ASSESSMENT OF DOMESTIC WATER SOURCES AND HEALTH IMPLICATION IN LAPAI LOCAL GOVERNMENT AREA, NIGER STATE, NIGERIA.

BY

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A PROJECT BEING SUBMITTED TO THE POSTGRADUATE SCHOOL, FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF TECHNOLOGY (M.TECH) IN GEOGRAPHY (ENVIRONMENTAL MANAGEMENT)
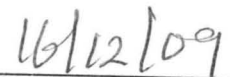
NOVEMBER, 2009

DECLARATION

I hereby declare that this thesis, Assessment of Domestic Water Sources and health implication in Lapai Local Government Area, Niger State, Nigeria, was carried out by Adam Hussein, and has not been submitted to any institution at anytime for the award of any degree. Information derived from published and unpublished work of others has been acknowledged in the text.

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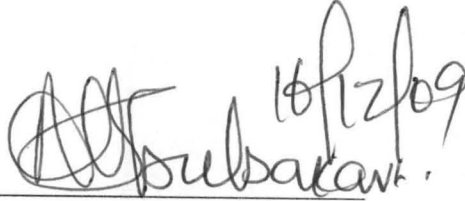   **DATE**

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CERTIFICATION

This thesis titled: Assessment of Domestic Water Sources and health implication in Lapai Local Government Area, Niger State, Nigeria. by: Adam Hussein (M.Tech/SSSE/2007/1633) meets the regulations governing the award of the degree of Master of Technology of the Federal University of Technology, Minna and is approved for its contribution to scientific knowledge and literary presentation.

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ABSTRACT

This research work studied the importance of water as a resource that needs to be sustained. From the study it was realised that poor planning, inadequate funding, insufficient relevant manpower and haphazard implementation of national policy for water supply is responsible for the inadequacy of water both in quantity and quality. The major aim of this study will be to determine ways and means of improving the availability of water in adequate quantity and quality.Data were gathered, collated and analyzed in respect of water supply situation in Lapai Local Government Area of Niger State. The research was carried out through sampling of communities at ward levels. It was realised that a total number of 117 boreholes were found out of which 1 was motorised and 116 were hand-pump. About 41.7% of the hand-pump boreholes were functional at the time of the survey. It was recommended in the study that planning for water supply facilities, especially at state and local government level should be comprehensive, and implementation of policies should be guided and strictly followed. In addition operations and maintenance of water facilities should be handed over to the local communities.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

This research work specifically examines Nigeria's water resources as studied in a part of Niger State, in terms of resource profile and the strategies adopted over the years towards optimal exploitation, management and utilisation. The environmental implications of water resource use (by man and nature) were also examined taking into specific account the link to sustainable development. Against this background, the problems militating against effective management of the country's water resources are highlighted. The ultimate objective is to identify a number of critical factors, which must be taken into account in designing appropriate strategies for sustainable utilization of the nation's water resources.

1.2 An Overview of the Case Study

Lapai Local Government is one of the focal points in Niger state not only because of its proximity to the state capital it also houses the state university coupled with its rich agricultural potentials. Bordered to the North and North-East by Paikoro and Gurara Local Government Areas respectively and to the South by the boundaries of the Federal Capital Territory Abuja and Kogi State. It covers an area of about 3,730 square kilometers, and its population was estimated to be about 88,172 (1991 census).

The favourable climatic conditions coupled with the vast gentle slope environment makes it possible for people to settle down within its environs for residential and agricultural purposes.

The Local Government experiences both wet and dry seasons, characteristics of a tropical climate. The rainy season starts from April/May to October with heavy downpour in most period of July to September. The mean annual rainfall varies between 1,300mm – 1,600mm. The cold harmattan wind ushers in the dry season between November and February. Extensive fertile land for agricultural uses in addition to River Etswan which provides domestic use as well as agricultural water for irrigation activities.
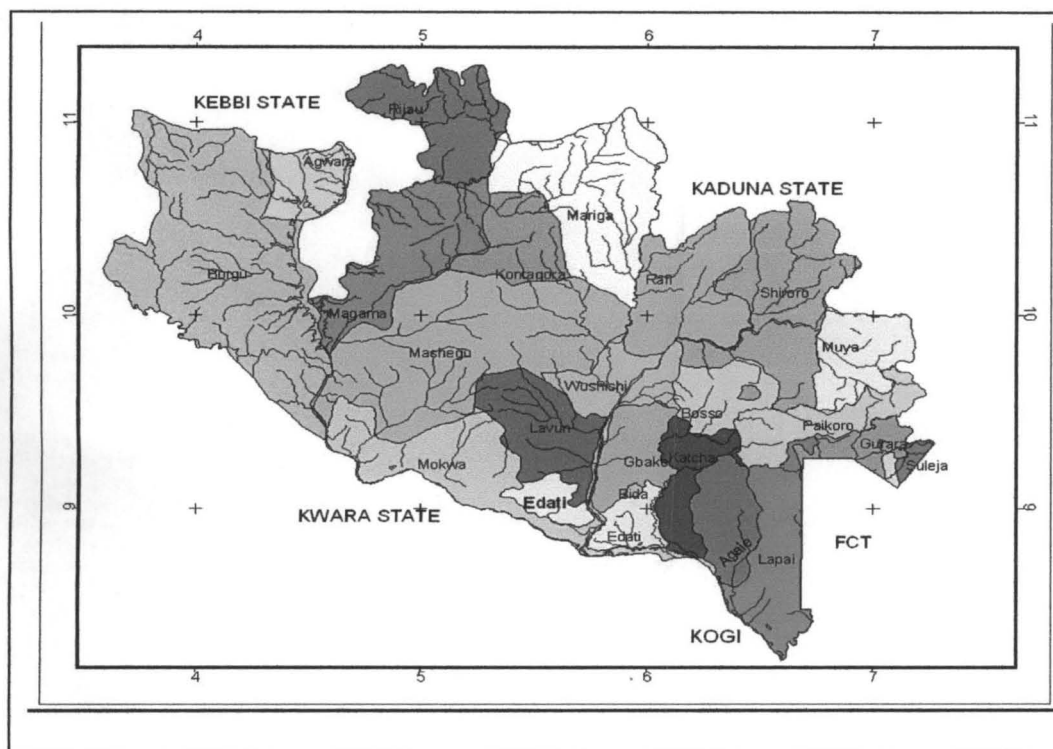
Fig. 1 Niger State Drainage Characteristics

1.3   Statement of Research Problem

Water, next to air, is the most important need of man. In spite of the considerable investment of Governments in Nigeria over the years in this essential human requirement, a large population still does not have access to water in adequate quantity and quality. It is estimated that only 48% of the inhabitants of the urban and semi- urban areas of Nigeria and 39% of rural areas have access to potable water supply. In spite of these low figures the average delivery to the urban population is only 32 liters per capita per day (ℓpcd) and that for rural areas is 10 ℓpcd. The quality in most cases is suspect. Various reasons responsible for this situation include amongst others, poor planning, inadequate funding, insufficient relevant manpower, and haphazard implementation of a national policy for water supply.

Niger state has also invested large sums of money beginning with the construction of Bosso dam in 1945 to the expanded water development programmes such as the new Tagwai dam in Minna, Kontagora, Suleja, Bida, and New Bussa water schemes and other water supply schemes spread across the state. The present level of supply is still very inadequate.

In Niger State, as in most parts of Nigeria, water resource management and utilization is crucial to the country's efforts toward poverty reduction, economic growth and food security while maintaining sustainable ecological systems. Even after nearly sixty years of water supply development in Nigeria, as much as 43% of the population still lacks access to safe water, with the situation worse in rural areas (Draft Niger State Water and Sanitation Policy, 2008).

In addition to the growing number of mega cities and increasing sizes of existing large cities, the issue of liquid and solid waste disposed into water bodies continue to receive little or no desired attention. Many sewage plants, where they exist, do not function efficiently.

1.4   Justification

The ultimate outcome of this work will be to suggest ways of improving the peoples' indigenous knowledge of water resource management in order to ensure sustainable water supply in the rural parts of the country. The results will also catalogue ideas and experiences of local initiatives that could be adapted to solve water supply problems in similar rural communities in Nigeria and elsewhere.

As the attention of African policy makers and the development partners are turned to how to urgently and concretely reduce poverty, it has become necessary to examine the water-environment nexus: its implications on the production processes relevant to the poor; environmental health and security and common resource use conflicts that are associated with water use; water pollution; other related cross sectoral and cross border conflicts in water catchment management; sustainable governance; public participation and empowerment; and the cost effectiveness/benefit of different water catchment management options. A holistic and integrated approach to interrogating these issues would yield results that are implementable over the long-run, with direct relevance to the poor achieved through participatory measures.

Some of these issues are not new. But attempts to address them continue to be ad hoc and hence without proper considerations for sustainable governance, stakeholder involvement and cost-effective choice of management options. Little is known about the drivers of stakeholders' willingness and ability to adopt and implement management options as well as their consequent preferences, attitudes, values and behaviour. Without a proper understanding of these issues, water management technologies are likely to be unsustainable. Many country governments are now paying attention to the policy issues around water and the environment.

The inadequacies outlined earlier in the Water Supply industry call for a well articulated approach to water supply towards a systematic development of the industry over a defined period of time. The approach therefore should define an acceptable Policy that will set up a planning process, research and manpower development, institutional structure, legal framework and financing strategy that will meet the socio-economic requirements of Niger state (Draft Niger State Water and Sanitation Policy, 2008).

1.5   Aim and Objectives of the Study

The major aim of this study will be to determine ways and means of improving the availability of water in adequate quantity and quality.

This study is carried out with a view to achieve the following objectives:-

- ➢ To determine the adequacy or inadequacy of water supply facilities in Lapai Local Government Area.

- ➢ To assess the level of water related borne diseases in Lapai Local Government Area.

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- To develop and sustain a program of operation and maintenance of the available water supply facilities in Lapai Local Government Area.

- To determine the providers/promoters of water supply facilities in Lapai Local Government Area.

- To find out the organ that is charged with the responsibility of maintianing the existing water supply facilities in Lapai Local Government Area.

1.6   Scope and Limitation of the Study

The scope of the research is so designed to give the researcher a reasonable and realistic fact of life that will allow thorough study of the subject matter as required. The researcher has decided to carryout assessment of domestic water sources and health implication, with emphasis on available portable water supply facilities in Lapai Local Government Area of Niger State, the result and findings of this research are valid and limited to year 2009 only.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1   Introduction

Water resources can be broadly grouped into two categories freshwater and marine water resources respectively. Freshwater resources consist of rivers and their plains, streams, lakes, wetlands and underground water reservoirs. Rainfall can also be grouped under freshwater resources – although man has no influence over its availability. On the other hand, marine water resources include lagoons, seas and the oceans. Sustainable welfare of man and indeed, all living things on earth depend on the wise and safe use of water. Freshwater resources provide the main source of safe drinking water for the human population, and also support agricultural activities through natural feeding, and irrigation practices, and it is far cheaper to use freshwater for industrial purposes. In many cases, freshwater resources, particularly rivers and lakes also perform recreational and trans-potation functions, while marine water resources are of vital importance, particularly for countries with seaward boundaries, providing the natural habitat for exploitable fishery resources. Historically, water resources have played significant roles in the evolution of human society and civilisation. In Europe for instance, the Rhine valley, recognised as a locus of both co-operation and conflict was a primary nexus of economic growth (Sadoff, Wittington and Grey, 2002). In Africa, early civilisations such as those of the Nile valley and plains provide another classic example of how seasonal inundation provided water and increased soil fertility that encouraged and enhanced agricultural productivity. In the West African sub-region, the Senegal and Niger rivers played similar roles.

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In the same vein, the decline of some civilizations had been closely associated in part with problems of effective water management and utilisation.

Water resources also have political and cultural dimensions, which dimensions ultimately determine human settlement patterns, economic structures and opportunities that are available to the entire population. In the African continent for example, there had been several migrations of peoples from one region to the other over the ages, influenced by water in terms of scarcity and availability, with the stronger groups of people generally tending to move towards and settle close to the great rivers and lakes.

In many African countries, as elsewhere, the demand for water has been on the increase in recent years (Sharma et al., 1996). This has been due to a number of factors. The critical factors include phenomenal increase in population, rising agricultural demand, urbanisation and associated water stress, as well as frequent droughts in the arid and semi-arid regions of the continent, where drought- induced water scarcities have brought social shocks on incipient fragile economies. The designing of an appropriate framework for the optimal exploitation, management and utilisation of Africa's water resources must of necessity be a fundamental policy imperative for the 21st century, in line with the 7th Millennium Development Goal, which encompasses the need to "ensure environmental sustainability through integrating the principles of sustainable development into country policies and programmes ... and halving by 2015, the proportion of people without access to safe drinking water (ADB, 2002).

Progress towards bringing about a cleaner environment has relied on a philosophy of pollution control. This has involved sometimes costly measures and controversial political decisions. As a result, developing countries, poor communities and financially constrained enterprises have often argued that the environment is an expensive luxury that diverts resources from more productive uses. This perspective is giving way to a new paradigm stating that neglecting the environment can impose high economic and even financial costs, while many environmental benefits can in fact be achieved at low cost (World Bank, 1998). However, most developing countries have long established laws and formal governmental structures to address their serious environmental problems, but few have been successful in alleviating those problems (Bell and Russell, 2002). Regulations are the most common approach to environmental problems. *Standards, bans, permits* and *quotas* are often favoured by policymakers because they promise certainty of outcome – without costly monitoring and enforcement, however, this promise may not be realized. However, experience from Nigerian environmental policies and implementation has shown that the traditional command-and-control system to pollution abatement had not produced the desired result both economic and environmental wise. There is hence the need to examine the potential of mixed environmental policies involving the use of market-based instruments to complement the traditional command-and-control system in achieving economic efficiency in the use of the resource.

The target of this thesis is for policy makers to be better informed on everything they need to do to make the market-based instrument work otherwise they would little to show for their efforts in terms of a cleaner and healthy environment. Hence, policy makers need to understand the extent to which resource and environmental

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conditions impinge upon macroeconomic performance. Bad resource policies can actually hurt long-run economic growth by dissipating the wealth inherent in natural resource stocks. Excessive pollution levels damage not only economic assets but human health as well.

Excessive levels of pollution-linked illness result in loss productivity, and excess levels of mortality imply substantial welfare loss.

2.2 The Effect of Environmental Degradation on Domestic Water Sources in Nigeria: (1978-2000)

According to Pickford (1978), leachates from domestic refuse, night soil, sludge and most industrial wastes may have high concentration of sulphates.

Akpata and Ekundayo (1978) also reported an increase in the number of total coliforms and of *E.Coli* in particular when faeces were added to the Lagos lagoon.

The discharge of wastewater from bathroom, laundry, slaughterhouses etc have been used to explain the deterioration of most tropical rivers as they pass through inhabited places (Oluwande et al, 1983). The condition, pollution load and effluent effects on water sources in Nigeria are the effect of uncontrolled disposal system renders surface waters and underground water systems unsafe for human, agricultural and recreational use, destroys biotic life, poisons the natural ecosystems, poses a threat to human life and is therefore against the principles of sustainable development. Little interest has been shown in the contamination of groundwater by pollutants. This may not be unconnected with the slow movement of groundwater,

as well as the slow degradation of many pollutants, the latter sometimes persisting for years (Cohen et al, 1984).

Okoronkwo and Odeyemi, (1985) reported a similar trend in the pollution of a stream by wastewater from a sewage lagoon from an industry somewhere in Ibadan.

Egborge and Benka-Coker (1986) also reported relatively higher faecal coliform loads at stations on Warri River in Nigeria that received faecal matter from slaughterhouses and raw sewage from human sources.

The concern for increases in the level of pollutants in surface and groundwater is justified since a large proportion of rural and recently urban dwellers in Nigeria obtain domestic water, and sometimes drinking water from ponds, streams and shallow wells (Sangodoyin, 1990). The use of dump as a mode of waste disposal, is seen as a means of reclaiming natural gullies and excavations in Nigeria. However, leachates from such waste dumps may contain organic and inorganic toxic pollutants which may flow laterally or percolate through permeable soil strata and pollute surface or groundwater (Benka-Coker and Bafor, 1999).

Benka-Coker and Bafor (1999) in their study of the pollution potential of the Teboga Waste tip in Benin City, Nigeria on the physical and chemical characteristics of the Adjacent Ikpoba River suggest that the leachates have the potential to pollute both surface and underground waters as could be inferred from the generally acidic nature of the waters of the Ikpoba river when compared to previous years values.

In Nigeria, the awareness of waste pollution is very low, thus tapping groundwater through shallow wells, sometimes very close to an excreta dump is not uncommon. Similarly, extensive use of water downstream of effluent discharge points is not uncommon. The pollution of natural and artificial waters by waste matters resulting from human activities constituted one of the most important, difficult and complex problems confronting public health authorities in Nigeria.

In Nigeria, which is regarded as a developing country, the pressure for the improvement of various aspects of living is tremendous and economic development is always on the highest priority of any government. The large increase in industries has brought about huge increases in the quantity of discharge and a wide diversity of types of pollutants reaching water bodies.

Increased industrial activity has also led to migration of people from the rural to the urban centres. The population explosion has resulted in huge generation and discharge of municipal waste. The combined discharge of industrial and municipal waste in highly populated concentrated nodal points has undesirable effects on human and other organisms in the aquatic environment.

The discharge of wastewater into surface waters and the resultant deleterious changes in water ecology have been reported by several researchers (Law, 1980; Okoronkwo and Odeyemi, 1985; Odokuma and Okpokwasili, 1993) WHO also expressed concern over human health and the possible accumulation of human enteric pathogenic microorganisms by aquatic organisms.

Some of these deaths have been traced to the use of waters grossly polluted by untreated waste (De Silva et al, 1988; UNEP, 1991).

As the drive for increased control of the environment gathers momentum, the financial expenditures for pollution control also increases. This becomes necessary to prevent deterioration in the quality of life arising from rapid economic development. Nigeria, like other developing countries suffer from a number of primary environmental problems mainly attributable to under-development and attendant poor living conditions. Added to this is the fact that numerous industries are fast springing up in different parts of the country. Consequently, failure to begin waging an early war against environmental degradation today is likely to affect output adversely and increase costs in the future.

However, if the adverse effects of river pollution and spread of water borne diseases are to be mitigated in Nigeria, it would appear that current planning laws and waste disposal practices should be reassessed (Sangodoyin, 1989).

Sangodoyin (1989) examined the quality levels of both river water and adjacent dug wells along the Ogunpa stream in Ibadan, Nigeria infer that the quality of the water as determined by several quality parameters fall far below established standards.

Water pollution have continued to generate unpleasant implications for health and economic development in Nigeria and the third world in general, the consequences of which include 4.6 million deaths from diarrhea disease and a sizeable number of casualties from ascariasis (Esrey et al, 1991). The rapidly increasing populations coupled with the deteriorating environment are some of the factors responsible for this trend (Sangodoyin, 1995). Hospital records have confirmed high incidence of typhoid, cholera, dysentery, infectious hepatitis and guinea worm in urban settlements of Nigeria.

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In the West African sub-region (with significant contribution from Western Nigeria) there are estimated 4 million cases of guinea worm, while about 500 million cases of trachoma leads to blindness of about 8 million people each year (Hoddinott, 1997). Most of the studies hypothesized that an improvement in water quality has a direct effect on people's health via reduced exposure to water-associated diseases. Patronage of hospitals and other health care facilities in Nigeria is on the increase. Of all the costs of urban environmental degradation, damage to human health is by far the highest. There is a direct link between urban environmental degradation and public health in terms of water related diseases such as diarrhea, dysentery, cholera and typhoid. However, despite the public and international agencies' policy focus on this problem, the situation in Nigeria seems degenerating and therefore demands increased attention. A number of studies (World Bank, 1993; Brockehoff, 1995; Hoddinott, 1997) have at one time or the other examine the impact of water pollution on variables that determines health status of the household members.

Kajogbola (1998) revealed the prominence of malaria, dysentery, chicken pox, measles and pneumonia as the greatest causes of morbidity within the Ibadan region in Nigeria. The study also revealed that the leading killer diseases in the region are solid waste management related precipitated by ignorance, poverty and low standard of living as shown in Table 1 below; The morbidity pattern shown in Table 1 was also found to be applicable to the larger Nigerian urban society since solid waste management problem is not peculiar to a particular region but a common feature in every urban community in Nigeria.

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Table 2.1:   *Ten top diseases from sampled hospital records in Ibadan, Nigeria*

Rank	Type of Disease	Recorded Cases	% of Total
1	Diarrhea	1530	25.0
2	Malaria	1130	18.5
3	Pneumonia	713	11.7
4	Tuberculosis	686	11.2
5	Eye Disease	459	7.5
6	Measles	421	6.9
7	Malnutrition	330	5.4
8	Anaemia	318	5.2
9	Hypertension	314	5.1
10	Hernia	219	3.5
	Total	**6120**	**100**

Source: Kajogbola (1998). Nigerian Environmental Study Action Team

Sources close to the National Health Policy in the Federal Ministry of Health gave the morbidity pattern in Nigeria as follows;

Table 2.2: General morbidity pattern in Nigeria

Rank	Morbidity	Percentage
1	Infectious and Parasitic diseases	38.2
2	Respiratory Diseases	12.7
3	Diseases of Nervous Systems and Organs	9.9
4	Ill-Defined Conditions	9.2
5	Skin Diseases	8.4
6	Digestive System	4.7
7	Accident	3.1
8	Muscle and Skeletal Diseases	2.9
9	Genito-Urinary Diseases	2.9
10	Blood Diseases-Anaemia	2.5
11	Nutritional and Metabolic Diseases	1.8
12	Others	3.7
Total		**100**

Source: Federal Ministry of Health (FMH, 1986)

The rapid growth of urban centers in Nigeria, coupled with the development of unstructured infrastructural and social services have created an environmental situation in many parts of the country which is becoming inimical to healthy living. Recent studies have shown that zoonotic diseases (diseases of animals transmitted to humans) are yet to be eliminated or fully controlled in above 80 percent of the public abattoirs in Nigeria (Olugasa et al, 2000; Cadmus et al, 1999). Thus, they pose serious environmental health risk. Some of these infectious diseases are tuberculosis, colibacillosis, salmonellosis, brucellosis and helminthoses. These are common examples of zoonoses prevalent in slaughtered cattle population in south-western Nigeria.

2.3 The Use of Market-Based Instruments for Pollution Abatement in Nigeria – Merits and Challenges

The market based approach to environmental management is concerned with creating conditions in which the production of goods and services can flourish with the support of an enabling environment for private sector activity and an economic framework of incentives and reward for good organizational performance.

Environmental management in Nigeria was until now characterized by a "command and control" approach. The limitations of this approach included an acute shortage of government funds, managerial skills and administrative enforcement capacities. Hence, the use of economic and financial instruments to complement the traditional command-and-control system could overcome some of these difficulties and also help in achieving economic efficiency in the use of the resource.

The market-based instruments approach involve setting up an appropriate taxes and pollution charges on generators of pollutants that is above the marginal cost of pollution control to or above the environmental cost that their pollutants impose on the affected population or communities. The environmental taxes and charges would have the simultaneous benefit of generating financial resources while also acting as disincentives to polluters. This include emission charges or taxes based on the quantity and quality of pollutants discharged (water effluent charges).

The pollution levy system would involve imposing charges only for pollutants that exceeded emissions standards by the Nigerian Federal Environmental protection Agency and then only for the one pollutant most in violation. To provide incentives

for enterprises to further reduce the within-standard pollutant discharges into water, a fee is also charged on the total quantity of wastewater discharged into river bodies.

The major challenges to the adoption of the market-based instruments approach in Nigeria include the need for an accurate monitoring network, transparency, a working legal system and a realistic incentive to trade. Other challenges include corruption, favouritism and poor enforcement of environmental laws. In addition, other unique challenges include the fact that there are fewer trained people and the best people tend to be concentrated in capitals rather than in field post, equipment for monitoring and data collection are scarce and most basic data are unreliable.

Other limitations include high administrative and transaction costs as the implementation of economic instruments entails significant administrative and transaction costs. The market-based instruments approach require some monitoring such as effluent fees and this monitoring is more complex and costly than required by regulation. Another challenge is the fact that the use of economic instruments may be complicated by several types of uncertainty as the marginal abatement cost functions need to be known otherwise effluent charges on polluting activity cannot be estimated effectively.

However, despite the challenges of the market-based instruments approach enumerated above, the system still offer high potential for efficient and cost-effective environmental management approach in Nigeria when mixed with the traditional "command and control" system. Hence, the argument for economic instruments above suggests that the efficiency gains from their use are an outcome of incentives for pollution abatement innovations and the ability of firms to reduce

emissions in the most cost-effective manner. However, as the impediments to the use of economic instruments indicate, in practice such instruments would require substantial government involvement and significant administrative costs (FEPA, 1991).

2.4 Water Resources, Environment and Sustainable Development in Nigeria

In Nigeria, as in many other Sub-Sahara African (SSA) countries, water is generally regarded more or less as a nature-given resource. In the few urban centres where municipal schemes of water supply still function, water is perceived more as a semi-public good, and being characterised by weak non-rival and non-excludable consumption, the majority of people have the implicit incentive to misuse and waste it. However, the form in which water is used, either in terms of consumption or production activities is not free in the strict economic sense. For instance, water that is treated for human consumption has a measurable economic value deriving from the scarcity value of non-nature-given resources that are used in producing it.

Essentially, the economist's view of consumptive use of water is that it occurs when one use of it makes it no longer suitable for subsequent desirable uses, except some extra cost is incurred. Using stream water for instance for waste disposal makes the use of the same water for recreational, fishing, or drinking purposes unsafe. Recreational use of the stream water requires certain biological purity characteristics, which are necessarily impaired by its pollution. The same holds for drinking water. To bring back the quality of water to its normal level, extra costs must be incurred. We can also consider water as a unitary resource, since all water

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in the hydrological cycle forms part of one whole. Consequently, any intervention by man or nature, at or on one part of the cycle has a definite impact on another phase of the cycle. Excessive extraction of groundwater for instance has the potential of reducing base flows to rivers. The diversion of surface water may reduce the rechargeability of ground water, just as the discharge of wastewater affects water quality. And ultimately, water quality determines the dynamics of the ecology (Sharma et al., 1996), with its interrelated natural systems such as land and forests. Generally, as human interventions intensify through the effect of rapid population growth, poverty and poor land use practices, water ecosystems such as rivers can be fundamentally altered in terms of increased deforestation, soil erosion and runoff, as well as possible modification, in the long-run, of microclimates. The loss of vegetation for instance may contribute to loss of soil and water quality, impede river flows and increase sedimentation processes. It is within this context that the management of water resources should be ideally set within a broader framework of land use and the level of economic activities, with man and sustainable human development as the primary factors of concern. It turns out that the poorest segments of society are the ones who have the least access to water, and incidentally, they are the ones who pay the most for water services, from the economic point of view. In the typical African urban centre for instance, the poorest communities are usually the last to be served by municipal water utilities a situation that usually forces them to gather their own water often from polluted sources, with their health threatened by contaminated water and improper sanitation. They are also the ones who purchase water from vendors, oftentimes at prices higher than what is paid by the privileged that are connected to the municipal supply system. In

the typical African rural community, particularly in arid semi-arid areas, it is the poor who are most affected by lack of access to water to support their livelihood through farming. They are also the ones that are most adversely affected by drought-induced famines. The scenarios painted above indicate that there is an intricate relationship between the availability of water for household consumption and other productive uses on the one hand, and the issues of health and disease, poverty reduction, food security, and hence sustainable development. Water of insufficient quantity and quality leads to water-related diseases. Inadequate rainfall and absence of irrigation facilities reduce agricultural production and threaten food security, and both factors work to intensify the problem of poverty. Understandably, the designing and implementation of an appropriate water resources management strategy is of fundamental importance, in any meaningful efforts to reduce poverty, enhance food security and productive living, and enhance environmental sustainability and economic growth in Africa. Against the foregoing background, we now examine the profile of water resources in Nigeria.

2.5 The Role of Government in the Water Resources Sector

Government policy on the water resources sector has been hinged on the need for a sensible and comprehensive development of the country's water resources to provide safe drinking water for the populace in both urban and rural areas, make water available for agricultural development through irrigation schemes, as well as the generation of electricity along the country's main watersheds. The earliest efforts by government, particularly at the central level to develop and manage the country's water resources predate the era of political independence. For example, during the

decade between 1946 and 1956, the colonial administration expended about 15.1%

of the country's total capital expenditure on water supply (Aminu, 2000), particularly

in designated urban centres. Between 1957 and 1960, the share of water resources

in total capital expenditure of the Federal Government was about 7%. The First

National Development Plan (1962 – 1968) allocated N48.6 million representing 3.6%

of the total planned capital investment expenditure to the development of water

resources. The Second National Development Plan (1970 – 1974) allocated N148.6

million to water resources development representing 4.5% of the total planned

investment. However, allocation to the sector was N930.04 million representing

2.83% of total planned capital expenditure under the Third Plan (1975 – 1980),

rising to N3.12 billion under the Fourth Plan, representing 4.4% of projected total

capital expenditure (Aminu, 2000).

Under the current democratic dispensation, the thrust of water resources policy is to

provide universal access to safe drinking water and adequate sanitation, with the

availability of rural water supply projected to increase from its current level of 30%

to 50% of the population by 2003 (FGN, 2000). In furtherance of its objective to

increase the population's access to safe water, the Federal Government in the year

2003 has adopted a Presidential Water Initiative, with the ultimate goal of increasing

water access in all state capitals, urban and semi-urban areas and rural communities

to at least 75% by the year 2007. This initiative is set as part of government's

programme of poverty alleviation, integrated rural development, and job creation.

Historically, the regional governments, and later state governments were responsible

for the production and distribution of potable water in urban and semi-urban areas.

By 1974, only the Western and Midwestern States had their own water corporations while in other states, the production and distribution of portable water were the responsibility of the Ministry of Works (CBN, 2000). However, by 1978, all states in the Federation had established their own Water Boards. Earlier in 1976, the development of water resources had received a boost, by the creation of the River Basin Development Authorities (RBDAs) to provide water for irrigation purposes, as well for human consumption, particularly in rural communities. The RBDAs were relatively more active during the mid-1980s. In 1985, the RBDAs had about 32.6 thousand hectares (ha) under irrigation, sank 108 borehole and 8 earth dams. The respective achievements for 1989 were 67.9 thousand ha; 462 boreholes and 16 earth dams. During the period 1991 – 1996, the total area of land brought under irrigation by the RBDAs was 46.6 thousand hectares, representing only 16.9% of the cumulative total of 275.4 thousand hectares achieved for the period 1985 – 1996. Under the Agricultural Development Projects (ADPs), the cumulative number of boreholes drilled country-wide over the period 1985 – 1996 was 53,499, with the total area of land brought under irrigation estimated at 85.6 million hectares, mainly through the Fadama Irrigation Programme (Sharma et al; 1996). The Federal Government of Nigeria (FGN) and the European Community also sponsored the Middle Belt Water Supply Project, and the Water Resources Decree (No.101) was also promulgated. The objective of the Decree was to effectively control and use the country's surface and groundwater and any other watercourses affecting more than one state, together with their beds and banks. Decree No.101 of 1993 vested the powers of control and use of Nigeria's water resources in the FGN, and up to the early 2000s, these powers were effectively exercised through the activities of the

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Federal Ministry of Water Resources and Rural Development, which also coordinated the activities of the National Council on Water Resources. At the state level, the governments continued to run their own Water Boards/Corporations. Some local government authorities have also made efforts at supplying water to the populace, particularly in rural areas. The developments reviewed above are related more specifically to the development of freshwater resources. At the level of managing marine water resources, not much seems to have been done. This is quite understandable as the management of marine water resources has trans-national implications. Efforts have however been made to monitor the movement of toxic wastes into the country's shoreline and continental shelf. To this effect, in 1990, the Federal Government signed the Basle Convention on the control of transboundary movement of hazardous wastes and their disposal. International co-operation in the monitoring of transboundary movement of toxic wastes is through the Toxic Waste Dump Watch.

In the year 1997 for instance, 10 alerts were received from South Korea, Japan, the USA and UK, to which the Federal Environmental Protection Agency (FEPA) created in 1988 (merged with the Federal Ministry of Environment in 1999) promptly responded. Part of the responsibility of FEPA also included the monitoring of water quality, particularly of flows from industrial processes. Some efforts have also been made to protect the Lagos shoreline and manage the effects of sea inundation in the country's coastal zone (CBN, 2001). We assess the effectiveness of efforts of government in the next subsection with respect to both freshwater and marine water resources.

2.6 Effectiveness of Water Resources Management Strategies

As established from the foregoing subsections, it is clear that the major objectives of Nigeria's water resources development policy are two- fold. First is the need to increase the access of the population to safe water for both drinking and industrial purposes, and second is to increase the supply of water through irrigation for agricultural purposes. Access to safe water is measured in terms of the proportion of the populations who have an adequate quantity of water from an improved source such as a household connection, public standpipe, borehole, protected well or spring or rain water collection. Reasonable access is defined as the availability of at least 20 litres of water per person per day, from a source of one kilometre of dwelling (World Bank, 2003a). In 1990, about 83% of the urban population was estimated to have access to safe drinking water. This however dropped to 78% in 2000. For rural dwellers, the relative proportions were 37% and 49% respectively for the same periods (World Bank, 2003a). The total volume of water available in 1999 was estimated at 5,675.8 billion cubic metres and remaining constant at this volume in 1999. However, in 2001, the estimated volume rose to 6,546.6 billion cubic metres, representing a range percentage increase of 15.3% between 1999 and 2001, with the total quantity of water for domestic consumption increasing in the aggregate from about 30% to 57% in the second half of 2003. There are therefore indications that the efforts taken at improving the quantity available for consumptive use by Government since the advent of the new democratic administration in 1999 may be yielding some positive results attributed largely to relatively enhance absolute budgetary provisions. However, on a comparative scale, the situation of water supply seems to have improved more significantly for rural communities, than for

urban centres. This may be interpreted as reflecting the preference of government towards improving the situation of water access for the rural population. Statistics shows that access to safe water in some selected African countries, including Nigeria. Compared to such countries as South Africa, Egypt, Libya and Cote d' Ivoire, whose relative water access rates are higher than the African average for 1990 and 2000, only the rural population's access estimated at 49% for 2000 is higher than the African average, for Nigeria. In spite of substantial resources made available through grants and loans from external agencies such as the World Bank, African Development Bank and other agencies during the early 1990s (CBN, 2000), particularly to develop water facilities in urban centres in the country, the largest proportion of Nigerian cities still do not have reliable public water supply facilities, and many residents produce water for consumptive use through individual boreholes or buy water at high prices from vendors. As for water supply for agricultural activities through irrigation, the records have not also been impressive. For example, total land under irrigation in the country has remained at 229.3 thousand hectares annually for the period 1997 – 2001, while the total volume of water consumed through irrigation fell from 2.29 billion cubic metres in 1997 to 1.99 billion cubic metres in 2001 (CBN, 2001) However, it is important to note that the Fadama component of the World Bank – supported ADPs in the country, particularly during the 1980s was relatively successful in helping farmers to increase water use for dry season crop production. The Fadama experiment allowed irrigation on about one or two hectares of land at an average cost of between US $350 and US $700 per hectare, with drilled tube wells, and water pumps made available to farmers at subsidised cost. By the early 1990s, the project had over 50,000 pumps operating

nation-wide, with 90% success rate in terms of farmer adoption (Sharma et al.1996). However under the current administration, significant attention has not been paid to the essentially stakeholder strategy Fadama programme. With respect to the management of coastal and marine water resources in the country, the efforts of Government have been complemented in the past by Non-Governmental Organisations (NGOs), particularly in the area of preventing desertification and pollution control of coastal waters, and protection of coastal shorelines from the effect of sea level rise and erosion. There is however much that is yet to be done in this area. A number of factors militate against efficient exploitation of Nigeria's water resources. Critical among these are the existence of a multiplicity of agencies responsible for the production of water and its distribution to users, and the absence of an efficient mechanism to fully maximise the willingness of the populace to pay for water services, both in urban centres and rural communities. A number of past water supply schemes, particularly under the DFRRI and RBDAs also did not take into account the need to involve all stakeholders, particularly the ultimate users in the management and maintenance of water facilities provided, thus leading to unsustainability of project benefits. Lack of adequate project preparation, particularly for city-wide water supply schemes had also led in the past, to project abandonment and failure. There is the problem of inadequate funding of water resources development projects although there are indications that during the first four years of the present democratic administration, the water resources sector received relatively more significant attention than was the case during the period 1991 – 1995, and between 1997 and 1999. On a comparative scale, the country is however still relatively far away from universal access to water. As admitted by the Federal

Minister of Water Resources, Alhaji Muktar Shagari, "despite the large volume of rainfall, streams and lakes, the true position is that there is scarcity of fresh or wholesome water for human consumption in the country". The new Presidential Initiative on water is in itself an admission of the fact that much remains to be done in terms of progress towards universal access to water in the country. As already noted, water resources utilization is closely linked to other subsystems of the human and physical environments in an intricate manner. For example, water supply shortages, particularly in urban centres, and the pollution of watercourses, could put a negative stress on the sanitation status of the populace, leading to the outbreak of water-borne diseases. Pollution of watercourses can also adversely affect fish population, and hence sustainable livelihood of people who depend on them for sustenance. The acknowledgement of this fact is responsible for why many governments in African countries have undertaken Development Action Plans, which, as a rule have emphasised the importance of water in environmental management. In the next section, we consider briefly, the interaction between water resources and the environment, and how this interaction affects sustainable development.

2.7 Water Resources, Some Key Environmental Issues and Sustainable Development

We first of all consider the key environmental issues. Thereafter, we examine their implications for sustainable development.

Of all environmental resources, water is probably the one that is most abused through Human activity For example, the emission of organic pollutants as a result of industrial activities is responsible for rapid deterioration of water quality, with definite health consequence for the human population. The total effect of

deterioration of water quality includes industrial, recreational and fishing diseconomies (Kneese and Bower, 1979). Scarcity of water, particularly in urban centres complicates the problem of sanitation, thereby posing a threat to public health. In rural communities without access to safe water, and where drinking water is sourced from polluted streams and stagnant water bodies, there has been marked incidence of water-related diseases such as cholera, river blindness, guinea worm infestation, all of which impose substantial welfare loss on society (Listorti, 1996). It does appear that the degradation of all categories of environmental resources records intense deterioration during the initial stages of the development process but over time substantial economic growth should lead to better environmental quality. This argument has been coined in the so-called *Environmental Kuznets curve* (see for example Grossman and Krueger, 1991; 1995; Shafik, 1994; Vincent et al., 1997; Harbaugh et al., 2000; Magnani, 2000; Boyce, 2003). However, it can be argued that economic growth alone does not provide the sufficient condition for improvement of environmental quality on all fronts, thus justifying environmental policy intervention at all stages of the development process (Orubu, 2003; Orubu et al. 2002). Thus given the linkage between economic and environmental processes, the identification of the specific environmental issues incidental to the exploitation and utilisation of Nigeria's water resources is justified. This should provide an appropriate analytic anchor on the basis of which an integrated framework for the management of water resources could be developed. There are a number of specific environmental issues relating to the Nigerian water resources. First, there is the problem of emissions of industrial pollutants from industrial sources, with the main polluting substances identified to include organic matter, metals, minerals,

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sediments, bacteria and toxic chemicals. Estimated emissions of organic water pollutants in Nigeria in 1980 amounted to 72,082kg per day, and this rose to 82,477kg per day in 2000, representing 14.4% increase over the period. This places the country as the third heaviest water polluter in Africa in 1980, and the fourth in 2000 (World Bank, 2003a). Inadequate water supply and inappropriate urban planning and management strategies in Nigeria have also compounded the problem of access to sanitation, thereby increasing health risk from water-related epidemics. The proportion of the population with access to adequate sanitation facilities during the period 1982 – 88 is estimated at 62%. This rose marginally to 63% in 2000, compared to such countries as Cameroon, Egypt, Lesotho, Libya, South Africa with access estimated for 2000 at 92%, 94%, 92%, 97% and 86% respectively (ADB, 2002). At present, there are no well-functioning municipal water treatment plants in the cities. However, the discussion provides an adequate point of departure for us to examine the connection between the sector and sustainable development.

Development is sustainable if current efforts directed at improving human welfare do not result in current distributional inequities or jeopardise the developmental possibilities of future generations. It is a development paradigm set within the early 1980s, and strongly popularised by the World Commission on Environment and Development (WCED), with the view that if economies are well managed in an environmentally-sensitive way, growth and development could occur without putting undue stress on the world's environmental resources. Thus, technological advancement, sensible environmental conservation and protection, as well as good economic management practices provide the means of obtaining sustainable development (Pearce and Warford, 1993). Since the 1980s, many countries, both

industrial and developing, have therefore adopted holistic development strategies, which recognised the need to marry economic policy with sound environmental management practices, and that sustainable development is significantly contingent on an efficient system of managing environmental resources (Jaganathan and Agunbiode, 1990; Ihedioha, 1999). Water resources are among the resources to be optimally exploited and managed, in order for the development process to be sustainable. This view has been strongly propagated by the International Union for the Conservation of Nature, the World Bank, the United Nations Development Programme (UNDP) and other United Nations initiatives such as the United Nations Environmental Programme (UNEP) and other conventions on the environment (Orubu, 2000).

2.8   Summary

Nigeria is one of the signatories to the United Nation International Drinking water supply and sanitation decade whose objective was to supply water to all citizens of the country between 1981 and 1990. In spite of the efforts of various Government at all levels, the water supply coverage in the country appears to be decreasing and deteriorating. One of the reasons for this deterioration is the enormous socioeconomic development. Other reasons include low investment level in operation and maintenance which accounts for frequent breakdown of the production facilities, and lack of proper management of the nation's water resources.

However, from all that have been proffered by different scholars and stakeholders in the improvement of water supply and sanitation, not much was achieved. The

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centre-piece of this research shall be the provision of sufficient potable water and in adequate to Lapai as a whole in an affordable and sustainable way through participatory investment by the state and the local government, the private sector and the beneficiary.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Research Populations and Sampling Size

The topic of this research study is assessment of domestic water sources and health implication in Lapai Local Government Area of Niger State. In all 10 households in 2 communities each in the 10 wards of the local government were questioned which the researcher used as a sample size out of a population of 100. The total number of people that responded to the questionnaires administered is 20 copies per ward. Also a survey and manual counting of the existing water facilities if any, was carefully conducted and recorded.

3.2 Instrumentation

In order to obtain information for the realisation of this study, the following instruments were employed:-

1. Data Collection: Data used were basically primary data obtained from;

    - Questionnaire administered to household on water supply and related diseases suffered in 2008.

    - Field survey carried out by the Researcher of the available/existing water facilities in the wards visited.

2. Secondary data obtained from health institutions in the various wards, periodic subject books, journals, and encyclopaedia.

3.3 Sampling Procedure Employed

The cluster or multistage sampling is the one the researcher used in conducting this research. This was employed because the units in the population exist in some natural groups. This type of sampling procedures is such that everyone of the possible cluster in the population has an equal chance of being selected.

The researcher has chosen the cluster or multistage sampling because of its relevance to the topic under study and it is believed to be simpler method of obtaining objectives/data in an investigative research of this nature.

3.4 Statistical Techniques Used in Analysing Data

The simple percentage statistical technique was used in analyzing the tabulated data in respect of the questionnaires administered to respondents. It was also used in analyzing the data collected for the proof of hypothesis.

CHAPTER FOUR

RESULTS

4.1   Sources of Drinking Water

Table 4.1 summarises the results obtained from the question: What is your family main source of drinking water?

4.2   Maintenance Responsibility

Table 4.2 summarises the results obtained from the question: Who maintain the available water supply facilities?

Table 4.1: Family main source of drinking water

WARD	HOUSE CON	BOREHOLE	MOTORIZED	DUG WELL	STANDPIPE	SPRING	HANDDUGWELL	UNPROWELL	VENDOR WATER	BOTTLED WATER	TANKER WATER	STREAM	RIVER	POND	BROKEN PIPE	TOTAL
AREWAYAMMA	8	12	0	0	0	0	0	0	0	0	0	0	0	0	0	**20**
B.MAZA TASHIBO	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	**20**
EBBO GBANCINKU	1	19	0	0	0	0	0	0	0	0	0	0	0	0	0	**20**
EVUTI KPADA	0	2	0	0	0	0	0	0	0	0	0	18	0	0	0	**20**
GULU ANG- VATSA	0	5	0	0	0	0	0	13	0	0	0	2	0	0	0	**20**
GUPA ABUGI	0	8	0	0	0	0	0	11	0	0	0	1	0	0	0	**20**
GURDI ZAGO	0	14	0	0	0	0	0	2	0	0	0	0	4	0	0	**20**
KUDU GABAS	4	14	1	0	0	0	0	1	0	0	0	0	0	0	0	**20**
MUYE EGBA	0	5	0	0	0	0	3	12	0	0	0	0	0	0	0	**20**
TAKUTI SHAKU	0	18	0	0	0	0	0	1	0	0	0	1	0	0	0	**20**
Total	**13**	**117**	**1**	**0**	**0**	**0**	**3**	**40**	**0**	**0**	**0**	**22**	**4**	**0**	**0**	**200**

Data Source: Researcher's Survey 2009

Table 4.2: Maintainer of the water supply facilities

Ward	Individuals	Community	L.G.A	State Govt	Fed. Govt
AREWA YAMMA	10	0	5	5	0
B.MAZA/TASHIBO	0	5	10	5	0
DUMA ZAGO	0	5	5	5	5
EBBO GBANCINKU	0	10	10	0	0
EVUTI KPADA	0	1	15	4	0
GULU ANG- VATSA	5	10	5	18	0
GUPA ABUGI	0	5	15	0	0
KUDU GABAS	8	2	6	4	0
MUYE EGBA	0	5	15	0	0
TAKUTI SHAKU	0	8	11	1	0

Data Source: Researcher's Survey 2009

4.3 Related Water Borne Diseases in Households

Table 4.3 was the summary of the results obtained from the question: Did any member of the household suffered from any water related borne diseases in 2008?

4.4 Reported Cases of Water Borne Diseases at Ward Level

Table 4.4 was the summary of the results obtained from the question: How many cases of water borne diseases were reported in your health institution in 2008?

4.5 Providers of Water Facilities

Table 4.5 was the summary of the results obtained from the survey of promoters/providers of water facilities in each ward

Table 4.3: Number the household members suffering from diseases in 2008

WARD NAME	DIARRHEA	GUNEAWORM	DYSENTERY	TYPHOIDFEVER	MALARIA	SCHISTOSOMIASIS	SCABIES	RINGWORM	CHOLERA	TRACHOMA	HEPATITISB	STREPTOCOCCI	ONCHOCERCIASIS	OTHERWATERD	TOTAL
AREWA YAMMA	20	1	11	20	20	0	1	1	0	0	0	0	0	0	74
B. MAZA TASHIBO	20	1	7	19	20	0	0	0	1	0	0	0	0	0	68
EBBO GBANCINKU	18	2	19	19	20	0	14	15	5	0	0	5	1	0	118
EVUTI KPADA	20	6	19	20	20	0	6	15	5	0	0	3	1	0	115
GULU ANG- VATSA	20	1	20	20	19	0	8	15	8	0			2	0	113
GUPA ABUGI	20	0	20	20	20	0	14	19	9	0	0	2	0	0	124
GURDI ZAGO	19	0	7	20	20	0	0	1	0	0	0	0	0	0	67
KUDU GABAS	12	0	8	17	20	0	0	0	1	0	0	0	0	0	58
MUYE EGBA	20	0	20	20	20	0	9	19	9	6	2	2	0	0	127
TAKUTI SHAKU	10	1	8	20	20	0	0	1	0	0	0	0	0	0	60
Total	179	12	139	195	199	0	52	86	38	6	2	12	4	0	924

Data Source: Researcher's Survey 2009

Table 4.4: Cases of reported /recorded water borne diseases in health institutions in 2008

WARD NAME	DIARRHEA	GUINEA WORM	DYSENTERY	TYPHOID FEVER	MALARIA	SCHISTOSO MIASIS	SCABIES	RING WORM	CHOLERA	TRACHOMA	HEPATITISB	STREP TOCOCCI	ONCHOCER CIASIS	OTHER WATERD	TOTAL
AREWA YAMMA	53	0	22	13	95	0	0	0	0	0	0	0	0	0	**183**
B. MAZA TASHIBO	85	0	44	1	444	0	0	1	4	0	0	0	0	0	**579**
EBBO GBANCINKU	233	0	55	51	365	0	20	16	0	21	0	13	0	60	**834**
EVUTI KPADA	119	0	23	16	196	0	3	7	0	7	0	8	0	9	**388**
GULU ANG-VATSA	581	0	299	364	783	0	112	65	0	26	0	68	1	51	**2350**
GUPA ABUGI	70	0	11	9	100	0	7	4	0	2	0	5	0	10	**218**
GURDI ZAGO	49	0	21	5	327	0	0	0	2	0	0	0	0	0	**404**
KUDU GABAS	134	0	10	13	993	0	0	0	0	0	0	0	0	0	**1150**
MUYE EGBA	91	0	13	12	149	45	0	7	0	2	0	6	0	27	**352**
TAKUTI SHAKU	10	1	8	20	170	0	0	1	0	0	0	0	0	0	**210**
Total	*1425*	*1*	*506*	*504*	*3622*	*45*	*142*	*101*	*6*	*58*	*0*	*100*	*1*	*157*	**6668**

Data Source: Researcher's Survey 2009

Table 4.5: Survey of promoters/providers of water facilities in each ward

Ward	Community	L.G.A	State Govt	Fed. Govt	Percentage%
AREWA YAMMA	0	0	20	0	100
B.MAZA/TASHIBO			20		100
DUMA ZAGO			20		100
EBBO GBANCINKU			20		100
EVUTI KPADA			19	1	95
GULU ANG- VATSA	1	1	18		90
GUPA ABUGI			20		100
KUDU GABAS			20		100
MUYE EGBA			20		100
TAKUTI SHAKU			20		100

Data Source: Researcher's Survey 2009

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

This chapter will highlight the data collected by the Researcher in 2009 analysed and interpreted accordingly,

5.1   Discussion

5.1.1 Analysis/Interpretation of Data in Table 4.1

From table 4.1, 13 of respondents which represents 6.5% of the total respondents, get water from connection from pipe borne source, while 117 respondents representing 58.5% get their water from boreholes, also 1 respondent representing 0.5% of the respondents get water from motorised boreholes, whereas 3 respondents representing 1.5% of the respondents get water from hand dug wells, nevertheless 40 respondents representing 20% get water from unprotected wells.

5.1.2 Analysis/Interpretation of Data in Table 4.2

From the question in table 4.2, it indicates that 50% of the available water facilities in Arewa/Yamma ward were maintained by individuals, while 25% each were maintained by the Local Government and State Government respectively. 25% of water supply facilities were maintained through communal efforts, 25% of the facilities were maintained by State Government, whereas the Local Government is responsible for the maintenance of 50% of water facilities in Maza/Tashibo ward. In Duma/Zago ward 25% each of the available water facilities were maintained by the Community, Local Government, State Government and the Federal Government respectively. However, 50% each of the available water facilities were maintained by

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the Community and Local Government respectively in Ebbo/Gbancinku ward. The table also shows that 5% of the available water supply facilities were maintained through communal effort, while 75% were maintained by the Local Government and 20% were maintained by the State Government respectively in Evuti/Kpada ward. Moreover, in Gulu Angwa/Vatsa 25% of the available water facilities were maintained by individuals, 50% were maintained through communal efforts and 25% by the Local Government. Maintenance of water facilities in GupaAbugi ward was 25% done through communal effort and 75% by Local Government. It also shows that in Kudu/Gabas ward 40% of available water supply facilities were maintained by Individuals, 10% through communal efforts, 30% by Local Government and 20% by State Government. In Muye/Egba 25% of the available water facilities were maintained through communal efforts and 25% by the Local Government, while 40% of the available water supply facilities in Takuti/Shaku ward were maintained through communal efforts, 55% by the Local Government and 5% by the State Government.

5.1.3 Analysis/Interpretation of Data in Table 4.3

From the question in table 4.3, 179 of respondents which represents 89.5% of the total respondents, suffered from diarrhea in 2008, while 12 respondents representing 6% of the total respondents suffered from guinea worm in 2008, 139 respondents representing 69.5% of the respondents suffered from dysentery in 2008, whereas 195 respondents representing 97.5% of the respondents suffered from typhoid fever in 2008, moreover, 199 respondents representing 99.5% of the respondents suffered from malaria fever, moreover, 52 respondents representing

26% of the total respondents suffered from scabies in 2008, total number of 86 respondents representing 43% of the respondents suffered from ringworm in 2008, 38 respondents representing 19% of the respondents suffered from cholera in 2008, also 6 respondents representing 3% of the respondents suffered from trachoma, the table also shows that 2 respondents representing 1% of the respondents suffered from hepatitis B in 2008, it also shows that 12 respondents representing 6% suffered from streptococci in 2008, and 4 respondents representing 2% of the total respondents suffered from onchocerciasis in 2008.

5.1.4 Analysis/Interpretation of Data in Table 4.4

Table 4.4, indicates that Arewa/Yamma ward has the least record of water borne diseases with a total recorded cases of 185 in 2008, however, Gulu Angwa/Vatsa ward has the highest recorded cases of water borne diseases with a total case of 2,550 in 2008.

5.1.5 Analysis/Interpretation of Data in Table 4.5

Table 4.5 indicates that 100% of water facilities in Arewa/Yamma, Birnin Maza/Tashibo, Duma/Zago, Ebbo/Gbacinku, Gupa/Abugi, Kudu/Gabas, Muye/Egba and Takuti/Shaku ward respectively were solely provided by the state government, while 90% of water facilities in Evuti/Kpada ward were provided by the state government, 5% are provided by the federal government. However, 95% of the existing water facilities in Gulu Angwa/Vatsa ward were provided by the state government with 5% provided by the federal government and another 5% are provided by the community.

5.2   Summary

The researcher in this chapter summarises his findings, draw conclusion and give recommendations. This will enable the major agencies responsible for providing improved and drinkable water supply to gear up in other to meet the world target of access to safe drinking water of at least 20 litres of water per person per day, from a source of not more than one kilometre from dwelling in the Local Government, State and the country at large. In the course of this research work it was realised that a total number of 117 boreholes were found out of which 1 is motorised and 116 are hand-pump operated. About 41.7% of the hand-pump boreholes were functional at the time of the survey.

Meanwhile, the Local Government Authority and State Government share the responsibility for provision and maintenance of water supply facilities. The LGA operates through its Health and Works Departments, while the State Government operates through the state water agencies. Other promoters include donor agencies, philanthropists and private commercial promoters who provides water supply facilities .

Thus they were easily kept in good operational condition. However, to some extent, operation of these facilities is still hampered by factors such as lack of spareparts, and acts of vandalism.

5.3   Conclusion

From the various discussions in this research study and survey carried out, the researcher concludes that most of the communities in the area under study lack

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access to adequate and safe drinking water, the scenario even worse with a high number of water related diseases, low physical and economic development which in turn made the communities a poverty impoverished one with large number of people fleeing these communities. Viewed from this perspective, it is therefore of enormous importance that a total/integral approach to water resources management be adopted. If these resources are sustained in the right way and manner, it will go a long way in alleviating the suffering of the inhabitants of these communities in particular and the local government as a whole and will improve the standard of livelihood of the citizens and economy status of the state also.

5.4   Recommendations

In the light of the above, the researcher would like to make the following recommendations which if implemented will help to solve problems discussed earlier:-

1. Planning for water supply facilities, especially at State and LGA level should be comprehensive and articulate.

2. Responsibility for operation and maintenance of rural facilities has been successfully transferred to communities in Niger State since the early 1990's. Under the UNICEF / Federal Government intervention between 1987 and 1993, Community Consumer Associations and / or community Management organs were established, to whom the boreholes were handed over after commissioning. Local inhabitants were also selected and trained on maintenance of the facilities and spare parts were stocked in the LGA Authority. Currently however, prompt maintenance is hampered by lack of spare parts, the management organs have

become ineffective and training of maintenance personnel is not kept up. There is therefore an urgent need to re-energise the system.

3. Acceptable, affordable and locally maintainable technology has been established as the key to sustainable facilities. Statistics from the survey show that hand-pump operated boreholes are more versatile than the motorized boreholes

4. Adequate qualified staff at the various operational levels – management, technologists, technicians and craftsmen, supported by other administrative professionals are required. Capacity building and development of appropriate skills by way of training and retraining at all levels of staffing is highly required in the various water agencies.

5. A basic minimum of operational support facilities such as workshops, laboratories, hand-tools, transport and offices are also required. Three to four mobile workshops can serve the entire state.

6. A pro-active policy or framework on water supply facilities and maintenance should be used as an instrument for resuscitating the water sector of the economy.

7. The formulation and implementation of a realistic water supply policy.

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DEPARTMENT OF GEOGRAPHY,
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QUESTIONNAIRE ON THE ASSESSMENT OF DOMESTIC WATER SOURCES IN RELATION TO SUSTAINABLE DEVELOPMENT IN LAPAI LOCAL GOVERNMENT AREA OF NIGER STATE

HOUSEHOLD SURVEY QUESTIONAIRE   **Date**..........................

Note: *This form is to be randomly administered by the researcher to a minimum of 20 Households in each political council ward.*

a. State: ....

b. LGA: ....

c. Status of location of the community

       Rural ☐   Small Town ☐   Urban ☐   State Capital ☐

d. Ward: ....

e. Address..

f. Describe how the house can be identified..

....

....

g. Enumerator's Name: ....

PART A - WATER SUPPLY

1.   What is your family's main source of drinking water?(*Please tick one from the options below*)

	A	**B**
a.	Household Connections	a. Unprotected Traditional hand dug wells
b.	Boreholes with hand pump	b. Unprotected wells
c.	Motorized borehole	c. Vendor provided water
d.	Protected Dug well	d. Bottled/sachets water
e.	Public Standpipe	e. Tanker truck provided water
f.	Rain water harvesting	f. Streams
g.	Protected Spring	g. River
		h. Pond
		i. Broken pipes

2. Who is responsible for the provision of the main source of drinking water? (*Please tick from the options below*)

    i. Government....................

    ii. Community....................

    iii. Donor Agencies..............

    iv. Private...................

    v. Religious Bodies................

    vi. Private supplier for a fee.......

    vii. Others (please specify).......

3. How far is the water source/point from your home?

    Rainy Season

    ....Meters   Dry Season

    ....Meter

4. State the number and sex of children and adult members of your household who fetch water for the family as in the table below.

Status	Male	Sex Female	Total
Children			
Adults			
Total			

...w many times does each of them collect water everyday .... times

...many litres of water does your family use in a day?........liters

...urveyor to assess)

...ATERRELATED DISEASES

...r of the household suffered from any of the following diseases in 2008?

    ....   Yes

    ....

    ....

    ....

    ....

                            No

7. Scabies……………………………..

8. Ring worm……………………………

9. Cholera……………………………..

10. Trachoma…………………………….

11. Hepatitis B………………………….

12. Streptococci…………………………

13. Onchocerciasis……………………..

14. Other water related diseases (specify) …………………………………

PART D: RECORDED WATER BORNE DISEASES IN HEALTH INSTITUTIONS IN 2008 FROM EACH WARD

DISEASES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOTAL
DIARRHEA													
GUNEAWORM													
DYSENTERY													
TYPHOIDFEVER													
MALARIA													
SCHISTOSOMIASIS													
SCABIES													
RINGWORM													
CHOLERA													
TRACHOMA													
HEPATITIS B													
STREPTOCOCCI													
ONCHOCERCIASIS													
OTHERS													