FLOOD FREQUENCY ANALYSIS & FLOOD INUNDATION MAPPING ALONG GODAVARI RIVER

Ankita Sakha[1] Dr. Sunil Ajmera[2]

PG Student[1], Professor[2]

Department of Civil Engineering & Applied mechanics

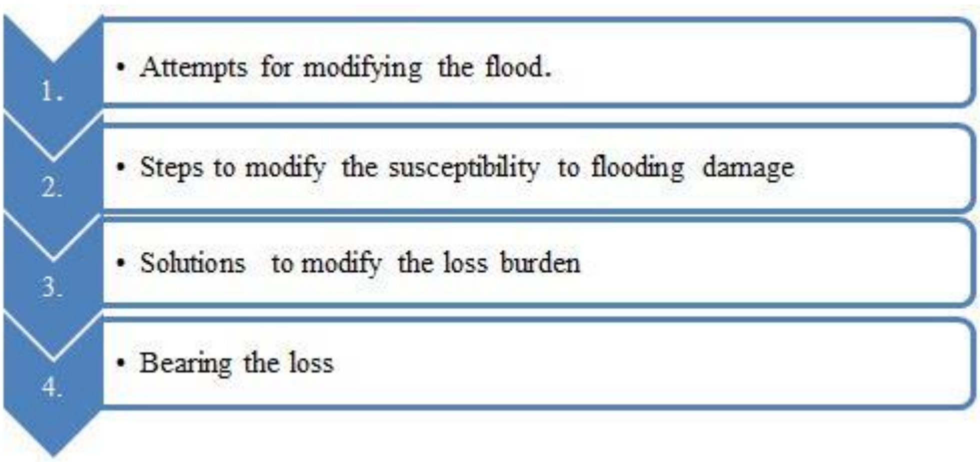
Shri G.S Institute of technology and science, Indore, Madhya Pradesh, India

ABSTRACT- The most extensive, disastrous & repetitive natural hazards of the world is flood. The flood risk areas are associated with the flood risk limit implementation and operation could prevent health and property damage from short-term and long-term flooding. From the available height data, the TIN is created. Then TIN location is transformed into a regular grid. The peak flow reflects the return periods of 50, 100, & 500 years and further using of data by HEC RAS used for creating the flood induction map.

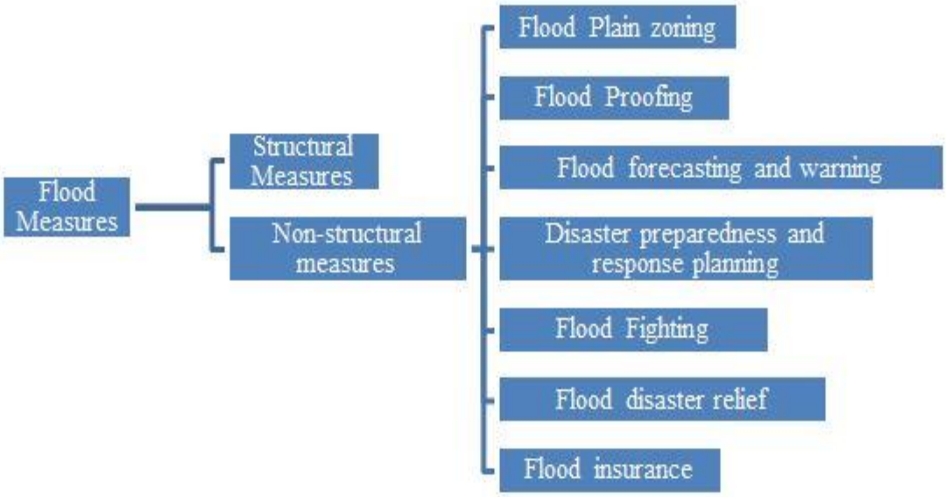
KEYWORDS: Flood Mapping, ArcGIS(Aeronautical Reconnaissance Coverage Geographic Information System), HECRAS ,Flood Frequency analysis

INTRODUCTION

The most extensive, disastrous and repetitive natural hazards of the world is flood. Within which India ranks second in the world. Flood takes over around 40 million hectares of the Indian subcontinent, which is around 1/8. Flood not only puts a negative impact on society but also affects the daily amenities and for these proper flood management is required. Hence flood management can be categorized into four main groups:



So as to reduce the flood not only management is required but for it proper measures are required as well :

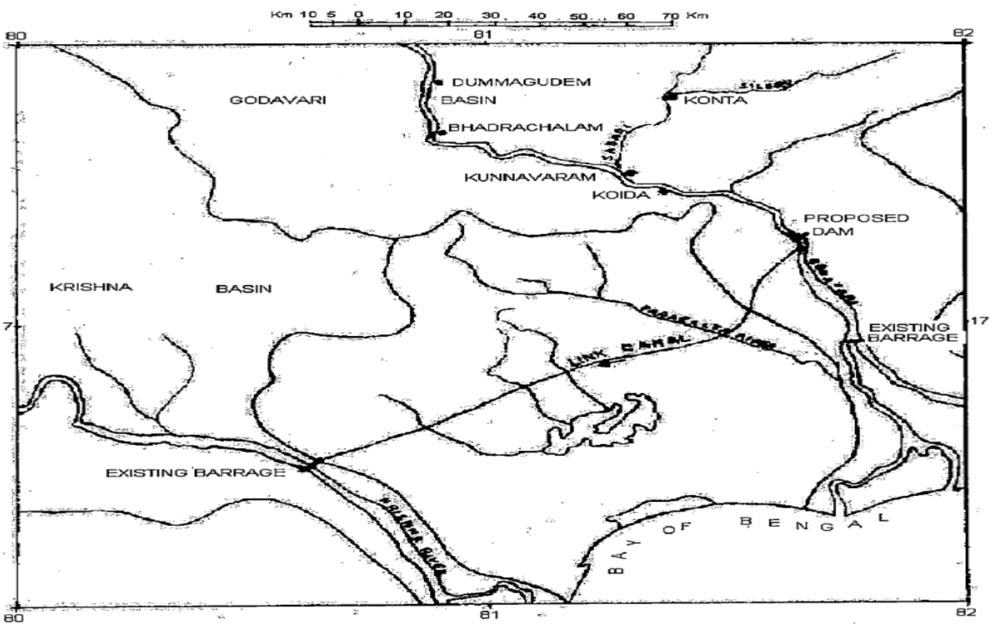


Given the nature of the flood control areas, a flood information system (GIS) is required. Integrated approaches to connect GIS with engineering models have been found out since the late 1980s which was part of GIS summation efforts to improve GIS analytical skills ("Sui and Maggio, 1999"). Despite of the effort, GIS was bounded in its ability to make any type of engineering model ("Yang and Tsai, 2000") & was limited to data storage, mapping , establishment & management, in food courses & GIS regularly indicates flood limits appearing under different approaches such as vector, raster & TIN (Azagraetal 1999). The "stand" of GIS has been seen as a major stumbling block with strong statements in the literature. "Until GIS has a clear time difference in data structures, its role will only be limited to data provider deployment, output output, and mapping device" ("Maidment, 1993").In detail study of the matter involved in flood risk and the parameters contributing to flood risk the risk maps to be used in geographical information systems from ("Romero and Usman 2018"). And to have the knowledge of maps involved preparing flood-risk maps including the digital data and the digital elevation model are prepared by ArcGIS & flood-lower simulations using the Hydraulic model (HEC-RAS)from ("Vahdettin and Demir 2016 ").

STUDY AREA

Godavari River bounded North by Satmala Hillis, Ajanta Range with Mahadeo Hills at south , by Eastern Ghats at the east of river & Western Ghats at its west .Godavari basin is between 16 Degree 16 Second North and 23Degree 43 Second North and 73 Degree long 26 Second East and 83 Degree 7 Second East. It rises in the Sahyadri hills which is at 1067m near to the Triambakeswar at Nasik district of Maharashtra and then flows along the Deccan Plateau from the Western to the Eastern Ghats. It rises west ghtas about 80km from the Arabian coast. The Godavari container covers an area of 312813 sqkm of about 10% of the total land area. The Godavari basin accommodates sites in the region of MP, Chhattisgarh, AP, , Maharashtra, Orissa and Karnataka. Percentage of regional areas in

Maharashtra, MP, AP, Karnataka and Orissa is 48.6, 20.9, 23.4, 1.4, 5.7 respectively (NWDA 1991).The area under study shown below:



METHODOLOGY

The theoretical study of the one-dimensional flow is done for understanding water surface profile data. The surface profiles of water are calculated at the study area by solving the equilibrium of a force by a repetitive process called the standard step method. Strength statistics are as follows:

$$Y_2 + Z_2 + \frac{a_2 V_2^2}{2g} = Y_1 + Z_1 + \frac{a_1 V_1^2}{2g} + h_e$$

The flood frequency is calculated between 1881-1975 yrs. and with further planning the Flood immersion map geographical information is required. So as to compute the geographical data and crating the map we use EDRAS and ARCGIS. For determining the water surface profile HECRAS is used. Preparing the flood induction map by sending the water domain data to HEC RAS to GIS data .

RESULTS AND DISCUSSION

The surface profiles of water are calculated from the to the other by solving the equilibrium of a force by a repetitive process called the standard step method. Strength statistics are as follows it include points :

1. Steady flow analysis and for return period 50,100 & 500 years:

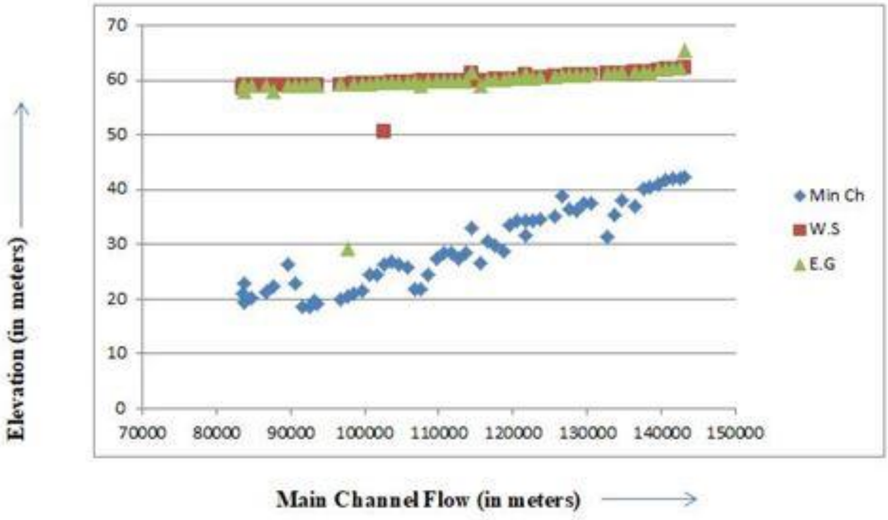


Fig 1.Water Surface Profile for 50 Yrs. Return Period Flood

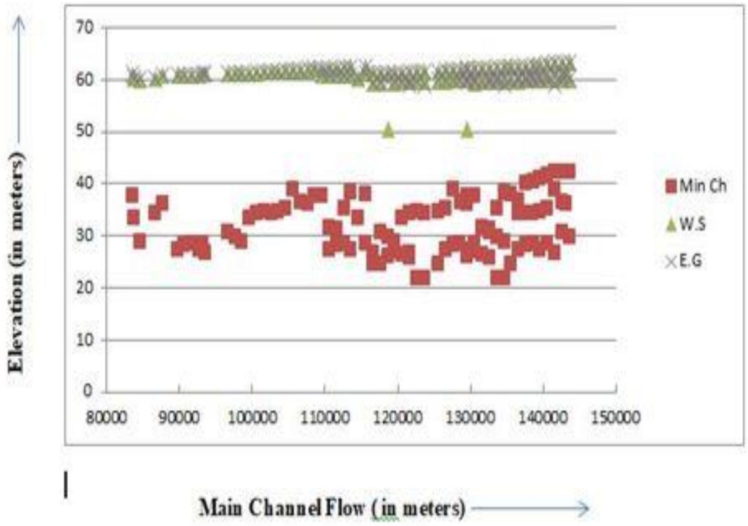


Fig 2.Water Surface Profile for 100 Yrs. Return Period Flood

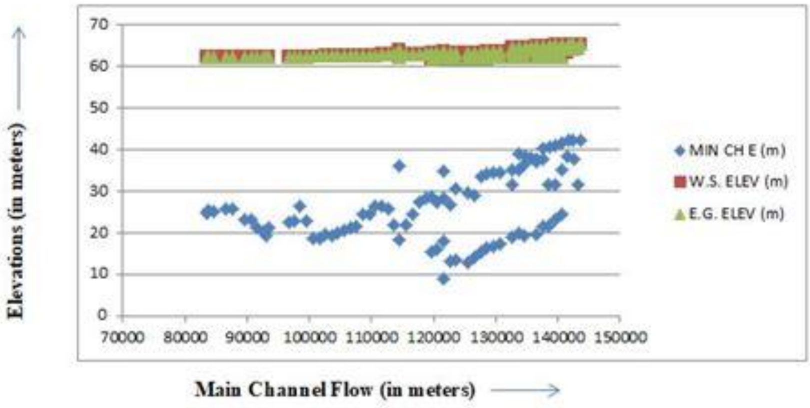
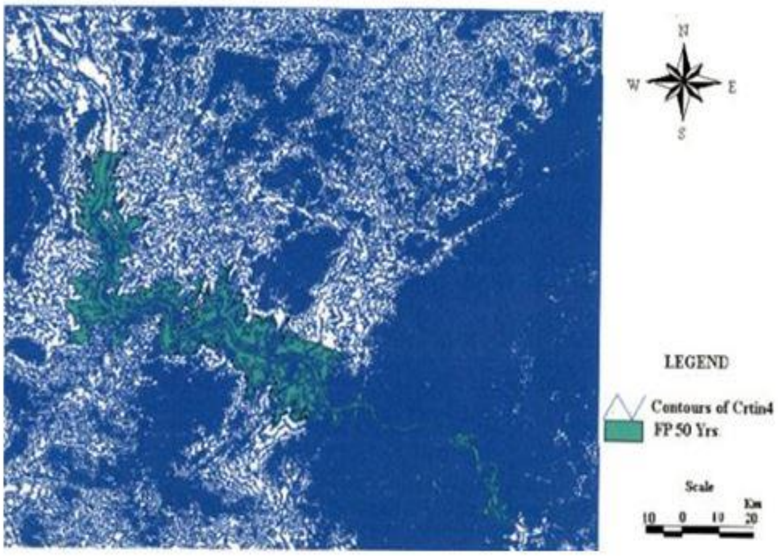
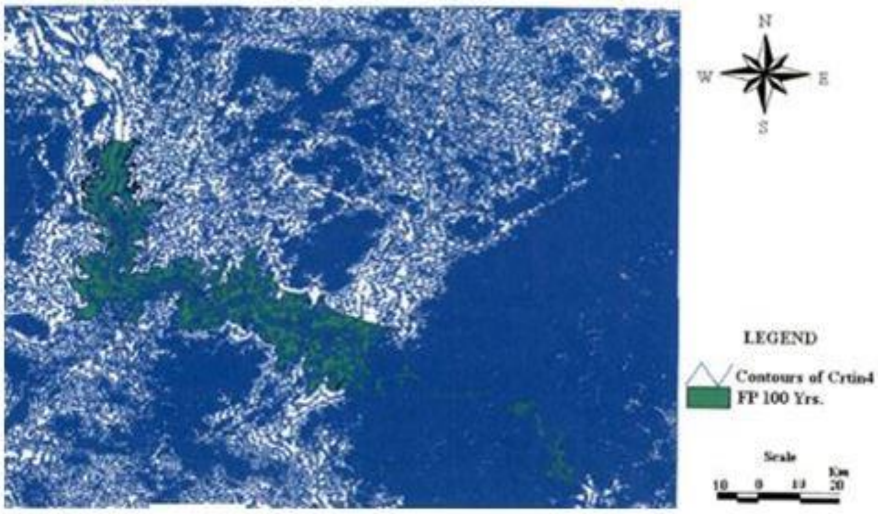


Fig3.Water Surface Profile for 500 Yrs. Return Period Flood

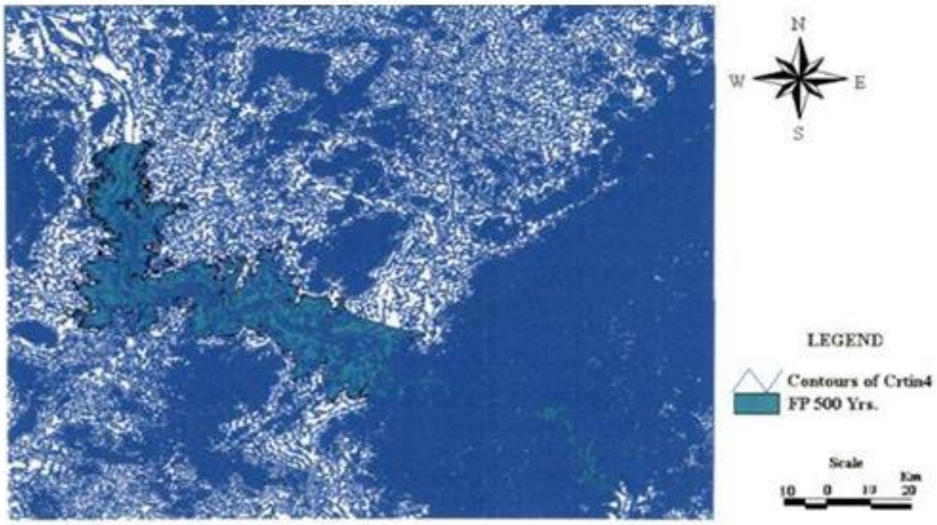
1. Flood inundation map for above data



Floodplain for 50 yrs. profile of a terrain profile



Floodplain for 100 yrs. profile of a terrain profile



Floodplain for 500 yrs. profile of a terrain profile

CONCLUSION

The current study attempted to create a flood map of the 143-kilometer (143 km) north of Dam on the Godavari River. The key views of the study are summarized as follows:

1. Flood mapping becomes an integral part of non-construction measures and data generated by remote sensitivity and GIS can be useful in hydraulic analysis.
2. The cross section are made using Remote Sensing data and GIS, along with a small trick that fits most of those seen in the limited areas of the sites in the supposedly accessible study of the Godavari River.

3. The 50,100 floods, and the 500-year-old floods using Gumble Distribution were 97640, 98948, and 96259 cumecs respectively and these appeared to be lying in the middle of those taken from the long-lasting and normal distribution of type III.
4. Floodplain areas are calculated using HEC-RAS for the 50, 100, and 500 years above.

REFERENCES

1. Sui, D.Z. and Maggio, R.C., 1999. Integrating GIS with hydrological modeling: practices, problems, and prospects. *Computers, environment and urban systems*, *23*(1), pp.33-51
2. Yang, C.R. and Tsai, C.T., 2000. Development of a GIS-Based Flood Information System for Floodplain Modeling and Damage Calculation 1. *JAWRA Journal of the American Water Resources Association*, *36*(3), pp.567-577.
3. de Azagra, A.M. and Álvarez, A., Selvicultura micológica
4. Maidment, D.R., 1993. GIS and hydrologic modeling. *Environmental modeling with GIS.*, pp.147-167.
5. Talukdar, S., Ghose, B., Salam, R., Mahato, S., Pham, Q.B., Linh, N.T.T., Costache, R. and Avand, M., 2020. Flood susceptibility modeling in Teesta River basin, Bangladesh using novel ensembles of bagging algorithms. *Stochastic Environmental Research and Risk Assessment*, *34*(12), pp.2277-2300.
6. Demir, V. and Kisi, O., 2016. “Flood hazard mapping by using geographic information system and hydraulic model: Mert River, Samsun, Turkey”. *Advances in Meteorology*, *2016*.