in-depth interview with key officials and administration of structured questionnaire. Seven rural communities were selected based on the availability of MDG water project for this study and 375 respondents were sampled. The descriptive statistical techniques involving calculations of frequency, percentage and tables were used to summarize the data collected. In addition Chi-square test was employed to test the hypotheses for differences on access to potable water by household, major sources of water, distance to source of water, travel time, amount spent, and prevalence of water related diseases before and after MDGs intervention. The findings revealed about (55.3%) of respondents reported that they covered the distance of <200 meters before MDGs water projects while(49.8%) covered the same distance after MDGs intervention. Also (46.5%) and (44.1%) of respondents reported that the cost of water before and after MDG water project is less than ₦100. The result shows that no increase water sources, no reduction of distance travelled or travel time to water sources after MDGs project this is due to the fact that MDGs water sources were not enough, and spatially distributed rather were constructed to satisfy the political interest of the privileged few of the locality. However, there was noticeable reduction (93%) in prevalence of water related diseases after the project. The study therefore, recommends proper need assessment on number of water source require as well as proper siting of the projects where they will be more effective and beneficial to the larger community than siting them around vested interests of local opinion leaders, rulers and politicians.

CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Water is a basic and essential human need. It is required by human, animals and plants for survival. Water is also required for socio-economic development of all human beings irrespective of where they live. Apart from personal consumption and domestic use, water is necessary for economic activities such as irrigation, agriculture, generation of electricity, industrial as well as transportation processes. Communities and individuals can exist without many things if they have to; they can be deprived of comfort, of shelter, even food for a period of time, but they cannot be deprived of water and survive for more than a few days because of the intimate relationship between water and life (Gleick, 1999). Many of the ill-health which affects humanity especially in developing countries can be traced to lack of safe and wholesome water supply (Lucas and Gilles, 2003)

Although there are three major sources of water, namely, surface water, ground water and rain water, the availability of water may vary a lot over the year, or even between one year and another. Over the years supply of wholesome water has been a very serious challenge, not only in developing nations, but also in developed countries. The challenge also affects both rural and urban settlements with more severe consequences in rural communities. It has been estimated that in the late 1990s over 1.1 billion people world-wide-lack access to adequate supply of clean water, with the problem being more grievous in sub-Saharan Africa including Nigeria (Park, 2003).

The effect of inadequate water supply is pervasive and can have far reaching consequences on household, health, agricultural, educational, transportation and other sectors. It can undermine household food security; reduce per capita income, which in turn exacerbates poverty level (Graz, 1998).

Inadequate water supply, whether as a result of poor access or quality, low reliability, high cost or difficulty of management, is associated with significant health risks. These health risks are experienced most strongly by the poorest nations, and the poorest households within these nations. There is a major link between poor water supply and diseases. Inadequate water supply results in so many diseases like water borne and water washed diseases such as diarrhea, cholera and other diseases which result in high infant and childhood mortality and morbidity (FAO, 2000).

As regards water supply in Nigeria, it has been established that prior to 1960, large scale water resources development was for urban supply and the exclusive preserve of the government. However, the government major intervention came during the first National Development Plan period (1962-1968) through the establishment of the River Niger and Lake Chad Basin Commissions. The commission was then mandated to produce hydrological maps of the country's water resources, use the map to fashion out a comprehensive development of agriculture and navigation (particularly River Niger). This was followed in 1973 and 1974 with the establishment of Sokoto-Rima and Chad Basin Authorities and subsequent increase of the number to eleven River Basin Development Authorities (RBDAs) in 1976 to cover the whole country. RBDAs were charged with the responsibility of a comprehensive water resources development of Nigeria for multipurpose uses. In 1984, the RBDAs, were increased to eighteen (18) and redesigned River Basin and Rural Development Authorities (RBRDAs) with functions similar to those of RBDAs. With the change to Military Administration in 1985, the 18 were scaled down to 11, retained the name RBDA and their functions limited solely to water resources development (Olawepo, 1999).

Other agencies were also created both at the federal and state levels to take charge of specific water resources activities. The Nigerian Dam Authority was created for hydro-electric power generation, the water boards corporations utilities were established at regional and later state level to take care of

water supply to the people. Other agencies have been established to support existing ones so as to increase water resources development, particularly in the rural areas. The agencies include the defunct Directorate of Food, Roads, and Rural Infrastructure (DFRRI), Agricultural Development Projects (ADPs) which have water supply components in their functions and development agencies of the United Nation Organization (UNO) such as Food and Agricultural Organization (FAO), United Nation Children Fund (UNICEF), United Nation Development Programme (UNDP) among others (David, 2000).

The three levels of government in Nigeria share responsibility for the delivery of water supply. The Federal ministry of water resources (FMWR), initially created in 1976, is responsible for formulating and coordinating national water policies, management of water resources including allocation amongst states and approving development projects. The RBDA were created in 1976 for planning and developing water resources, irrigation work among other things. Their main involvement in potable water supply has been the provision of multi-purpose dams and the supply of water in bulk, the National Water Resources Institute (NWRI) established in 1985, was responsible to the FMWR for engineering and research function. A Utilities Charges Commission was established in 1992 to monitor and regulate tariffs, including those of state water agencies (David, 2000).

As the importance of drinking water supply grew during the 1970s, most water departments were gradually transformed into State Water Agencies (SWA) to provide urban, semi-urban and in some cases, rural water supply (David, 2000). Each SWA has in general been established under an edict to develop and manage water supply facilities within its respective state and to meet sound financial objectives. The 774 local government authorities are supposed to be responsible for the provision of rural water supplies in their areas. Only a few LGAs have rural water supply divisions and are able to

construct small water system such as open wells and small impoundment of surface water (David, 2000)

At the national level and as part of the effort by the federal government to provide adequate water a national water supply policy was adopted in January 2000.This policy makes the supply of adequate water a right to all Nigerians and gives responsibility to the three tiers of government, the private sector and beneficiary. Furthermore, the effort in making water available has not just been a local or national issue, rather it is an international concern. One of the international organizations working to improve the availability of safe drinking water in some world poorest countries is Water Aid International. This organization operates in 26 countries including Nigeria where it is working to ensure improvement in people's quality of life by providing long-term sustainable access to clean water.

More recently, the quest to improve sustainable water supply has received a boosts through the Millennium Declaration. In the year 2000 Nigeria, joined 189 countries worldwide to endorse the United Nations Millennium Declaration. The eight inter-related and time-bound Millennium Development Goals (MDGs) that were formally adopted in 2001 and which are to be achieved by 2015 seek to address issues of poverty, hunger, education, gender equality, reduction in child mortality, improved maternal health, ensure environmental sustainability and global partnership for development in areas termed as less develop or developing.

A key target of Millennium Development Goals 7, which aims to ensure environmental sustainability, is to reduce by half the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015 (MDGs, 2008) This water supply target underpins several other MDGs, including those relating to poverty (MDG1), education (MDG2), and gender equality (MDG3). In

particular, it underpins MDG4, the reduction of child mortality, because many deaths in young children in developing countries are due to diarrhea and unsafe water. At a meeting of the National Economic Council (NEC) in August 2003, all state governors in Nigeria agreed to adopt an economic reform agenda that is similar to National Economic and Development Strategy (NEEDS). The Kaduna State version of SEED is called KADSEED, like NEEDS, KADSEED is intended to pull together all the available resources in the state, private sector, NGO'S, CBOs and the larger society, towards the achievement of the primary objectives of the Millennium Development Goals (KADSEEDS, 2004)

In its pursuit of the MDGs, Nigeria has taken remarkable steps in mobilizing funds to implement pro-poor programmes and improving the management and accountability of its investments. The Conditional Grants Scheme (CGS) is an innovative mechanism introduced by the Federal Government to ensure the active participation of the state and local governments in the effort to achieve the MDGs. Under CGS states are expected to design their own interventions in a way that would most effectively have a better impact on the MDGs in their domains. By 2009 all states of the federation had benefited from CGS and a total of 120 billion naira was invested (MDGs conditional Grants Scheme, 2010). About 45% of the stated amount was invested in water and sanitation, which provided 3,524 solar-powered boreholes and 6,031 hand pump boreholes and 393 small town water supply scheme (CGS, 2010) In an effort to reduce the problem of rural water supply in Kaduna State, MDGs office under the Conditional Grants Scheme executed 546 new hand pump boreholes and rehabilitated 469 broken down boreholes in various locations. As a result every local government area in Kaduna state has between 40 and 50 hand pump boreholes (CGS, 2010).

1.2 STATEMENT OF THE RESEARCH PROBLEM

Much of the ill-health which affects humanity, especially in developing countries, can be traced to lack of access to safe and adequate wholesome water throughout the year. There can be no state of good health and well-being without safe water (Park, 2003). Water is not only a vital environmental factor to all forms of life; it has also a great role to play in socio-economic development of the human population. Water supply has a profound impact on quality of life indicators and is a major determinant of productivity and poverty level. Lack of access to potable water has resulted in increasing morbidity and mortality especially among children under five (157 per 1000 birth in 2008) (MDGs report, 2001).

Rural dwellers in Nigeria have been variously referred to as the "neglected majority" (Harande, 2009), "the stagnant sector" and the "victims of collected collective under development" (Niyi, 2005). This is because the rural population collectively lacks the purchasing power to enable them acquire the basic necessities of life. In developed countries potable water supplies are considered as essential commodity and are relatively inexpensive. Babalola (1990) posited that the average residential daily water supply demand is 380 litres per person, although it can go as high as 1900 litres per person. The more usual requirement however, are that water be free enough of harmful bacteria, chemical and other contamination to be drinkable; free of substances that make its taste or appearance unpleasant and if the water is to be used for washing, should be free of salt or calcium and magnesium that will interfere with the action of soap. On the other hand it has been estimated that almost 1.4 billon (80%) of the people in the developing country live in the rural areas where at present there seems to be great inbalance in water supply schemes between rural and urban areas with the rural dwellers, especially women and children, usually walking several kilometers daily in search of water and in most cases of questionable quality and quantity (WHO/UNICEF, 2010).

Nigeria has been an independent nation for the past 53 years with policies on potable water development but rural areas are still suffering from water scarcity and as a result the quality of peoples' life continues to deteriorate due to the long neglect by all tiers of governments during both politicians and military regimes (Babalola, 1997). In recent years at the global scene, various organizations such as African Development Bank (ADB), World Bank, World Health Organization (WHO), United Nation International Children Emergency Fund (UNICEF), European Union (EU), Japan International Cooperation Agency (JICA), United State Agency for International Development (USAID), Water Aid as well as other water related agencies have been at the forefront in the provision of safe drinking water in rural areas in Nigeria. In 2005 for instance, China signed a grant agreement with Nigeria to drill 598 boreholes in rural areas in 18 states and Abuja (Abubakar, 2009). Similarly EU supported water supply project in six states in Nigeria, including Kaduna State with 87million Euros grant funding (Gandy, 2006). UNICEF has supported rural water supply in communities and schools across the country since 2002, with a total of 6,960 new safe water sources- drilled boreholes, dug wells and protected spring (WHO/UNICEF, 2O1O).

The Millennium Development Goals (MDGs) were arrived at (which also included the issue of water resource management) at the Millennium Summit in 2000. Millennium Development Goals (MDGs) has eight goals, 18 targets and 48 indicators. The seventh goal is to ensure environmental sustainability while the target is to reduce by half the proportion of people without access to clean drinking water and basic sanitation. In Nigeria huge investment in improving rural water supply has been made under MDGs, both at federal, state and local government levels. President Good luck Jonathan, speaking at the Presidential Summit on water at the State House with the theme: "Innovation funding of water sector in Nigeria", said that Nigeria required about 350 billion naira annually to meet water and sanitation targets of its growing population (National News, 2013).

Globally, various studies have been carried out on different aspect of rural water supply. For example MacDonald (2005) looked at the ground water and rural water supply in 10 African countries including Nigeria and noted that areas where suitable groundwater sources are hard to find often have the greatest problems with health and poverty with the implication that helping to solve water problems in these rural areas may have greater impact on reducing poverty in sub-Saharan Africa than drilling many more boreholes in areas where it is relatively easy to find water. The findings also revealed that rural water supply in Africa is fundamental to achieving many of the internationally agreed Millennium Development Goals because without safe water close to dwellings, the health and the livelihood of families can be severely affected. Children's education suffers as the daily tasks of survival take precedence over all other concern.

Similarly, Nwankwoala (2011) studied the strategy for achieving rural water supply and sanitation in Nigeria and the extent to which different but interrelated mechanisms have been employed by government to deal with water stress in rural areas of Nigeria. The study also examined the sustainability of the approaches being used to provide rural water supply toward achieving the Millennium Development Goals.

Eze (2012) assessed the impact of rural water supply in Ebonyi State Nigeria and found that provision of rural water supply impacted on the farmer's good health, because they had access to good drinking water all year round which had reduced diseases infection among farmers. Eze's study (2012) also focused on the prevalence of water borne diseases, especially among children, found that rural areas with adequate water supply had a lower level of prevalence of water borne diseases than the areas without.

Adeoye, *et al* (2013) carried out an appraisal of rural water supply in Kwara State and found that most rural dwellers in the state are still not benefiting from rural water scheme whether from governmental or non-governmental organizations. The study also discovered that majority of the people surveyed were drinking water with physico-chemical and bacteriological parameter values higher than WHO and Nigerian standards for drinking water. Based on the information obtained from the ministry of water resources, MDGs executed a lot of water projects in all the 23 LGAs in Kaduna State. To the best of this researcher's knowledge, no study has attempted to assess socio-economic impact of MDGs on rural water supply in beneficiary communities of Kaduna State. Kudan LGA is faced with a lot of water related problems and since the rural communities benefited from the MDGs' water project, it would seem appropriate at this juncture in the life of the MDGs to assess the impact of its water projects on the life of the people. The problem focus of this study therefore is to examine how the water projects executed by MDGs have impacted on selected aspects of the life of the people in a beneficiary communities using Kudan LGA as a case study.

1.3 THE RESEARCH QUESTION

Answers to the questions were explored below in order to make the study more sharply focused

i. What are the sources of water supply before and after the MDGs project in the study area?
ii. What are the characteristic of water supply before the MDG intervention?
iii. What is the effect of MDGs in accessibility of water by communities in the study area?
iv. To what extent has the accessibility of water impacted on socio-economic activities of communities in the study area?

1.4 AIM AND OBJECTIVES OF THE STUDY

The aim of this study is to examine the impact of MDGs rural water supply programme on the people in the Kudan Local Government Area of Kaduna State.

The specific objectives are to

i. Identify the sources of water supply in the study area

ii. characterize the sources of domestic water supply before and after the MDG projects in the study area.

iii. examine the level of access to potable water in the study area before and after the execution of MDGs water projects in the study area.

iv. examine the socio-economic effect of MDGs rural water supply project on the beneficiaries in the study area.

1.5 HYPOTHESIS

Ho: There is no significant difference in access to potable water before and after the MDGs water project.

1.6 JUSTIFICATION OF THE STUDY

The Millennium Development Goals (MDGs) are international declarations which have been fully accepted in many developing countries including Nigeria. In Nigeria, the proceeds of debt relief gain have been channeled to finance MDGs activities which include supply of potable water. Activities of MDGs is being implemented at all levels of government viz; Federal, state and Local governments. In

view of the enormous fund so far invested in the area of water supply, it is pertinent to evaluate the impact of these activities especially on the rural dwellers that the debt relief was meant to be targeted. MDGs project particularly on rural water supply has not been properly documented. Currently there is very little literature on this aspect. Therefore this study is intended to bring to the fore valid and reliable information on the contribution of MDGs rural water supply project in Kudan local government area in Kaduna state. The study would attempt to document the activities of the MDGs in providing rural water supply, the mechanism through which these activities/interventions were conducted and the impact of water projects on the rural communities. Information from this study would be invaluable in influencing decision making on MDGs rural water supply projects.

In Kudan LGA prior to the MDG project, water supply were mainly from the household efforts and the LG council, State government and Constituency projects by the legislators representing the area at the National Assembly. Even, in all these projects the impact on the socio-economic lives of the people have not been assessed and documented. This study is therefore aimed at filling this missing gap which would be of help in subsequent implementation of water projects in the area.

1.7 SCOPE OF THE STUDY

This research examines the socio-economic impact of the rural water supply under the MDG project in Kudan LGA of Kaduna State. The study covers a sample of seven rural communities in seven out of the eight wards where the water projects were executed. The study however excludes communities where the water projects were either uncompleted or non-functional. Similarly the remaining two wards where no MDG water projects were provided were excluded. The content of the study focuses on the geographical access to water by considering\ the distance and travel time to obtain water as well as household expenditure on water. Also examined is the educational impact of the water projects such

as school absenteeism by the pupil due to the search for water as well as health impact (morbidity) due to water-related diseases. The temporal scope of the study covers the period when the MDGs water project started until the period of field work and data collection, that is, 2000-2013.

1.8 ORGANISATION OF THE THESIS

This thesis is organized into Five Chapters. Following this introductory chapter is chapter two in which we examined some conceptual issues related to rural water supply and the situation of rural water supply in Nigeria. The Third Chapter gives an overview of the study area and the methodology employed in the study. In chapter four summaries of data collected under each of the study objectives are presented and discussed. A summary of the major findings of the study, their policy implications, conclusions of the study and recommendations based on the findings of the study constitute the content of chapter five.

CHAPTER TWO: LITERATURE REVIEW

2.1 CONCEPTUAL ISSUES

2.1.1 The Concept of Water and Water Supply

Water is defined as a colorless, odorless, tasteless liquid compound of hydrogen and oxygen (H_2O) that is required by all life forms on earth (Goni, 2006; Eze. 2012) the significance of water can be seen in the case of early settlers who in most cases settled along the banks of rivers and streams (MacDonald, 2005).

Water is the most abundant compound on the earth's surface, covering about 70% of the planet (Goni, 2005). It is also the only substance found naturally in all the three common states, that is, in solid, liquid and gaseous states. Water is a renewable resource, but that does not mean it is inexhaustible. Although the total quantum of water available on the average may be enough to meet all our demands put together, its availability is highly irregular, being unavailable in places where needed, at times when required, and in the quantities in which it is needed.

Water is an indispensable natural resource for the survival and well-being of human kind as it is essential for production of food, raw materials and energy that contribute to the economic development of the society. Safe and reliable supply of water is therefore essential for the welfare of individuals and the community. The United Nations (2003) define water supply quantitatively as the delivery of 30litres per capita per day of safe water within 250metres of the community and serving about 250-500 persons per water point. Safe water means water that meets both international and or national quality standard for drinking (Jafaru, 2005).

Water supply in rural communities can be sourced from rainwater, ground water, and surface water such as rivers and springs. However ground water is the most practicable choice for safe water supply. There is a wide range of low cost techniques available that can be sued to extract from the ground water that is safe for drinking in rural areas (Opara, 2005). In areas where ground water is not available in adequate quantities the next best available option for water supply is from surface water source which are often, are more contaminated than ground water (Machingambi and Manzungu, 2003).

A number of water lifting devices are in use in various part of the world. These include rope and bucket devices, counter poise lift and Archimedes screws (Opara, 2005). The sanitary rope and bucket system are designed for open dug wells and are simple to maintain, the design was developed by WHO this simple arrangement apart from providing good services also protects the well from pollution. With the intervention of water agencies in rural areas the hand pumps were introduced and have become most commonly used extraction devices to lift water from shallow wells as well as tube wells.

Water supply is the amount of water accessible to a community; it involves the treatment, storage and distribution system necessary to dispense water in a community (Gleick, 1999). Water has multifunction purposes, it is used not only for domestic and industrial purposes but also for many things like agriculture, navigation, recreational and power generation. All living things depend on water in one form or the other for survival and comfort (Abraham, 2001). Universally, water supply is usually measured in litres of potable water per given population. Portability means delivery of water suitable for drinking, cooking and meeting basic hygiene standard through an acceptable system. The domestic consumption of water is only one of the uses of water but it accounts for 50%- 70% of the total water consumed (World Bank, 2000). This report by World Bank further stressed that of all the

resources needed for a major effort to overcome the lagging development 2/3 of the globe, none is more needed and none is more critical like water. In a similar statement (Gandy, 2006) revealed that all the resources needed for development, water is the most essential and its supply is still inadequate. The author further maintains that water continues to be critical and the common denominator in every major effort to advance the cause of civilization.

2.1.2 The Concept of Rural Settlements

Rural areas are sparsely settled places away from the influence of large cities and towns. Such areas are distinct from more intensively settled urban and sub-urban areas and also from unsettled land such as outback or wilderness. According to Aderemi, *et al* (2000) the term "rural" has both spatial and occupational connotations. The spatial index tells us the percentage of people that live in rural areas, while the occupational index indicates the proportion of people whose pre-occupation is wholly with agriculture. Oduyale and Adeleye, (2005).maintain that the word "rural" is associated with the countryside, the open land as distinguished from city or town. According to them, rural communities have sometime been described as traditional societies that are often devoid of sophisticated means of agricultural production, processing, storage, preservation and adequate sources of potable water.

People who live in rural villages on farms and in other isolated houses usually lack utilities like piped water, sewer, street light and garbage collection. In addition public transport is usually absent in rural areas and people use their own means of transport, walk or ride on animals (John, 1996).We can say like Adeniyi (1994) that the absence of basic social amenities like good source of water supply, electricity and hospital makes a given community rural.

From oral and written evidences several criteria have been adopted over the years for classification of rural communities though the acceptable sizes vary from one country to the other. In Canada, the

Organization for Economic Cooperation and Development define a "predominantly rural region" as having more than 50% of the population living in rural community where a rural community has a population density of less than 150 people per square kilometer (Chigbu, 2012). In United States, the U.S census bureau and the office of management and budget have come together to define rural areas as territory outside urbanized areas and urban clusters. An urbanized area consist of a central surrounding areas whose population is greater than 50,000 (Olayiwola and Adeleye, 2005).

In Britain rural areas are defined by the government Department of Environment, Food and Rural Affairs (DEFRA) as any local government area with less than 26% of its population living in a market town. "Market town'' is being defined as any settlement which has permission to hold a street market.

In India rural areas are also known as country side or a village that has a very low population density, agriculture is the chief source of livelihood along with fishing, cottage industries, pottery etc. According to Linda (2005), in India a town with a maximum population of 15000 is considered Rural areas house up to 70% of India's population and rural India contributes a big chunk to India's GDP by way of agriculture, self-employment services, construction etc. has adopted the United Nations' definition of a rural place as settlement with a population of less than 20,000.

2.1.3 The Concept of Rural Development

Generally, rural areas are characterized by low income, which is as a result of under-development and low productivity. The quality and quantity of rural water supply are inadequate in addition, they have poor road network, poor housing, health facilities and services and educational services that are inadequate and irrelevant to the needs of the rural dwellers.

Mabogunje (1980) defined rural development as the improvement of the living standard of low income population in rural areas on a self-sustaining basis through transforming the socio-spatial structure of

their productive activities. Thus it is a process that requires increased productivity overtime, a rise in income and greater purchasing power of the majority of rural populace. These transformations should be aimed at providing available and strong economic base making available such amenities. (Chibug, 2012). According to Ukwu (1998) the term "rural development" refers to the distinct approach to interventions by the state in the economies of the rural areas, and one which is broader and more specific than agricultural development. It is broader because it entails much more than the development of agricultural production for it is in fact a distinct approach to the development of the economy as a whole. Germany is divided into 402 administrative districts consisting of 295 rural districts and 107 urban districts and Germany is among the largest agricultural producers in the European Union (Cosgrove and Berman, 2000). More than half of Germany territory, almost 19million hectares are used for farming and located in rural areas. This is why rural areas are considered to be important as urban areas and all effort are made to develop them equally unlike in some other parts of the world, most especially developing world, where rural areas are known for being backward when compared to urban areas. In Germany rural development is achieved through a process of mass mobilization, mass participation, development of skills and capacity at local level to ensure effective mobilization and maximum use of existing resources. One of the essential resources needed to advance this development is water because water has profound influenced on health, social well-being and productivity of the rural community.

Water is required for development as well as sustaining the environment; it is in fact a crucial component of rural development. Ensuring a safe and sustainable water supply in rural areas is a fundamental importance for rural development all over the world as access to basic water is a crucial right, vital for development and reduction of poverty (Fisher, 2005).

2.2 Water and Socio-Economic Development

Water is life and especially potable water is essential for life and health, so access to drinking water improves overall socio-economic and environmental existence (Gebrehiwort, 2006). Water has also become a key pivot for socio-economic development of rural communities (Jafaru, 2005). Water and economy are inextricably linked. Sub- Saharan Africa is a good example of how water has a very significant impact on the lives of people. It has been observed that in rural areas, women spend up to 6 hours a day on water collection chores (WHO/UNICEF, 2010) this is time that could be used productively on a host of activities.

People living in rural areas are significantly poorer than those in urban areas. This poverty has many dimensions such as low or very low income levels of the poor, higher incidence of health risks and lack of appropriate medical services, illiteracy or low educational level (Machingambi and Manzungu, 2003). They further argued that better access to clean water and water management creates tremendous opportunity for the poor and is a progressive strategy for economic growth. According to Eze (2012) poor people gain directly from improved access to basic water supply through improved heath, averted health care cost and time saved.

Good water management resources bring more certainty and efficiency in productivity across economic sectors and contribute to the health of the ecosystem. In Africa, the cost of basic water has been estimated at US$534 per healthy life year gained (about ₦ 80,000) and when a cost per healthy life year gained is below three times GDP per capita of a country, the intervention is deemed by the WHO as a cost effective use of health budgets. For instance in Zimbabwe, where GDP per capita is US $324(about ₦ 30,000) a strong argument exist for investing health budgets in water supply, when

in addition to improving access to water supply, intervention are added to improve water quality by treating it at the point that it is used(Machingambi and Manzungu, 2003).

Harvey and Reed, (2007) in an economic study conducted for Zambia, the impact resulting from poor rural water supply cost the economy of the country dearly in the form of adverse health effects associated with poor water supply, cost of treating these health problems, loss of productivity that result when individual are sick and others have to care for them and the time spent to access services.

There are many benefits to be derived from improved rural water supply some of these benefit are intangible because they are difficult to measure. These include dignity, comfort, privacy, security and social acceptance (Yahaya, 2004). Water at homes can improve school enrolment, attendance and completion and also increase female participation in work force hence. Therefore easy access to potable water can promote social equality and economic growth.

2.3 Consequences of Inadequate Water Supply in Rural Communities.

Though the statistic on access to water is conflicting due to divergent definition, indicators and methodologies applied by different agencies, water coverage rates in Nigeria is amongst the lowest in the world WHO (2010). The government of Nigeria in the third National Developmental Plan 1975-1980, recognized the fact that ‘’the supply of potable water in adequate quality and quantity is a vital factor in the determinate of health welfare and productivity of the population” Despite this, the present water situation in rural areas in Nigeria is that of inadequacy (Water Aid Nigeria, 2010). Water Aid further revealed that all over the country there are sizeable communities without pipe borne water in the rural areas no more than 10% of the population have access to pipe-borne water. This means that majority of the people depend on unhygienic sources for their water supply such as shallow wells and streams which has been recognized by WHO (2010) to have adverse effect on health of the people.

Not just health the inadequacy or lack of sufficient water supply situation in rural areas has also implication for economic activities.

Inadequate water supplies are both a cause and effect of poverty (Babalola, 1997). According to Abraham, (2003) those without adequate and affordable water supplies are the poorest in the society. The effects of inadequate water supply (diseases, time and energy expended in daily collection, high unit cost etc) exacerbate the level of poverty. Water and health are related in a number of ways. There is the direct impact of consuming contaminated water known as water borne diseases which include diarrhea, typhoid, viral hepatitis A, cholera and dysentery. There is effect of inadequate quantities of water being available for personal hygiene, or the un-hygiene practices which contaminate water and cause water-washed diseases like skin and eye infection. Water based and water borne are related diseases in which the aquatic environment provides an essential habitat for the vectors and intermediate hosts of parasite that cause human diseases.

UNESCO (2005) had reported that water related disease are among the most common causes of illness and death affecting mainly the poor in developing countries, they kill more than 5 million people every year more than ten times the number killed in the wars.

The importance of safe water in poverty alleviation and socio-economic development cannot be overemphasized. Access to safe drinking water is part of the MDG of reducing poverty by the year 2015.

2.4 Problems of Rural Water Supply

Based on the literature review, many water development projects have failed particularly in developing countries due to one problem or the other. Harvey and Reed (2007) in a study conducted in Ethiopia stated that about 33% of rural water supply projects in Ethiopia are non- functional due to

lack of fund for operation and maintenance, inadequate community mobilization and less community participation in decision making.

According to Graz (1998) in a study in Swaziland, a major factor attributed to problems of many rural water supply schemes are inappropriate technologies, lack of spare parts, lack of local maintenance and operational capacity, lack of local community education and participation, ineffective community demand and lack of cooperation of sector agencies.

Well (1998) made the summary of rural water supply problem to include insufficient water facilities, poor physical structure, low reliability of the services and facility design, distance and time needed to collect water and low awareness about their uses are some of the problem of rural water supply. Well (1998) further stated that the sustainability of rural water supply projects is correlated with institutional, social, technical, environmental and financial dimension.

In summary, the review of relevant literature has indicates that the rural water supply situation in Nigeria at large is that of inadequacy. The MDGs water supply scheme is an intervention to improve rural water situation, the effectiveness of which the present study aims to investigate by using Kudan LGA as a case study.

2.5 RURAL WATER SUPPLY SITUATION IN NIGERIA

Nigeria is endowed with enormous surface and groundwater resources, yet the provision of potable and safe water supply is still inadequate, consequently many programmes to improve rural water supply had been launched by many government agencies and international organization. Harande (2009) and Nwankwoala (2011) share the view that the good intention of government in trying to make potable water available in rural areas is being hindered the absence of basic infrastructure for providing water to rural areas.

Despite the formation of many programmes for rural water supply the above argument still holds. This is because for rural areas the issue is the absence of a uniform or coordinated scheme for water supply by the different agencies concerned. Even though some progress has been made, the water supply situation, particularly as it affects the objectives set out in the Millennium Development Goals 13years after pronouncement, may have not been met.

According to Peter (2008) is spite of the development of water resources in Kwara State Nigeria, the major sources of water for the rural populace are still hand dug wells, natural springs and streams together with rainfall harvest, majority of which are highly unreliable during dry seasons. So in site of the investment in the provision of potable water to local dwellers in Kwara state by both government and non-governmental organization, there is still a long way to go.

For four decades, since independence in 1960, rural water supply development in Nigeria has proceeded inconsistently. Serious efforts at addressing rural water supply issues began with the onset of the International Drinking Water Supply and sanitation Decade (IDWSSD, 1981-1990) which established target of universal coverage. This was followed immediately by the world summit for children (1990), which established goals of universal access to safe water and complete eradication of *Dracunculiasis* (Guinea worm). Following this, the Nigerian national programme of action (NPA) for the survival, protection and development of the Nigerian child envisaged 100% coverage of the country in water supply by the year 2000 (Goni, 2006).

Initiatives that emerged during this 20year period included among others the National borehole programme, DFRRI, RUWATSAN programme, FGN/UNICEF water and environment sanitation projects, UNDP-World Bank RUSAFIYA projects, Water supply projects of the agricultural development programme, Petroleum trust fund (PTF) Water supply projects etc. Despite these

initiatives, the most conservative estimate puts Nigeria as still recording less than 50% access to safe water by the population due largely to policy inconsistency of the projects (Olusegun, 2012) Even the joint federal government of Nigeria and UNICEF water projects which have consistently been implemented throughout the 20-year period, were interventionist, short- lived, pilot or demonstrative in nature.

Until in the year 2000, there has been no national water supply policy, which defines policy objectives, guidelines and targets for the entire sector (Abubakar, 2009). Following her failure to supply water to the majority of the people Nigeria subscribed to the water target of the international millennium development goals of reducing by 50% the proportion of people without access to adequate quantity of affordable and safe water (MDG, 2001).

In Nigeria, many people especially in the rural areas have to resort to getting water from unhealthy sources such as polluted streams, shallow wells and ponds. Sometimes women resort to fetching water from unprotected springs, rivers and other sources that are close by in order to reduce the time spent to fetch water. These sources have resulted in the prevalence of water-borne diseases, sometimes on epidemic scale. Such diseases include cholera, dysentery, typhoid fever, etc (Abubakar, 2009).

According to UNICEF and WHO (2010) joint monitoring programme for water supply and sanitation 2007, 54% of the Nigerian population did not have access to improved drinking water source in 2004. For the rural population, the figures rose up to 69% and with the population of about 150million people living in Nigeria, this translates to about 70million people who do not have access to improved drinking water. The report further revealed that household members in rural areas using water for various domestic activities spent most of their time and energy in search for water. The report indicated further that 70% of the household required up to 100-200 litres of water per day for domestic

use which is mostly drawn by women and children from community's hand dug wells, ponds, stream, spring etc. Women and children were reported to complain of enormous fatigue and acute body pains from the physical exertion expended in fetching water from deep wells, covering long distance to water source and transporting heavy 18-20 litres water pots on head and shoulder portaged over a distance of 2-3km from the sources to their homes.

In Fikayi in northern Nigeria, women and girls had two choices where to collect their water: It is either from a river nearly an hour away or a pond 20metres away. Although the pond is dirty, shared with livestock, frogs and unknown germs and diseases, it is much closer to the village and therefore used as the main water source (Chigbu, 2012)

Gbadegesin (2005) reported that although household water use is enhanced by the harvesting rain water during rainy seasons, daily water use is often restricted to cooking, drinking and bathing. Washing of different kinds and other non-domestic uses of water are restricted due to scarcity. The rural community adjustment to water scarcity include digging of stream bed to produce ponds, pools, management of spring water shed, digging of more wells during the dry season, the adjustment mechanisms carry significant implication on community health since most of the water obtained from these sources are rarely treated before consumption.

As in the case in most part of sub-Saharan Africa, water demand in Nigeria far outstrips supply. The main source of water for household are piped supply from treated water source mostly in urban areas and untreated piped water from ground-water source, shallow boreholes, wells, ponds, spring, lakes, rivers and streams in rural areas(Gandy,2006).

2.6 MILLENNIUM DEVELOPMENT GOALS (MDGs)

2.6.1 Introduction

Many conventions, declaration and initiatives have been undertaken at different times in different places at various levels; international, regional, national and sub-national. The purpose of these conventions and declaration were to foster cooperation, improve socio-economic situations and resolve emerging problems. For instance, the Kyoto Declaration of 1997 for the control of atmospheric pollution, Alma-Ata declaration of 1978 for achieving health for all by the year 2000, Bamako initiative of 1987 for revitalization of primary health care and Vision 2010 for socio-economic development of Nigeria. Sambo and Yakubu, (2005).

According to Sambo and Yakubu (2005), a millennium declaration popularly known as Millennium Development Goals (MDGs) was made by 186 United Nation's member nations in September 2000 at New York. MDGs are series of eight time-bound development goals that seek to address issues of poverty, education, gender equality, health, environment (sanitation and water issues) and global partnerships for development, agreed by the international community to be achieved by the year 2015 (Africa and Millennium Development Goals, AMDG (2004). The goals include; eradicating extreme poverty and hunger, achieve universal primary education, promote gender equality and empowerment of women, reduce child mortality, improve maternal mortality, combat HIV/ AIDS, malaria and other diseases, ensure environmental sustainability and develop global partnership for development. In addition to the eight goals, MDGs have 18 targets and 48 indicators for performance monitoring.

2.6.2 Nigerian's Response to Achieving MDGs

Being a signatory to MDGs declaration, the Federal Government of Nigeria launched the National Economic Empowerment Strategy (NEEDS), a comprehensive socio-economic reform compact that

incorporates MDGs. For proper implementation and coordination of MDGs strategies, the government created a Presidential Committee on the assessment and monitoring of MDGs and established the office of the Senior Special Assistant to the President on MDGs (Jafaru, 2005).

This office of the MDGs which serves as the secretariat of the Presidential Committee has numerous functions among which is the establishment of Virtual Poverty Fund (VPF) which houses all the proceed from debt relief. The major activities to be supported by this fund are those that have direct impact on the poor segments of the population which include immunization, HIV/AIDS treatment and prevention, supply of teachers, rural electrification, youths programmes, gender mainstreaming, rural water supply, road infrastructure, slum upgrading, environmental issues and Agriculture Anthony, (2009).

2.6.3 Structure of MDGs and Rural Water Supply

The United Nations Millennium declaration confirmed the central role of water in sustainable development and the major contribution that expanded access to safe drinking water and sanitation can make to poverty alleviation WHO (2004). Water infrastructure stands out of all infrastructure (physical and social) as critical to the attainment of MDGs because beside goal number 7 and target 10 which are specifically water based, issues addressed by goals 1-7 directly or indirectly relate to water availability. Therefore, meeting the water needs of Nigerians would be scores of ladder closer to attaining the overall MDGs.

According to African and Millennium Development Goals AMDGs (2004), poor access to water and the attendant water scarcity in Africa affect women and children disproportionately, the situation is worse in rural areas due to institutional and cultural barriers, including those of disparities in rights, decision making power, tasks and responsibilities over water for productive activities.

The provision of safe drinking water is among the most critical challenges for achieving sustainable development over the next decade because water is intrinsically interconnected with the MDGs target of reducing by half in 2015 the proportion of people without sustainable access to safe drinking water which is one of the numerical and time bound target defined for MDGs at the world summit held in Johannesburg in 2002 (Anthony, 2009).

CHAPTER THREE: THE STUDY AREA AND METHODOLOGY

3.1 THE STUDY AREA

3.1.1: Location

Kudan LGA is located on a plateau at a height of 732m above sea level in the center of northern Nigeria. Precisely the area lies between Latitudes $10^0$25N and $11^0$31N of the equator and Longitudes $7^0$6E and $8^0$35E of the Greenwich Meridian (See figure 1). Kudan is bounded in the north by Katsina and Kano States, in the south-west by Sabon-Gari LGA, in the south-east by Soba LGA and in the eastern side by Makarfi LGA (Works Department, Kudan LGA, 2013).

3.1.2 Relief and drainage

The relief is characterized by open rolling country consisting of upland which gently slopes into low lying streams and marshes called fadama. The area is surrounded by hill features with the prominent one called “Dutsen-Hunkuyi” (Ladan, 2003).

The main rivers draining the area of study are the Galma in the centre, the Kinkiba in the south, and Kubanni in the north. These rivers flow mostly during the rainy season and water may occur in discontinuous pools with large part totally on the surface in the dry season. The drainage pattern is mostly dendritic, especially in deeply weathered areas which imply that the water courses are not structurally controlled. However, river Galma follows some structural trend in a number of places. A prominent right angled turn is observed between Nasarawa and Kwasallo where the river flows a long a fault trend almost north for approximately 1.5 km before branching off in the south-west direction.

The Galma River which is the major river in the study area flows slowly along gentle slopes. And slow rate of erosion. There is also a small dam in the area although it does not sustain enough water.

Both relief and drainage do not seem to act as significant barriers to the movement of people and goods (Kudan LG Manual, 2011). Also the rivers provide water for domestic and agricultural uses.

3.1.3 Climate

The study area falls within the tropical savanna climate. The area is invaded by two distinct air masses. The first is from the north- east (dry and continental in origin which the Saharan air mass) and the other which blows from the Atlantic Ocean is the south- west trade winds (moist, cool and equatorial maritime in nature). The two air masses have a discontinuity zone at their boundary giving rise to distinct wet and dry seasons. Temperature varies between less than 20`c around January to over 30`c in April. The area experiences two distinct seasons- a raining season which extends from April/May to October, and a dry season between November and April (Ladan, 2003).

The annual rainfall ranges from a minimum of 768.5mm to a maximum of 1188.3mm (Survey Department,. Kudan Local Government council secretariat). From the beginning of the rains, there is a gradual increase in monthly total until a single maximum is attained in August. Rainfall is not continuous during the wet season, there are a few dry spells which occur mostly at the beginning or end of the rainy season.

The rainy season is a period of abundant water in rivers, rivulets and wells. The dry season is usually characterized by suffering and struggle for water, especially in areas far from the rivers. These distinct seasons have a role in water availability either from boreholes or wells provided by the MDG water projects.

Figure1: Kaduna State Showing Kudan L.G.A.

Source: Adapted from the Administrative Map of Kaduna State.

3.1.4 Soil and Vegetation

The soil in the study area is classified as leached ferruginous tropical soil which consists of upland soil which has the tendency to form a hardpan. This pan can be seen outcropping in many parts of the study area. It is very hard and vesicular in appearance. Sometimes quartz is embedded in the hardpan. This usually impairs drainage and general level of fertility is low.

Flood plain soils called the "fadama" are found there. The soils are mostly dark grey clays with poor drainage. The Fadama is of special importance as they are fairly rich in nutrients and have a good to excessive water supply which persists during the dry season (Survey dept. Kudan LG council, 2013)

The natural vegetation of the study area is the northern guinea savanna which consists of vast expanse of short grasses and scattered strands of shrubby plants of about 1.2m height. Economic trees like silk cotton, Shea-butter, baobab, locust beans and edible fruits trees are found in the area. The dominant wooded trees in the area include *Isoberlina doka, Tomentosa spp* and *Uapasatogoensis* etc. Well-developed grass species in the area are *hyparuthenia, Androprogon* and *mocymbium ceresiiforro* (Ladan, 2003).

The long history of occupation of the village has had a major impact upon the plant community which now bears the profound mark of anthropogenic influence in the grazing, intense cultivation and fire. All these modified the vegetation of the area and shrubs re-growth in this area never gets a chance for further development even in the forest reserve.

3.1.5 Population size and distribution

According to the latest (2012) statistics by the Kaduna State ward population estimate, the population of Kudan LGA is 161,129. Kudan LGA has eight wards with varying population sizes (Table 3.1).

Table 3.1 Population distribution in Kudan LGA

S/NO	Ward	Population
1	Kudan	24249
2	Sabon Gari	28951
3	Doka	12605
4	Kauran wali North	10381
5	Karan wali South	8986
6	Garu	13186
7	Likoro	19756
8	Zabi	13514
	Total	**161,129**

Source: Kaduna State Ward Population estimates (2012)

National population Commission Kaduna 2010

3.1.6 Settlement pattern and ethnic composition

Three major patterns of settlement can be distinguished in the area. First the bigger agricultural villages of various sizes called "Kauye". These villages are mostly located in the centre and serve as nucleus of the rural communities. These villages provide different kinds of service including marketing and are better connected with the outside world. In the past these villages provide protection against outside incursion and most of them had walls around them.

Secondly around these nucleated villages are located smaller units of settlement called "anguwa". These satellite units of varying distances from the nucleated villages are usually not self-sufficient and

depend upon the bigger villages for various goods and services. The population is usually composed of extended family groups who trace their origin to nucleated villages or "Kauyuka" in Hausa (Survey Dept. Kudan LG Council, 2013).

The third form of settlement consists of farmsteads of one or more nuclear families scattered between the hamlets or in the bush. Some settled rural families move out of the villages or hamlets to be near their farms.

The population of the study area consists of Hausa and Fulani ethnic groups, with Hausa being the dominant group.

3.1.7 Land use and economic activities

The study area is predominantly a farming community. Both wet and dry season farming is practiced due to the concentration of rivers like river Galma, Kubanni, Likarba in the area. Agriculture employs 70-75% of the total population. The land is devoted to the cultivation of maize, millet, sorghum, rice, yam and sweet potatoes. Cash crops like cotton and tobacco are cultivated in the area. On local flood plains or fadama are cultivated crops like sugar cane, tomatoes, carrot, cabbage, lettuce etc. Animal husbandry (cattle, sheep and goats) is also a major economic activity in the area. Fishing along the streams, cloth dyeing, leather works and tannings are some minor livelihood activities in the study area (Ladan, 2003).

3.1.8 Water issues in the Study Area

Major source of domestic water supply in Kudan are largely shallow hand dug wells and bore holes during both wet and dry season. This is because almost all the household have a well in the compound or nearby, and also there are a few hand pump bore holes constructed by the local government council in Likoro, Damuga, Matarwa and Arewacin sabon-gari. There are functional MDGs water projects in

seven communities in the study area (Figure 3.2). Patronage of these boreholes fell drastically during dry season because many of them do not have water in them and this can be attributed to poor quality work carried out by the contractors in the construction of boreholes, lack of maintenance, construction during wet season and also on false aquifer The direct collection of rain water is another major source of water for domestic use during the wet season. During the dry season, majority of the people depends on wells for water. The ponds are dry during this period, as most of the streams. There is therefore heavy reliance on groundwater. Some people purchase water from vendors to supplement their water requirements. These water vendors could go longer distance to look for water even at the peak of scarcity in the dry season (Kudan LG Manual, 2011).

3.2 METHODOLOGY

3.2.1 Reconnaissance Survey of the Study Area

A visit was made to the Ministry of Water Resources where detail information of water projects executed under the MDGs was obtained. A reconnaissance survey in which field observation was made in the study area was also carried out. The purpose was to acquaint the researcher with the study area. During the visit discussions were held with officials at the LG council secretariat as well as community leaders and some community members. The discussions helped the researcher to gain a deep insight into the water projects executed under the MDG project. The information obtained in the field varied significantly with the information obtained from the ministry. In terms of number and functionality of the projects, record from the ministry indicated that there are sixteen hand pump MDG water projects in Kudan LGA which are all functional while the actual number is fifteen with only ten functioning. Table 3.2 summarizes the actual situation on ground

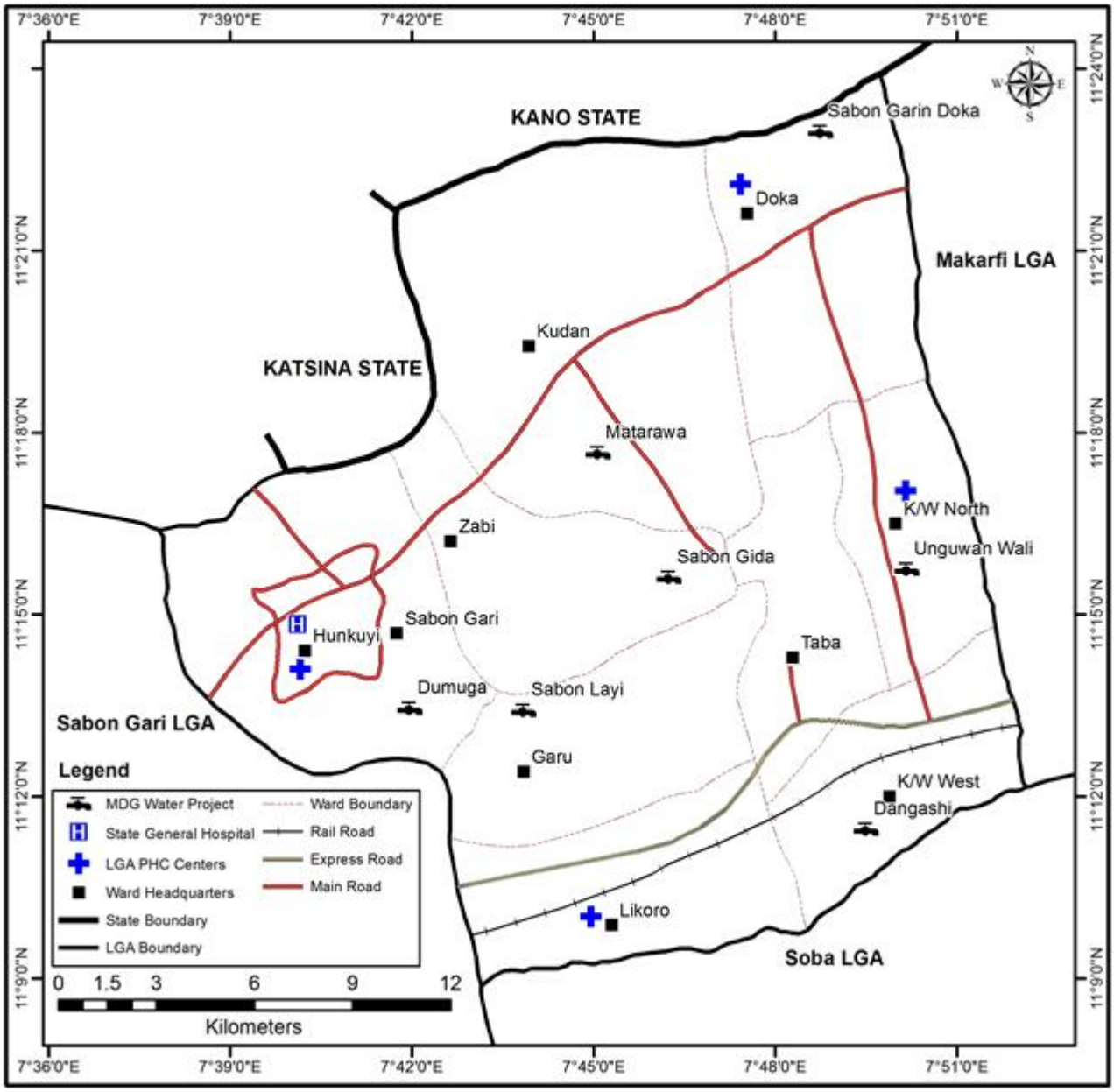

Figure 3.2: Location of MDG Water Project in Kudan L.G.A.

Source: Adapted from the Administrative Map of Kudan L.G.A.

TABLE 3.2:Population of Study Area and the Distribution of the MDG Water projects

Ward	S/N	Community/ settlement	Settl. Pop[1]	Type of water supply	Functionality
Kudan	1	Model Pri. Sch. Kudan	6150	Hand pump	Functional
	2	Kofar Gabas Kudan	3450	Solar	Non-Functional
	3	Matarwa	5000	Solar	Functional
	4	Damaski	9215	Hand pump	Non-Functional
Sabon Gari	5	Damuga Ang. Sarki	900	Solar	Functional
	6	Ang. Dan-Tsoho	1350	Hand pump	Function
	7	Arewacin Sabon-Gari	1180	Hand pump	Non-Functional
Doka	8	Tashar Kanawa	3900	Hand pump	Uncompleted
	9	Sabon-Garin Doka	3230	Hand pump	Functional
Kauran Wali North	10	Ang. Wali	1495	Hand pump	Functional
Kauran Wali South	11	Dan Gashi K/Wali	3030	Hand pump	Functional
Garu	12	Sabon-Layi Garu	1430	Solar	Non-Functional
Likoro	13	Likoro	1825	Hand pump	Functional
Zabi	14	Tashar Kade	8585	Hand pump	Functional
	15	Sabon Gida	765	Hand pump	Functional

Source: Field survey, 2012. [1]Ward populations are projected from the 2006 census.

3.2.2 Types of Data Used

In order to achieve the objectives of this study, information was collected from the community members, community leaders, MDG desk officers as well as health care facilities. The data required for this study are:

i. sources of water in the LGA; access to water by the communities, the process of implementing water project under MDGs, the level of involvement of LG Councils and communities in MDGs water project

ii. socio-demographic characteristics of the sample population such as gender, age, marital status, household size, level of education, state of origin, health and occupation

iii. impact of the water projects on some aspects of the socio-economic development of the rural populace such as distance or travel time to the source of water, amount of money spent to obtain potable water before and after the MDGs water projects, and quality of the water.

iv. Data from health care facilities on morbidity associated with water related diseases such as diarrheal, typhoid fever, skin diseases, hepatitis, before and after the water project

3.2.3 Sources of Data

3.2.3.1 Primary and Secondary source of data

i. Field survey of sample communities was conducted to collect information on the existing MDGs water projects. This comprises of a questionnaire survey when information was obtained from carefully selected respondents.

ii. Qualitative data were also collected using in-depth interview with stakeholders associated with MDGs water projects and household interview with the officials on the challenges of water supply in the communities before the MDG project, the selection of communities for MDG water project, how the water projects were implemented, the role of State and the LGA in the implementation of water project, the level of the community involvement and finally the impact of the MDG water project from the perspective of policy makers.

Secondary Source of Data

Data were also collected from the health care facilities with a view to assessing the trends of water borne diseases; especially diarrhea, typhoid fever and skin diseases before and after the MDGs water

projects were executed. These helped to fill the gaps that may exist in primary data, Also relevant information from journals, texts, periodicals and others documents are useful for literature review.

3.2.4 Sample Size and Sampling Techniques

Eight of the 10 wards in Kudan LGA have benefitted from the MDG projects. But only seven wards were found to have functioning bore holes during the reconnaissance survey in 2012. As such only the 7 wards were considered in this study. Since each of the sampled community has a health facility, the available health facilities in the sampled communities, the 7 health facilities therefore constitute the sample considered in this study. To determine the sample size required for the questionnaire survey, Krejcie and Morgans (1970) method was adopted, where for a population size of between 15,000-19999 it is considered adequate to use as 375 sample size. Therefore, for the population of the communities in Kudan LGS which is 16,915 a total of 375 respondents were selected for questionnaire administration. As such households were selected and household heads, women and young people were the targeted respondents. The 375 copies of questionnaire was distributed proportionately among the communities selected using this formula

$$\text{Sample Size} = \frac{n \times 375}{N}$$

Where n= Population of a sampled community

375= Total number of sample size

N = Population of the whole sampled communities.

Table 3.3: Distribution of the sample.

Ward	Sampled community	Community Population	Sample size
Kudan	Matarwa	5000	111
Sabon-Gari	Damuga A/Sarki	900	20
Doka	Tashar Kanawa	3900	86
Kauran-Wali North	Ang. Wali	1495	33
Kauran-Wali South	Dangashi K/Wali	3030	67
Likoro	Likoro	1825	41
Zabi	Sabon-Gida	765	17
Total		**16,915**	**375**

Source: Field survey, 2013.

3.2.5 Techniques of Data Analysis

The data collected were cleaned and processed using the SPSS. Descriptive statistics were used to summarize the data. On the other hand, inferential statistic (chi-square) was employed to test for differences in potable water by households before and after MDGs projects in the study area, travel time to the source and time spent to get water during the dry season. All statistical analyses were performed mainly by using the Statistical Package for the Social Science (SPSS) version 22.0, and the tests were at 0.05 probability levels.

CHAPTER FOUR: DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 INTRODUCTION

The first part of this chapter is devoted to a presentation of the respondents' socio-economic characteristics. The second part presents information on the sources of potable water before and after the execution of MDGs water projects in the study area. This is followed by an assessment of the level of the people's accessibility to potable water supply after the MDGs water project have been executed as compared to the period before these projects. Then the result of an assessment of the impact of the MDG water projects on some aspects of the socio-economic life of the people was presented. It is worth pointing out that of the 375 copies of the survey questionnaire distributed only 329 were valid for analysis. The remaining 46 copies were containing incomplete information and contradictory responses which make them unsuitable for analysis.

4.2 SOCIO-ECONOMIC CHARACTERISTICS OF THE RESPONDENTS

The socio-economic variables investigated in this study are sex, age, marital status, educational level and occupation. The distribution of respondents according to their socio-economic characteristics is shown in Table 4.1.

4.2.1 Age

Largest proportion of the respondents falls between the ages of 20-50years. This result is not surprising considering the fact that these age cohorts are the most active when it comes to water provisioning. This is similar to the findings of the study by Niyi (2005) which indicates that the decision to fetch and use water in the household, in most cases, rest squarely on this age group.

4.2.2 Sex

The result also shows that about 247 (90%) of the respondents were male while the remaining were females. The reason for this high record of male respondents is not unconnected with religion and culture of the people of the study area where only males are permitted to be interviewed except in rare cases. Contrary to the findings was that of Esrey, (1996) in other part of the world (Kenya) where decision about household water use fall directly on women who are expected to simply get water by whichever means while the males go to the farm or undertake other economic activities. Water provisioning responsibility is also shared by males hence their large number among respondents, for instance males dig wells, use horse cart to transfer water in jerry cans and other similar responsibilities.

4.2.3 Marital Status

There are four marital characteristics among the respondents in the study area. These are married, divorced, separated and others. About 90% of all the respondents were married while about 2.4% were divorced, 27% were separated. The remaining 4.9% were among others like widows. More often, the quantity of water used is related to household size, hence the married households are likely to be high consumers of water. Similarly Esrey (1996) found that water fetching responsibility exerts a lot of pressure on large household in the rural areas where almost all adult members are expected to partake in the production process.

4.2.4 Educational Attainment

It is a well-known fact that the literacy level in rural Nigeria is generally low. The result obtained from this analysis, therefore, is not much different from what is expected. The highest education attainment of more than 45% of the respondents is Qur`anic education. This result could probably not be unconnected with the dominant religion in the area under study which is Islam is

strictly observed. Also 32% of the respondents had attained primary school education, 13% claimed to have acquired secondary education while only about 5% achieved tertiary education. One of the socio-economic indicators of development in an economy is educational attainment. Similarly Harande, (2009) found that education could inspire a higher ethical behavior, refine taste, cultural awareness, patriotic devotion and social responsibility. It also affects water use particularly awareness of water related diseases and infections.

4.2.5 Occupation

The distribution of respondents among the various occupational groups in the communities shows that there are more farmers (54.7%) than any other group. Housewives account for about 20% of the respondents. Farming is the main occupation in the study area as in the other rural areas of particularly the developing countries. The situation is the same in Nigeria where more than 70% of the rural populace are engage in farming activities.

Table 4.1: Socio- economic profile **of respondents**

Characteristics	**No. of respondents**	**%**
Age (Years)		
<20	6	1.8
20-29	92	28.0
30-39	91	27.7
40-49	77	23.4
50-59	28	8.5
60-69	23	7.0
70+	12	3.6
Total	**329**	**100**
Sex		
Male	247	75.1
Female	82	24.9
Total	**329**	**100**
Marital status		
Married	296	90.0
Divorce	8	2.4
Separated	9	2.7
Others	16	4.9
Total	**329**	**100**
Educational status		
Primary	106	32.2
Secondary	44	13.4
Tertiary	16	4.9
Qur'anic Education	163	49.5
Total	**329**	**100**
Occupation		
Farmer	180	54.7
Trader	25	7.6
Civil servant	17	5.2
Artisans	30	9.1
House wife	64	19.5
Students	12	3.6
Others	1	0.3
Total	**329**	**100**

Source: Field survey**,** 2013

4.3 SOURCES OF WATER BEFORE AND AFTER MDG WATER PROJECTS

It is expected that choice of water source will be determined by the quality and reliability of water as well as the distance covered. In this respect the sources of water were examined. Result shown in Table 4.2 indicates that before the MDGs water projects the hand-dug shallow well was the main source of potable water for a large proportion (97.9%) of the respondents. After the MDGs intervention, as high as 92.4% of the respondents testified to still be using water from shallow wells due to their proximity and affordability. Also from the field survey, it was observed that there were hand-dug wells in the compounds of almost all the communities surveyed on which they much relied on for domestic purposes. Majority of the respondents would have preferred tap and borehole provided by MDGs, LGA or philanthropists but their location is far from them.

The proportion of the respondents who relied on water from streams declined slightly from 1.5% before the MDG water projects to 0.9% after the projects were executed. About 0.3% of the respondents indicate getting their water from water vendors both before and after MDGs intervention especially in Likoro and Sabon Gida communities. Also 0.3% of the respondents use borehole before MDG projects while after the MDGs, the percentage increased to 6.4%. Normally water quantity at the source is the prime consideration before they make their choice instead of quality. The shallow wells are not lined making particulate matters to accumulate to elevated levels in them. Plate 1 is a hand-dug well at Damuga, the main source of water for the community.

Table 4.2: Major Sources of water by households before and after the MDGs water Project

Water Sources	Before MDG water projects		After MDG water projects	
	No. of respondents	%	No. of respondents	%
Wells	322	97.9	304	92.4
Stream	5	1.5	3	0.9
Water vendor	1	0.3	1	0.3
Bore hole	1	0.3	21	6.4
Total	**329**	**100**	**329**	**100**

Source: Field survey, 2013.

The indication is that rural people in Kudan are in common with their counterparts in most of the developing world. As described by Opara (2005) in a similar study in Calabar that rural dwellers use water from a variety of sources for a range of different uses, they used water from streams and wells for washing only and from boreholes for cooking and drinking. It seems that for many people, the pattern is to use whatever water source is most convenient and to revert to streams and wells for drinking and cooking when the other convenient source have become unavailable.

4.4 ACCESS TO POTABLE WATER SUPPLY

4.4.1 Awareness of MDGs among the Respondents

In order to find out from sampled population's their knowledge of the term "MDGs", provision was made in the questionnaire administered to test their awareness of MDG programmes. Many of the respondents (63.8%) were aware of the term "MDGs" This high percentage might be as a

result of public enlightenment through traditional rulers before the projects were implemented as testified by the traditional ruler of Dangashi community. This perhaps is because community awareness of any project is a precondition of the success of such project. As Ellen and Kellog, (2005) in their work observed failure to actively inform and involve people resulted in poor performance and non-commitment on the part of the people in the maintenance of established projects.

4.4.2 Community Participation in MDGs Water Projects in the Study Area

Public participation is a popular and interesting concept which influences many aspects of human activities. The success of rural projects depends on the extent to which the community is involved during the planning and implementation stages. Enthusiastic community participation can play a significant role in developing and increasing community awareness, a sense of responsibility and pride of ownership towards any projects, culminating in success and high level of performance (FMOH, 2010). There is ample evidence that communities and individuals have traditionally developed their own water resources in the study area. Most of the compounds visited in the course of this survey have hand dug wells that are maintained throughout the year. MDG established in 2000, as part of its programme, constructed solar-powered boreholes in 10 communities in Kudan LGA. However, in the execution of the water projects where they exist, it was discovered that 81.2% of the benefiting community were aware of the community members' involvement. This is in contrast with the findings of Gomez, (2002) where the researcher found out that, there are communities that were never involved in either the planning or implementation of projects, despite the existence of development associations in all the communities studied.

S Table 4.3: Areas of involvement in MDGs Water Projects Identified by Respondents

Areas of involvement	No. of respondents	%
Project planning	7	2.1
Provision of land	206	62.6
Implementation	15	4.6
Provision of security	177	53.8
Monitoring	44	13.4
Nil	55	16.7
Others	18	5.5

Source: Field survey, 2013.

With growing awareness of the respondents on the significance of these projects, majority of the villagers interviewed (62.6%) testified that they were only involved in the provision of land as shown in Table 4.3. Likewise 53.8% claimed they were involved in provision of security. This percentage is not unconnected with the responsibility saddled with the community in protecting MDGs water projects. In an interview with the village heads of Damuga and Matarwa they revealed that as part of their duty to protect the water project, a vigilante group was formed and every household delegated a member to participate in providing security for these water projects. Another village head of Dangashi in an interview also emphasized that they were ever ready to protect MDG or whatever water project scheme. He pointed out, "*After all, they are for our benefit; we give support in protecting the boreholes from being vandalized". He* further emphasized that they even contributed money for minor repairs

4.4.3 Distance, Time and Money Spent on Water Collection

The collection of water for household use is a function of distance from the household, time available to the household and financial resources at the disposal of the household. It is necessary to see how these factors affect water sourcing in the study area. Table 4.4 focuses on distance

Table 4.4: Distance to the Source of Portable Water Among the Respondents

Distance In Metres(m)	Before MDG water projects		After MDG water projects	
	No. of respondents	%	No. of respondents	%
<200	182	55.3	164	49.8
201-300	94	28.5	103	31.3
>300	53	16.1	62	18.8
Total	**329**	**100**	**329**	**100**

Source: Field survey, 2013.

Average distance covered by respondents to sources of water before and after the MDGs water projects was considered too. One of the reasons why a great deal of time and energy is spent fetching water in rural areas is because many of the sources are of considerable distance from households especially during dry season. Table 4.4 shows that the distance from the sources of water supply to more than half of the respondents (55.3%) before the MDGs water projects was about 200m, while 28.5% of the respondents claimed that the distance to main water source was between 201m-300m while only 16% of the respondents stated that they covered more than 300m to the source of water. This result is not surprising considering for example the fact that several communities relied on few boreholes constructed in each ward, household members travel from far and near to fetch water from these boreholes which according to them they use for drinking only. For instance communities of Sabon layi Garu trek about 300metres in order to get hand pump water from Angwan wali.

Similarly Ifabiyi, (2010) find out that, access to safe water is necessary for all human beings. Among the targets of the MDGs is to halve by 2015 the proportion of the population without

sustainable to safe drinking water. However the current MDG indicator defines access to safe water as "the availability of at least 20 litres per person per day from a source within 1 kilometer of the user's dwelling.

Also according to WHO (2010) a good water source must be copiously available all the time, it must be within easy reach and its collection must not involve any undue strains or dangers. This corroborates what Adebayo *et al* (2006) posited that accessibility is the balance between the demand for and the supply of consumers services over a geographic space and narrowing or bridging the gap between geographical spaces is the all significance of distance.

Table 4.5: Travel time from Resident to sources of water before and after MDGs Interventions

Travel time	Before MDG water projects		After MDG water projects	
	No. of respondents	%	No. of respondents	%
<30mins	180	54.7	159	48.3
30-60mins	98	29.8	111	33.7
>1hr	51	15.5	59	17.9
Total	**329**	**100**	**329**	**99.9**

Source: Field survey, 2013

The average time spent in fetching water is an important indicator of the level of efficiency of water supply within rural communities.

As shown in Table 4.5, before MDGs water projects 54% of the sampled population claimed to spend less than 30minutes to get water, 29.8% of the respondents spend between 30-60 minutes, 15.5% spent greater than one hour. After the execution of the MDGs water projects 48.3% of the

respondents attested to the fact they are spending less than 30 minutes to get water, 33.7% spent 30-60minutes while 17.9% spent over one hour. The reason for the observed variation in the time spent before and after MDGs water projects can be attributed to the few numbers of MDGs water projects within the communities. It was observed that most of the water projects were situated in strategic places like Emir's palace, for instance, in Matarwa where a solar-powered borehole system is situated in front of the Emir's house which is also not far from the counselor's house. Therefore people come from distant locations to get water from this borehole, particularly for drinking. It was also observed that water collection is usually done more than once a day, in the morning and evening and sometimes in the afternoon as well. Thus several trips may be made in a day. The major implication of this result is that since a substantial amount of time is spent in fetching water in rural areas, it then means that there is a substantial man-hour loss. In a similar study in Tanzania Taylor (2009) noted that most rural informal income generating activities are labour intensive. Therefore, the productivity of labour is drastically reduced in the course of fetching water and low productivity deepens poverty

Table 4.6: Amount of Money Respondents Spent to Obtain Potable Water before and after the MDGs Water Projects

Value ₦	Before MDG water projects		After MDG water projects	
	No. of respondents	%	No. of respondents	%
0	141	42.9	169	51.4
< 100	153	46.5	145	44.1
101-200	22	6.7	13	4.0
201-300	6	1.8	1	0.3
301-400	2	0.6	1	0.3
>500	2	0.6	0	0.0
Total	**329**	**100**	**329**	**100**

Source: Field survey, 2013.

Table 4.6 shows that the amount spent by 46.5% of the respondents to obtain potable water before the MDGs water projects was less than 100 naira, while less than one percent (0.6%) of them admitted to spending 401-500 and >500 Naira each to obtain potable water. For instance in Likoro, while after the MDGs intervention 44.1% of the respondents spent less than 100 Naira but none of the respondents claimed to be spending 401->500 Naira for potable water after the MDG water projects. The United Nation in the World Water Development Report (2009) observed that in Kenya household head work for 7 hours as a daily labourer and earn 1000 Kenyan shillings (ksh), the household loses at least 145 ksh per day, 1016ksh per week, 4066ksh per month 48800ksh annually. One ksh in Kenya is equivalent to 40 Nigerian Naira. In this regard it is obvious that combating poverty should start in the water front, by first combating the

poverty of water. The amount spent to obtain potable water in the study area was found to be reasonable when compared to the amount spend by rural dwellers in Kenya where they are paying as much as 150ksh per one jerry can of water from different sources. They were paying higher rate for borehole water and lower rate for stream water.

4.4.4 Seasonality of Water Scarcity

It is obvious that respondents do not differ in their perception of the season of the year in which water is most scarce. It is unanimously agreed by the respondents in the study area that water is most scarce during dry season. This is obvious because during dry season water table falls considerably. During this season, majority of the people depends on well for water. The ponds are dry during this period as most of the streams. Some of the respondents purchase water from water vendors to supplement their water requirement. Some reported getting their water from MDG water boreholes which are characterized by long queues.

Table 4.7: Main Sources of Water in the Dry Season

Sources of potable water	No. of respondents	%
Well	306	93
Stream	10	3.0
Water vendor	1	0.3
Borehole	12	3.6
Total	**329**	**100**

Source: Field survey, 2013.

4.4.5 Main Sources of Water in Dry Season

The result of the survey shows that despite the high percentage dependence on well water, most household still rely on other sources for their water supply (Table 4.7). The very high percentage recorded in the usage of well is because almost all the households have a well in their compounds or nearby. (see plate 2). When is observed that the patronage of MDG borehole fell drastically about (3.6%) during dry season. This is because many of the boreholes do not have water in them and this can be attributed to poor quality of work carried out by the contractors in the construction of boreholes and lack of maintenance. Stream flow also fluctuates depending on the vagaries of weather. For example at the peak of rainy season in August, streams are characterized by full discharges, with many rivers, streams and rivulet coming alive. At the peak of dry season in March/April, however, the streams and rivulets become dry valley necessitating the need for the respondents to travel long distances to fetch water in the dry season.

Hand-dug wells as a source of water are more popular when compared to both boreholes and stream resources. About 93.0% of the respondents claimed to use well water in dry season while only 3.6% and 3.0% used boreholes and streams respectively.

4.4.6 Time Spent by Households to Get Water during Dry Season

Table 4.8 shows that in the dry season, 35% of the respondents indicated spending 51 minutes to 2hours to collect water for domestic purposes, 23% spend less than 5 minutes to get water during dry season. 4.9% spend between 2-3hours, 3% however spend 3-4hours. It is also observed that water collection is usually done more than once a day, most of the household collect water in the morning and evening and sometime in the afternoon. Thus several trips may be made in a day.

Table 4.8: Time spent by households to obtain water during Dry Season

Time spent in hours	No. of respondents	%
0.5 or less	77	23.4
0.51min -1 hr.	116	35.3
1.1-2hr	117	35.6
2.1 - 3hr	16	4.9
3.1 -4	3	0.9
Total	**329**	**100**

Source: Field survey, 2013

In developing countries women and girls spend hours every day walking many kilometres to collect water most especially during dry season from different water sources. As reported by UNPF (2001) women in developing countries during dry season walk an average of 6km per day to collect drinking water meanwhile it has been discovered that these statistics vary according to countries for example in Cameroun women spend an average of 6hours per day ADF(2004) shows that in Kenya it is about 4hours in dry season and 2 hours in wet season average of 4-6hours have been reported in Burkina Faso, Botswana and Ivory coast, about 17 hours a week has been estimated for Senegal. On the whole an average time lost by children and women in a day has been put at 200million hours in search of water (Kellong and Kellog, 2005).

4.4.7 Consequences of Water Inadequacy in the Study Area

Rural dwellers suffer several dimensions of difficulties due to inadequate water. Some of these range from educational disadvantages in the form of absenteeism and lateness to school to health

consequences. The perception of the respondents on the effect of inadequate water supply on school attendance is shown in Table 4.9.

Table 4.9: Respondents' Perception on Effect of Inadequate Water Supply on School Attendance

Children missing school	No. of respondents	%
Yes	172	52.3
No	157	47.7
Total	**320**	**100**

Source: Field survey, 2013

Water collection from distant sources is one of the problems which MDG water projects were designed to ease. Each family was known to have made its own individual arrangement of person responsible for fetching the amount of water required for their daily household. Responses on children who miss school in order to get water in the questionnaire administered in the area of study shows in Table 4.9 that 52.3% of the household interviewed admitted to having children miss school in order to get water for home during dry season while 47.7% claimed the contrary. This result is not surprising because on the aggregate, women and children are involved in fetching water in all cases. Hence the household chores of women are disaggregated from children

Goni (2006) discovered that in typical African communities, there is a near strict division of labour in household in relation to water fetching, cooking and farming activities. The first two

are almost exclusively reserved for women and children while the last is for men. The areas under study which is predominantly Hausa/Fulani where purdah is strictly observed. Water collection is done by children. Where women are solely involve in fetching water it could either be due to availability of a private well within the compound from which enough water could be drawn by the lady without necessarily going out of the matrimonial compound or that the household was not observing the purdah system, or there are no grown up children in the household who could fetch the water needed for the day's use. The finding of this work shows that the task of carrying water was principally shouldered by men and children with women giving a helping hand.

Table 4.10: Number of times in a week Children missed School as Result of Fetching Water

No. of times missed school/week	**No. of respondents**	**%**
Once	107	62.2
Twice	41	38.3
Thrice	31	28.9
>Trice	4	0.7
Total	**183**	**100**

Source: Field survey, 2013.

The average number of times the respondents indicated that their children missed schools in order to fetch water for domestic use varied from 1 to more than 3 times in a week as shown in Table 4.10. This situation represents one of the disadvantages inherent in rural life. A close scrutiny reveals that the respondents whose children and wards missed school are those in distant locations from the MDG water projects. Besides, absence or reduced yield of these projects could complicate issues of access to water. A deduction from the foregoing analysis is that much is still needed to be done to improve access to potable water in the study area.

4.4.8 Socio-Economic Benefits of MDG Water Projects in the Study Area

4.4.8.1 Pattern of Water Related Diseases Affecting the Communities

Diarrhea and skin diseases accounted for 52% and 18.5% of common water related diseases affecting families of the respondents before the MDGs water projects (Table 4.13). This reflects the general situation in Nigeria where the inadequacy of safe water usually leads to the prevalence of water related diseases. Diarrhea which results partly from consumption of water of poor quality is the second main cause of under-five mortality. Also in a related study it is observed that prevalence of diarrhea is higher in the rural than urban areas and in the northern zone than in the south. An estimated 150,000 to 200,000 diarrhea- related death occurs among children below 5 each year (National Rural Water Supply and Sanitation Strategic Framework, 2004). In Nigeria the drive to poverty reduction recognizes water supply because water supply cuts across and affects several sectors including agriculture, rural infrastructural development, education and industrial development. Indeed all the sectors of socioeconomic development require the use of water for the benefit and welfare of human being.

Table 4.11: Common Water Related Diseases Observed before the MDGs Water Project

Water related diseases	No. of respondents	%
Diarrhea	171	52.0
Typhoid	79	24.0
Skin disease	61	18.5
Others	3	0.9
Total	**329**	**100**

Source: Field survey, 2013.

On the other hand, WHO/ UNICEF (2010) reported that if women fetch water from distant source, they lose one third of their nutritional intake which is about 600 calories because they walk a long distances to fetch water. So improved water sources near to the household decreased the amount of calories that burn and increased the nutritional status of most women and children.

4.4.8.2 Respondents' Perception of Prevalence of Diseases after MDG Water Projects

The study shows that a large proportion of the respondents (93%) perceived that the prevalence of diseases (Table 4.12) water significantly dropped after the MDG water projects. This result is not surprising because improvement of access to water is a crucial element in reduction of mortality and morbidity particularly in poor rural areas. Millions of people worldwide suffer from other water related disease such as bilharzias, cholera and hookworm, improvement in water supply services tend to lead to improvement in people's health and quality of their lives.

Tables 4.12: Perception of Respondents on Trends on Water Related Diseases

Perception	No. of respondents	%
Same level	23	7
Increase	0	0
Decrease	306	93
Total	**329**	**100**

Source: Field survey, 2013

4.4.8.3 Trends in Prevalence of Water Related Diseases Since Inception of MDG Water Project

Figure 4.1 shows an increase in the prevalence of diarrhea, typhoid fever and skin diseases from 2008 to 2009 which gradually declined through 2010, 2011 and 2012 in four the health facilities in Kudan LGA. The case was quite different for dental caries which remains same from 2008 to 2010 before it declines through 2011 and then plateaus. Hepatitis remained almost at the same level throughout the period under review.

The implication of this result is that, before the MDG water projects there was increase in the prevalence of diarrhea, typhoid fever and skin diseases in the year 2008-2009, therefore quiet a number of people are been exposed to water related diseases since the main source of water for the people are open wells which are subject to pathogenic contaminating activities.

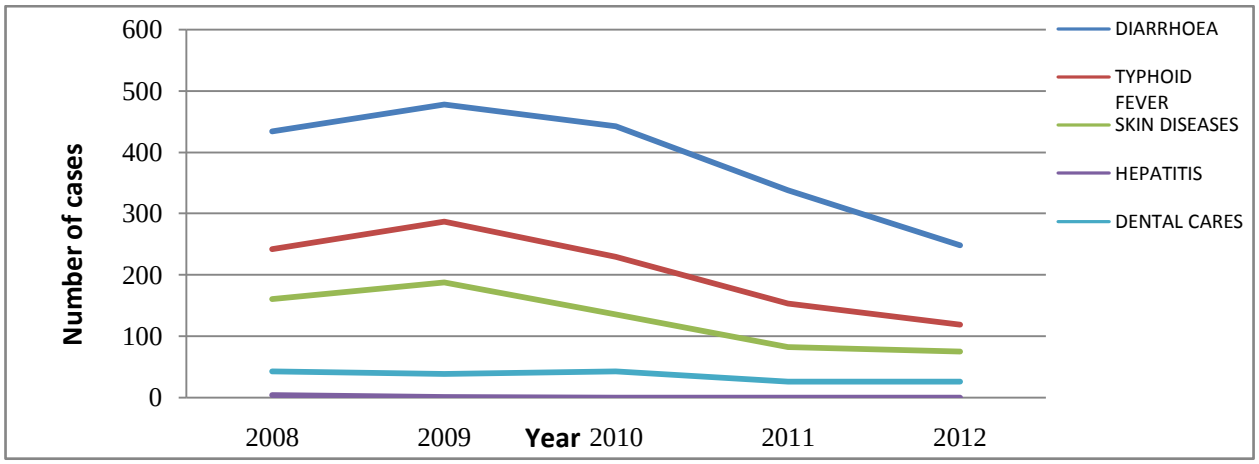

Figure 4.1: of reported cases of water related diseases
Source: Culled from the record of the four health facilities in Kudan LGA (2008 to 2012)

4.5 IMPROVEMENT REQUIRED WITH MDG WATER PROJECTS IN THE STUDY

Table 4.13: Respondents suggestion to improve MDGs water project in the study area

Suggested areas of improvement	**No. of respondents**	**%**
More Borehole	229	69.6
Provision of Security for Boreholes	6	1.8
Training of Community on how to repair/maintain the Boreholes	4	1.2
Regular maintenance of Boreholes	3	0.9
Provision of tools for maintenance of Boreholes	1	0.3
No response	86	26.1
Total	**329**	**99.9**

Source: Field survey, 2013

In order to find out from the sampled population how to improve the quantity and quality of their water supply, provision was made in the questionnaire administered for suggestions on how best this can be done. Their responses in Table 4.13 show that a large proportion of the people (69.9 %.) suggested the construction of more boreholes a strategy for improving the water supply situation in their respective locality. A significant number of the respondents (26%) however gave no response on it. About 2% of the respondents suggested that the provision of security for boreholes would curtail the cases of vandalization while 1.2% suggested other alternative such as training of community on how to repair/ maintain the boreholes will improve water supply. Regular maintenance of boreholes was suggested by 0.9% of the respondents while only 0.3% of the respondents suggested provision of tools for maintenance of boreholes.

Plate 1: An unprotected hand-dug- a well major source of water in Damuga and other communities before the MDGs intervention

Source: Field survey, 2013

Plate 2: Hand pump borehole in Damuga provided by MDGs intervention
Source: Field survey, 2013.

4.6 Testing of Hypothesis

The null hypothesis in this study is that "there is no significant difference in access to potable water before and after the MDGs water projects". When it was tested using chi-square, the analysis is shown in the table 4.14

Table 4.14 Analysis of Chi-square Results

Variables	Calculated	P- Values	df
Major sources of Water	10.64	0.001	5
Distance to source of water	1.974	0.016	120
Travel time	2.68	0s.10	1
Amount spent	0.78	0.02	12

The significant level is 0.05

4.6.1 Discussion of hypothesis result

Table 4.14 Presents the Chi-square result of the selected variables. Major source of water have a calculated chi-square value of 10.64 and critical value of 0.001 indicating no significant differences in water sources before and after MDGs water projects. From the chi-square results, the major sources of water before and after MDG project were unchanged. This is partly explained by the fact that respondents still use wells, streams and other sources before the MDG water projects. This means water sources component is not seriously affected by MDG project. Distance to source of water has the calculated chi-square value of 1.974 with critical value of 0.016, and the calculated chi-square value of travel time is 2.68 with critical value of 0.10.

Concerning distance and travel time to source of water, the distance and time appears to have increased after MDG projects. This negative aspect is due to the fact MDG boreholes are located in strategic locations such as the house of chief and politicians. This makes the average rural dweller trek greater distance and consequently travel time to fetch water from boreholes compared to previous situation when the MDG boreholes were not existing. The amount spent has calculated value of 0.78 and a critical value of 0.02. The findings indicate that for some indicators, H_1 is accepted while for others there is no sufficient evidence to statistically accept the alternate hypothesis. This implies that there is a ambivalent relationship.

In terms of amount spent, the chi-square value is greater than the critical value indicating that there is reduction in the amount spent on water after the MDG projects. A further analysis indicates that MDG water projects are beneficial to the rural dwellers. In terms of reduction in water related diseases, school absenteeism among children and the consumption of hygienic water. However, the fact that these boreholes are not many reduced the positive impact they would have had on the people.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 SUMMARY OF MAJOR FINDING

5.1.1 Characterized the sources of domestic water supply before and after the MDG projects.

Prior to MDG water project the source of water in the study area was hand dug wells on which they much relied on for domestic purposes and most of these shallow wells are not lined making particulate matter to accumulate to elevated level in them. The findings also indicates that even after the MDG water project communities' major source of water remains the same, this is because the rural dwellers so much relied on well water as their major source of water. This may be due to proximity, since the hand dug wells people constructed for themselves are not enough to cater for their need because it dries up during dry season. Normally water quantity at the source is the prime consideration before they make their choice instead of quality. It seems that for many people, the pattern is to use whatever water source is most convenient and to revert to streams and wells for drinking and cooking when the other convenient source have become unavailable. The use of boreholes increases after the MDG water projects.

5.1.2 Access to Potable Water in the Study Area before and after the Execution of MDGs Water Projects.

In terms of distribution of distance from household to source of water, the study showed that people in the study areas covered a distance of less than 200m to source of water before the MDG water projects while after the projects some of them cover greater than 300m. According to WHO (2010) reasonable access to water should not be more than 1000m from house to public stand.

The study also revealed that there is marginal increase on the people that spent no money to obtain potable water as shown in table 7. Other socio-economic impacts revealed by the study include school

absenteeism, in this study most of school children missed school during dry season, and the frequencies of missing school range from once a week by the pupil to greater than thrice as shown in table 11.

5.1.3 Socio-economic effect of MDG rural Water Supply Project

Furthermore, with respect to water associated diseases, the study revealed that almost all the diseases in this category had been reported in the communities. Specifically; diarrhea, Typhoid and skin diseases as in table 13. However, some of the community members perceived that the incidences of these diseases have decreased with the implementation of MDGs water project as shown in table 15. This assertion was confirmed when the trends of these diseases were reviewed over the duration of five years by hospital record. As depicted in figure 5, there was gradual decrease in the number of cases of water related diseases between 2008 to 2012 as shown in the figure 5. The cases of diarrheal diseases decreased from 400 to 250, Typhoid from 250 to about 120, skin diseases from 160 to 85 cases. However, the trends of hepatitis and dental caries remained fairly stable, this might be attributable to poor reporting of these conditions at the level of primary health care facilities.

5.2 IMPLICATION OF THE STUDY

Implication of this study is that provision of improved water supply can contribute effectively to social, health and cultural development of rural dwellers as evidenced in Kudan LGA. The study area could be regarded as an underprivileged community where there is a wide gap in terms of water demand and supply. The observed gap in the demand and supply of water notwithstanding, the effect of portable water in lowering the prevalence of water borne diseases and school absenteeism in the area has policy implications which encourage the policy makers to intensify their efforts in planning and implementing rural water supply projects. In other words, this is a wakeup call for water provision planners, decision makers, NGOs and external donor agencies to contribute and support more

communities in their effort to maintain the projects that have been handed over to them and encourage their self-help participation in providing more improved water.

5.3 CONCLUSION

This study shows clearly that Kudan is one of the LGAs in Kaduna State that indeed benefited from MDGs water projects. The study also revealed that although the community members had not been fully involved in the process of designing and implementation of water project, they have contributed in other ways to bring the water project to life and have indeed benefited from the solar-powered and hand pump borehole projects provided in the area.

The provision of these facilities by MDG has reduced a lot of hardship among the members of the community in terms of reducing distance and travel time in order to obtain water. It has also been able to reduce the amount that household had to pay in order to obtain water for domestic uses. Other socio-economic impacts unraveled by this study include reduction in absenteeism from school by school pupils as well as reduction in the incidence of water related diseases and thereby reducing the cost for seeking medical care.

The combined impact of these findings especially reducing cost for obtaining water, reducing absenteeism as well as reducing cost of medical care has great potential for improving socio-economic status of the rural folks. This is because the monies saved from these can be re-invested in other socio-economic activities that might bring self-sufficiency to the people.

Although the MDG water projects and the existing hand-dug wells provide some relief from water hardship in the areas, they are not sufficient and are not uniformly distributed. In a number of cases sites were chosen for the construction of the hand pump or solar bore powered boreholes without proper geophysical survey, but just to satisfy the political interests of the prominent indigenes of the

locality who influenced the siting of the water projects in their vicinity. Such sites are not necessarily the most water yielding points in the aquifer. Thus they yield water for only a very short period. In Many of the MDGs water source are not functioning some are even in the process of construction as observed during survey. The population pressure on the few functioning water source leads to the breakdown of some of the pumps due to excessive use. However, those that are not functioning were as a result of damage, dilapidation, vandalization or break down which might be as a result of poor management and maintenance by the people using them. Therefore the level of MDG water projects provided in the study area is found to be generally inadequate considering the growing population of the rural communities.

5.4 RECOMMENDATIONS

Water supply is an overarching issue because water is required by all sectors of the economy and society. Therefore government officials including MDG coordinators and other development partners engaged in providing rural water supply should take more time to understand the livelihood patterns of rural water users and explicitly tailor their intervention to support these, using a multiple approach. This might imply, for example, providing less (but more reliable) water for drinking from nearest sources while developing other sources (such as dams) for non-drinking productive uses.

Communities should be given a real voice in identifying and prioritizing their various water need and in choosing water services options that suit those priorities. This voice should be clearly reflected in the development of water plans. Adequate geophysical survey and community preference should be the bases of siting further MDG water projects rather than the vested interests of local opinion leaders, rulers and politicians.

To re-echo the opinion of the rural dwellers as a recommendation, a significant number of respondents recommended for the construction of more boreholes. Moreover other alternatives such as household connection, public stand pipe, protected dug well, protected streams and rain water harvesting technologies will be the other strategies that can improve the access of the people of Kudan LGA to adequate portable water

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ANNEXES

IN-DEPTH INTERVIEW GUIDE WITH OFFICER IN CHARGE OF WATER PROJECT IN THE LGA

INTRODUCTION

1. Sir, over some years there have been a lot of talks about Millennium Development Goals, what do you know about this MDGs?
2. Sir, MDGs has been involved in the water projects in this community, what were the challenges of water supply in the communities before MDG intervention?
3. What water projects have been conducted by the MDGs in this community?
4. Please, could you explain the level of involvement of LGA in designing, implementing and monitoring of this project.
5. What is the level of involvement of communities in designing, implementing and monitoring of this project.
6. In your own opinion what are the impact of water supply projects in improving socio-economic development of the communities?
7. What are the problems/challenges encountered in the implementation of this projects
8. How do you think that these problems could be addressed?

INVENTORY CHECKLIST FOR ASSESSING MDGS WATER SUPPLY PROJECTS IN KUDAN LGA IN KADUNA STATE

Beneficiary communities	Project Description/ Nature of w project	Date of comme	Date of comple	Functionality the water proj	Remarks

QUESTIONNAIRE TO ASSESS THE KNOWLEDGE AND IMPACT OF MDGs WATER PROJECT AMONGST RURAL COMMUNITIES IN KUDAN LOCAL GOVERNMENT OF KADUNA STATE

LGA……
Community……

Date…….

SECTION A: Socio-demographic profile

1. Age:……
2. Gender: M……..F……
3. Marital Status: Married……Divorced……Separated…… Others (specify)……
4. Level of Education: Primary……Secondary…….. Tertiary……Others (Specify……
5. Occupation: Farmer……Trader……Civil Service……self-employed….. Others (specify)……

SECTION B: Knowledge of MDGs projects

6. Have you heard about the term MDGs?

7. Are community members involved in these projects? YES……NO……..

8. If yes, in what areas?
   - Designing…….
   - Provision of land……..
   - Implementation…….
   - Provision of security……..
   - Monitoring……
   - Nil……
   - Any other specify…….

SECTION C: Impact of MDGs Water project

9. Rank the sources of potable water by your household before the MDGs water project?

a. Well----------

b. Stream----------

c. Water vendors----------

d. Boreholes----------

e. Hand pump----------

10. Number of boreholes and hand pumps after the MDGs water projects----------

11. What is the distance to these sources of water?

a. ----------

b. ----------

c. ----------

12. What is the travel time to these sources of water supply?

a. ----------

b. ----------

c. ----------

13. What is the travel time to MDG water supply

14. What is the distance now to MDG water sources?

a. ----------

b. ----------

c. ----------

15. How much do you spend to obtain portable water before the MDGs water project? ----------

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16. In what season of the year is water most scarce in the community?----------

17. On average how many months in the year do you record water shortage----------

18. Do the frequency of water shortage reduce after MDG water projects----------

19. How many hours a day do you spend to get water during this season?----------

20. Do your children have miss school in order to go and get water for the home during that season?----------

21. How many times a week do children miss school in order to go and fetch water?----------

22. What is the frequency of school absenteeism by your children before the implementation of the MDGs water project?----------

23. On average how many buckets of water do the members of the household utilized before the MDG water projects

24. How many buckets of water do the household utilized after MDG project----------s

25. What were the common water related diseases affecting your family before the MDG projects.(e.g. diarrhea, typhoid, skin diseases etc)----------

26. How often do people get sick in your family as a result of using bad water?----------

27. How do you compare the prevalence of these diseases after the MDG water project? ----------

28. Can you suggest other areas that MDGs rural water supply project could be improved?

- ……
- ……
- ……
- ……
- ……

Health facilities checklist to assess the trends of water associated disease in the last five years

Water associated dise	Number of cases reported				
	2008	2009	2010	2011	2012
Diarrhea					
Typhoid fever					
Skin diseases					
Hepatitis					
Dental cares					
Others					