INTERNATIONAL RESEARCH JOURNAL OF HUMANITIES AND INTERDISCIPLINARY STUDIES
(Peer-reviewed, Refereed, Indexed & Open Access Journal)
DOI : 03.2021-11278686 ISSN : 2582-8568 IMPACT FACTOR : 8.031 (SJIF 2025)

Review Paper on Flood Risk Analysis

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DOI No. 03.2021-11278686 **DOI Link ::** https://doi-ds.org/doilink/03.2025-12842696/IRJHIS2503008

Abstract:

This paper has tried to show what are the reasons behind the flood risk in different regions, what methods can be used to analyze the flood risk and its long term, what kind of problems can flood cause to any social group and what are the effects of flood on people from previously published research papers. The attempts made by various researchers to analyze floods using primary data, secondary data, various types of maps, various statistical methods, and remote sensing and GIS are shown, along with the impact of floods on people's lives, especially on their work, education, daily life, etc. Floods in various rivers in India are a major disaster. The causes of floods in plain areas are different from those in hilly or plateau areas. Researchers get the opportunity to analyze different types of floods in India. In different countries of the world, floods occur due to various causes such as river floods, floods in low-lying coastal areas during storms or due to sea waves during tsunamis. Researchers have analyzed all these floods in their research paper and shown the causes, consequences, and control methods of floods.

Keywords: *Flood risk, Researcher, Disaster.*

1. Introduction:

Floods are one of the most common disasters in the world. During the monsoon season, heavy rainfall in the humid tropics forces the main rivers and their tributaries to carry more water than they can hold, resulting in flooding of the riverbanks. During the monsoon season, when rainwater gets trapped in low-lying areas, floods occur in small areas. Large waves caused by cyclones, tsunamis, etc. on the coast cause flooding in coastal areas. Coastal zones form a cyclical system between the marine and terrestrial water cycles, and people living in coastal areas face various hazards arising from storms, floods, and coastal erosion (N.K Barman, S. Chatterjee and A.Khan). The impact of floods in rural and urban areas is different. Floods in rural areas cause the most damage to agricultural land, followed by damage to human settlements, communication

systems, etc. Floods in urban areas cause the most damage to the city's economy, communication systems, settlements, etc. Regular floods gradually erode the economic condition of the people and force the settled people of an area to migrate to other places and they have to leave their main livelihood of agriculture and take various forms of small livelihood like rickshaw pullers, shop assistants and even begging. Through interviews, letter communication, data collection through telephone and direct house to house primary data collection, the hazard and impact of flood can be known accurately. Apart from primary data collection, flood related data is collected through various secondary sources like various government offices, books, previously published research papers, papers and journals. Various research papers analyze data using various statistical methods, mathematical methods, remote sensing, and GIS, and present it in various forms. From the previously published research papers, it is known that researchers have analyzed the causes, effects, results of floods in different flood-prone areas of the world and the different methods used to know all these things.

2. Literature Review:

The Journal of Indian Geophysical Union

v.19, no.3, pp: 322-332

Quantification of panchayat-level flood risks in the Bhograi coastal block, Odisha, India.

N.K Barman (Department of Geography, Hijli College), S. Chatterjee (Department of Geography, Presidency University), and A.Khan (Department of Geography and Environment Management, Vidyasagar University)

This paper discusses the severity of floods, causes of floods and impact of floods up to the panchayat level in the Bay of Bengal coast where the Subarnarekha river flows in the eastern part of the Bhograi block of the Indian state of Odisha. The causes of the floods are said to be the flat nature of the entire region, which is only 2.5-3.5 meters above sea level, occasional tropical cyclones hitting the region, storm surges, the high water holding capacity of the soil of the entire region, air humidity ranging between 90% and 96% for most of the year, etc. To complete this study, more emphasis has been given to collecting data on flood intensity from the field to the Gram Panchayat level, which has been done based on both primary and secondary data. For primary data, data has been collected through household survey using pre-prepared questionnaires. Secondary data has been collected from various administrative offices of Bhograi block according to Gram Panchayat. The data used here are -Percentage of Fully and Partly Damaged Houses, Number of deaths of humans and animals, Crop damage, Fishery damage, Flood depth information, Percentage of flooded area etc. This study has revealed that out of a total of 32 gram panchayats, Narayanmohantiparia, Rasalpur and Kharidpimpal gram panchayats fall in the very high flood risk zone, while Dehunda, Baunsadiha and Balim gram panchayats fall in the very low flood risk zone. The flood hazard map included in the research paper

shows that the south-western part of Bhogadia block falls in the very high flood risk zone, while the northern part mainly falls in the very low flood risk zone. The gram panchayats included in the very high flood risk zone are mainly located in the Subarnarekha river basin near the sea coast. The flood damage types map shows that the roads and crops have been damaged the most due to floods here.

International Journal of Innovative Research in Science, Engineering and Technology

Vol. 3, Issue 8, pp: 15348- 5356

Flood hazard and risk assessment in chamoli district, Uttarakhand using satellite remote sensing and GIS techniques.

G.D. Bhatt & K.Sinha (Department of Petroleum Engineering and Earth Sciences, University of Petroleum & Energy Studies Dehradun), P.K. Deka (Department of Centre for Information Technology, University of Petroleum & Energy Studies, Dehradun), A. Kumar (Department of Ecology and Biodiversity, Rain Forest Research Institute, Jorhat)

This study uses remote sensing and GIS to assess flood risk and hazard in Chamoli district of Uttarakhand. Landsat satellite data from the United States Geological Survey (USGS) has been collected for this study. UTM projection and WGS 84 datum have been used for the study area. The study area boundary has been created using ERDAS Imagine ver. 9.2 software. Vegetation type/land use maps have been created using screen visual interpretation techniques by modifying satellite imagery using False Color Composite (FCC). To assess the vulnerability of flood hazard and risk, a digital elevation model (DEM) has been constructed using Surface Reflectance Terrain Model (SRTM) and vegetation type/land use-wise slope and aspect map has been taken into account. The study area is mostly covered by forest, cropland, and wetlands. This study shows that this study area experienced severe floods in 1974, 1986, 1998, 2010 and 2013. The reasons behind the large-scale floods here are that during the monsoon, excessive rainfall washes away soil, gravel, pebbles, stones, sand from the upper reaches of the river and deposits them in the lower reaches of the river, reducing the navigability of the river. Due to this, excessive flooding occurs in the lower reaches of the river. Field studies have shown that the gradient has changed due to sediment deposits in the Alkananda, Bhagirathi rivers and their tributaries. It has also been seen that the depth in some parts of the Alkananda river has decreased by about 11 to 35 meters. Crops and settlements have been developed in the sediment deposits of all these rivers, which has increased the problem of flooding in this region.

Caminhos de Geografia

v. 12, n. 39, p. 283 – 296

Environmental impact of flood & their sustainable management in deltaic region of West Bengal, India.

V.C Jha (Professor and Ex-Head Department of Geography,Visva-Bharati University) & H.Bairagya

(Researcher, Dept. of Geography, Visva-Bharati University)

The research paper focuses on the impact of floods on the environment and the intensity and duration of floods in Murshidabad district, a delta region of West Bengal, India. This study area of Murshidabad district is a flat terrain area belonging to the "Khadar" region, with an altitude of only 10 to 30 meters above sea level, which is suitable for increased flood susceptibility. To conduct this study, flood intensity was measured using Gumbel's statistical method using 35 years of flood data, and various results of this study were obtained using topographical sheets, Satellite Imageries such as IRS P6, LISS III, field photographs and daily, monthly and annual rainfall data. Using Gumbel's method for Flood Frequency Analysis, this paper shows that the flood volume of the Bhagirathi River in 1987 was 176686 cumec, which was the highest between 1968 and 2001. In 1971, the Bhagirathi River was flooded for 59 days continuously. The floods have caused some environmental problems in this district, the most notable of which are the destruction of the natural levee along the Bhagirathi River, the shifting of the Ganga and Pagla rivers, which are moving closer to each other and have reduced the distance between them from 8.53 km in 1923 to a very narrow one in 2001. If the two rivers meet in the future, the current Ganga river will be abandoned and the Farakka Barrage will become useless. River widening in this region is an ongoing process. This research paper reveals that the floods in this region have led to an increase in socio-economic problems such as Poverty and Migration, Agricultural Deficiency, Unemployment, Child Labour, Child Marriage and Trafficking, Sexual Exploitations, deterioration of education and health systems, loss of rural population, massive death of domestic animals, and damage to industry and communication systems. After the construction of Farakka Barrage, the erosion of Bhagirathi upstream has increased rapidly and the siltation problem has increased due to the gentle slope of the southern part of Murshidabad district. This research paper sheds light on the Sustainable Development and Management measures taken to control floods in this study area i.e. Murshidabad district such as -River Channel Improvement, Proper and scientific Reservoir control, Controlling Measures of Messanjore Dam, Embankment maintenance, Sheet Erosion Control and Soil Conservation, Cut-off channel, Early warning, People Awareness etc.

11th International Conference on Urban Drainage, Edinburgh, Scotland, UK, 2008

Assessing public perception of flood risk & flood control measures in urban areas.

N. Nascimento & E.Guimaraes (Department of Hydraulics and Water Resources Engineering – Federal University of Minas Gerais, Brazil), S.A. Mingoti, N. Moura and R. Faleiro (Department of Statistics – Federal University of Minas Gerais, Brazil),

As the risk of flooding is much higher in urban areas, there is also a greater need for flood control measures. This paper compares the flood control and environmental impacts of two detention basins in two urban catchments in Brazil, the Santa Lucia and the Vilarinho detention basins. Data on

detention ponds, flood risk, local environment were collected from the people living in the detention basins mainly through structured questionnaires and interviewing. Interviewees were first contacted through letters and then through telephone calls to convince them for interviews. Census socio-economic data from two urban catchments were collected for the success of this study. People in the Vilarinho detention basins area are more likely to be low-income than people in the Santa Lucia detention basins area, and Santa Lucia has a higher literacy rate.

International Archives of the Photogrammetry, Remote Sensing and Spatial Information Science
Volume XXXVIII, Part 8,

Application of remote sensing & GIS for flood risk analysis: A case study at kalu-ganga river, srilanka.

S.M.J.S.Samarasinghe (GIS Branch, Survey Department, Sri Lanka), H.K.Nandalal (Department of Civil Engineering, University of Peradeniya, Sri Lanka), D.P.Weliwitiya (Arthur C Clark Institute for Modern Technologies, Sri Lanka), J.S.M.Fowzed , M.K.Hazarikad & L.Samarakoond (GeoInformatics Center, Asian Institute of Technology, Thailand)

This research paper discusses the flood risk of the Kalu-Ganga River basin of Sri Lanka using remote sensing technology and GIS. In addition to using satellite data such as ALOS/PALSAR HH polarization, Contour Maps, Spot Heights, Land use maps and LiDAR data, Bathymetric cross section data of the Kalu-Ganga River, rainfall data from 13 meteorological stations, gauge data from three gauging stations of the Kalu-Ganga River, and comments were collected from the people of the flooded areas through questionnaires to complete this study and also use census data. Hazard & Vulnerability map was created using ArcGis software. By analyzing the risk of this flood, it is known that roughly 11.3 km2 area is under high risk category, 65.1 km2 moderate and 33.1 km2 areas are under low risk categories for 100 years.

Proceedings of IAHS (PIAHS)
370, 139–145, 2015

A metric-based assessment of flood risk and vulnerability of rural communities in the Lower Shire Valley, Malawi.

A. J. Adeloye (1Institute for Infrastructure and Environment, Heriot Watt University), F. D. Mwale, and Z. Dulanya (University of Malawi)

This research paper discusses flood risk and flood severity in 13 rural communities in the Lower Shire Valley of Malawi, Africa, using Community Based Disaster Risk Index, Remote sensing GIS, and administering questionnaires. The results of the discussion indicate that the impact of flooding on the collective communities of the Lower Shire Valley is moderate to high. While 8 to 12 communities are at moderate risk, the communities most at risk are notably Katunga and Maseya in Chikwawa district, and Mbenje and Tengani in Nsanje district.

Journal of Human Ecology

30(3): 201-211

Flood and Erosion Induced Population Displacements: A Socio-economic Case Study in the Gangetic Riverine Tract at Malda District, West Bengal, India.

Showkat Iqbal (Centre for Himalayan Studies, North Bengal Universit)

Floods are a common occurrence for people to migrate to other places. Regular floods in the Gangetic region of Malda district every year and the resulting river erosion have forced many people from the region to migrate to other parts of India. By directly visiting the affected area and collecting primary data, this study has revealed the effect of floods and river erosion on the socio-economic conditions of the study area. The primary data was analyzed using various statistical methods. Floods and river erosion have forced people to abandon their homes and move away from agriculture, the main source of livelihood in this region. Most of them are rickshaw pullers in the nearby Malda town, some people have moved to big cities like Delhi Mumbai for different jobs.

IMPACT: International Journal of Research in Applied, Natural and Social Sciences (IMPACT: IJRANSS)

Vol. 1, Issue 3, Aug 2013, 141-152

Socio-economic status of population in flood prone areas of Chanchal sub-division in Malda district, West Bengal.

Md. Ismail (Research Scholar, Department of Geography, Aliah University) & Md. Mustaquim (Assistant Professor, Department of Geography, Aliah University)

The main objective of this study is to analyze the socio-economic condition of the flood affected people of Chanchal sub-division of Malda district. Emphasis is mainly placed on primary survey to carry out this study, secondary data is also used in some cases. In the primary survey, this research was conducted on 171 households in four flood-prone villages of Chanchal sub-division. Research has shown that family size in this region is quite high, with an average of 6 to 7 people. The condition of the houses here is very poor, with about 80% of the houses being made of mud, mainly made of bamboo, grass, clay, etc. The illiteracy rate is very high, which is about 45%, as a result, the unemployment rate is also very high here. About 44% of the people do not have their own agricultural land; as a result, the economic condition of most of the people is very poor.

Selected Paper prepared for presentation at Southern Agriculture Economics Association

Annual meeting, Birmingham, Alabama, February 4- February 7, 2012

Analysis of Spatial Variation in Flood Risk Perception

A.Atreya and S.Ferreira (Department of Ag & Applied Economics, University of Georgia)

Using hedonic property models with the help of individual property sales data, Geographic information System (GIS) data, simulated flood inundation maps of Flint River, the flood hazard

potential of the city of Albany near the Flint River is highlighted here. The study found that property price fluctuations are correlated with flood risk. This provides researchers with the ability to determine property value declines for increased risk of severe flooding.

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