A Review of Flood Risk Assessment

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Abstract— *Floods are one of the most common hazards in the world and cause loss of lives, livelihood and property destruction. The objective of this study was to review and synthesize concepts and techniques of flood hazard, vulnerability and risk assessment with reference to the Himalayan region. Flood risk is a function and a product of hazard and vulnerability. The impact of flood and flash flood (slow onset and rapid onset) events at a particular sitecan reflect key socioeconomic factors and environmental services, like number of people at risk, affect on ecological services and capability of human population for recovery. Risk assessment is important in making decisions, policies and managing floods. Using PRISMA methodology of literature review, 120 articles were retrieved using PubMed and Google Scholar database. 90 articles were included in the initial review. 30 articles were excluded from the review after reading the whole content because they did not match the objectives of the literature review and the inclusion criteria. Flood hazard assessment techniques are based on various parameters such as meteorological, hydrological and socioeconomic. There are four important steps in flood risk assessment such as characterizing the area, determining hazard level and intensity, assessing vulnerability and risk. Recently, advancement in GIS, remote sensing and hydraulic modeling technology has been extensively used in formulating models used for flood hazard calculation and risk analysis. The occurrence of floods in mountainous regions are now more common related to past and in the future, itseems more frequent due to global warming. Community based flood warning systems can go a long way in helping rural communities, as well as flood management agencies, to prepare for flash floods. The enhancement of community resilience through socioeconomic empowerment and strengthened adaptive capacity can play a vital role in flood disaster management.*

Keywords— flood, hazard, vulnerability, risk, GIS, global warming, disaster.

I. INTRODUCTION

The etymology of the term “Hazard” probably began from the French language which meant “put something at stake in a game of change played with dice” in 1300 A.D. In English, the word hazard was first referred in 1540s as “Chance of loss or harm, risk” (Ghimire, 2010; Sharma, 2013). In the beginning the term ‘hazard’ was understood as ‘natural hazards’ which was defined as those elements of the physical environment, harmful to man and caused by forces extraneous to him (Burton et al., 1978). UNDRO (1983) defined it as the probability of occurrence, within a specific period of time in a given area, which is potentially damaging phenomenon. The term hazard in a wider sense, as a threat and future source of danger, which has potential to cause harm to people, human activity, property and loss of environmental amenities (ADPC, 2015). UNISDR (2009) defines a hazard as a dangerous phenomenon, which affect human activity or livelihood, services, socioeconomic disruption and environmental damages. There are some important characteristics of a hazard such as magnitude or scale, intensity and frequency of events. A natural phenomenon which may occur in a human occupied area with the probability of causing loss or damage is called a hazard event. A physical event in a remote area that does not affect human beings is not considering a disastrous event (Bohle, 2001).

Hazard can be categorized as natural and anthropogenic hazard. Natural hazard can be classified a geophysical (earthquake, landslides, volcanic activity), hydro-meteorological (floods, tropical storms, drought), and biological (disease epidemic).Anthropogenic hazard incorporates the human processes such as climate change, fire, mining of non-renewable resources, environmental degradation and technological hazards (UNISDR, 2009). The hydro-meteorological phenomenon is the process of atmospheric and hydrologic that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption and environmental damage is called a hydro-meteorological hazard. These hazards include tropical cyclones, thunderstorm, hailstorm, tornados, heavy snowfall, avalanches and coastal storm surges, floods including flash floods, heat waves and drought (Balikie, et al., 1994).

Floods are the most lethal kind of hydro-meteorological disaster on the earth's surface (Ologunorisa, 2004). Flood is the most impressive interaction between man and his environment, which put emphasis on both the sheer force of natural events and man's insufficient efforts to control them (Khan and Rehman, 2005). There are several types of floods such as riverine flooding, flash flood, urban drainage, ground failures, fluctuating lake level, coastal flooding and erosion. The dynamics of riverine flooding vary with terrain. In flat areas, floods my shallow, slow-moving for days or even weeks. In hilly and mountainous area, floods may come minutes after a heavy rain. The short notice, large depths and high velocities of flash floods make these types of floods particularly dangerous. Among the common types of riverine flooding are overbanks flooding, flash floods, dam and levee failure, alluvial fans, ice jam flooding and moveable bed streams (Borga, et al., 2014). A flash flood is generally defined as a rapid onset flood of short duration with a relatively high peak discharge (WMO, 2010). A rapid and extreme flow of high water into a normally dry area, or a rapid water level rise in a stream or creek above a predetermined flood level (USNWS, 2010).

IPCC (2007) studies revealed that, there is no evidence that the trend of global warming will discontinue. The implications of global warming affect future flood disasters. There are also concerns about continued growth and development in floodplains interfering with natural systems and ecological processes and highlighting that human behavior is a contributor to the problem of flooding. Encroachment in the form of unsustainable land use and rapid economic development practices may often make a sizeable contribution to increase of risk and vulnerability (Wheater and Evansb, 2009). According to Dilley et al. (2005) estimated that more than one third of the world's land area is flood prone, which affecting around 82 percent of the world population. In 90 countries, about 196 million people are exposed to catastrophic flooding and 170,000 deaths were associated with floods worldwide between 1980 and 2010 (UNDP (2004). Flooding is the most common among the all environmental hazards and it regularly claims over huge number of lives per year and adversely affects millions of the people world-wide (Smith, 1996).

Mountain regions occupy approximately one fifth of the earth's land surface and cover 54 % of Asia's land mass. Mountainous regions are inhabited by 800 millions of people. The major rivers of the world originate from these areas (ICIMOD, 2002). The Seasonality of streamflow in mountainous basins has been found to be extremely sensitive to global warming and the concern about the increase of flood risk in these areas is rapidly raising (Diaz et al., 2003; Barnett et al., 2005; Bates et al., 2008; Marty, 2008).

Risk as the production of hazards such physical and statistical aspect of the flooding and vulnerability is the exposure of people and assets to floods and susceptibility of the elements at risk to suffer from flood damage (Cutter, 1996).The concept of vulnerability has been a powerful analytical tool for describing states of susceptibility to harm, powerlessness, and marginality of both physical and social system (Adger, 2006). The concept of vulnerability implies a measure of risk associated with the physical, social, and economic aspects and implications resulting from the system's ability to cope with the resulting event. The word disaster is used in diverse ways, mostly to refer to any sudden, unexpected misfortune, regardless of number of people, size of region or, country or even theentire world (Proag, 2014).

Smith and Petley (2009) analyzed that risk is a statistical concept and probability refer to a negative event or condition which effect people, infrastructure and environment. Risk an integral part of life. Risk is derived the Chinese word "Weji-Ji" combines the characters meaning opportunity/chance and danger; it always involved some balance between profit and loss (Smith, 1996). Risk referred to chance of loss of life or property, or injury, damage, or disruption to economic activity due to a particular event for a given area and reference period. Risk is the combination of hazard and vulnerability (ICIMOD, 2010). The research of flood risk is a multidisciplinary character and subject of interest for hydrologist, sociologists, economists, environmentalists and geographers (Solı´n et al., 2011; Solı´n 2012). Hazard assessment mapping delineates flood hazard areas in the river basin by local knowledge, hydro-meteorological, geomorphologic and socio-economic data can be used (Tsay, 2013; Forkuo, 2011). Geographic information system (GIS) and remote sensing provides a broad range of tools for determining area affected by floods and for forecasting areas that are likely to be flooded due to high water level in a river. Remote sensing technology along with GIS has become the key tool for flood monitoring in recent years ((Getahun and Gebre, 2015; Pradhan, et al., 2009).

The need of research in flood hazard, vulnerability and risk assessment has been stress in literature (Askew, 1999;

Smith, 1999; Ologunorisa, 2001). The objective of this paper to review, synthesize concepts and techniques of risk assessment into a coherent piece and give an overview of recent literature related to flood hazard, vulnerability and risk.

II. MATERIAL AND METHODS

Using PRISMA methodology of literature review, 120 articles were retrieved using Pub med and Google Scholar database. 90 articles were included in initial review. 30 articles were excluded from the review after reading the whole content because they did not match the objectives of the literature review and the inclusion criteria. Key words used to search the articles are: Flood and floods types, flash floods, hazard and disaster, type of hazards, flood hazard assessment, flood vulnerability assessment, floods risk assessment, flood hazard mapping, GIS based flood hazard assessment, Socio-economic impacts of floods, application of remote sensing and GIS for floods hazard mapping and Disaster management, Climate change and flooding, Global warming and it impacts, floods risk in mountain areas, monsoon and floods, poverty and floods.

Scientific literatures were searched from journal articles, books, proceedings and others published article starting from the year 1995 to the year 2015.

The major journals included in this review paper were from various journals such as, Journal of Flood Risk Assessment, Geophysical Research Letters, Journal of Water Resources Management, Natural Hazards and Earth System Sciences, Journal of Natural Hazards, Hydrology of Mountain Areas, Journal of Geography and Regional Planning, Mountain Research and Development, Indian society of Remote Sensing, Hydrological Science Journal, International Journal of Geomantics and Geosciences, Arabian Journal of Geosciences, Global Environmental Change, International Journal of Disaster Prevention and Management, ICIMOD Archive, Journal of Risk Analysis. Though the articles published in the last 20 years were the prime concern initially but data from a few older articles were also extracted in order to give meaning to the paper.

III. RESULTS AND DISCUSSION

Theoretical Clarification

Flood hazard, vulnerability and risk assessment requires an understanding of the causes of a potential disaster. According to Ken Granger (2002) and UNCHS-HABITAT (1981) has defined the term hazard, vulnerability, element at risk and risk are in the following way:

Hazard (H) means the probability of occurrence, within a specified period of time in a given area and potentially damaging natural phenomenon.

Vulnerability (V) means the degree of loss to a given element at risk or set of such elements resulting from the occurrence of a natural phenomenon of a given magnitude.

Element at risk (E) mean the population, building and civil engineering works, economic activities, public services, utilities and infrastructure in a given area.

Risk (R) means the expected degree of loss due to a particular natural phenomenon. Risk analysis can be defined as a systematic use of available information to determine how often specified events may occur and the magnitude of their likely consequences.

Flood risk is a function and a product of hazard and vulnerability, “**Risk = Hazard x Vulnerability”** (Ologunorisa, 2001).

Risk Assessment Techniques

Meteorological Parameters

Meteorologically flood can be defined as situation over a region or place where that rainfall is mostly heavy and higher than the normal climatologically mean value. The definition and criteria for flood is vary in different realms such as in South Asia, when seasonal rainfall is an excess over a normal meteorological subdivision is regarded as moderated, and an extremely excessive rainfall over the normal mean value as a sever flood. (Parthasarathy, et al., 1987; Ologunorisa, 2001). There is combination of factors contribute to the severe flood such as heavy winter snowfall, high summer temperature, development of unusual low pressure, change in direction of track and anomaly of rainfall. This severe weather can be explained in terms of climate change, but from individualevent, climate change cannot be confirmed until supported by long-time meteorologicaldata(Atta-ur-Rahman, 2010; Atta-ur-Rahman, 2003). The total seasonal rainfall of June through September as well as it time developed an index that has been evolved for identifying a year as hydrological flood/drought in different parts of Indian, Pakistan and Bangladesh (Mirza, 2003; Ologunorisa, 2004).

The quality of weather forecasting models has significantly improved during the last years. These models can provide important information on temperature, wind, and precipitation for forecasting of any meteorological event. Forecasting cannot assess accurately the location and the extent of precipitation. In particular, information on the location and intensity of local convective heavy rainfall is still insufficient for the direct forecast of flash floods (Koutsoyiannis, 2009). A coherent global climatology of flooding cannotbe easily constructed from stream discharge frequency and magnitude statistics. The difficultly arises because the frequency and magnitude of floods vary between and within drainage networks because of variability in basin characteristics. This kind of variability is complicated due to diversity in weather systems (Hayden, 1988).

Hydrological parameters

Hydrologic response of the basins as represented by the available stream gauge network is a result of the physical response of several of the physiographic regions contained within the basins (Smakhtin, 2001). Hydrological variables are very important to monitor flood risk. For such an assessment it is necessary to analyze the change in hydrological conditions and especially the characteristics of heavy precipitation, at the regional to local hydrological scale. Hydro-climatologically parameters are essential for understanding the interaction between the atmosphere and hydrosphere (Smakhtin, et al., 2001).

The hydrological records and analysis of the flood wave has been used to improve manipulation with waters using weirs, flood diversion canals and retentions. This hydrological analysis highlighting particularly to prevent disastrous floods in different parts of world.Flooding from rain -on-snow events are most damaging floods in rivers and these large floods inundate communities and farms lands (Trinic, 1997;Kattelmann, 1997). The analysis of previous floods, volumes, duration,and the assessment of damages and the evaluation of possible changes in the flood behavior are particularly useful for the flood hazard management. An assessment of the change in floods severity and intensity can be analyzed at much smaller scales than the global or continental level.

Socio-Economic Vulnerability

Socio-economic vulnerability refers to a common set of indicators to explore differences in social and economic vulnerability between places. Vulnerability has frequently been characterized as a function of both a system's exposure and sensitivity to stress and its capacity to absorb or cope with effects of these stressors (Gunderson and Holling, 2001).The concept of vulnerability has been a powerful analytical tool for describing states of susceptibility to harm, powerlessness, and marginality of both physical and social systems, and for guiding normative analysis of actions to enhance well-being through reduction of risk (Janssen, et al., 2006). A vulnerability measure focused on human well-being therefore incorporates material aspects and outcomes of vulnerability (Adger and Winkels, 2006).

The ability of a society in a physically vulnerable zone to acclimatize to flash flood or disaster risk determines socioeconomic vulnerability.Adaptive capacity of a people itself is a function of social andeconomic development. Due to increase in population, poverty, limited availability of land, communities develop new settlements along river banks or flash flood debris fan, which indicates a good example of high vulnerable to flash floods. As compare to those communities with good access to communication, financial institutions, markets and diversified income sources have stronger adaptive capacity and are hence, less vulnerable (ICIMOD, 2007; ICIMOD, 2008; Birkmann, 2007). Chen (2010) and Tung (2011) describes that assessing socio-economic vulnerability determines how factors of population distribution, agricultural activities, industry, and infrastructure influence the process of assessing flooding vulnerability, simulate flooding situations under different rainfall scenarios and implementation of land use and coping strategies for planning flood-prone areas.

Physical vulnerability relates to buildings, infrastructure and agriculture. Although the focus is on physical assets, it also includes the potential loss of crops and other infrastructure necessary to livelihood. Vulnerability analysis should examine the risk faced by critical facilities, which are vital to the functioning of societies in disaster situations, such as hospitals and dispensaries, emergency services, transport, communication systems, essential services (Rose, 2007). Social vulnerable groups include women, mentally and physically handicapped persons, children, and elderly persons, the poor people, refugees, and livestock. Economic vulnerability assesses the risk of hazard-causing losses to economic assets and processes. These falls into two groups: Direct damages to physical and social infrastructures, repair or replacement cost and crop damage while indirect losses refers to loss in production, employment, vital services, income disparities (Cutter, et al., 2001). There is also increase in the incidence of psychiatric disorders in the flood affected population; some common problems are acute stress disorder, post-traumatic stress disorder, anxiety disorders, depression and alcohol and drug abuse (Ali, et al., 2015). The Environmental components includes indicators which refer to damage to the environment caused by flood events or manmade interferences which could increase the vulnerability of certain areas (Merz, et al., 2007).

GIS and Remote sensing techniques

Geographic Information system (GIS) is computer based system that provides capabilities for input, data management, data storage and retrieval, manipulation, analysis and output to handle spatial data (Aronoff, 1995; Bhatt,et al., 1995). GIS technology is essential in the hazard and flood related problems which support surface water modeling and flood hazard exposure (Boyle *et al,* 1998; Greene & Cruise, 1995; Paudyal). GIS and remote sensing focus on delineation of flood zones, preparation of flood hazard and risk maps (Bhatt, et al., 2013). According to Gashaw and Legesse (2011), Flood hazard mapping is a vital component for mitigation and appropriate land use planning in flood prone areas. It creates easily read, rapidly accessible charts and maps, which facilitates the administrators and planners to identify areas of risk and prioritize their mitigation/response efforts.

Remote sensing has substantial contribution in flood monitoring and damage assessment. Flood monitoring using satellite data provides an effective method to get quick and precise overview of flooded areas. High resolution imagery and digital elevation model (DEM) can be used in ArcGIS to develop flood prone areas (Jeyaseelan, 2004; Kussul, et al., 2008). DEM can be used to show areas of different vulnerability to flood hazard. A flow accumulation models can be used in the DEM and the DEM can be reclassified into high risk, moderate risk and low risk zones using equal interval of separation based on elevation (Lillesand, et al., 2004; Forkuo, 2008; Forkuo, 2010). Panchromatic satellite image data can be used for flood hazard assessment with the help of various digital image processing techniques, such as, image to image registration, texture analysis, Edge-sharpening filter and image classification methods(Wang, 2004; Jain et al., 2005).

Demirkesenet al., (2006) observed that delineating flood extent areas and water bodies are always the most important concern to deal with flood mapping process. LANDSAT images are typically the primary preference because of their convenient obtainment. LANDSAT, SRTM, ASTER DEM is known as an economical and efficient method for mapping flood hazard and deal with the problem of inadequate data source in developing countries (Wang, 2004). A combination of GIS extension, DEM and HEC-RAS model can be used to delineate floodplain and visualizing the spatial extent of different flood scenarios and determining flooded areas at risk (Yang, et al., 2006).

Remote sensing and GIS pay vital role in flood vulnerability assessment of human settlements. GIS and remote sensing techniques help in the identification of locations of high grounds during the extreme hydrological events. It also helps to identify the settlements fall in a zone that is expected to experience a high flood discharge cause extraordinary damage to life and property (Cannon, 2000). High resolution satellite imageries can be used to study to classify non flooded areas and flooded zones and to delineate human settlement at village level. GIS and remote sensing techniques are cost effective and efficient way to create a moderate resolution database for identifying human settlement that are highly vulnerable to flooding (Henderson and Xia, 1997).

Flash Flood Risk Assessment

Flash floods are floods that rise and fall rapidly with little or no advance warning. Flash floods are common in mountainous regions of Karakoram, Himalayaand HinduKush. They are usually caused by intense rainfall or a sudden, outburst of a landslide dam or glacier lake or by failure of artificial hydraulic structures (Bahadurzai and Shrestha, 2008; ICIMOD, 2011). Flash flood risk assessment is essential in making decisions and in the management of flood risk. Flash flood risk assessment has four steps such as characterizing the area, determining hazard level and intensity, assessing vulnerability and assessing risk. Characterizing an area prone to flash floods is important for hazard and vulnerability assessment, some important information's are, geography, geology and geomorphology, hydrology and hydraulics, vegetation, land use and historical analysis (Borga, et al., 2014;Shrestha, 2005). Hazard analysis includes defining the strength of the flash flood and scenarios in the area where it will occur. Assessing physical and socio-economic vulnerability is an important step in flash flood risk assessment. Physical vulnerability includes susceptibility and exposure while socio-economic vulnerability based on quantitative and qualitative indicators. Assessing hazard and vulnerability has four levels (High, moderate, moderately low and low. Four levels of hazards and four levels of total vulnerability are considered as risk level scale which can be classified into five different risk levels: very high, high, moderate, moderately low and low (Bahadurzai and Shrestha, 2008; Cutter, 1996).

Global Warming and Flood risk in Mountainous Areas

Climate change has been suggested to be a cause for increasing losses from extreme weather events (IPCC, 2007).Climate change and global warming have been progressively more under media scrutiny over the past 20 years.During this period, the concerns over global warming and climate change issues have gradually shifted froma mainly scientific concern to mainstream media (Singh and Kumar, 1997). In 1990, the IPCC confirmed the increase of greenhouse gasses in the atmosphere and the resulting global warming of the earth.

Flooding caused by extensive and long-lasting rainfalls, partly connected with the melting of snow and ice, occurs mostly in plain areas. Local, sudden floods/flash flooding in small catchments that is mainly caused by short and highly intensive precipitation/ thunderstorms. Flash floods occur primarily in hill and mountainous areas due to prevailing convective rainfall mechanisms(Allmano, et al., 2009; Mokrech, et al., 2008). The mean global temperature has risen by 0.3-0.6 C^o since the end of the 19th century, and 0.2-0.3 C^o of this increase occurred in the last 40 years (Feyen, et al., 2009).In mountainous regions temperature determines the situation of precipitation and in turn considerablyaffects runoff formation. The seasonalityof streamflow in mountainous basins has been found to be exceptionally sensitive to global warming (Diaz et al., 2003;Barnett et al., 2005; Bates et al., 2008; Marty, 2008).While the anxiety about the increase of flood risk in theseareas is rapidly raising (Olsen et al., 1998; Palmer andRalsanen, 2002). In the scientific literature there is still a lack of consensus about the effects of temperature variationson floods (Mudelsee et al., 2003; Birsan et al., 2005).

Klien and Konnen (2003) analyzing peak discharge time-series recorded in different gauging stations in the Swiss Alps found significant increase of flood peaks during the last century.The impacts of an intensification of the hydrological cycle, most notably in connection with the possibility of an increasing occurrence of extreme events are also important to the millions of people living downstream of mountain river basins. The HinduKush, Karakoram and Himalayan(HKH) region is extremely vulnerable to various types of water-induced disasters, particularly floods and landslides (ICIMOD, 2010). A significant increase in heavy rainfall events in future will result in an increased flood risk to society, physical infrastructure, and water quality. Increases in the frequency and severity of floods and droughts are projected to have an adverse effect on sustainable development. Shrestha et al (2003) suggest that the number of flood days and consecutive days of flood events have been increasing in mountainous regions of South Asia. Increases in glacial melting and likely increases in runoff will also intensify the risk of glacial lake outburst floods.Unpredictable precipitation and increased glacial melting might aggravate the flooding that is already common in mountain areas such as riverine floods, flash floods, glacial lake outburst floods, and breached landslide dams(Bajracharya, et al., 2007; ICIMOD, 2009; Shrestha, 2009).

Flood early warning systems is important in mountainous regions which include a chain of activities: understanding and mapping flood vulnerability,monitoring rainfall and water levels, forecasting impending events, processing, and disseminating andcommunicating understandable warnings to decision makers and the population so that they can take appropriate and timely actions in response (UNISDR 2007, IUCN, 2009).

Flood Risk Management

Floods are one of the most common hazards in the world, affecting people’s lives and livelihoods (Uddin, et al., 2013). Flood hazard management epitomize the multi-dimensional nature of much environmental management. It is a problem integrates aspects of the natural sciences, the social sciences, and engineering. It is significant for the efficiency and efficacy of the decision making process to recognize the complexity (Penning, 1996). Flood risk management is an organized process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies, and improved coping capacities in order to lessen the adverse impacts of flood hazard and the possibility of disaster (Mitchell, et al., 2010). The term management is used in at least two different ways in the literature on floods, either excluding or including risk analysis. The first understanding is based on the hydrological reliability of existing flood defense structures. Management is interpreted, therefore, as decisions and actions undertaken to mitigate the remaining risk above flood protection design standards (Hooijer et al., 2004; Oumeraci, 2004). The second understanding defines management as decisions and actions undertaken to management covers the risk analysis, risk assessment and risk reduction (Plate 1999, Sayers et al., 2002, Hall et al., 2003).

For a comprehensive approach, UNDRO (1991) has identified four tasks and components: Risk analysis, Risk assessment and Risk reduction. Risk analysis provides information on previous, current and future flood risks, risk assessment deals with their perception and evaluation and risk reduction is dedicated to interventions with a potential to decrease the risks. Flood analysis included; hazard determination, vulnerability determination and risk determination. Risk assessment included; risk perception and risk weighting. Risk reduction is based on pre-flood reduction, flood event reduction and pre-interventions(Correia, et al., 1997). The concept of flood risk management now is an activity of several professional communities: hydrologist, engineering, economist, social scientist, environmentalist, ecologist and planners. The concepts used in these professions and between them internationally do not share a common terminology; thus there is a need to develop coordination among these professions for accepted disaster management language (NCR, 2002). Community based flood warning systems can go a long way inhelping communities, as well as flood management agencies, to prepare for flash floods.The enhancement of community resilience through socioeconomic empowerment and strengthened adaptive capacity can pay a vital role in flood disaster management (Deka, 2008; Goswami, 1998, Hazarika, 2010).

IV. CONCLUSION

In this paper, we have reviewed and synthesized concepts and techniques of flood hazard, vulnerability and risk assessment into a coherent piece and give an overview of recent literature related to flood risk assessment. Floods are the most lethal kind of hydro-meteorological disaster on the earth surface.Flooding is the most common of all environmental hazards and it regularly claims over huge number of lives per year and adversely affects around millions of the people world-wide.More than one third of the world's land area is flood prone which affecting around 82 percent of the world population. Using PRISMA methodology of literature review, 120 articles were retrieved using Pub med and Google Scholar database. 90 articles were included in the initial review. 30 articles were excluded from the review after reading the whole content because they did not match the objectives of the literature review and the inclusion criteria. Meteorologically flood can be defined as situation over a region or place where that rainfall is mostly heavy and higher than the normal climatological mean value.GIS and remote sensing play an important role in flood hazard, vulnerability and in risk assessment and useful for delineation of flood zones, preparation of flood hazard and risk maps

Flood risk is a function and a product of hazard and vulnerability. Flood Hazard assessment is based flood probability scenarios in the areas where it will hit and strength of the flood. Assessing vulnerability based on physical and socioeconomic processes. Assessing physical vulnerability depends on the susceptibility and exposure to hazards. An exposure indicator depends on how far the receptor is from the source of the hazard. Exposure can be described as high, moderately high, moderate, and low, which constitutes a qualitative description of levels of exposure. Susceptibility to floods is the state of defenselessness, whereas high susceptibility, has the potential to endanger or lose lives, property, ecological species, and landscapes. Assessing socioeconomic vulnerability based on the adaptive capacity of a society and status of economic activities or it is a combination of qualitative and quantitative indicators.Four levels of hazard and four levels of total vulnerability (high, moderate, moderately low and low) can be used in risk assessment. Risk level scale can be categorizedinto five different risk levels, such as very high, high, moderate, moderately low and low. A significant increase in heavy rainfall events in the future will result in an increased flood risk to society, physical infrastructure, and water quality. The enhancement of community resilience through socioeconomic empowerment and strengthened adaptive capacity can play a vital role in flood disaster management.

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