SURFACE WATER FLOODING IN DAGONA: PROBLEMS AND PROSPECTS.

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Abstract
The study was an attempt to assess the causes of surface water flooding in Dagona, level of damages caused by the flood and the aftermath prospect that was hitherto derived from the event was also evaluated. The total number of wards in Dagona was twelve. The researcher employed a non-probability sampling techniques to determine the sample in Dagona community to represent the major flood prone areas. Dagona has a population of 8,000 people (Census, 2006) out of which a total of sixty respondents (five people from each of the twelve wards form the sample to fill the questionnaire using the sample size calculator at a prevalence of 0.5. Findings revealed that flooding has dangerously affected only three areas out of these twelve. The affected areas include: Filatari, Unguwar zango, and Takarin gida. It was found that heavy rainfall, inadequate drainage facilities and mismanagement of water reservoirs are the major causes of the flood disaster in the area. However, other factors like infestation of water channels, topography, and lack of vegetation in the area might have played a great role. Recommendations were made to curtail the future occurrence of the disaster and areas of further research were also proposed.

Keywords: Surface water, flooding and Dagona

Introduction

Dagona is a riverine community situated in relatively flatland in Northern part of Yobe state and also is the former Bade West Local Government Headquarter. Dagona village lies along the famous river Yobe, few kilometers from convergence of River Jama'are and Hadejia, as narrated by the village head, 2022. According to the last national population census in 2006, the

population of Dagona was about 8,000 persons. This community experienced an annual average rainfall of 500 to 1000mm with maximum summer temperature range of 38°C to 40°C (March-April) and minimum temperature of as low as 23-28°C (December-January) during winter (NIMET, 2010). The spoken language of the indigenous people of this village is Bade. Dagona is one of the most developed villages in Bade West and was regarded to have both economic and ecological relevance to the entire ecosystem of this region which is largely associated with the location of the village within Nguru-Gashu'a Wetlands.



Fig 1: Dogona village (drainage facility)

Dagona settlement is primarily known as fishing and farming community almost a hundred years ago (According to the village head, 2022). Some of the inhabitants of Dagona are notably immigrant fishermen (According to the village head, 2022). The average monthly income per person is said to be between 10,773 Naira to 15,000 Naira monthly (According to the village head 2022). There were various occupations found in Dagona but the major occupation found in the settlement are fishing, farming and trading (According to the village head, 2022).

Dagona village is having a coast of river Jama'are-Hadejia and some villages in Yobe state area, often faces surface water flooding challenges over the years (the village head, 2022). However, the recent water flooding had devastated various areas that had connection with the village (the village head, 2022). Indeed, considering the catastrophic situation of water flooding experienced by most Dagona inhabitants we ought to known what the term water flooding means.

Flooding is a situation in which an area is covered with water especially from rainfall or darm-breck or snow melt (Mukhopadhayay, 2010) as contained in Yunusa H et tal (2019). Moreover, the flooding could also be caused by intrusion of sea water or coast land during cyclone.

Flooding is a disaster which occurs when the content of a river valley over flows it banks to surrounding areas (Yunusa H, 2016) as contained in Rafferty J. P (2011)

The flooding in various parts of Nigeria have forced thousands of people away from home, and also destroyed businesses (Olorafemi, 2011) as contained in Yunusa H et tal (2019). The surface of water flooding in Nigeria have attributed pyrography soil vegetation river attraction increased heavy rainfall, uncontrolled waste dumping, land use change and unplanned urbanization (Adeloye, 2011) as contained in Abumere S. et tal (2002).

Flooding is one of the most destructive of all natural hazard, in 25years ago analysis revealed that 39% of death from natural hazard had been causes by water flooding (Hoyois, 2013) as contained in HassanY et tal (2018).

Methodology

Introduction

The chapter was designed to present the material and method used for the purpose of this study. The study was an attempt to assess the after math of surface water flooding in Dagona and how it affect education, and suggest ways of controlling/mitigating the future occurrences of the flood in the area.

Methods of data collection

The data was collected using survey involving the use of questionnaire/interview to ascertain the nature, frequency, causes and consequences of flood disaster in the study area. The questionnaire is made up of systematically designed questions based on the research problem. The Questionnaire was translated into Hausa language (the language which the respondents understand better) due to considerations of their literacy level. In this study, 60 questionnaires was distributed in Dagona, and from each ward, 5 people were used as sample. These people include 2 youths, 2 old men and 1 female making 5.

Sampling frame and technique

The researcher employed a non-probability sampling techniques in determining the sample in Dagona community, to represent the major flood prone areas. Dagona has a population of 8,000

people (Census, 2006) out of which a total of 60 respondents (five 5 people from each of the twelve wards form the sample to fill the questionnaire using the sample size calculator at a prevalence of 0.5.

Sample size

A sample size indicates the proportion of a research population adequately selected to represent the study population characteristically (Krejcie and Morgan, 1970). The sample size of this study was determined using the Sample Size Calculator for Prevalence Studies (SPSS) version 1.0.01. The sample size calculator software was developed by Naing, et al (2006) to determine sample size of a known (finite) study population. The software uses the following formula in determining the sample size:

$$n = \frac{NX^2P(1-P)}{d^2(N-1)+X^2P(1-P)}$$

Where

n = sample size

N = Population Size

(a) X^2 = Chi-square value for a selected confidence level (at 1 degree of freedom) P = Expected prevalence proportion (e.g. if the prevalence was 30%, P = 0.3), d = Precision (e.g. if precision is 5%, d = 0.05). Hence, the causes of surface water flooding in Dagona may be categorized into three (3): (a) Due to heavy rain fall, (b) Due to improper and inadequate drainage system and (c) Due to both (a) and (b) above.

(a) Causes of Water Flooding Due to Heavy Rainfall

Table 3.1 Sample Size

DAGONA CUMMUNITIY	NO. OF RESPONSE	PERCENTAGE (%)
Gatapzako	5	80.20
Gatapliki	5	75.80
Madari	5	80.23
Karin Agada	5	77.70
Tukudi	5	88.00
Madanabi	5	85.30
Ufdan Miya	5	78.80
Gasaktite	5	88.80
Karin Mada	5	79.95

Anguwar Zango	5	89.95
Takarin Gida	5	88.90
Filatari	5	89.72
Total	60	100%

Source: Research's Survey, 2022

(b) Causes of Water Flooding Due to Improper and Inadequate Drainage System

Table 3.2 Sample Size

DAGONA CUMMUNITIY	NO. OF RESPONSE	PERCENTAGE (%)
Gatapzako	5	33.71
Gatapliki	5	30.22
Madari	5	33.11
Karin Agada	5	38.21
Tukudi	5	29.28
Madanabi	5	39.00
Ufdan Miya	5	32.33
Gasaktite	5	31.21
Karin Mada	5	22.20
Anguwar Zango	5	42.66
Takarin Gida	5	40.81
Filatari	5	38.90
Total	60	100

Source: Research's Survey, 2022

(c) Causes of Water Flooding Due to both (a) and (b) above

Table 3.3 Sample Size

DAGONA CUMMUNITIY	NO. OF RESPONSE	PERCENTAGE (%)
Gatapzako	5	75.25
Gatapliki	5	70.31
Madari	5	43.25
Karin Agada	5	33.32
Tukudi	5	34.81
Madanabi	5	43.25
Ufdan Miya	5	42.11
Gasaktite	5	50.20
Karin Mada	5	48.11
Anguwar Zango	5	88.21
Takarin Gida	5	92.22

Filatari	5	88.33
Total	60	100

Source: Research's Survey, 2022

Results and discussion

Analysis of Demographic Variables

The demographic variables of the respondents were analyzed and discussed as follows:

Table 4.2a Residential Status of Flood Victims

Residence Status	No. of Response	Percentage (%)
Indigene	50	85.50
Non-indigene	10	14.50
Total	60	100

Source: Field Survey, 2022

Table 4.2a shows the residential status of the respondents. From the table it was indicated that 85.5% of the respondents were indigenes while 14.5% were nonindigenous or settlers. This revealed that majority of the residents are indigenes and as such they are in the right position to give account of the risks and damages associated with the flood disaster in the areas over the years.

Table 4.2b Period of Time Victims Residing in the Area of research

Duration	No. of Response	Percentage (%)
0-2 years	8	2
3-5 years	12	3
6-10 years	14	10.25
Over 10 years	26	84.75
Total	60	100

Source: Field Survey, 2022

Table 4.2b shows the period of time the flood victims have being residing in the research area. It was indicated that 84.75% of the victims resides for over 10 years, 10.25% resides for about 6-10 years, 3% for about 3-5 years and 2% for less than 2 years.

These findings revealed that majority of the victims are residents of the area for over 10 years. This period however, falls within the temporal scope of the study (2022). Thus, it supports the

findings discussed under table 4.1a that the respondents were in the best position to give an account of the risks and damages associated with flood disaster in the area.

Most Common Environmental Disasters in the Study Area

Table 4.3a Most Common Environmental Disasters

Environmental Disasters	No. of Response	Percentage (%)
Flood	45	99.75
Desertification	10	17.75
Droughts	3	5.20
Erosion	2	3.10
Total	60	100

Source: Field Survey, 2022

Table 4.3a shows the distribution of the most common environmental disasters occurring in the area of the research. From the table, 99.75% identified flood as the most common environmental disaster in the research area, 17.75% shows desertification as another common environmental disasters while 5.2% indicated droughts, and 3.1% shows erosion as another environmental disasters occurring in the area, in that order.

From the findings it is obvious that majority (almost all) of the respondents (99.75%) identified flood as the most common environmental disaster in the area, followed by erosion (mainly gully) which occurs perhaps as a result of the persistent floods.

Table 4.3b Nature and Magnitude of Flood Disaster in the Area

Nature of Flood	No. of Response	Percentage (%)
Devastating	50	97.50
Non-disastrous	10	2.50
Total	60	100

Source: Field Survey, 2022

Table 4.3b shows the nature and magnitude of flood disaster in the study area. From the analysis 97.5% of the research respondents indicated that the flood disaster occurring in the affected areas was devastating in nature over the years, while 2.5% shows that the flood is not devastating in nature. This finding revealed that flood disasters were often accompanied by tragedies and serious risks and damages to socio-economic and environmental features in the areas. The flood disaster usually forces thousands of people away from their homes, destroys thousands hectares of farmlands, properties worth millions of naira, and pollutes drinking water sources.

Frequency of occurrence and level of flood risk

Table 4.4.1 Frequency of Flood Occurrence

Frequency	No. of Response	Percentage (%)
Annually/Regularly	45	68.50
Periodically	15	31.50
Total	60	100

Source: Field Survey, 2022

Table 4.4.1 shows the frequency of flood occurrence in the study area. From the analysis 68.5% of the respondents indicated that the flood occurs regularly while 31.5% shows that the flood occurrence was periodic. From the analysis, majority of the respondents identified the flood as an environmental disaster that occurs regularly. This revealed that flood disaster occurs almost every year in the study area as shown in the figure below.

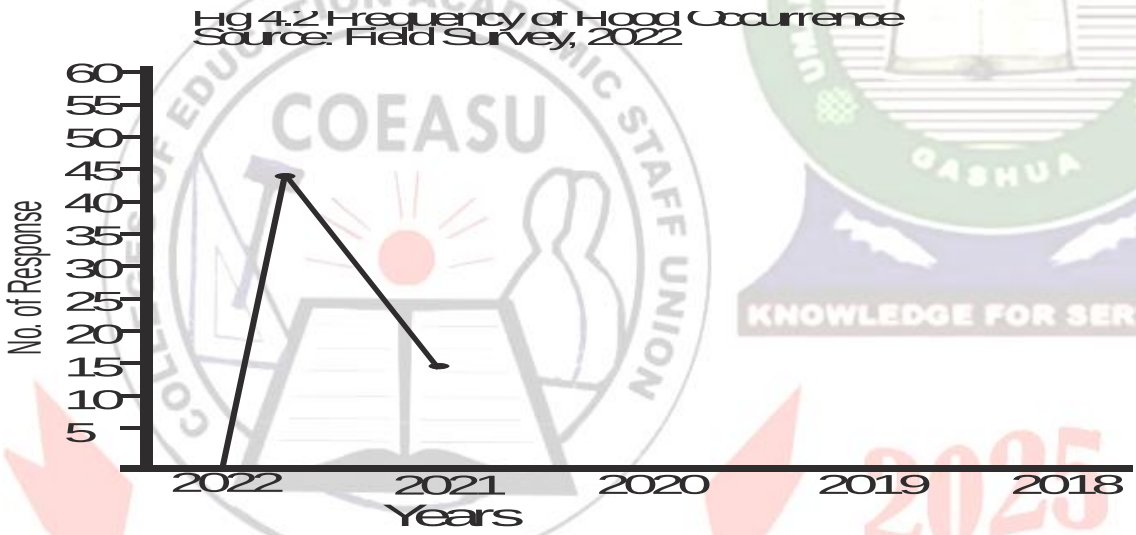

Figure 4.2 shows flood disaster occurrences within the temporal scope of the study (2022). From the analysis it is obvious that significant number of the respondents indicated that flood disaster has occurred over the years. The trend line shows that the highest incidence was in 2022. From the result obtained, it was indicated that the flood disaster may occur after every year interval in the area. These findings therefore revealed that the frequency of flood occurrence is very high and alarming over the years. The finding was in line with the assertion of the United Nations Environment Program (UNEP, 2003), that among all other natural environmental disasters, flood has the highest frequency of occurrence, wider coverage and highest impacts.

Causes of flood disasters in the area

The results and finding on the causes of flood disaster in the area of study were presented and discussed as follows:

Table 4.5a Causes of Flood Disaster in the Area

Causes	No. of Response	Percentage (%)
Heavy Rainfalls	25	20.25
Normal Rainfalls	10	8.21
Inadequate Drainage Facilities	15	12.22
Mismanagement of water reservoirs (Dams)	5	3.22
Siltation/Infestation of water channels	5	3.22
Total	60	100

Source: Field Survey, 2022

Table 4.5a shows the responses of flood disaster victims on the causes of flood in the affected areas. From the analysis, 20.25% of the respondents believed that flood occurs as a result of heavy rainfalls. 8.21% indicated that normal rainfalls of long duration also causes flood, 12.22% indicated that flood occurs as a result of inadequate drainage facilities, 3.22% as a result of mismanagement of water reservoirs (Dams) and 3.22% indicated that siltation/infestation of water channels by sand and water weeds contributes to flood occurrences in the study area. From the analysis, it was obviously revealed that heavy rainfall (20.25%) is the major cause of floods in the area.

This finding however corresponds to that of Alex (2009), who asserted that intensive rainfall is the most common cause of flooding. According to him, intensive rainfall results in soil saturation which leads to increased surface runoff into the surrounding water channels, thereby exceeding the channel's capacity and consequently flood occurs. The finding was further strengthened by the correlation between the victims' response on the frequency of flood occurrence and the rainfall amounts in the study area. The correlation is shown in the table below:

Table 4.5b Relationship between rainfall amounts and flood occurrences

Year	Rainfall	Flood Occurrence
2022	727.34	345
2021	653.38	246
2020	660.31	235
2019	662.26	296
2018	654.5	268
	Correlation 0.668572	

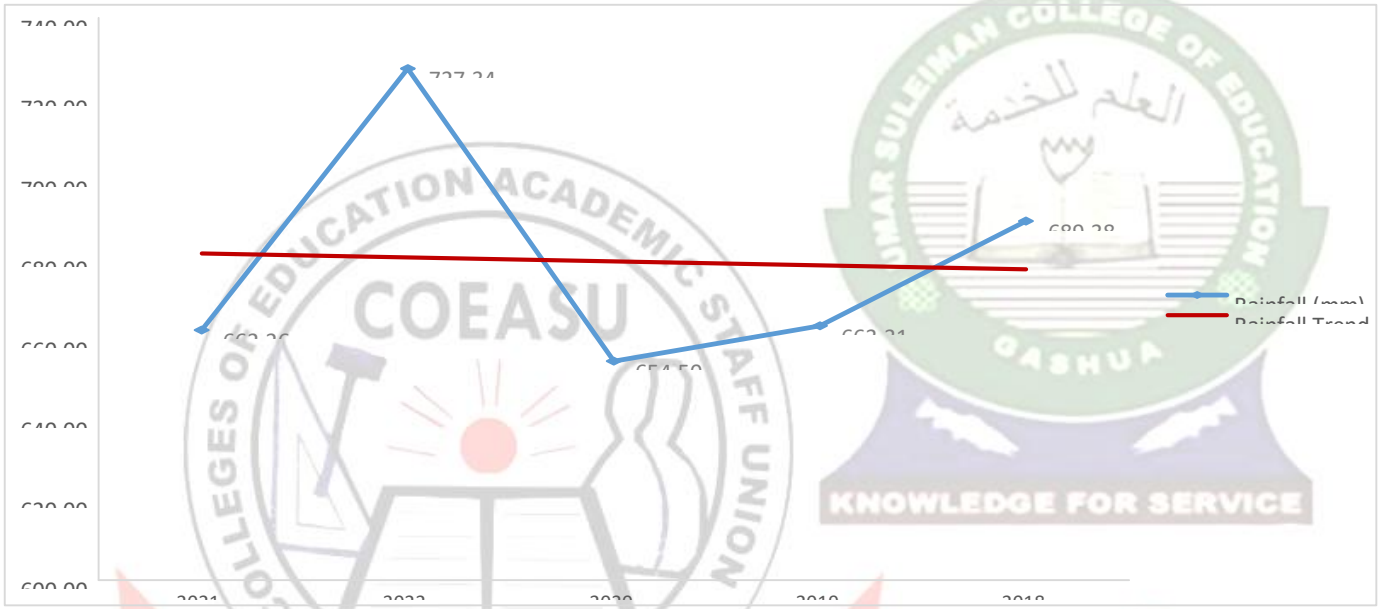

Fig. 4.3 Rainfall pattern over the last five years 2018-2022)
Data source: Yobe Agricultural and Rural Development Authority (YARDA, 2022).

It further indicated that the trend was almost stable over the years, and this could serve as another justification for recurring flood disaster in the study area over the years.

Findings also revealed that inadequate drainage facilities (75.25%) and mismanagement of water reservoirs were among the major causes of flood disaster in the affected areas.

VARIABLES/ASPECTS	LEVEL OF DAMAGE							
	Serious Damage		Less Damage		No Damage		Total	
Response	No.	%	No.	%	No.	%	No.	%

Table 4.6a Level of Flood Damage to Infrastructure

Houses	25	71.5	15	21.25	10	7.5	60	100
Roads	15	46.75	17	39.25	20	14	60	100
Electrical Gadgets	10	29.5	16	28.25	15	42.25	60	100
Health and Health Facilities	5	14.5	6	35	5	35.5	60	100
Lives	5	14.5	6	39.25	10	14	60	100

Source: Field Survey, 2022

Looking at this analysis however, majority of the victims indicated that flood disaster poised serious damages on their houses. This revealed that the level of damages caused by flood disaster on houses was severe and critical. This finding is in line with the assertion of made by Jinaidu (2015), that whenever flood occurs, it usually causes serious damages to several houses in the affected areas.

Table 4.6a further shows analysis of the level of damages caused by flood disaster on roads. From the analysis 46.75% of the respondent shows that the level of damage caused by flood disaster on roads was serious while 39.25% indicated that the level of damages on roads was less and 14% indicated that flood disaster does not caused any damage to roads.

The analysis of the level of damage caused by flood disaster on electricity and electrical gadgets was described in the table. From the analysis, 29.5% of the respondents indicated that flood disaster causes serious destruction to electricity in the affected areas. 28.25% indicated that the level of damage is less while 42.25% indicated that flood disaster does not affect electricity infrastructures in the affected areas, and thus, no damage was caused. The findings further revealed that the level of damages caused by the flood disaster on electricity network was minimal compared to other components like houses.

On the assessment of the level of damage caused by flood disaster to the health-facilities in the areas was 29.5% which indicated that flood disaster causes serious damages to health centers and health facilities, 35% indicated that the level of damage is less while 35.5% indicated that flood disaster does not cause any damage to health or health facilities in the affected areas.

On the assessment of the level of damage caused by flood disaster to lives, the analysis revealed that only 5.5% of the respondents indicated that flood disasters cause loss of lives. 18.75% indicated that the level of damage was acute while 76% indicated that flood disaster does not cost lives in the affected areas.

On average, the analysis revealed that flood disaster causes serious damages to infrastructures in the affected areas, with houses and roads having the highest level of risk as shown in fig 4.5e below:

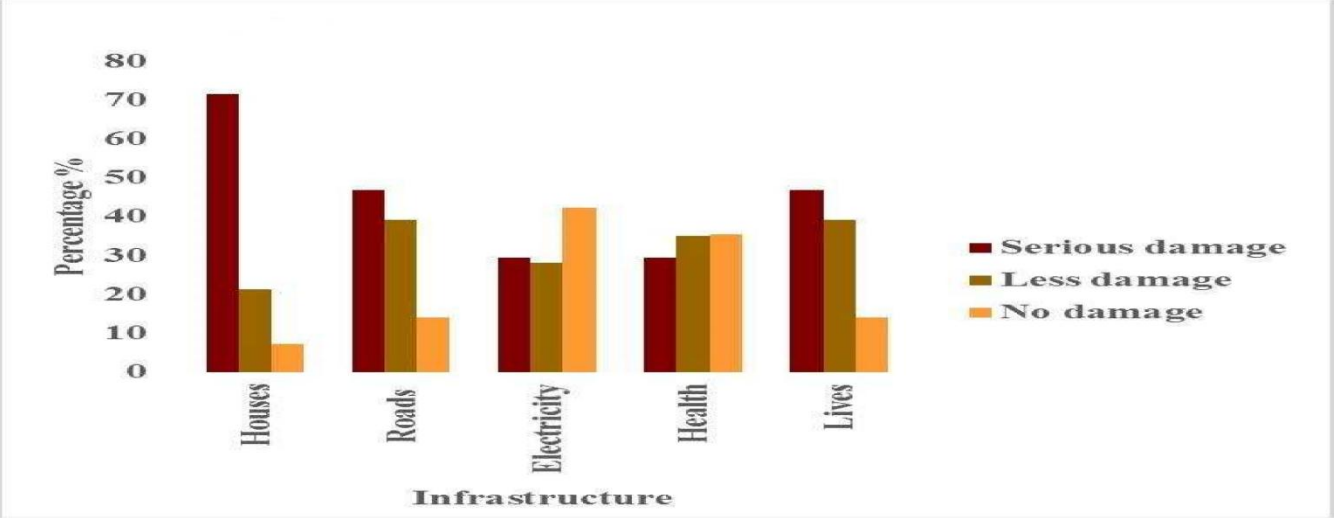

Fig. 4.5e Level of flood damage to Infrastructure Source: Field Survey, 2022

Level of flood damage on educational facilities

Table 4.6b Level of Flood Damage to Classrooms

Level of Damage	Percentage (%)
Serious damage	36.75
Less damage	37
No damage	26.5
Total	100

Source: Field Survey, 2022

Table 4.6b shows an analysis of the level of damage caused by flood disasters to classrooms. From the analysis, 36.75% of the respondents indicated that flood disaster causes serious damages to classrooms, 37% indicated that the level of damage is less and 26.25% shows that flood disaster does not caused any threat or damage to classrooms over the years. Findings from the analysis revealed that the level of flood damage on classrooms is limited. However, it is important to note that even though the level of damage was minimal, it has seriously affected educational activities in the areas. This is because the unaffected classrooms are usually used as relocation shelters/camps by flood victims during flood disaster events, and as such, normal lessons and school activities does not took place effectively.

Summary, Recommendations and Conclusion

Summary of the Major Findings

The research study examined and assessed the level of risk and damages associated with flood disaster in the study area and suggestions were put forward on how to prevent/mitigate the future occurrence in the area.

The total number of wards in Dagona was twelve (12). Findings from the study revealed that, flooding has dangerously affected only three (3) areas out of these twelve. These wards include: Filatari, Unguwar Zango and Takarin Gida. It was revealed that heavy rainfall, inadequate drainage facilities and mismanagement of water reservoirs (dams), are the major causes of flood disaster in the area. However, other factors like infestation of water channels, topography, and lack of vegetation in the area of study might have played a great role.

Recommendations

In order to prevent the future happening of flood disaster in the study area, the following measures was recommended:

(i) Building of Dikes and Levees:

Dikes and levees are embankments constructed to prevent flooding. Levees may be formed naturally or artificially. They prevent the water from overflowing and flooding the surrounding areas.

(ii) Removal of Refuse From Water Ways

Dump of refuse any how along the water ways may cause flooding. For this reasons dirt/left overs should be disposed only in a refuse bin and government should enact laws that will penalize defaulters.

(iii) Proper Management of Dams

The findings revealed that apart from the heavy rain fall in the area, inadequate drainage facilities and mismanagement of water reservoirs (Dams), were the major causes of the flood disaster in Dagona. Therefore, in order to the prevent future occurrences of flooding in the area, there is a need to rise to the challenge.

Conclusion

Flood disaster was the most devastating and the most frequent occurring environmental disasters in the study area. The fact that the flood disaster occurrences are often or sudden, and not well prepared for, poses serious risks and damages to socio-economic and environmental features of

the study area in terms of loss of lives, property damages, displacement of people, disruptions of school activities, socio-economic disruptions, and poised serious environmental issues. Although the flood disaster in the area was flash flood, mainly caused by heavy rainfall, lack of proper and adequate drainage systems, and rainfall cannot be stopped, risks and dangers of surface water flooding can be mitigated. It is hopeful that the suggested precautionary and preventive measures proposed, will go a long way in mitigating the future occurrences of flood disaster in the study area, and also enable the people in the flood prone areas live with the flood and appropriate its positive impacts.

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