

## Rapid Dry-up of Dudi Lake in Malunfashi Local Government Area of Katsina State

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### ABSTRACT

The *Dudi* lake of Malunfashi Local Government Area in Katsina State is a very important water body to the community. The community depends on the lake for their livelihood and some percentage of their food and aquatic protein come from the lake. Historically, the lake has never dried until recently, in years less than a decade. It has frequently continued to dry year after year since the first incidence. This study was done purposely to understand the complex causes of drying up of the lake as well as its impacts on the community. The paper focuses solely on the perceptions of the local community as well as believes from them about the problems causing that, and to draw conclusions and provide possible suggestions. The major problems are excessive sand deposit into the lake by erosion, too much human consumption through irrigation and other means, pollution of the water, and little rain water input. It was interesting to understand that the community perceives the changes in rainfall and average temperature. They perceived the change in increasing temperature and decreasing rainfall, the paper draw a conclusion connecting the dramatic tragedy with the climate change.

**Key Words:** Rapid, Dry-up, Lake, Katsina State.

## INTRODUCTION

How will life be when access to fresh, clean and reliable water becomes very difficult? Although fresh water is very small compared to the overall water in this earth, but it does make the most important living components of many organisms. Human beings are not an exception. Globally there are serious problems attached to most important sources of fresh water. Groundwater, lakes, dams and so on are by far the most important sources of fresh water and each has its own peculiar problems. Lakes in tropics as in any other part of the world are faced with serious problems posed by anthropogenic interference with the environment. *Dudi Lake* is an important lake in Malunfashi Local Government Area of Katsina state of Nigeria. The lake has priceless values to the community, at the same time encountering worst problems in its history.

### Aim and Objectives

The paper aims to study the cases of drying up of the lake in the last decade. This was achieved through the examinations and assessment of the causes and consequences of the drying up of the lake on the community. Possible suggestions and recommendations were discussed at the end of the paper.

### Background to the Paper

Globally open water bodies are experiencing different environmental problems. *Dudi Lake* in Malunfashi also faces problems that are peculiar to it. Quite for a long time, since I know about the dam, it has been a year-round source of water. The community was always happy as of that time. They fetch water from it, for their daily activities, irrigate from it and fishing goes on year round as well. With all the benefits from the lake that the community enjoyed, it seems they can no longer guarantee those benefits lasting throughout a year. There are recent changes the community is experiencing, these changes are having magnificent impacts on the lake and consequently on the community.

At least a decade back if not less, the lake has been drying at some point in time. Of course there are many causes for this, depending on what class you view the problem from. The community will have an explanation for the problems and of course environmentalists and other experts will have a different explanation to the same problems. To come up with an appropriate solution the problem, it is highly important to understand the perception of the community about the problem and at the same time use the expertise and skills to accurately understand their input. The paper takes a local approach to identifying the problems and understanding them.

### Study Area

Malumfashi Local Government has an area of 674 km<sup>2</sup> and has a population of 182,920 as of 2006 census. The Malumfashi is in Sahel savanna and basically has two seasons: the wet and the dry. The wet season lasts for 4-5 months while the remaining months in the year are dry. The lake of *Dudi* is located in the outskirts of the town; the population of the community population is estimated to be 2500. The area is very busy, different people indulge in so many activities, some of the common activities taking place around the lake besides farming and fishing, include river-side-laundry, animal watering, and commercial activities by the farmers and the fishers at minor and major scales.

### LITERATURE REVIEW

Water has for long been considered as a free resource, but the concept of water footprint will bring about a paradigm shift. According to Evengard et al. (2011), water footprint is an amount of water used in the process of food or any other goods production. The concept is needed in changing the public belief about values of water and the behavior of consumption.

### **Water Security**

Water security is the assurance that every individual in the community has a reliable access to water, not any water but safe water and at an affordable price that will lead to a healthy, productive and dignified life, while maintaining the ecological system that makes the water available and also depends on the water to exist (UNEP as cited in Unuoha 2008). Water security according Norman et al., (2010) is the sustainable access to adequate quantities of water of acceptable quality to ensure healthy ecosystem human existence.

### **Water Scarcity**

According to UNEP (as cited in Unuoha, 2008), water scarcity happen when the withdrawal of water from any source is impressively large that water supplies are not enough to satisfy the human and ecosystem needs, as a result competition warms up between users and demand. According to Evengard et al. (2011), water stress (scarcity) occurs when the demand of water surpasses the amount available in a given period of time, or it happens when the quality of water is diminished that it prevents its use.

### **Livelihood**

Livelihood as defined by Chambers and Conway (as cited in De Satage, 2002), encompasses of capabilities, activities and assets, social and material, for the purpose of leaving. According to Ouden (as cited in Legesse 2006), livelihood genuinely describe the endeavor of individuals or groups of human in making a living, their steps to accomplish their various economic and consumption needs, compounded with reaction to opportunities, unseen future and selection between available options.

The Concept of livelihood is indeed the implication of human life to the environmental and the influence of the environment to their lives. It captures the complexity of the interactions between humans and their environment. The term livelihood consider how the environment serves as reservoir of resources base for the existence of human and how the

exploitation of these resources by human enhances the resilience of the environment or undermine it.

### **Environmental Degradation**

When resources in the environment decline, there is said to be an environmental degradation. The process or situation in which the quality and/or the quantity of resources in the environment such as air, water, mineral resources, fauna and flora are degraded as a result of poor climatic condition, pollution or/and over exploitation by humans (Onuoha, 2008). The impact of environmental degradation on social existence is clearly noticed to as the disruption of socio-economic balance in the immediate population depending on the resource, (Onuoha, 2008).

Defined by Miller (as cited in Jimoh, 2006), environmental degradation is: "The downward trend in the environmental resources such that their levels of use in the human societies equally decrease at an increasing rate".

Environmental degradation is a serious environmental issue that exists at global and local level. The global form of environmental degradation comes in forms like climate change, desertification, and the local forms of environmental degradation are environmental problems whose effects are generally localized to a settlement. According to Unuoha (2008), examples of such environmental concerns include depletion of sources of fresh, deforestation, depreciation of rangeland, degradation of agriculturally fertile soil, animals going extinct, improper disposal of waste and pollution of water systems and air. The effects are directly or indirectly on human beings. For instance, destruction of topsoil affects the food production, deterioration of rangeland decrease animal production and the depreciation of fresh water quality affects the fishes and other aquatic lives.

### **Why do Lakes dry up?**

As good source of fresh water as lakes are; they are seriously affected by diminishing of resources. The factor affecting this are said to be anthropogenically induced such as climate change, rapidly expanding human population and unsustainable use of water. These happen in the process of urbanization, changes in agricultural practice as demand for classier diets goes high, and over use of ground water.

### **Climate Change**

Over last century the global average temperature has increased by about 0.6° (Watson, 2001). According to him, the increase of temperature from 1976 has doubled the rate of increase from 1910 to 1945, thus is greater than any other in the last 1000 years.

In the case of lakes in the tropics, climate variability that has much effect on the lake is the decrease in rainfall. Variation of rainfall is not only in the area of the lake itself, but also in the area of watershed that feed the lake. Rainfall problems compounded with frequent drought incidences in some regions. Climate change impacts also include the hotter temperatures that proliferates excessive evaporation of the surface water.

### **Unsustainable Exploitation**

Agriculture today accounts for more than 70% of the total water use today (Global Water Security, 2010). There is need to produce 50% more food than we produce today as predicted by 2030 which simply means the need to divert more freshwater to agricultural use (White et al., 2007).

### **Demographic Change**

Quite a good number of closed lakes and seas have reduced in their sizes and the amount of water they store in the last century, due to human activities and/or natural causes (Nihoul et al. 2004). The local people and the ecosystem that depends on it have coped with the changes in the

past, but pressure from demographic increase jeopardizes the renewable resources (Njaya et al., 2011).

As hypothesized by Harden (1968) that the major cause of degradation of most lakes in Africa as well their pollution is the rapid growing of population in the continent. Increased number of people residing along water bodies skyrockets the demand for the resource. In the developing countries, large populations highly depend on four important resources that are the fundamentals of crop production: cropland, fresh water, forests and fish (Homer-Dixon and Blitt, 1998). The increasing population of human and that of their livestock have increased the exploitation of the resources of the lake by overgrazing, unsustainable agricultural practices, and extreme fishing to feed the population.

## CASE STUDIES

### Lake Chad

Lake Chad, the Africa's largest lake, is a shallow lake with depth of rarely more than 7 meters. The lake has been prone to climatic change and human activities over the last forty years (Onuoha, 2008). The great lake had an area of about 26,000km<sup>2</sup> in 1960, it shrunk from about 25,000km<sup>2</sup> to less than 1,500km<sup>2</sup> between 1966 and 1997 (Coe & Foley 2001). The lake further shrunk drastically between 1994 and 2004 having an area of 532 km<sup>2</sup>. Masari (2006) mentioned, the lake has shrunk by remarkably huge amount, 90% of its size. The main economic activities in the Lake Chad basin are fishing, herding and agriculture. There are more than 150,000 fishermen living on the lake shore and islands.

Lake Chad sustain and serves as a source of economic livelihood to over 20 million people, residing in about thirty communities along of the four riparian states: Nigeria, Chad, Niger and Cameroon (Onuoha, 2008). According to Science in Africa (2003), 11.7 million of these people are in Nigeria, 5.0 million in Chad, 2.5 million in Cameroon and 193,000 in Niger. According to UNEP (1999 as cited in Onuoha, 2008), the

number of people residing in Lake Chad catchment area has increased by 50% from 13 million to 26 million between 1960 and 1990. The number is now estimated to be 37 million (UNESCO, 2007)

The region has faced serious frequent drought incidences that affected the rivers feeding the lake, falling ground water, increased loss of topsoil by erosion and dwindling fertility and so on. Again, according to (Lemoalle et al. 2011) West Africa has face variations in the rainfall regimes, and it has implications on the water management. This has greatly affected the inflow of water from the tributaries of Lake Chad especially the Chari River. According to him, the decade between 1950 and 60 is wet and the subsequent were dry.

Unsustainable irrigation practices, large irrigation projects by the riparian countries have much contributed to the drying tragedy of the lake. According to Onuoha (2008), the water diverted for irrigation between 1983 and 1994 has accounted for 50% of additional decrease of the lake. As a result, the lake lose its carrying capacity, thus lose its ability to replenish itself. According to Sambo (as cited in Onuoha, 2008), in spite of the deteriorating condition of the lake, researchers have forecast the increase of population by 75%.

### **Impacts of Lake dry up to Human Livelihood**

Impact of natural resources degradation and depletion on livelihood is often instigation of conflict. The conflict starts between the immediate users and the beneficiaries of the resources before it extends to the greater community. The demand for the resource goes up while the supply comes down, as a result the competition warms and the air before the beneficiaries becomes thicker. According to Onuoha (2008), conflicts among and between farmers, pastoralists, fishermen and a times the security agents, most times transformed into larger ethnic or inter-state conflicts. According to him the ongoing crisis in the northeastern Nigeria is highly linked to the drying Lake Chad.



Apart from support to livelihood and serving as a source of fresh water for domestic uses the lake serves as the as source of water for agriculture. Production of economic and food crop was base on availability of the water.

In Nigeria, the North-Eastern region is one of the regions devastated by high level of poverty. Poverty in the region will be exacerbated as a result of shrinkage of Lake, which will contributes to crop collapse, death of livestock, dwindling of the fishing industry, increase in salinity of the soil and economic livelihoods breakdown.

Study in Alaska has show that, limited access to water has consequences on health care. According Hennessy et al. (2008), studies in Alaska have shown higher pace hospitalization among children less than 3 years old for respiratory and virus infections and higher rates of dermal infections in people of all ages in villages with the majority of the houses having very limited access to water, compared to homes with higher access to water because of pipe-born water.

### **Remedies**

The political will of protecting water bodies need to be there. Commitment of the political leader will support the community leaders and other interesting NGOs. The local communities are the immediate beneficiaries and victims of the changes, there is a greater need to put them part of the management of the resources and as well part of the decision making process. The community should be just considered as stakeholders rather as participants whose participation and knowledge are highly needed to ensure success of projects and their sustainability.

### **Implication of this Review**

The review was clearly an important part of the paper. It has opened our eyes on so many concepts about the research topic. We do understand after the review that the work being done by others in the field of

hydrology is so important and related to this paper. Though this kind of study is first being done on the lake in question, still there are many other ways to advance the research further. Lake Chad is one case scenario that was very close to our study, although there are few differences but they do have a lot in common.

### Summary

My initial believe about the causes of lake shrinkage and drying is mainly because of global warming, thought, that hasn't been wrong completely. It was clear after the review that some other factors as demographic change and unsustainable exploitation are first class contributor to lake dry up. One common thing that was obvious is that all of the three factors are exacerbated by anthropogenic interference with environment. The impacts are not limited to humans but the entire ecosystem in the area of the lake and in most cases beyond.

### METHODOLOGY

The research was conducted over the period of the 2015 presidential election, from 29<sup>th</sup> of March to the 1<sup>st</sup> of April 2015. The questionnaires were administered in the field with the help of a friend who understand and could speak Hausa. Some other good methods of grabbing information were by asking important questions that were not on the questionnaire, visual monitoring and shooting pictures. Some of the interviews were quite not very formal, that way the information gotten was really vast. Some of the village leaders and pioneers farmers and fishermen were interviewed.

### RESULTS AND DISCUSSIONS

Almost all of the environmental problems we faced today are believed to be caused by human reckless interaction with the environment. Though, the consequences of their actions are not only felt by them but other organisms in the ecosystem. The major dangers posed to the lake are: too much fetching, sand deposit, pollution and less rainfall according to

some few respondents. Fetching covers all kind of human activities that take water out of the lake; these include irrigation, animal watering and fetching for other minor industrial and domestic uses. Fetching as a form of human consumption has posed a great danger, 41 people out of the 50 respondents consider the rate of fetching as unsustainable. Irrigation farmers among the respondents explained the correlation between increased number of farmers around the lake and the facilitated drying of the lake. According to Lawal Shugaba, one of the leaders of farmers, increasing number of farmers should be taken into account when it comes to drying up of the lake.

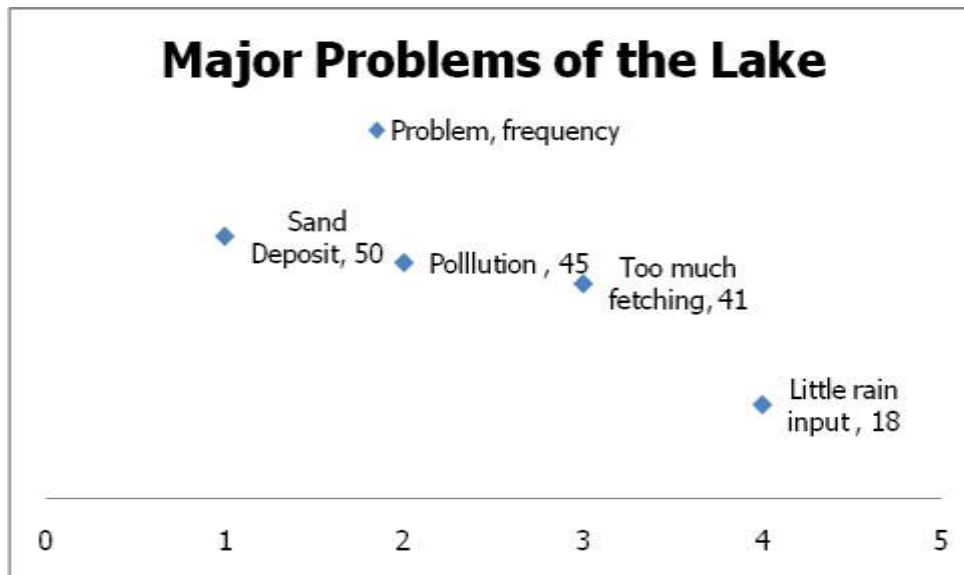


Fig. (1): Ranking of the problems confronting the lake.

Sand deposit as a problem to the lake has been ranked the most threatening by all the 50 respondents. All of the respondents believed the cause of the drying is primarily because the deposited sand in the lake due to erosion from the upper part to the downstream. According to 90% of the respondents, pollution of the lake is another serious problem that the lake is suffering in this decade. Improper waste disposal and managements always plays an important role in preventing and/or handling pollution issues. Washed rubbish from the town especially the

polythene bags, sacks and bottles by rain are directly deposited into the lake. Little rain input isn't a serious issue to the lake, though there were a reasonable number of farmers reporting that the amount of rainfall is decreasing with years. Among all the problems listed on the questionnaire, little rainfall input in the least important contributing to the rapid drying up of the lake, only 36% of them see it as a problem.

The first incidence of drying of the lake is very important to the research. It was widely seen from the response of the respondents that the first incidence can be date back to less than a decade. Since after the first incidence, it was widely believed that the lake continually dries up every year. The drying period in every year is widely accepted to be between one to two months before first rain of a new season falls.

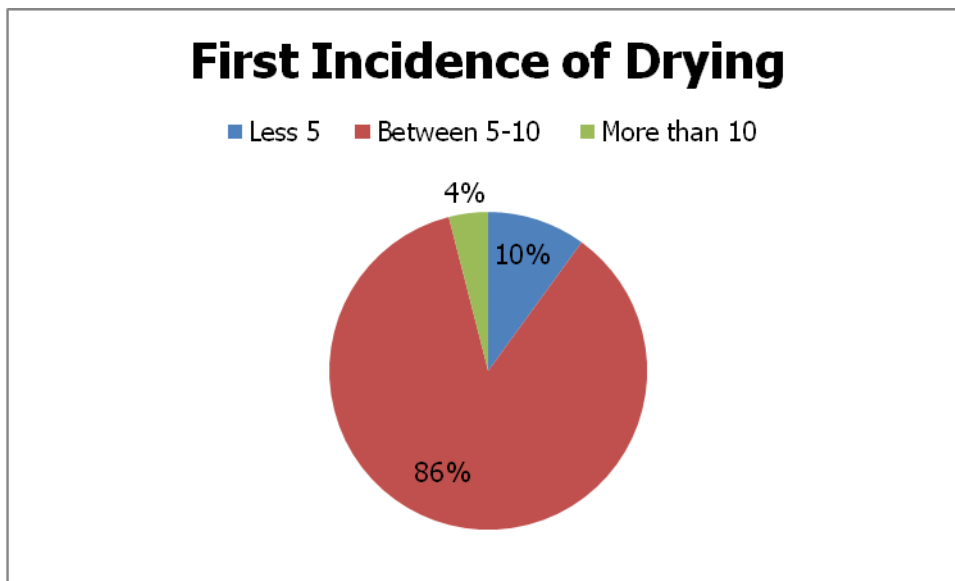


Fig. (2): Graph showing the percentage believes of the respondents about the beginning of the drying incidence in years

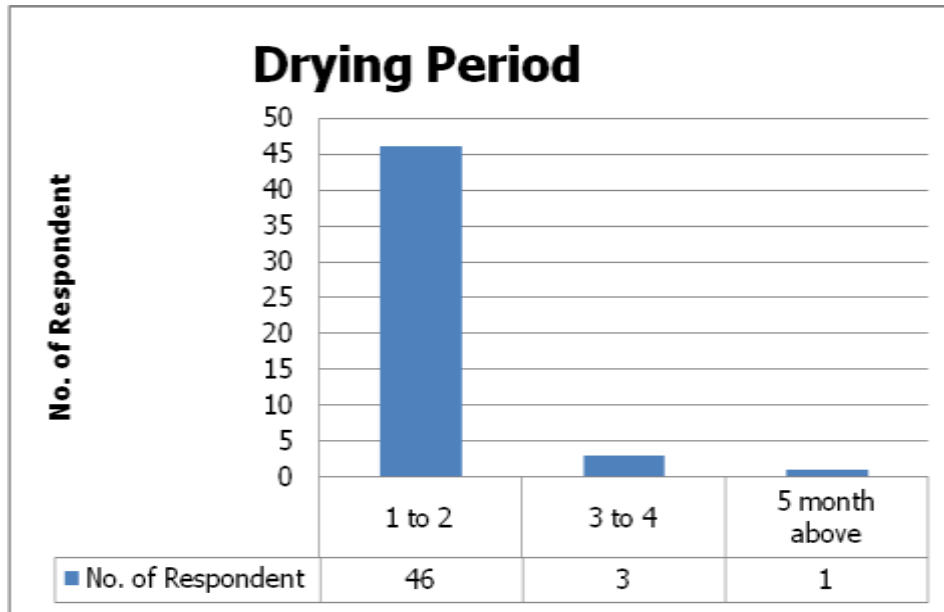


Fig. (3): Graph showing the responses about the drying period in month

The common two parameters of climate change that are easily understood by local people, especially farmers can be changing rainfall and average temperature. Rainfall is such an important factor to the farmers that they consider while critically selecting the crop to farm. To successfully do that, they monitor the amount, the starting time of rainfall and the duration it will take raining. Being rainfall such an important parameter to farmers, over 60% of the respondent believed strongly that precipitation pattern is decreasing. This strongly affirmed that the change happens as a result of climate change. 80% of the respondents affirmed that average temperature is increasing.

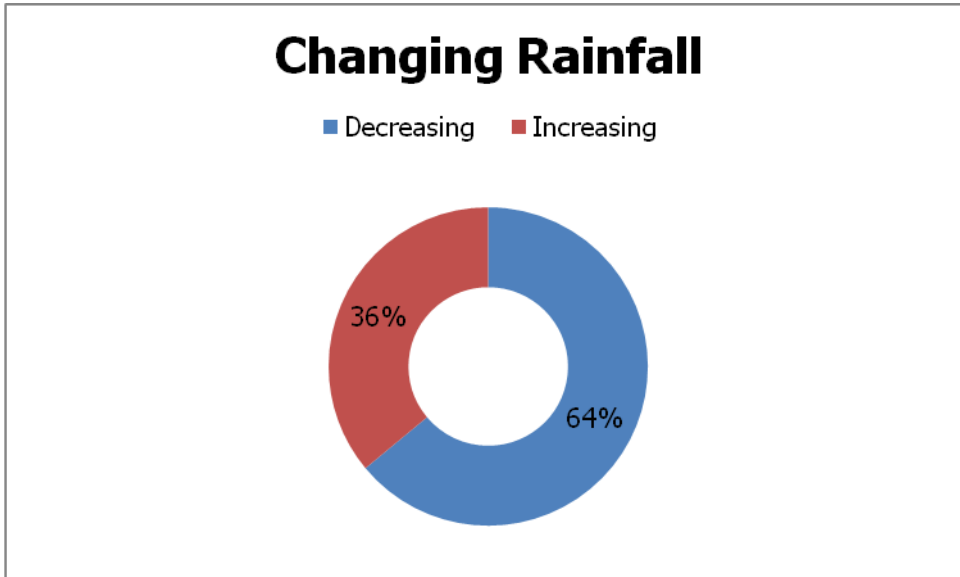


Fig (4): Graph showing the percentage of the respondents' believes about the changing rainfall

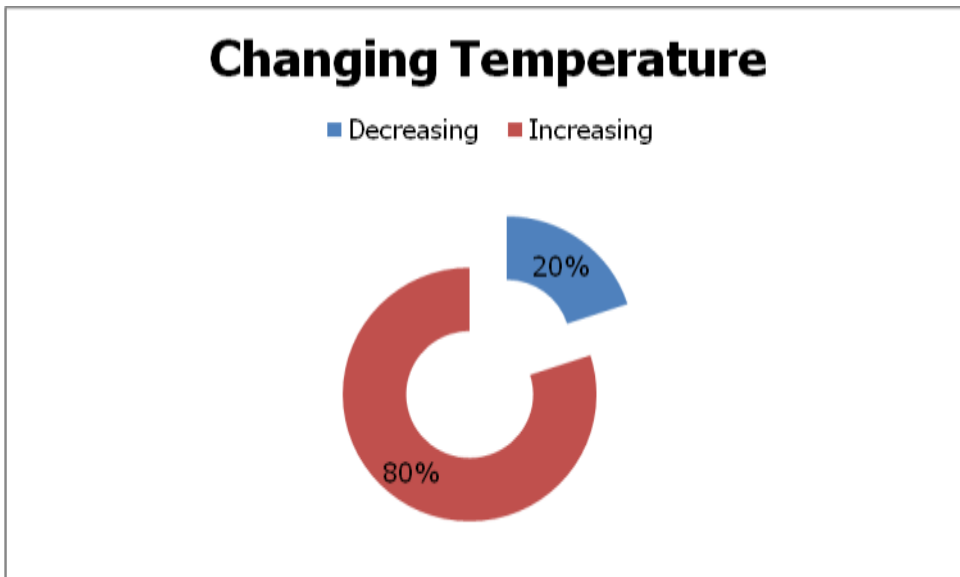


Fig. (5): Graph showing the percentage of the respondents' believes about the changing average temperature

## CONCLUSION

It is clear that Lake of *Dudi* is facing one of its worse decade in the history. Many of the problems are caused by unprecedented demand of

its resources. Referring back to the problems index of the lake, sand deposit caused by excessive erosion is a key player in filling up the lake with sand. The water holding ability of the lake is reduced significantly. Compounded with increasing number of irrigation farmers around the lake, the issue has now emerged to whole new level. Although the sand deposit is a major problem, but the increasing number of farmers is the instigator to the yearly drying of the lake. Of course improper waste management has impacted on the environment either directly and/or indirectly. The direct impacts of improper management of waste in our case are on the farmers and the fishers, as it affects their livelihood. While the indirect is on the community, as they rely on the lake for some of their domestic needs.

Little rain input is a not as serious as most environmentalists will imagine hearing about the *Dudi* lake scenario. It is ranked as the lowest problems in all the set of problems. Even though, majority of them do believe in the decreasing amount rainfall in this decade compared to decades back, but as a major concern to the drying of the lake they believed little rainfall input is not. With a high number of the respondents believing in the increasing average temperature and the changing raining pattern, climate change is happening.

## RECOMMENDATIONS

To curtail this gigantic problem confronting our community, the task is beyond government only but our individual actions and choices as well will make lasting impacts. The following are some of the most important recommendations:

- a) Government should see the importance of the lake to the livelihood of the community and urgently commence excavation and expansion of the lake.
- b) To reduce the amount of sand deposit being washed into the lake by rain, proper water channels should provided in the town.

- c) There should be proper waste disposing guide lines and infrastructural provisions, to address the issue of improper waste disposal
- d) Waste piles and dumping sites should be kept far ways from water ways and hilly locations
- e) Government should take full responsibility of monitoring the number of irrigation farmers around the lake and set regulations to govern their activities
- f) There should be a strong cooperation between the farmers and the fishers so that they can monitor and speak out of any damage-causing activities by either individuals, or industries.



**Fig. (6): Picture showing the drying lake with few water remaining polluted with many polythene bags**





Fig. (7): Picture showing the vast dried area of the lake



**Fig. (8):** picture showing the dried, polluted and sand filled part of the lake



**Fig. (9):** Picture showing the polluted bank of the lake with animal steps after water drinking



Fig. (I0): Picture showing some of the irrigations farms



Fig. (II): Picture showing another polluted site of the lake



Fig. (12): Picture showing a fisherman on fishing in the little water remaining in the lake



Fig. (13): Picture showing collapsing farms due to no or little water from the lake to irrigate

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