Chapter - 1

INTRODUCTION

Floodings take place since long before people established their first settlements. In fact the first civilisations started in flood plains as they provided fertile flat grounds to be used for agriculture, which made it possible to leave the nomad style of existence and remain at one location for a longer time. Living on a flood plain meant that regular floodings had to be dealt with. From living on mounts and running to higher grounds during floods, the flood management strategies have developed in many ways over time. In the last century flood management strategies have changed tremendously due to the increased priority and are still evolving worldwide.

Man exists in an essentially ecological relationship with his environment and has to face, live with variety of hazards which threaten their lives and property. By definition, such river hazards are a function of both the geophysical world and human society (Smith, Tobin 1979). Among the various disasters and hazards, flood is a major one. In a study of natural hazards of the world over 1947 to 1967, Sheehan and Hewitt (1969) ranked first floods among sixteen disaster-types. Altogether floods accounted for about 30% of all natural disasters and 40% of the fatalities. (Smith and Tobin, 1979). A flood may be defined as the rise in the level of a river or stream beyond the bankfull stage. Flood is a discharge which exceeds the channel capacity of a river and then proceeds to inundate the adjacent flood plain. In tropical countries such high flow are normally caused by prolonged rainfall. In India, an area of 40 million hectares in the country is prone to floods. The area affected annually, on an average, is 8 million hectares which had risen to as much as 18.6 million hectares in a single year. On an average, the area of crops affected annually is 3.7 million hectares which rises to 10 million hectares in the worst affected year. The average annual direct damage is placed at about Rs 626.85 crores, which had risen to over Rs 4,059.26 crores in a single year. In fact, the statistics of damage from 1953 to 1985 indicate that the total damage suffered by the country during this period alone is over Rs 20,686 crores. Deforestation in the catchments, inappropriate land use and degraded lands, inadequate capacity of drainage channels to carry the peak flow, and extensive human occupation of the flood-prone plains are the causes for aggravating the damage caused by floods.
1.1 Conceptual Background

Literature review and transformation of knowledge concerning risk perception approach of disaster and hazards researches definitely demand discussions so as to understand how Conceptual background has emerged through those. Time and again, disastrous floods threaten regions and the people living there, their belongings and the basis of their existence. Flood risks, its causes and consequences create public consciousness. As far as new approaches of flood risk management – instead of mere technical flood defence – focus on flood hazard mitigation and prevention as well as on a sustainable, participative development of floodplains, it is indispensable to integrate the subjective world-views of the people living in flood-prone areas, their risk perceptions, information and prevention behaviour. Floods, being natural phenomena, represent a hazard only with respect to human society. Therefore “the human response component” is no less important in flood risk assessment than those components studied traditionally. Everyday risk perception approach is considered being fundamental for the behavior towards risks and for the decision to take preventive measures. In order to develop effective information and risk communication strategies, the perception of risks and the influencing factors should be known.

Floods are natural phenomena with an important role in the development of the environment. Human perception of flood risk is thus as important in flood risk assessment. Investigation of the perception of the flood hazard by the riparian population and decision-makers provides necessary information for developing flood assessment policy based on the agreed criteria between the individuals and the society.

A common trend among hazard and disaster management practices during the 20th century has been the dominance of a scientific or technocratic viewpoint, focused primarily on the physical processes of disasters. This ‘dominant viewpoint’, as Hewitt (1983) refers to it, recognizes that the potential threat posed by a hazard requires the presence of a vulnerable human population to turn a situation into a disaster. The problem with this view lies in “the sense of causality or direction of explanation … [that] runs form the physical environment to its social impacts” (Hewitt, 1983, p5). According to Hewitt (1983), the dominant view functions based on the assumption that social factors are a dependent variable and have no effect on the physical processes of a disaster event. The dominant view served as the basis for the majority of research and policy development until the pioneering works of Gilbert White began to identify human dimensions as a fundamental consideration in disaster events. Seminal works by scholars such as Ian Burton, Robert Kates, Thomas Saarinen, E.L.
Quarantelli, Dennis Mileti, Kenneth Hewitt and many of their colleagues challenged the technocratic notion and laid the groundwork for theories that integrated social process into the explanation of disasters. The one-dimensional disaster model that focused solely on physical agents was refuted and it was suggested that disasters are outcomes of an interface where social human factors and natural physical processes interact.

Traditionally, hazard research has been based on questions relevant to decision makers (S.L. Cutter, 1999). What can be done to reduce the impacts of flooding? What types of policies, emergency preparedness are required for long term recovery from a particular hazard. Today, these kind of questions are still relevant as they were. But there is a change of attitude or the way we think about hazard, There are two significant changes have occurred in our thinking about hazards (Mitchell 1989). The first lies with the ‘nature’ of hazard. Hazards are no longer seen as singular event, they are viewed as events of complex interactions between natural, social technological system. Even the basic text books of hazards now acknowledge this interrelatedness and increased complexity of the phenomena we study(Smith 1992, Burton, Kates and White 1993). Another second important change is related to how we ‘respond’ to hazardous events. Hazards are imbedded in larger political, social, economical and technological structures and it is often impossible to separate these influences from the impacts of the events. In assessing societal vulnerability to hazards, it is impossible to divorce the context from the event (Cuny 1983.Cutter 1993). As a result, the management of risks and hazard has also become complex, entailing new management systems at the local, regional and global scale. Management alternatives no longer rely solely on technical solutions, as risk and risk reduction becomes increasingly politicized and management options are debated in the court of public opinion (Cutter, 1999).

While academics may have recognized the importance of human dimensions in disaster studies, many decision makers and practitioners still function under the premises of a scientific ethos. Hazard and disaster management at the community level has been somewhat limited and local stakeholders have not been effectively included in the policy process. The prevalent style of management has been a top-down or command-and-control approach where government representatives make the decisions, often without taking into account the values and perceptions of the local residents.
It is imperative that decision-making authorities in the basin address the social aspects of flood disasters and work towards long-term risk reduction. “Disaster marks the interface between an extreme physical phenomenon and a vulnerable human population. It is of paramount importance to recognise both of these elements. Without people there is no disaster” (O’Keefe et al., 1976). The inclusion of social aspects in decision-making is essential to increase the resilience of residents and create sustainable hazard and disaster management practices; human responses and the characteristics of vulnerable populations play a pivotal role in disasters. This is because “[t]he severity and form of damages [from a disaster] depend primarily upon the pre-existing state of society and its environmental relations” (Hewitt, 1997).

1.1.1 The Role of Risk Perception

A crucial step in the inclusion of social aspects is to understand how different stakeholders perceive risk. “Perception of a hazard is an individual’s understanding of the character and relevance of a hazard for self and/or community” (Mileti et al., 1975). The notion of risk perception refers to the intuitive risk judgements of individuals and social groups in the context of limited and uncertain information (Slovic 1987). These judgements vary between individuals due to different levels of information and uncertainty, due to different intuitive behaviour, and also due to specific power constellations and positions of interest. An assessment of risk perception is vital in the discernment of the social state of a community. “The idea of ‘risk’ conveys a fuller sense of … [disasters], in that it embraces exposure to dangers, adverse or undesirable prospects, and the conditions that contribute to danger” (Hewitt, 1997). As such, an awareness of risk perception will provide decision makers with insight into the impetus for individual and community response and behaviour during disaster events; thus enhancing hazard and disaster management. “Those who promote and regulate health and safety need to understand the ways in which people think about and respond to risk” (Slovic, 1987). As a consequence, the individuals of a community may assess the risk of being flooded very differently, because they do not have the same information about the probability of flood hazard events in their region, about flood mitigation measures and their effectiveness, and they perhaps have a different historical background regarding the experience of living in a floodplain and of being flooded. Due to their specific perception of flood risk individuals, social groups and also public persons like mayors, politicians and employees in the public sector dealing with flood protection and disaster management may handle this issue very differently. Experts responsible for flood protection may try to maximise their scientific
information on flood hazards and flood risk in order to optimise the effectiveness of flood protection measures. Politicians may be more interested in attracting additional inhabitants or enterprises into a floodplain region in order to strengthen the regional economic development.

Mileti (1980) defines risk perception as the “cognition or belief in the seriousness of the threat of an environmental extreme”. The cognitions, benefits, and subjective probabilities that determine how an individual perceives a stimulus, such as a disaster, are influenced by a number of factors. As such, the concept of risk perception is quite broad; “risk events interact with psychological, social, and cultural processes in ways that can heighten or attenuate public perceptions of risk and related risk behaviour” (Kasperson et al., 1988).

Risk perception is an important determinant of the behaviour towards risks, e.g. for the decision to take preventive measures. If risk perception of people living in risk prone areas is known, effective information strategies on protective measures can be designed. Risk perception research in the domain of technical risks has shown that (affected) peoples’ perception of risk is subject to many influencing cognitive, personal, situational and contextual factors (Sjöberg 2000a). Because of its complexity, it is very difficult to deduce general statements or a general theory of risk perception. Nevertheless, knowledge about the risk perception of persons living in risk-prone areas is relevant whenever risk management strategies are to be developed or applied. Here risk perception is defined as an everyday subjective assessment process that is based on experience and on available information without referring to reliable data, series and complex models. Individual, subjective risk judgments are often called intuitive to emphasize that major parts of the underlying processes pass unconsciously. In more sociological terms, risk perception is a construction process embedded into and determined by society and culture. Risk judgments therefore imply value judgments. “Risk perception is all about thoughts, beliefs and constructs.” (Sjöberg 2000) In this construction process, possible consequences or outcomes (negative and positive), possible cause-effect relationships, and situations experienced are attributed to hazardous events, situations or activities. Risk here consequently is defined not in mathematical or technical terms, but as a multidimensional concept that comprises subjective “quantitative” assessments based on experience and information as well as perceived or attributed “qualitative” risk characteristics within a certain social, cultural and historical context (Renn 1995).
1.1.2 Approaches to Disaster Research

After surveying the general literature on disaster, Alexander (1993) identified six schools of thought on natural hazards and disaster studies: the geographical approach, the anthropological approach, the sociological approach, the development studies approach, the disaster medicine approach and the technical approach.

The geographical approach (pioneered by Barrows, 1923 and White, 1945) deals with the human ecological adaptation to the environment with special emphasis on the 'spatio-temporal' distribution of hazard impacts, vulnerability and people's choice and adjustment to natural hazards. Social science methods are widely used in this approach.

The anthropological approach (Oliver-Smith, 1979, 1986; Hansen and Oliver-Smith, 1982) emphasizes the role of disasters in guiding the socio-economic evolution of populations. Anthropologists adopting this approach search for reasons why communities in the 'Third World' fail to provide basic requirements for their people's survival. They also discuss the 'marginalization syndrome' caused by impoverishment of disadvantaged groups in 'Third World' countries. Oliver-Smith (1996) developed three general themes as the major trends in anthropological research in disaster: behavioural response approach, social change approach,
and political economic/environmental approach. Oliver-Smith argues that disaster in developing world occur at the interface of society, technology and environment and is fundamentally the outcomes of the interactions of these characteristics. He has also reported that although occurrence of disaster is frequent, theoretical work in disaster research is limited.

The sociological approach (Dynes, 1970; Qurantelli, 1978; Mileti, Drabek and Haas, 1975; Drabek and Boggs, 1968; Drabek, 1986) discusses vulnerability and the impact of disaster upon patterns of human behaviour and the effects of disaster upon community functions and organization.

The development studies approach (Davis, 1978; Knott, 1987) discusses the problems of distributing aid and relief to 'Third World' countries and focuses on refugee management, health care and the avoidance of starvation. The disaster medicine and epidemiology approach (Beinin, 1985) focuses on the management of mass casualties. It also includes the treatment of severe physical trauma and other diseases which may occur after a disaster.

The technical approach (Bolt et al. 1977; El-Sabh and Murty, 1988) focuses on geophysical approaches to disaster such as studied in seismology, geomorphology and volcanology and seeks engineering solutions.

Among these approaches two disciplines, geography and sociology, have dominated the field of disaster research since the 1950s and have emphasised the environmental and behavioural aspects of disaster. Drabek's (1986) findings on existing sociological literature are the significant contributions to the conceptual typology of sociological disaster research. He identified different areas of concern in disaster research such as planning, warning, evacuation, emergency, restoration, reconstruction, perceptions and adjustments. He discussed sociology of disaster under four major headings: preparedness, response, recovery and mitigation. However, most of the approaches and sociological research on disaster have been formulated and conducted for the developed world (especially the USA). Their application to developing areas is problematic and very limited, one major issue for this is the difference in cultural context. Moreover, there is almost no discussion of the gender response to disaster under any theoretical approach. In fact, only recently sociologists turned their attentions to the larger questions of social change related to disaster or the pre-impact conditions in disaster areas as sources of post-impact changes (Oliver-Smith, 1986).

“The study of man’s relationship with the environment has been increasingly concerned with explaining why man behaves as he does, why among other things, he grows one crop
rather than another, or chooses particular transport routes, or builds factories in specific places. “(Knowles and Waring, 1976) The environment is assessed based on how it is being perceived. Farmers have their own estimation of floods or droughts or other types of hazards. Based on their perception, strategy for acceptable returns, risk-assessment and damages are being made (Nag.P, 1986). Behavioural geography, aims to interpret the spatial reality that depend on human nature, on the conscious subjects. As the name behavioural geography indicates, it is interested in human action and behaviour in relation to environment (Passi, 1984). Man and environment paradigm, as a major offshoot of human geography, includes that ‘the notion that individuals and groups relate to their environment through their perception or cognition of them (Blunden, Haggett and Sarre, 1978).

1.1.3 Hazard Perception Research in Geography

Contemporary hazard perception studies date back in mid 20th Century. Way backing 1945, Gilbert White had presented his Ph.D Thesis on “On Human Response to Floods”. Gilbert Fowler White (November 26, 1911 in Chicago - October 5, 2006 in Boulder, Colorado) was a prominent American geographer, sometimes termed the "father of floodplain management". White is known predominantly for his work on natural hazards, particularly flooding, and the importance of sound water management in contemporary society. In his influential Doctoral dissertation entitled "Human adjustment to floods," published in 1945 by the University of Chicago Department of Geography, Gilbert F. White argued that an over-reliance on structural works in the United States had increased damages caused by flooding rather than decreasing them. He argued famously in this work, one of the most important contributions made by a geographer in 20th century North America (Hinshaw 2006) that "Floods are an act of God, but flood losses are largely an act of man". Public confidence in structural works increased occupancy of, and building on floodplains. The reasons for an increase in flood damages caused by reliance on structural works can be associated with design standards, and over-confidence on such adaptations. Structural works were built to certain design specifications (for example, the 100-year flood, or 1% flood). In instances where the design specifications were exceeded (in the case of a 150-year flood, etc.), the structures were prone to failure, thus causing catastrophic loss in over-developed floodplains (White et al., 1958). Gilbert studied nature’s extremes, the hazards they posed for humanity, and the political, scientific, and philosophical issues regarding their mitigation and effective societal response. He believed with a passion that any person can make a significant difference in this world. It only takes the determination to live one’s life in cultivation of a talent or an idea that is useful,
and then to present and advocate that idea to ensure its appreciation or adoption, in order to make a difference. Gilbert White was such a person. White studied a more holistic approach to flood control than the popular methods of the time. He developed his innovative ideas of flood control while working for the Mississippi Valley Committee in the 1930s and as an advisor to President Franklin Delano Roosevelt in the early 1940s. Gilbert White's most important work was done in collaboration with his wife, Anne, and David Bradley. They studied thirty sites in East Africa, investigating the water-gathering practices of local people to gain information about the costs of time, energy, money, and health. Until their book, *Drawers of Water*, was published in 1972, no researchers had studied the decision-making processes of people in developing countries where 60 percent of populations obtain their water by going some distance to draw it and then carry it to where it is needed. This study changed government perspectives toward the quantity and quality of water provided for poorer people in their countries.

Gilbert White—a geographer regarded as the modern founder of disaster social science—viewed flood disasters from the perspective of people's, rather than nature's, behaviour and proposed a range of "adjustments" to human behaviour to be adopted for reducing flood damage, going beyond the standard government approach of seeking to control the water (White, 1942/1945). In a paper entitled "Taking the 'naturalness' out of natural disasters", O'Keefe et al. (1976) extended the focus on human behaviour to all "natural disasters", identifying "the growing vulnerability of the population to extreme physical events", not changes in nature, as causing the observed increase in disasters.

The focus on human decisions leading to vulnerabilities which cause disasters, with the potential implication that disasters are never "natural", is now embedded in the disaster literature (e.g. Lewis, 1999; Miletis et al., 1999; Steinberg, 2000; Wisner et al., 2004). Smith (2005) summarizes: "It is generally accepted among environmental geographers that there is no such thing as a natural disaster. In every phase and aspect of a disaster—causes, vulnerability, preparedness, results and response, and reconstruction—the contours of disaster and the difference between who lives and who dies is to a greater or lesser extent a social calculus". Practitioners also accept the notion that human input exists to all disasters. Abramovitz' (2001) report "Unnatural Disasters" describes the factors which make disasters with environmental phenomena unnatural: "undermining the health and resilience of nature, putting ourselves in harm's way, and delaying mitigation measures". Turcios (2001) asserts "Natural disasters do not exist; they are socially constructed". UNISDR (2002) notes that "Strictly speaking, there
are no such things as natural disasters" while UNISDR's (2007) terminology of basic disaster risk reduction terms does not include "natural disaster".

The argument is that natural disasters do not exist because all disasters require human input. Nature provides input through what could be considered a normal and necessary environmental event, but human decisions have put people and property in harm's way without adequate mitigating measures. The conclusion is that those human decisions are the root causes of disasters, not the environmental phenomena.

Under White’s leadership a group of workers was formed the University of Chicago to study human response to flood hazard using Simon’s theories of decision making. From this group and their graduate students came a large body of research on perception on natural hazard. Though the initial work had related to flood, before long it was extended to cover all types of natural hazards. The influence of Chicago school quickly spread to other countries. The University of Toronto, Colorado and Clark emerged as important centres of research on the natural hazards problems. Soon after cross-cultural research on the perception of hazards was studied as a part of hazard research under the aegis of Commission on Man and Environment established in 1968 by the International Geographical Union (IGU). The impact of behavioural sciences on geography has resulted an attempt to understand the significance of the individual’s experience of the world (Nag, 1986). Lowenthal has claimed that ‘personal geographies’ form the part of common world view “The whole structure of the shared picture of the world is relevant to the life of every participant; and anyone who adheres to a consensus must personally have some of its constituent elements” (Lowenthal, 1961). The introduction of the geography lead to more anthropogenic human geography. The perception research requires a con-disciplinary approach in a cross-cultural perspective. Anne V.T White in her Technical note, Guidelines for the Field Studies in Environment Perception, has tried to bring together methods and techniques, and has evaluated them for use in the field in widely differing environments and cultural settings (Whyte, 1977).

In the paper titled as ‘Assessing public perception of flood risk and flood control measure in urban areas’ by Nilo Nascimento, Eduardo Guimarães Sueli Mingoti, Naila Moura, Roseane Faleiro (2007) examines public perception of the urban environment and of flood risk on the basis of base of survey carried out in Bel Horizonte, the capital of Minas Gerais State, in Brazil. Surveys were conducted in two urban catchments where detention basins are employed mainly for flood control purposes: the Santa Lucia and the Vilarinho detention basins. The research employed methodology consisted of interviewing people employing
structured questionnaires. The questionnaire main focuses were on perception of local risks (risks associated to the detention ponds, flood risk) and on the local environment. The sampling design for each catchment was based on census socio-economic data about the study population comprised by inhabitants as well as owners or employees of commercial and service shops in the study area. Stratified random sampling was then adopted to compose the designed sample. The study reveals that “perception of people demonstrated to have a good understanding about detention basin main roles for flood control, although not identifying in these solutions a possible contribution in terms of pollution abatement. In spite of a good acceptance of storage facilities for flood control and the recognition of the possibility of combining these facilities with other urban equipments (e.g.: parks, squares, etc.), lining creeks is still perceived as a major flood control alternative. Respondents living in flood prone areas revealed a good knowledge of typical flood parameters. In fact, issues of this survey point out a tendency on overestimating flood probability and significant difficulties in stating flood control objectives in terms of accepted flood frequency. This issue also point out the inadequacy of the approach here employed in assessing people acceptance to live with foods.”

Abu Muhammad Shajaat Ali’s work(2007) on ‘September 2004 Flood Event in Southwestern Bangladesh: A Study of its Nature, Causes and Human Perception and Adjustments to a New Hazard’ examines the nature, magnitude and causes of September 2004 hazardous flood that affected the dry and drought prone southwestern region of Bangladesh in Jhikargacha, Keshabpur, Kalaoa, and Satkhira thanas in the districts of Jessore and Satkhira. It explores human perception of this flood and their methods of adjustments to this practically new natural hazard. Field research for this study involved extensive field visits in the affected villages and personal interviews of 453 victim families of this year’s flood, who were selected using the systematic random sampling technique. Findings of the study suggest that the villagers perception of causes of flood during the 2000 and 2004 floods, apart from high rainfall, sedimentation is overflow of the Ichamati river that flows along the India–Bangladesh international border. According to respondents, as the Ichamati river embankment breached by the Indian border patrol in the Indian side to release the overflow of flood water inside India, breached thus conditions inside Bangladesh were aggravated by rapid inflow of an enormous volume of water from the Indian side of the border resulting much more severe destruction of life, crop and property in Bangladesh.
The study finds that immediate short-term effects from this flood included total and partial displacement of affected people, loss and damage of standing crops, contagious and epidemic diseases, increased unemployment, and starvation. Flood victims suggested several long-term adjustments to cope with the flooding in Southwestern Bangladesh. Respondents perceived that dredging, excavation and construction of flood control embankment dykes on these two rivers namely Kobadak river and Betna river would significantly reduce the occurrence of flood. Respondents also suggested that border security should be tightened and alerted this time of the year so that the residents and border security patrol from Indian side could not breach the Ichamati River embankment across the Indian border. Bilateral talks at the government level on the Farakka barrage issue and dredging of the Hoogly–Bhagirathi and Ichamati Rivers in India were suggested by most of the educated respondents. The creation of alternative employment opportunities for the farmers and wage laborers were suggested by majority of respondents. Distribution of small credit from banks was the most urgent demand and introduction of rice-duck farming was suggested by the villagers. These respondents perceived that since duck can survive under high flooding and if they are raised for 2–3 months in the rice field prior to flooding, they could lay eggs during and immediately after the flooding and selling of eggs and the poultry could generate income for the flood affected families. Establishment of industries in the area was also suggested by the respondents.

The study by Tadahiro Motoyoshi (2006) on “Public Perception of Flood Risk and Community-based Disaster Preparedness” is indeed a good work in hazard and disaster research. The study aims to involve in three local residents of Japan in flood disaster-prevention activities and examines consciousness in accepting flood risks. The study intends to participate in community-based disaster preparedness activities and carries out studies on each causal model based on questionnaire surveys. Questionnaire surveys were conducted on 4,000 households in areas of flood affected localities by the Tokai heavy rainfall in 2000. The survey forms were mailed to 2,000 households in Nishi-ku of Nagoya-shi, 1,000 households in Shinkawacho, and 1,000 households in Nishibiwajima-cho, and the forms were collected through personal visits by staff. It was found that consciousness of the acceptance of flood risks was affected by the following four factors: consciousness of self responsibility, consciousness about zero risk, acceptance of ordinary risks, and trust in administrative bodies. The study reveals that in order “to promote acceptance of flood risks, it is important to increase self-consciousness about disaster preparedness through risk communication, understand that it is impossible to achieve zero risk, deepen understanding of not only flood disasters but also
overall risks, and establish relationships of trust between the public and administrative bodies. Second, people have a greater intention to participate in community-based disaster preparedness activities when they take great interest in subjective norms and flood disasters. Furthermore, recognition of costs of disaster preparedness activities serves as a factor to decrease intention to participate. As a result, it was pointed out that it is possible to activate disaster preparedness activities by regarding these activities not as measures to reduce disaster risks but as voluntary activities in local communities.

Another interesting and noticeable work in this premise was done by ‘Flood Risk Perception in the Red river basin, Manitoba: Implication for hazard and disaster management’ by Michael E. Olczyk (2004). The study examines flood risk perception and its role in decision-making in relation to hazard and disaster management in the Red River Basin. A survey of flood area residents from Winnipeg and from southern Manitoba provided the primary data used to examine perceptions at the local level. In addition, a survey of Institutional Representatives provided the primary data used to examine perceptions at the organizational level. The data were collected through the use of a Delphi Process, a modified version of a qualitative research method that involved preliminary face-to-face interviews followed by a two-round mail-out survey. It has been found from the study that hazard and disaster management prior to and during the 1997 flood event in the Red River Basin largely did not account for the perceptions and views of local residents. As a result, there were significant adverse psychological impacts on many of these residents. The study exemplified the nature of flood risk perception in the Red River Basin and potential implications for hazard and disaster management decision-making. Since some of the factors that influence perception and vulnerability are interrelated, an analysis of perception can also indicate the vulnerability of local residents. The analysis emphasizes that when equipped with this knowledge, hazard and disaster management decision makers can develop proactive programs and policies that address perceptions and are intended to reduce vulnerability and increase the resilience of local residents. Therefore, more resources and effort needs to be focused on including local residents’ perceptions and awareness of risk in the decision-making process. The communication gap was found to exist in study between flood area residents and institutional representatives. Clearly, both sides have misconceptions with respect to the perceptions of the other part have developed due to a lack of meaningful communication. As the research indicated, while most Flood Area Residents may not comprehend the precise statistics involved in risk calculations, many have a general understanding of objective risk. Alternatively, many
Institutional Representatives have an awareness of local issues and concerns, but not a detailed understanding of local perceptions.

Existing literature asserts that a gap exists between experts’ estimation of risk (based on objective or quantitative probabilistic assessment) and those of the public (based on qualitative assessments that involve a diversity of factors beyond fatality rates) (Cutter, 1993). Two of the primary factors contributing to this divergences are the persistence of a technocratic dominant view and the influence of psychological, sociological, and anthropological principles on individual decision-making. ‘‘When laypeople are asked to evaluate risks, they seldom have statistical evidence on hand. In most cases they must rely on inferences based on what they remember hearing or observing about the risk in question’’ (Slovic et al., 1979, p. 15).

Douglas and Wildavsky (1982) reasoned that socio-cultural processes were working to govern the selection of risks (why some are emphasized and others ignored). According to Short (1984), individual responses to hazards are strongly mediated by the social fabric at risk, i.e. social influences transmitted by friends, co-workers, and respected public officials often provide after the fact rationale for hazard behaviour (Slovic, 1987 ; Cutter, 1993). In sum, Cutter (1993) clarified that ‘‘the cultural selection of risk was not linked to objective risk measurements or the physical reality of risk. Rather the selection of risk reflected moral, political, economic and power positions that were all value-laden and culturally constructed’’. (p. 22).

When laypeople evaluate danger they seldom use statistically evidence, rather they rely on inferences based on what they hear or observe about the situation. By utilizing general inferential rules in situations wrought with uncertainty, laypeople make decisions in boundly rational manner. ‘‘Knowledge of the workings of bounded rationality forms a basis for understanding constraints on decision-making and suggests methods for helping the decision maker improve as an adapting system’’ (Slovic et al., 1974, p.200). Laypeople use these rules, termed heuristics, to reduce difficult mental tasks into simpler, more manageable tasks. The four primary rules identified in the literature are the availability heuristic, representatives heuristic, anchoring and adjustment heuristic, and affect heuristic. The problem herein is that these heuristic are subject to large and persistent biases when they are used to make sense out of an uncertain world. ‘‘People respond to the hazards they perceive. If their perceptions are faulty, efforts at public and environmental protection are likely to be misdirected’’ (Slovic et al., 1979, p.14).
Whenever decision-makers, policymakers or scientists plan or design strategies to reduce vulnerability and to increase the disaster preparedness of a community, there are some aspects that should be considered. First, mitigation strategies are one component of risk management. Risk management can be viewed as a bundle of decision processes and actions. These decisions and the resultant actions are shaped by individual and collective perceptions of risk. This is also the case with natural disasters (Tobin/Montz 1997, 281). Second, deciding about risk management is definitely not a task of professional risk managers, authorized disaster managers, and local authorities alone, but is also a necessary, though often neglected, task of the people living in the exposed areas. Their risk perception is a fundamental base for their decisions and behavior concerning natural risks and their management of natural risks. Consequently, the risk perceptions of the inhabitants of a community have been taken into consideration concerning disaster management planning on community level. Third, for the development of effective information strategies on protective measurements (risk and communications policies), the risk perception of the targeted group and as well influences on risk perception should be known. In this thesis, first results of a survey on risk perception in different villages along the Mayurakshi river basin area of Jharkhand and West Bengal will be presented. Hereby, the perception of risk such as flood, are viewed from a social scientists perspective. At first, the chosen social science approach to risk perception will be outlined. Then, the methods and sampling procedure of the survey will be sketched. These remarks should provide a sound foundation for the description of the survey and its first results. The data analysis was then started and results are found.

1.2 Location and Selection of the Study Area:

River Mauurakshi, today has become infamous for its widespread flooding and long duration water logging in the lower reach of its basin. The heavy rainfalls, decay of drainage channels, excess water released from Massanjore dam and human intervention intercepting the hydraulic regime cause catastrophic flood.

The river Mayurakshi, one of the major right bank tributary of the river Bhagirathi emerges at Jharkhand from Trikut hills at an elevation of 400 metres, flows down through a large part of Eastern India. The river with a length of about 380 km.s constitutes the transitional zone between the mega physiographic provinces of the Chhotonagpur peninsular massif and the Bengal basin. Important settlements like Deoghar, Dumka, Massanjore, Suri,
Sainthia, Kandi have taken shape within the basin area over decades. It lies between latitudes 23.45°N. to 24.15°N. and longitudes 87.15°E to 87.45°E. (Fig.1)

Fig. 1.1: Location of the Study area.

Mayurakshi is the northernmost of the western tributaries of Bhagirathi. Her tributaries are Brahmani, Dwarka, Bakreswar and Kopai. After coming down from the plateau fringe, it enters in West Bengal in Birbhum district and finally joins the Bhagirathi near Dattabati. The river is obstructed for about 30km. by the natural levels of the Bhagirathi, so that when only 5km. away from the Bhagirathi, it turns at right angle to the south and runs parallel to the Bhagirathi, with natural level between them. After flowing down 30km.s in this manner, it succeeds in finding a gap between the levels and joins the Bhagirathi about 20km. north of Katwa. The highest flood discharge recorded in this river is 2,62,000 cusec in the year 2000. The river bed is almost dry in the summer months.
River Mayurakshi is very infamous for flooding. (Fig.1.2) Mayurakshi River (also called Mor River) is a major river in West Bengal, India, with a long history of devastating floods. Mayurakshi is one of the many of the rivers that originate on the Chota Nagpur Plateau and flow down into West Bengal are rain fed and have for ages wrought havoc with their seasonal floods. This includes the Mayurakshi. Annual rainfall over the basin varies between 765 and 1607 mm with an average of 1200 mm of which 80% occurs during the monsoon season from June to September. The upstream part of Mayurakshi flows over Deoghar and Dumka district of Jharkhand and the the downstream part flows across two districts of West Bengal namely Murshidabad and Birbhum after which it merges with Bhagirathi River. Actually, Mayurakshi in Jharkhand is a tributary of river Hooghly. The name Mayurakshi means the eye of a peacock. The river was named so because of its crystal clear water that sparkled due to the sun rays falling on it. An amazing fact about Mayurakshi River is that the river creates great havoc during monsoons when it brings floods in the areas through which it pass. In order to mitigate the floods, to provide irrigation and power generation, the Mayurakshi project was conceived in 1928 and started in 1951. It was implemented in 1955 and completed by the State Government in all respect in 1985.
Plate No. 1: Area inundated due to excess reservoir water, Dhwajapara Village, Upper basin.

Plate No. 2: Nature and Extent of Sandsplay over cultivated plots, Uttar Gobindapur, Middle basin.

Plate No. 3: Author’s interaction with Villager, Dhwajapara, Upper basin.
This project comprises:

1) A dam at Masanjore in Jharkhand (erstwhile Bihar) with a 4 MW Hydro-Electric power station at its foot.

2) A barrage at Tilpara near Suri in Birbhum district of West Bengal.

3) A major canal system taking off from the Tilpara barrage.

1.2.1 Selection of the study area:

The reason behind the selection of Mayurakshi river basin as study area besides this river beyond the Masanjore experience regular flooding, the river is having such important structural measures like Masanjore Dam, Tilpara barrage and canal. One of Prime Minister Nehru’s first commitments after independence in 1947 was to combine power, flood control and irrigation scheme on the construction of large dams and Masanjore dam was the outcome of this vision. But in this case for irrigation only, with no designed flood storage. The Masanjore reservoir has no flood storage capacity. The initial capacity of Masanjore reservoir was $5 \times 10^5$ acrefeet or $61.67 \times 10^7$ m$^3$. According to the report of the Irrigation and Waterways Directorate, the capacity of Masanjore dam has been reduced by about 48 per cent in dead storage and 15 per cent in live storage. (Source: Irrigation and Waterways Department, 2000) The Massanjore dam and Tilpara barrage played a very significant role in millenium flood in September 2000 in west Bengal. According to some Engineers the western reservoirs played vital role in reducing the magnitude of flood by accommodating substantial amount of water. The argument seems to be untenable. For example, the pond level of Massanjore reservoir was raised from 378 ft. to 402.61 ft. between 17th September to 21st September, 2000. This added a tremendous momentum to the released water which caused havoc in the downstream areas of Birbhum district. On the 18th of September, Tilpara barrage started to release water, highest discharge released was reportedly 1076.38 cusec. The Deucha barrage on Dwaraka river and Baidara on the Brahmani river, were outflanked simultaneously and consequently a huge sheet of water rushed eastward and swept away many villages. On the 21st of September at 12 noon, the Tilpara barrage released 256297 cusec of water.

This river is also having inter-state boundary. So, the selection of this basin as study area provides the opportunity to find out of the root causes of flood problem as well as get the chances to analyse the facets of flood management from the point of view of the dwellers residing along the river. In this research, twenty one villages have been selected along the upper, middle and lower Mayurakshi river basin. The basic objective was to assess the risk
perception about flood and its management among the inhabitants. People’s perception approach for mitigation and reduction of flood risk is indispensable to integrate the subjective world-views of the people living in flood-prone areas; their risk perceptions, information and preventive measures. Hence this research intends to examine the nature of variation of human response in upper, middle and lower basin area. In this basin area, these three parts of a river basin can distinctly be identified.

For the convenience of our study we have divided our study area into three parts on the basis of the relief— the upper basin with more than 300 mt to 50 mt mostly covers the extension of Chotonagpur plateau covering Deoghar and Dumka district of Jharkhand, the middle basin from 50 to 25 mt attitude covering mostly Birbhum (blocks of Sainthia, Suri I, Mayureswar II, Md.Bazar) and part of Murshidabad of West Bengal and the lower basin with less than 25 mt altitude, lying on the Kandi and Burwan blocks of Murshidabad district of west Bengal. (Fig. 1.2)

![Fig.1.3 : Physiography of the Selected Study Area.](image)
1.2.2 Selection of villages:

In the upper basin, 6 sample villages have been taken for the study namely Ghoramara, latasare, Bazar Rahamatganj and Jhajapara, Ektala and Ranishwar. These villages are all located in Jharkhand and lies above the Massanjore Dam. In the middle basin, 11 representative villages have been taken namely Khatangadihi, Narasinghapur, Par Simulia, Uttar Gobindapur, Junedpur, Kultor, Harish kopa, Ghashberia, Napara, Rambati, Amra—all lying in between Massanjore Dam and Sainthia. In this part, Tilpara barrage is located and all the villages are situated in Birbhum district of West Bengal. In the Lower basin, 4 villages have been selected namely Panchthupi, Godapara, Purandarpur and Sabitri Nagar of Murshidabad district. (Fig.1.3)

Fig. 1.4: Selection of the villages.
1.3 The Scope of the Study:

In recent years, perception of flood risks has become an important topic to policy makers concerned with risk management and safety issues. Knowledge of the public risk perception is considered a crucial aspect in modern flood risk management as it steers the development of effective and efficient flood mitigation strategies. This study aimed at gaining insight into the perception of flood risks along the Mayurakshi basin.

It has been observed many a times that the root causes & the solutions of a problem of a region is understood better by the inhabitants of that particular region than a planner. History shows us that many of the villages did find the way to uproot their problems adopting simple indigenous methods & that has been praised by the scientists, planners & researchers as an easy method & has also been held from the economic point of view.

Decidedly much importance to the opinions of the dwellers of the flood affected villages is to pay. The impact of flood on them as well as what method of mitigating it has been thought of as the most befitting one is also to be realized and then all views are to be analysed. Simultaneously what the flood management authority thinks about it & what measures they have thought of to tide over the problem are also to be understood. Only then the gap between the thinking patterns of the flood victims & flood management authority, if there is any, can be found specifically along with root causes of the differences. Hopefully, if this gap can be bridged properly, the ways & means for solving this problem for good will come out.

With an enhanced understanding risk perception, decision makers and institution experts will be better able to establish and implement proactive mitigation and preparedness strategies that are sustainable and improve resiliency. One of the keys to this inclusion, is the two way communication process that involves learning from both the sides –flood area residents perception and Institutional perception.

1.4 Objectives of study

In the tropical parts of Asia most of the major cities have grown in the deltas literally building on the foundations of a rice-growing civilization. The landscape has been managed for floods for centuries. Communities whose livelihood depends on the productive functions of “normal” seasonal flood cycles have learned to live with floods and have embraced its arrival with songs and dances. Institutions and cultural practices around the “management” of floods are among the most persistent, sometimes, surviving for centuries. Over the last few decades
industrialization and the accompanying processes of urbanization have led to very different land-use patterns, economic structure and livelihood base. Political organization has also changed. Floods are now perceived as much more threatening events by people for whom the idea of living with floods is anathema to a modern-society built around highways and the automobile.

It has been recognized that a part of the solution to effective hazard and disaster management is awareness of the dynamics of risk perception. To carry out participatory flood risk management in local communities, it is necessary to understand how residents perceive flood risks in their areas and what type of consciousness residents have regarding disaster preparedness actions. Since not all people are so tolerant of flood risk in the areas where they live, it is important to identify which factors affect the degree of acceptance of people to flood risk. In order to provide an well managed disaster planning, it is necessary that the public as well as the administrative authorities need to participate and cooperate to protect their communities so that their efforts should be reflected in administrative planning. In order to find ways to involve local residents in disaster-prevention activities, there is a need of conducting a study to identify factors contributing to the participation of local residents in disaster prevention activities. The primary goal of this study was to examine flood risk perception and its role in decision-making in relation to hazard and disaster management in the Mayurakshi River Basin. This research examines consciousness of the inhabitants about flood risks and its management and carries out studies on each causal model based on questionnaire surveys. This research gives an overview of people’s perception of flood risk and its management plans, with special focus on existing practices, initiatives, and research results in the domain of human security and vulnerability in the study area.

1.4.1 The Significance of Endogenous System of Surviving and Responding to Disaster:

It is a wonder how the people live and survive in the midst of poverty. There must be something from within that enables the people to live and overcome their conditions and their vulnerabilities. A study that examined the relations between the history of disasters and the political structure, economic system and social order within Filipino society pointed out that “the treats of disaster … has been integrated into the scheme of daily life to form what can be called ‘culture of disaster’ (Bankhoff 2003). The constant exposure of the people to both natural and human-made hazards have led to the formation of individual, family and community mechanisms of responding. There is an endogenous system that enables the people and communities to respond to their vulnerabilities and to disaster events. This endogenous
system refers to the interrelated mechanisms coming from within, and using the internal resources and capacities. It includes the values and practices that are of external origin but are assimilated by the people in their way of life (Luna 2000).

One of the endogenous systems is the coping mechanism. It is viewed that “in every society there is a variety of internal structures that help individuals and families through difficult periods … they become collective instruments for organizing actions on behalf of the disaster victims … Examples of coping mechanisms are: the family, the extended family, religious organizations and clans … formal organizations such as villages and local government” (Cuny 1983: 80). Others use the term natural disaster response mechanism as “positive coping response in which victims themselves take stock of the situation and begin acting constructively to meet the needs of the situation, in spite of the traumatic experience” (OUNDRC 1986:13).

The ways the communities respond to disaster are also influenced by exogenous factors that bring in new approaches and technologies in risk reduction and disaster management. For example, in the field of community development, the principles of participation, empowerment and people-centered development, as well as the processes of community analysis, community education and conscientization, participatory planning and community organization and mobilization, and participatory planning are integrated in the risk reduction and disaster management processes.

1.4.2 Need for Understanding the People’s Responses:

The social and human system is a significant factor in the occurrence, prevention and mitigation of disasters. A disaster can alter the formation, growth, sustenance and expansion of communities. If the community is able to withstand the hazards because of certain level of capacities, then such experience become an enabling factor that can be used as a resource when the next threat comes.

This research aims to study the risk perception on flood of Mayurakshi river basin in the Jharkhand-West Bengal and its management. The area is perennially affected by flooding, the worse of which happened in 2000 when the flood reached 18 feet in some localities and lasted almost three months to subside. When it finally subsided, two feet silt had accumulated inside many houses of the villages along the basin.
1.4.3 **The basic objectives of the research are:**

To find out the nature & extent of flood-hazard of 2000 in Mayurakshi river basin.

1) To identify the emerging problems due to flood.
2) To analyse people’s perception on flood-hazard & the nature of the flood.
3) To find out people’s opinion regarding flood-management strategies taken by the Government & other agencies.
4) To identify existing functional gaps between the attitude & point of view of flood-victims & management people.
5) To outline recommendations about procedures which would harmonize Governmental measures and people’s perception.

The present research aims to study public awareness and perceptions of flood-risk & flooding; public knowledge of and preferences for river management and flood alleviation options. The focus of interest would be to monitor the attitudes and preferences of the public at different stages in the development and implementation of river management schemes and consultation processes, scheme design to post-project appraisals. It would also try to examine the public preferences for consultation procedures. Such type of studies can contribute to the theoretical and empirical literature on the relationship between the public and flood, major investment decisions such as flood alleviation scheme design and implementation.

1.5 **Methodology**

a) **Pre-field section**: The Pre-Field section is comprised of preliminary studies, precisely; dealing with matters prior to any interaction in the field is made. At first studying the toposheets thoroughly, a basin map has been prepared. To achieve the objectives of the study thorough review of pertinent literature was done. 21 Villages were selected along the river as representative sample for survey. From Census Handbooks population data & land use information has been collected. Literature regarding Mayurakshi river & its people were studied in this section.

b) **Field section**: In the Field Section field survey of the basin has been made. Field section comprises of field works that include recorded Interviews of people & photographs. We prepared a model questionnaire with a wide range of issues related to perception of frequency of flood, cause of flood, results of flood damage, level of assistance received after flood, perception of risk and preparedness etc. We have conducted questionnaire survey in
21 villages with a sample size of 907 in order to reveal the attitudes of floodplain residents to the flood hazard and its manage and to provide information on their likely response to future events.

c) Post-field section: In this section pre-field & fieldworks are to be considered & analysed. First, primary data has been tabulated & then analysed. Diagrams has been prepared based on this tabulation. Then these diagrams have been interpreted. After the questionnaire survey we analysed the results using some statistical techniques and tried to analyse the obtained results. The most detailed information was collected on the residents’ perception of the flood hazard, with particular emphasis on the awareness of any authoritarian adjustments and residents perceived response to future flood. Interviews were analysed to represent the views of the interviewers.

1.6 Constraints of the study:

- In general, as risk perception research in hazard and disaster research is intended to provide a in-depth and reiterative examination of risk perception for e.g flood risk perception, the scope of the study will be limited if the sample size (i.e. respondents) becomes small. Accordingly, the outcomes that will be established cannot be used for generalizations applicable to all residents and institutional representatives in the particular area. So it would be useful to conduct a larger investigation into flood risk perception using a larger sample size and quantitative tools so that broader generalizations and direct correlation can be made. The present research uses quite a large number of sample size of 907 in order to avoid this problem.

- Another limitation of this study is related to the geographic extension, if the study area consists of limited spatial extension, the findings cannot always be sufficient to assess large scale phenomena especially if their origin lies away from the zone of perception of the community. Michael .E. Olczyk’s (2004) study on ‘Flood Risk Perception in the Red river basin, Manitoba: Implication for hazard and disaster management’ was limited to Winnipeg and southern Manitoba. He pointed out that in a larger study, residents living north of Winnipeg in the Selkirk and Breezy Point areas would be included. Residents in these regions face significant risk from ice-jam flooding and their perceptions need to be considered. The present research thus twenty one villages have
been selected along the upper, middle and lower Mayurakshi river basin to examine the nature of variation of human response in upper, middle and lower basin area.

- In addition, limitation in hazard and disaster perception research is also associated to time span of the occurrence of particular event and the research work. More the closer occurrence of research conducted after a particular event more information, detailed and vivid memories can enrich the perception and thus the established foundations we get become very sound indeed, and provide an excellent base on which to build an appropriate and sustainable information infrastructure that can address issues from the village level to the level of the district and beyond. Since in this present research, questionnaire survey was conducted four to eight years after the 2000 flood the possibility exists that some memories could have faded and may not have been as detailed as they were closer to 2000 flood. In Olczyk’s (2004) work, he also mentioned this possibility since his work was conducted six years after the 1997 flood in Red river basin the possibility exists that the perceptions may not have been as detailed as they were closer to 1997.

- Risk perception and risk communication are inherently linked as the manner in which risk is communicated can have profound influences on subsequent risk-related decision-making and behaviour, effective communication involves a two-way process between individuals and authorities. A fundamental component of risk communication is trust and confidence in institutions. If the receiver does not trust and have confidence in the communicator, the effectiveness of the message will be significantly reduced. So, whenever this kind of research work is conducted much attention should be given on that surveyor should entail trust of the respondents of the area, should have empathic and as well as objective approach towards the victims. In the present study, the researchers paid much attention to the structuring of questionnaire and in-depth interview of the flood victims in order to share their grievances and experience. As the vernacular/mother tongue of researcher is same with the people living in the study area, it becomes easier to communicate with the respondents.
The objectivity of decision makers is an important consideration for hazard and disaster management. Risk management involves the integration of “an ‘objective’ process of determining what is known about the risks and a judgmental or ‘subjective’ process of deciding what can be done about the risks” (Gough, 1998), p. 114). As such, when making decisions institutional representatives may try to remain objective, but some of their personal values may in fact influence the decisions they make. In some instances if the particular expert happens to be the director or lead decision maker for the organization, the policies and direction of the organization may effect the personal values of the leader. As such, the potential exists that an expert’s personal perceptions of risk, which may be somewhat subjective, could influence decisions made at an institutional level. Once again, this suggests that the gap between laypersons’ and experts’ perceptions of risk may not be overly substantial, as institutional decision-making may involve a degree of subjectivity. In this regard, the role of researcher is very vital because he/she should maintain objectivity in order to avoid the influence of the subjective perception of the concerned parties of victims and authorities. The researcher should maintain a neutral standpoint to find out the communication gap rather than make judgemental viewpoints.