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A CASE STUDY ON BAGALKOT FLOOD

Sushmita. Halavarthi[1], Apoorva. Kolur[2], Asha. B. Chavaraddi[3], Sheetal. A. Kavadimatti[4], Rahul. R. Bannur[5]

[1,2,3,4]B.E Student, Dept. of Civil Engineering, S.G.Balekundri Institute of Technology , Belagavi-590010 (Karnataka).
[5]Assistant Professor, Dept. of Civil Engineering, S.G.Balekundri Institute of Technology, Belagavi-590010 (Karnataka).

Abstract - *Bagalkot is the city which is surrounded by water all over. The flood may be the general factor but we interested in the field which is not affected by natural water bodies but various causes. The flood related study starts by searching of the causes, the various causes is identified by field visits, localities, media and the technical survey. The most flood affected area is found out in Bagalkot near Apmc. The effects of flood in study area is recognized by the field visits. The road which connects navanagar to muchkandi is the main area which is mostly affected by food, especially flash flood. Conducted several field visits and certainly located there the phenomenon like blockage of drainage, improper alignment, improper maintenance, land occupation. The objective of the study is to analise the scenario and figure out what needs to be done for the smooth and safer water flow. Considered monthly rainfall of 5 years from 2015 to 2019. This helps us for the design of drainage. After completion of analysis of problems and cause researched about few solutions. Some of are very economical and practically easier and suggested best suggestions for the nominal flood control.*

Key Words: *flash flood, drainage, nominal flood control*

1. INTRODUCTION

A flood is an overflow of water that submerges land that is usually dry. In the sense of "flowing water", the word may also be applied to the inflow of the tide. Floods are an area of study of the discipline hydrology and are of significant concern in agriculture, civil engineering and public health.

Flooding may occur as an overflow of water from water bodies, such as a river, lake, or ocean, in which the water overtops or breaks levees, resulting in some of that water escaping its usual boundaries, or it may occur due to an accumulation of rainwater on saturated ground in an areal flood. While the size of a lake or other body of water will vary with seasonal changes in precipitation and snow melt, these changes in size are unlikely to be considered significant unless they flood property or drown domestic animals.
Floods can also occur in rivers when the flow rate exceeds the capacity of the river channel, particularly at bends or meanders in the waterway. Floods often cause damage to homes and businesses if they are in the natural flood plains of rivers. While riverine flood damage can be eliminated by moving away from rivers and other bodies of water, people have traditionally lived and worked by rivers because the land is usually flat and fertile and because rivers provide easy travel and access to commerce and industry.

Some floods develop slowly, while others can develop in just a few minutes and without visible signs of rain. Additionally, floods can be local, impacting a neighborhood or community, or very large, affecting entire river basins.

2. PROFILE OF BAGALKOT CITY

Bagalkot, is a city in the state of Karnataka, India, which is also the headquarters of Bagalkot district. It is situated on branch of River Ghattaprabha about 481 km (299 mi) northwest of state capital Bangalore, 410 km (255 mi) southwest of Hyderabad, and about 570 km (354 mi) southeast of Mumbai. The population of the urban agglomeration was 111,933 according to the provisional results of 2011 national census of India, and the city is spread over an area of 49.06 square kilometers (18.94 sq mi) with an average elevation of 532 m (1,745 ft) above MSL.
Bagalkot is located at 16.18°N 75.7°E. It has an average elevation of 533 metres (1,749 ft). It is situated on the bank of the river Ghataprabha. The district of Bagalkot is situated entirely on the North Karnataka Plateau, which is part of the larger Deccan Plateau. Located in north-central Karnataka, Bagalkot is surrounded by Belgaum District to the west, Bijapur District and Gulbarga District to the north and north-east, Raichur District to the east and Koppal District, Gadag District and Dharwad District to the south-east, south and south-west respectively. It is positioned at 16°12′N 75°45′E and covers an area of 6593 km^2. Bagalkot district has nine taluks — Bagalkot, Badami, Hunagunda, Mudhol, Jamkhandi, Bilgi, Rabakavi Banahatti, Guledgudda. The average elevation in this area reaches approximately 610 m. The climate is warm and dry throughout the year and rainfall is scarce.

Bagalkot district receives the lowest rainfall annually in Karnataka. The average rainfall in the region is approximately 318 mm annually. The months of September and December account for about 52% of the total annual

rainfall. Bagalkot is devoid of large canopy tree vegetation; the region is semi-arid.

The Krishna River, Ghataprabha River and Malaprabha River flow through the region but are non perennial. Soil in the area can be categorized as either the majority black or minority red. Black soil retains moisture and is often used for the cultivation of cotton. Rabi and jowar are primarily cultivated in Bagalkot, as are groundnut, cotton, maize, bajra, wheat, sugarcane and tobacco.The district is also rich in mineral wealth. The village of Kaladgi, located 24 km from the town of Bagalkot, harbors copper. Iron ore also exists in the southern part of the district. Like much of Karnataka, the gneiss is the most common rock family. Common rock types in the region include greenstone, quartzite, sandstone and limestone. The dry climate makes the region susceptible to drought and crop failure.

3. KRISHNA BASIN

Krishna river is the second biggest river in the peninsular India originates in the western Ghats at an altitude of 1336.48 m above MSL near Mahabaleshwar in Maharashtra. Krishna River rises at Mahabaleshwar in Satara District, Maharashtra in the west and meets the Bay of Bengal at Hamasaladevi in Andhra Pradesh, on the east coast. It flows through Maharashtra, Andhra Pradesh, and Karnataka. The river has a number of tributaries but Tungabhadra is the principal tributary. The river flows quickly, causing much erosion in June and August. During this time, Krishna takes fertile soil from Maharashtra, Karnataka and western Andhra Pradesh towards the delta region. The river flows quickly, causing much erosion in June and August. During this time, Krishna takes fertile soil from Maharashtra, Karnataka and western Andhra Pradesh towards the delta region.

Fig -1: River Krishna basin

Krishna Basin extends over an area of 258,948 square kilometers which is nearly 8% of total geographical area of the country. The basin lies in the states of Andhra Pradesh (1,13,271 sq km), Karnataka (76,252 sq km) and Maharashtra (69,425 sq km).

4. CAUSES

Floods can occur under several types of conditions. Flash flooding occurs when it rains rapidly on saturated soil or dry soil that has poor absorption ability. The runoff collects in gullies and streams and, as they join to form larger volumes, often forms a fast flowing front of water and debris.

Floods most often occur in normally dry areas that have recently received precipitation, but they may be seen anywhere downstream from the source of the precipitation, even many miles from the source. In areas on or near volcanoes, flash floods have also occurred after eruptions, when glaciers have been melted by the intense heat. The identified problems which are responsible for flood in study area:

- Shape and size of catchment
- Irregular rainfall
- Land use, land cover
- Improper maintenance of drainage system
- Open canals
- Non working regulators

5. GEOGRAPHY AND ENVIRONMENT

All the factors of geographical environment climate is of vital significance in the study of land use of an agro-economic area, as it determines the activities of farmers and controls the production of crops to a great extent.

The climate of Bagalkot district is characterized by general dryness and healthy year is divided into four seasons; the summer season is from March to May and the southwest monsoon season which riches up to the end of September. October and November constitute the post monsoon season. The cold season is from December to February. The large variation in the rainfall year to year both in the amount and its distribution through the seasons render the district liable to drought and famine. The seasonal winds have profound effects on the climate of the district; hence it can be described as a tropical monsoon climate.

- TEMPERATURE:

The average temperature of the district is 33. 89° e. the minimum temperature is recorded in the month of January and it is 17° c and maximum temperature of May is 40° c, the mean maximum temperature in the monsoon months does not differ appreciably from that of the winter months. In the southwest monsoon there is little variation in the temperature, but there is slight increase in day temperature in the month of September and a secondly maximum reached in September.

- HUMIDITY:

The relative humidity refers to water evaporate present in the atmosphere and it is the single most important component of the air for standing weather and climate. The relative humidity is very high during the monsoon i.e. 82.35 %, ma>dmum at 8.30 hrs. It starts to increase from March till to the August and then onwards, there is a decrease (53.55 %) in its percentage.

- CLOUDINESS:

Sky is generally clear or lightly clouded during the months from December to March. Cloudiness begins to increase progressively from April and during the monsoon months. (June to October). The sky is heavily clouded on the most of the days.

- RAINFALL:

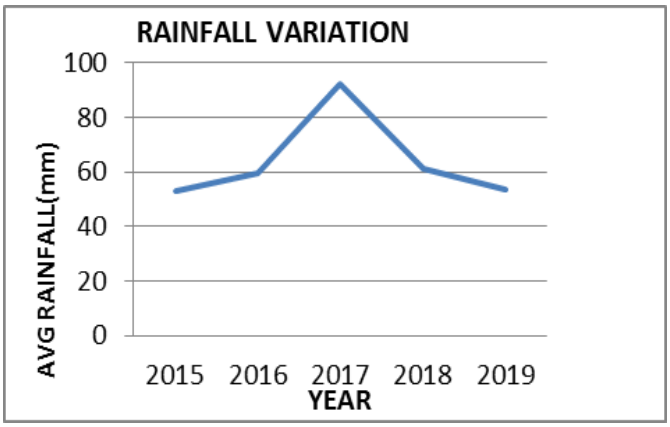

Chart-1: Graphical Representation of rainfall

- DISCHARGE:

Q = 0.0028 × C × i × A
= 0.0028×(0.35)×(2.4)×(15)
= 12.6×10^6 m3/sec

- TOTAL WATER FLOW:

The total water which affects the study area during flood:

V=Amount of rainfall flow after percolation + Amount of water flow through sluice gate
V =(1300*10^3)+(1260×10^3)
= 2400*10^4+130*10^4+164*10^4
=4560*10^4 lits/month

6. DRAINAGE AND THE CULTIVATOR

The drainage system of Bagalkot city comprises of 140 km length of Drainage network which includes primary and secondary drains. . The drainage system has box type trench on either side of the road, these drains further connect to the secondary drains and then to the open channel drains lined with concrete retaining walls. According to survey done by the govt the average depth of the drainage system varies from 1 m and average width varies from 1 to 2m,however the larger drains have max width up to 4 m.

6.1 Design of drainage

The existing drainages in study area are not in working condition. So the surplus water reaches the lower elevation part. Hence to avoid this, we designed the economical section of drainage, that is, trapezoidal shaped open type of drainage.

ECONOMICAL SECTION:
Ac = (1.8+1.8+2.4)m/2*(1.2)m
= 3.6m^2
P= 1.8m+2√((1.2m)^2)+(1.2m)^2
=5.194m
Rh = Ac/P
= 3.6/5.194
= 0.6931m

Substituting the given equation into manning's equations;
V= a/nACRh2/3S01/2 → 8m3/s
= 1m1/3/0.022(3.6m2)(0.6931m)2/3S01/2
=0.003897
It gives the slope to be SO=0.003897.

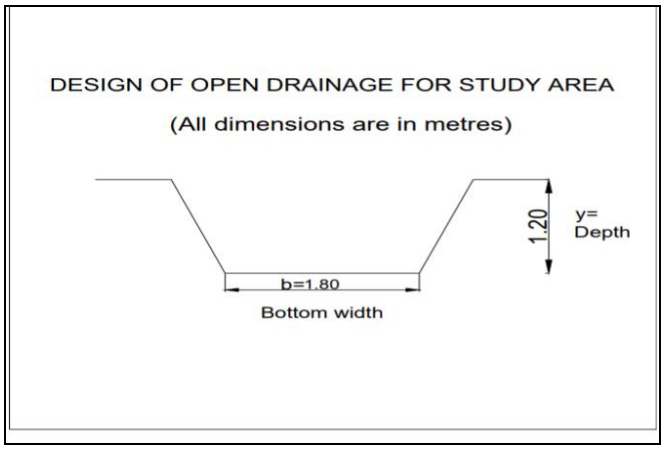

Fig -2: Trapezoidal shaped open drainage

7. EFFECTS

Floods have large social consequences for communities and individuals. The impact of flooding include loss of human life, damage to property, destruction of crops, loss of livestock and deterioration of health conditions owing to water borne diseases. Losses are as follows:

- Human Loss
- Property Loss
- Affects the Major Roads
- Disruption of Air / Train / Bus services

- Spread of Water-borne Communicable diseases
- Communication Breakdown
- Electricity Supply Cut off
- Economic and Social Disruption
- Increase in Air / Water Pollution

7.1 Flood relief informations

1) No of deaths cases, no of cases in which payment made, & reasons for non-payments if any.
No of Human Death Cases -03
No of Missing Cases –00
No of Cases which payment made- 03
Non-Payment cases -00

2) No of families Eligible for Gratuitous Relief,
no of families paid, balance to be paid & reasons for nonpayment if any.
No of Families Identified- 40187 No of
Families paid – 40187
Balance to be paid – 00

3) Total no of Relief Camps opened, no of Relief camps closed & no of Relief Camps actually working as on today
Total No of Relief Camps opened-242
No of Relief Camps closed-175
No of Relief Camps Actually
Working as on today-67

4) No of Relief Camp & No of Persons staying in the Relief Camps as on 25-08- 2019.
No of Relief Camps: - 67
No of Persons Staying in
Relief Camps-43,675

5) Fund requirement for different items in the format given by govt.
(In Crores)
Estimated Loss: - 2558.02
Relief sought: - 353.44

6) House Damage Survey Status
Total No of House damage – 24,956
(Survey is Under Progress)

7) Crop Loss Survey Status. (in Ha)
Agriculture Crop 66159Ha,
Horticulture CROP, 5528.5Ha
Sericulture – 63Ha
(Crop loss survey under progress)

8) No of Cattle Camps opened, no of cattle camps closed, no of cattle camps working & no of animals presents as on today also to be given.
No of Cattle Camps Opened –128 No of Cattle Camps closed 86
No of Cattle Camps working – 42
No of Animals Present in Cattle Camps on today – 8792

SUBMERGED AGRICULTURE CROP AREA DUE TO FLOODS (APPROXIMATE)

Submerged Area -5034 Ha
Crops :

- Green gram
- Sugarcane
- Maize
- Red gram
- Sunflower
- Bajra

SUBMERGED HORTICULTURE CROP AREA DUE TO FLOOD (APPROXIMATE)

Submerged Area -1612 Ha Crops:

- Pomegranate
- Guava
- Lime
- Papayas
- Onion
- Banana
- Mango
- Flowers

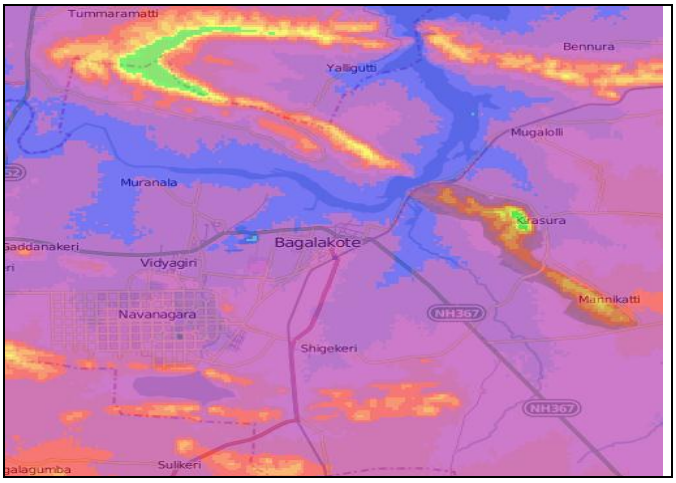

Fig -2: Satellite imagery showing submerged area of Bagalkot

8. REMEDIAL MEASURES

[1] Introduce better flood warning systems

Bagalkot must "improve flood warning systems", giving people more time to take action during flooding, potentially saving lives. Advance warning and pre-planning can significantly reduce the impact from flooding.

[2] Modify homes and businesses to help them withstand floods

The focus should be on “flood resilience” rather than defence schemes, concreting floors and replacing materials such as MDF and plasterboard with more robust alternatives.

waterproofing homes and businesses and moving electric sockets higher up the walls to increase resilience.

[3] Construct buildings above flood levels

Bengaluru should construct all new buildings one metre from the ground to prevent flood damage,conventional defences had to be supplemented with more innovative methods to lower the risk of future disasters.

[4] Tackle climate change

Climate change has contributed to a rise in extreme weather events, scientists believe. We have to find solutions to tackle climate changes.

[5] Protect wetlands and introduce plant trees strategically

The creation of more wetlands – which can act as sponges, soaking up moisture – and wooded areas can slow down waters when rivers overflow. These areas are often destroyed to make room for agriculture and development. Halting deforestation and wetland drainage, reforesting upstream areas and restoring damaged wetlands could significantly reduce the impact of climate change on flooding, according to the conservation charity.

[6] Restore rivers to their natural courses

Many river channels have been historically straightened to improve navigability. Remeandering straightened rivers by introducing their bends once more increases their length and can delay the flood flow and reduce the impact of the flooding downstream.

[7] Introduce water storage areas

introducing the water storage areas will control the flood water upto max extent .

[8] Improve soil conditions

Inappropriate soil management, machinery and animal hooves can cause soil to become compacted so that instead of absorbing moisture, holding it and slowly letting it go, water runs off it immediately. Well drained soil can absorb huge quantities of rainwater, preventing it from running into rivers.

[9] Put up more flood barriers

Temporary barriers can also be added to permanent flood defenses, such as raised embankments, increasing the level of protection. As the threat and frequency of flood risk increases, the use of passive flood defense has to be the only realistic long term solution.

[10] Wetlands

Wetlands span the surface/ sub surface interface, storage water at various times as groundwater, soil moisture and surface water. They are vital ecosystems that support wildlife and perform valuable ecosystem services, such as provide livelihoods for millions of people who live within and around them.

9. CONCLUSIONS

The respective project "A CASE STUDY ON BAGALKOT FLOOD" is basically concentrated on the flood affected BAGALKOT.

The main factor for the flood is rain fall, analised by the basis of the monthly rainfall data of the last 5 years and the rain fall variation is irregular. On the basis of data of outflow of water from the reservoir and the runoff after precipitation, the total volume of waterflow is computed. For this volume, design of drainage has been given as the drainages present in bagalkot requires proper maintenance. The effects of flood in study area is recognized by the status of effected places, published news papers and field visits. On comparing the satellite images of past and present, identified the exact locations with respect to longitude and latitudes which are the built up area of the previous water bodies. And certainly located the phenomenon like blockage of drainage, improper alignment, improper maintenance, land occupation and suggested the remedial measures for the same.

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BIOGRAPHIES

Sushmita. Halavarthi is B.E. Student, Dept. of Civil Engineering in S.G.Balekundri Institute of Technology, Belgavi – 590010, Karnataka India.

Apoorva. Kolur is B.E. Student, Dept. of Civil Engineering in S.G.Balekundri Institute of Technology, Belgavi – 590010, Karnataka India.

Asha. B. Chavaraddi is B.E. Student, Dept. of Civil Engineering in S.G.Balekundri Institute of Technology, Belgavi – 590010, Karnataka India.

Sheetal. A. Kavadimatti is B.E. Student, Dept. of Civil Engineering in S.G.Balekundri Institute of Technology, Belgavi – 590010, Karnataka India.

Prof. Rahul. R. Bannur is working as Assistant Professor, Dept. of Civil Engineering in S.G. Balekundri Institute of Technology, Belgavi – 590010, Karnataka India.