Human perception and responses to flood hazard: A case study from Jhelum district

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ABSTRACT: *This study attempts to find out the human perceptions and their responses about the flood hazard in district Jhelum. District Jhelum is one of the severely flood-affected areas in Pakistan, worstly affected during the floods of 1992, 1995 and 1997. The study found that the government machinery was mostly engaged in post disaster activities. Concentrating more on the evacuation and rehabilitation measures instead of long-term sustainable solutions. Due to negligence by the implementing agencies, the people are becoming more susceptible to flood hazard. Keeping in view the importance of the problem, an intensive study has been carried out, to find out the human perceptions and responses towards flood hazard; A standard questionnaire was designed, and a survey was conducted in nine selected villages.*

INTRODUCTION

District Jhelum is situated in the northern part of Punjab province, and is comprised of three Sub-divisions: namely Jhelum, Pind Dadan Khan and Sohawa. River Jhelum forms a natural boundary with Gujrat, Mandi Bahauddin and Sargodha districts on the east and south side, whereas on the west, Rawalpindi and Chakwal districts and in north Mangla reservoir and Mirpur district of Azad Kashmir are situated (Fig.1). Geographically, the study area is stretches from 32°. 25' to 33°. 15' north latitudes and from 72°. 30' to 73°. 47' east longitudes. Cities like Jhelum, Pind Dadan Khan and Jalalpur Sharif are situated right on the active floodplain of river Jhelum (Fig. 2). Likewise, many other populated villages are also located on the floodplains. The floodplain forms a narrow strip along the river Jhelum, stretches almost in north-east to south-west direction. The maximum width is about 11 kilometers on left bank of the river.

Flood in the study area are caused mainly by heavy rainfall combined with snowmelt in the upper catchment areas of river Jhelum and its tributaries during the monsoon season i.e. from July to September, when tropical cyclones move inland from the Bay of Bengal. Generally, floods are restricted to these three months but early and late floods have also been experienced in the month of June and October, which are relatively dry months (Ahmed and Qureshi 1995). Rainfall in the upper catchment area is the main contributor to flooding in this area. When river Jhelum enters into plain area of district Jhelum just below the Mangla dam, it is braided into three tributaries upstream of Jhelum city. These channels produced certain islands, bounded from all sides by water bodies. Gurah Nasrullah, Langerpur, Mirajpur, Munawarpur and Maghdupur villages are located on these islands (Fig. 3). These water locked lands are locally known as "Bella". Down stream from Jhelum city, braided channels get united and it flows as an integrated channel.

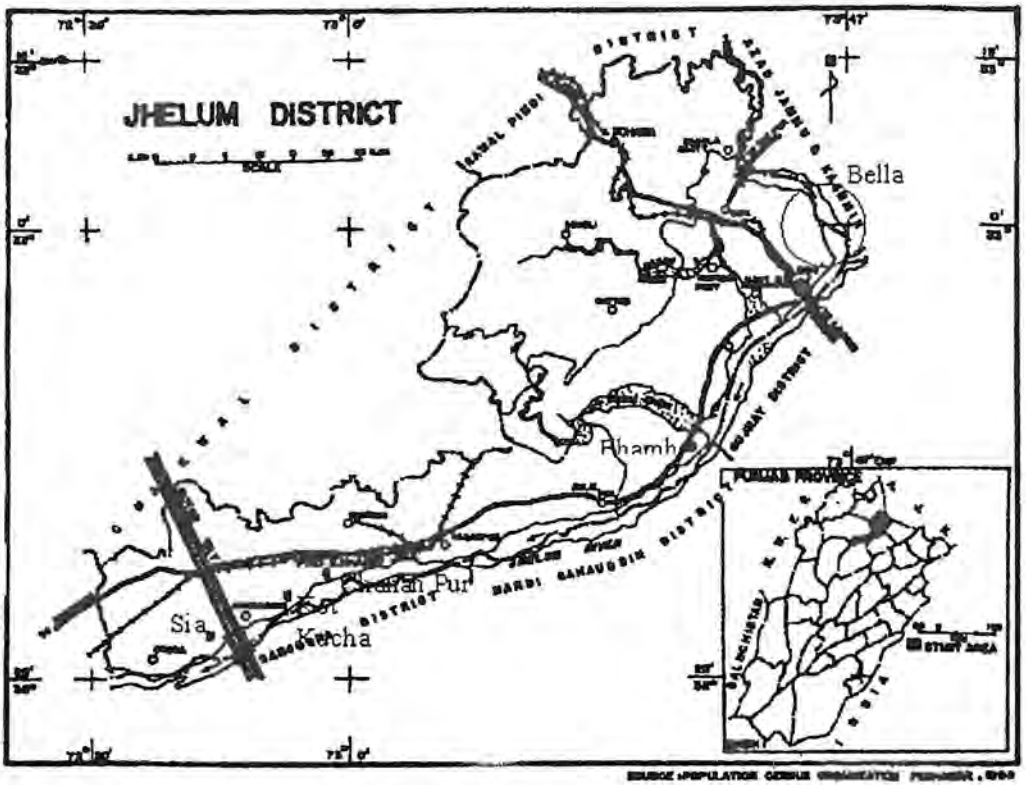

Fig. 1. Geographical sketch map showing location of the studied area.

Bhambar village is situated at the confluence of river Jhelum and Bunha (Fig. 4). Sial, Kot Kucha and Chanan Pur are other study villages situated in Pind Dadan Khan Sub-Division (Fig 5). Whole of the district including Jhelum, Pind Dadan Khan and Jalalpur Sharif cities were severely affected during 1992, 1995 and 1997 floods (Ahmed and Qureshi 1995).

The study of human response to environmental extremes, provides a useful theme and attracts researchers from many disciplines with in the social sciences (Sewell and Graham, 1969). There have been many attempts to synthesize human response and adjustment to disasters only in its aftermath or as it has occurred. Perception and response survey during this study is aimed at finding people's perception and responses towards the flood hazard. In the light of these responses, recommendations have been made for adjustments in the physical and human system.

RESEARCH METHODOLOGY

To achieve the objectives of the study both primary and secondary sources were used. The primary source was considered most appropriate for necessary data collection. The primary data was collected from the general public of nine selected villages in District Jhelum. Six villages were selected from Jhelum sub-division, while three were selected from remote sub-division of Pind Dadan Khan. For this purpose a standard questionnaire was designed to collect the relevant data. About 20% of the total population was surveyed. Likewise, another questionnaire was prepared to collect necessary data from line agencies. Beside this, interviews with the general public and observations were also undertaken.

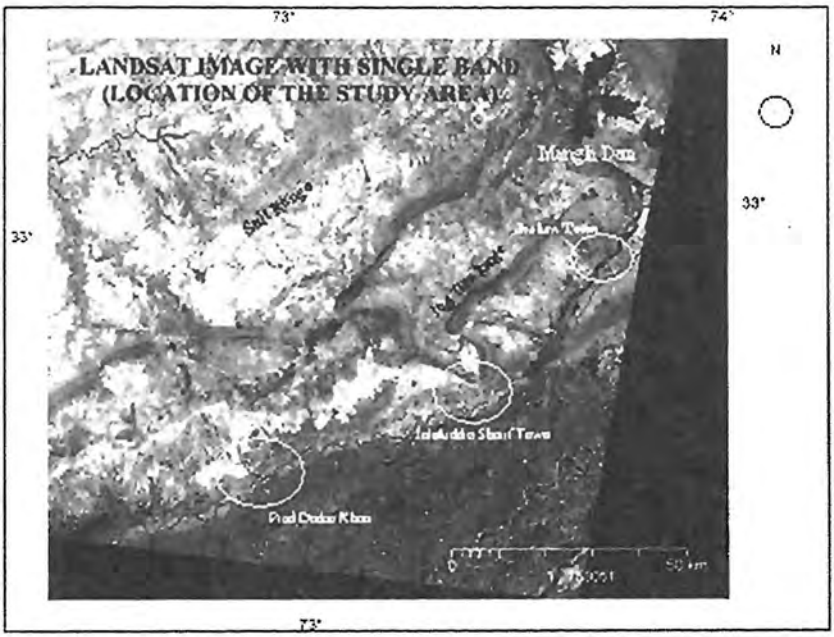

Fig. 2. Landsat Image showing the physiographic setting of the study area.

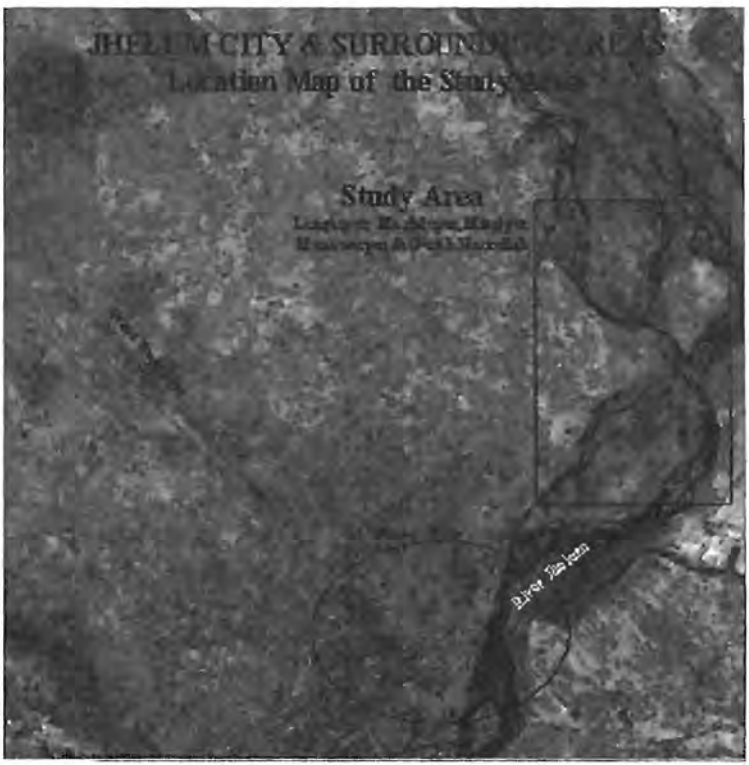

Fig. 3. Location of the Bella where the study area is situated

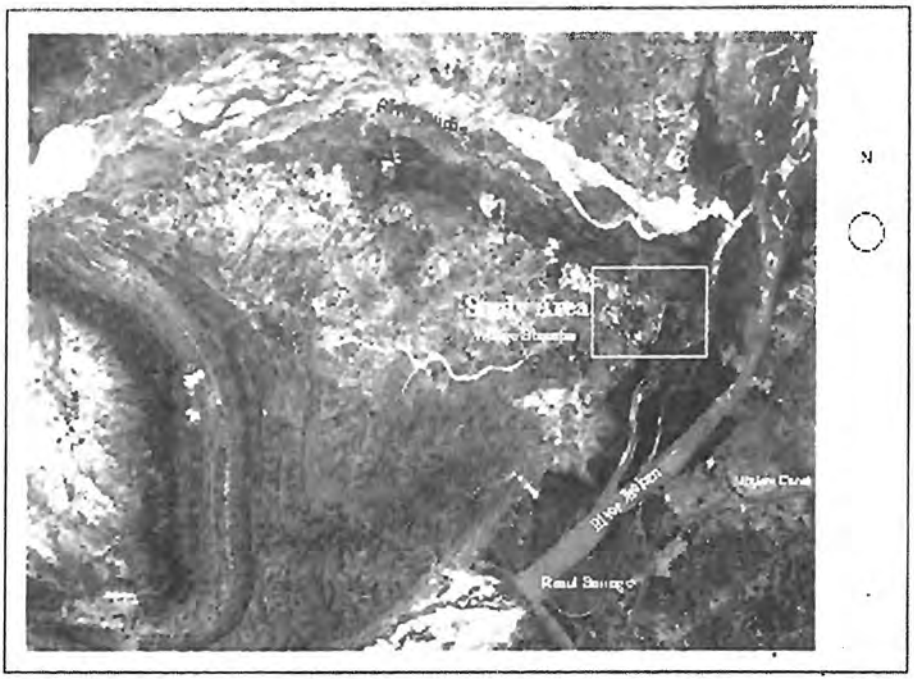

Fig. 4. Landsat Image showing location of Bhambar at the confluence of River Bunha and Jhelum. Rasul Barrage is also prominent.

Fig. 5. Landsat Image showing the study area in Pind Dadan Khan. Motorway is also prominent.

As the secondary data is concerned, it includes the reports, journal, books etc of various line agencies. Ultimately the collected data and information were classified and analyzed keeping in view the existing socio-economic and physical environment of the study area.

Consequently, the conclusion were drawn and presented in the form of map, tables and description. Analysis was conducted through computer accessories.

ENVIRONMENTAL SETTING OF THE STUDY AREA

The physiographic setting indicates that the study area is more vulnerable to flood hazard than the surrounding districts. The river Jhelum is flowing in large meander curves towards the left bank, as it flows out from Mangla reservoir. Consequently, the floodwaters overflow the natural levees and hit upon the Jhelum city, which lies at a distance of 20 km down stream from the Mangla dam. Between Jhelum city and Mangla dam, the soil is very fertile but all of the human efforts spoil when the floodwaters spread a thick sheet of sediments over the agriculture land. Especially the river Bunha brings a lot of sediments. Due to this sedimentation, the width of the river Bunha at the confluence of river Jhelum reach up to two Kilometers, but it hardly contains water except during monsoon season. A broad alluvial fan spread out between river Jhelum and surrounding hills, and is known as Reverine region, starting from the Mangla Cantonment (just near Mangla Dam) to the Bugga village in Pind Dadan Khan Sub-division. Its average width is about 11 kilometers but is subject to great variation, for example near Jalalpur town the plain is confined only a few feet between the river and the foothills (Fig. 4). This tract consist of fertile loam which gradually grows sandy as it approaches the river and stony towards the mountains. The hill torrents generally bring down fertilizing floods, but sometimes sweep away fertile ground, or bury it in a layer of unproductive sand. However, these tracts are generally small in area and poor in quality.

The climate of district Jhelum is continental sub-tropical. It is sub humid in the north-eastern part and gradually changes to semi-arid in the south-western part of the district. The main features of this type of climate are high temperature in summer, cold nights in winter and torrential and erratic monsoon rains in late summer. May and June are the hottest months temperature usually ranging from maximum 44° to 46°C. July and August are although the hot but monsoon keep the weather pleasant. December and January are the coldest months when the temperature falls 1° to 4°C at night. Rainfall is mostly received in two rainy seasons. About two third of the total rain occurs during monsoon season from July to September. The monsoon rains are usually accompanied by thunderstorms and occur in heavy downpours. The remaining rain received in the form of gentle showers of long duration during winter. Table 1 show the month wise mean temperature and precipitation during 1961-1990.

River Jhelum is the main river flowing in the study area and the main contributor to frequent flooding. It is one of the eastern tributary of the Indus River system. Its catchment area above Mangla dam is 20,708 Square kilometres (including the main river Jhelum and its tributaries) and flows from north-east to south-west direction in district Jhelum. It originates from the spring of Verinag in the north-western side of Pir Panjal Mountains range, and flows through Dal and Wular lakes in Occupied Kashmir. From its source to Mangla Dam, it covers a distance of 563 kilometres. During its course, the river falls approximately at an average rate of 4.67 meter/kilometre.

River Bunha rises in the government forest reserved area "***Surla***" in district Chakwal. It turns towards east, and confluence with the Kulian, Kutian and Saruli nullahs. The united torrents flow through the Ghorigala pass. Its bed at the Ghorigala is only a few paces in width, but near the confluence of

TABLE 1

MEAN MONTH-WISE CLIMATIC DATA OF DISTRICT JHELUM (1961-90)
(SOURCE: DISTRICT CENSUS REPORTS OF JHELUM, 1998)

Months	Temperature (C°)		Precipitation (mm)
	Maximum	Minimum	
January	24	1.8	118.4
February	26.9	3.5	117.4
March	32.5	7.4	261
April	39.4	12.4	144.1
May	43.7	16.8	89.1
June	45.7	21.1	148.9
July	42.2	21.8	502.5
August	38.8	21.9	545.9
September	38.2	18.8	252.3
October	36.3	12.4	61.5
November	31.5	5.4	40.1
December	25.9	2.4	186.3

River Jhelum it is two kilometres wide. Finally it falls into the River Jhelum between Darapur and Bhambar village. Gurawala, Sanghoi, Mackrach and Jabba kas are other small torrents, which join with River Jhelum in the study area (Ahmed, 1978).

HUMAN PERCEPTION AND RESPONSES TO FLOOD HAZARD

To find out the human perception and response to flood hazard, a model questionnaire prepared by White et al. (1974) has been used during field survey (Table 2). For this purpose, nine villages were selected which were affected during minor flooding. The respondents were selected randomly, which make 20% of the total population. Their responses were tabulated, analysed and the result has been drawn.

The hazard exists at all

In response to this perception, none of the respondent denies the existence of flood hazard. They were of the opinion that flood is a recurrent phenomena in the study area.

Accept the hazard as a natural and inevitable event

When asked about the perception to accept the flood hazard as a natural and inevitable event, majority of the respondents said that whenever flooding occurs, we can only pray for the retreat of flood as it is in the hands of Almighty Allah, who protect us from such calamities. The respondents of Bella's villages said that we were trapped by the floodwater from all sides. Floodwater entered into the houses and caused great damage. The respondents replied that we took

protection over the roof of the houses and pray all the time for the flood receding. In Bhambar (82%), Mirajpur (87.5%), Munawarpur (85.7) and Gurah Nasrullah (82.8%) expressed that we can only pray in such a situation, while respondents of other villages also expressed the same response (Table 3). Many of the respondents said that we do nothing; we only wait for the retreat of flooding. We only try to transfer our belongings either to roof of the houses or any other safe place, but we do not leave our houses. They said that they get high floods almost in every five years. In Chananpur (35.7%), Sial (31.6%), Kot Kucha and Langerpur each (28.5%) said that we do nothing as flood occurs here recurrently.

When asked about the perception that flood hazard is inevitable but it is controllable by taking some structural adjustments (Table 4); in village Langerpur (82.9%), Mirajpur (87.5%) and Kot Kucha (51.4%) respondents were of the opinion that government should construct embankment and dykes to restrict floodwater within the channel limit. Whereas some of the respondents replied that reservoir and barrages can't stop flooding, rather it is a cause of flooding. It was especially realized in village Bhambar (17.5%) that was severely affected during 1992 flood that due to the release of stored floodwaters at Rasul barrage, whole of the village was under water for almost two weeks. Similarly, the respondents of Bella have also expressed the same feelings, as they believed that due to the sudden opening of the reservoir gates we suffered more as compared to the downstream villages. In response to modify the causes of flooding by the aforestation in the catchment areas, the respondents of Maghdupur (60%), Munawarpur, Chananpur

TABLE 2

MODEL QUESTIONNAIRE (White et al., 1974)

S. #	Hazard perception	Common response
1	The hazard exists at all	• **Do nothing e.g.** It can't happen here It happen 20 years ago but it will never strikes in the same place again
2	Accept the hazard as a natural and inevitable event	• **Do nothing e.g.** We get floods recurrently. • **Pray e.g.** Its all in the hands of God
3	Hazards are inevitable, but controllable	• **Modify the causes of flooding e.g.** Forest plantation in the catchment areas • **Modify the flood level e.g.** Building reservoirs, embankments/ dykes & barrages etc to control the river in its channel
4	Hazards are inevitable, but the effects can be controlled	• **Reduce the damage potential e.g.** Warning systems; community awareness programs; evacuation procedures, special building designs or land use zoning etc • **Leave the area e.g.** Seasonal nomadism; move with friends or family; permanent migration • **Plan for the damages & losses e.g.** Flood insurance • **Spread the losses across the community e.g.** Disaster relief funds; Govt. subsidized insurance; International emergency relief • **Bear the losses e.g.** Use savings
5	Some hazards are made or intensified by the people	• **Alter human behavior & land use patterns e.g.** Land use zoning; stop erosion; change of social, political & economic factors

TABLE 3

ACCEPT THE HAZARDS AS A NATURAL AND INEVITABLE EVENT. HAZARDS ARE INEVITABLE, BUT CONTROLLABLE *(SOURCE: FIELD SURVEY 1998)*

Response	Langer-pur	Maghdu-pur	Miraj-pur	Munawar-pur	Gurah Nasrullah	Bhambar	Sial	Chanan-pur	Kot Kucha
Do nothing; e.g. we get floods in every 5 years	28.5	25	12.5	14.3	17.2	18	31.6	35.7	28.5
Pray e.g. its all in the hands of God	71.5	75	87.5	85.7	82.8	82	68.4	64.3	71.5

and Gurah Nasrullah each (71.4%) and Bhambar (82.5%) were in favour of the aforestation not only in the catchment areas but also along the bank of the river Jhelum, Bunha and Kahan. The reason for this response to be high in those villages where the literacy ratio is comparatively high, so the people are aware of the benefits of the long term sustainable solution of the flood control. Most of the respondents replied that there must be some permanent solution for reducing the adverse affects of flood hazard.

Hazards are Inevitable, but the Effects can be Controlled ?

Table 5 indicates that majority of the respondents were in favour of both structural and non-structural adjustment. Some of them were in favor of improved flood warning system. However, they were dissatisfied with the warning system given by the civil administration about flooding. Some respondents were found interested in community awareness programs. However, they were not in favour of

TABLE 4

HAZARDS ARE INEVITABLE, BUT CONTROLLABLE *(SOURCE: FIELD SURVEY 1998)*

Response	Langer pur	Maghdu pur	Miraj pur	Munawar pur	Gurah Nasrul-lah	Bhambar	Sial	Chanan pur	Kot Kucha
Modify the causes of flooding e.g. aforestation in catchment areas	17.1	60	12.5	71.4	71.4	82.5	50	71.4	48.6
Modify the flood level e.g. build reservoir, embankment & barrages etc	82.9	40	87.5	28.6	28.6	17.5	50	28.6	51.4

adopting special building design. In the study area majority of the people are living below poverty line, therefore they are unable to construct their houses according to the building codes and design. Similarly, some respondents oppose the idea of land use planning and regulations as they said that it is not possible to shift to other places.

In village Chananpur (80%), Gurah Nasrullah (78.6%), Langerpur (71.4%), Munawarpur (71.4%) and Maghdupur (60%) respondents expressed that flood-warning system should be improved as well as the government should introduce community awareness programs at the village level. The respondents of Bella especially complain about flood warning system. They said that inspite of living very near to the Jhelum city and Mangla dam, the government machinery do not inform us well in time. In response to leaving the area either permanently or seasonally, only a few respondents favoured. One reason for such a poor response was the emotional attachments to their ancestral places as they expressed that it is our property, also our forefathers were living here. No data was recorded for leaving the area in village Maghdupur, Mirajpur and Sial. In Bhambar 25% and Kot Kucha 7.1% said that if government provides shelter then they are ready to leave the area. Another reason for the positive response was that the respondents were living in kacha houses made of mud. Hence they demanded that government should construct pacca houses for them. However, the respondents in village Maghdupur (20%), Munawarpur (14.3%) and Gurah Nasrullah (10%) were in favour of flood insurance. They said that it is not possible due to low income in our country but still flood insurance is necessary if there is no way out. The

TABLE 5

HAZARDS ARE INEVITABLE; BUT THE EFFECTS CAN BE CONTROLLED

(SOURCE: FIELD SURVEY 1998)

Response	1	2	3	4	5	6	7	8	9
Reduce the damage potential e.g. warning system; community awareness programs; evacuation procedures; special building designs; land use zoning etc	71.4	60.0	25.0	71.4	78.6	42.5	10.0	80.0	8.6
Leave the area e.g. seasonal nomadism; move with friends or family; permanent migration etc	2.9	0.0	0.0	2.9	7.1	25.0	0.0	2.9	7.1
Plan for the damage & losses e.g. flood insurance	7.1	20.0	0.0	14.3	10.0	0.0	0.0	0.0	0.0
Spread the losses across the community e.g. disaster relief funds, Govt. subsidized insurance; International emergency relief	15.7	20.0	75.0	4.3	2.9	32.5	90.0	15.7	84.3
Bear the losses e.g. use savings	2.9	0.0	0.0	7.1	1.4	0.0	0.0	1.4	0.0

LEGEND: 1: Langerpur 2: Maghdupur 3: Mirajpur
4: Munawarpur 5: Gurah Nasrullah 6: Bhambar
7: Sial 8: Chananpur 9: Kot Kucha

reason for favour of flood insurance was that majority of the respondents were educated in these two villages. In other villages no one was in favour of insurance schemes for the flood affectees. When asked about the disbursement of disaster relief funds, an overwhelming majority of respondents in Sial (90%), Kot Kucha (84.3%) and Mirajpur (75%) favoured relief funds for the flood affectees. They blamed government officials that they normally interfere in the distribution of relief. As a result, the relief could not reach to the target population. In these villages majority of the respondents were illiterate, which shows their narrow approach towards selecting a short-term solution of the problem. In response to bearing of losses, the respondents said that they are very poor and can't bear all the expanses by themselves.

Some hazards are made or intensified by the people

The response of intensifying the flood hazards, a few respondents said that there should be ban on living in the flood prone areas. However, in Gurah Nasrullah 28.6%, were in favour of ban on living in the flood prone areas. Infact most of the respondents in this village were literate, therefore, they were fully aware of the physical adjustment, however they said that in future government should ban on further encroachments in the flood prone areas. In response to stop erosion in the flood prone areas, in village Munawarpur (40%) and Langerpur (28.6%) respondents said that government should take some concrete steps to control the erosion (Table 6).

FINDINGS OF THE STUDY

Following are the main findings of the study,

- Field study revealed that no body denies the occurrence of flood hazard.
- Majority of the respondents were of the view that although hazards are inevitable but by adopting some protective measures, floods can be reduced.
- Respondents blamed the line agencies for proper warning.
- The respondents did not accept the idea of land use planning and adopting design codes for the construction of houses in flood prone areas.
- The studies also revealed that majority of the respondents were not ready to migrate either on permanent or seasonal basis to safe areas.

TABLE 6

SOME HAZARDS ARE MADE OR INTENSIFIED BY PEOPLE *(SOURCE: FIELD SURVEY, 1998)*

Response	Langer-pur	Maghdu-pur	Miraj-pur	Munawar-pur	Gurah Nasrul-lah	Bhambar	Sial	Chanan-pur	Kot Kucha
Ban on living in flood prone area	7.1	15.0	0.0	7.1	28.6	0.0	0.0	7.1	2.9
Stop erosion	28.6	10.0	6.2	40.0	14.3	19.2	10.0	5.7	2.9
Alter political, social and economic factors of the area	57.2	75.0	81.3	50.0	57.1	68.3	65.0	85.7	65.6
Do not express	7.1	0.0	12.5	2.9	0.0	12.5	25.0	1.4	28.6

- The interference by the government officials and political leaders during the disbursement of relief was also noted in some villages.
- The study revealed that, majority of the people said that we are unable to protect ourself from floods.
- The respondents admitted that mankind is also a source of accelerating the flood hazard.
- It was found that most of the respondents were in favour of changing the socio-economic condition of the area.

RECOMMENDATIONS

The following recommendations are put forward in order to reduce the adverse effects of flood hazard.

Improved flood forecasting and warning system

The National Flood Forecasting and Warning Bureau should be well equipped with the improved techniques including the installation and up-gradation of various facilities such as wider range RADAR, telecommunication and satellite receiving systems; improved warning dissemination through radio, television, newspapers, telephone, fax, e-mail, internet and special warning system, upgraded data collection system and better prediction technology for flood warning. Also it is important for the civil administration of the concerned area to issue flood warning within limited time. With the application of modern techniques, they will be able to communicate a reliable and advanced warning to the people of flood prone areas. The receipt of early warning will allow the flood hazard co-ordinating bodies and the general public to undertake more effective measures to cope with the flood threat (Cunny 1983).

Improved Communication and Infrastructure Network

The important aspect of the communication network is the effective evacuation of the people who are living in the flood prone areas, especially road network and bridges over the river should be constructed on priority basis (Cunny 1983). All communication links with flood prone areas should be examined through out the year and especially before monsoon season, so that they would function without creating problems during flooding.

Community involvement and awareness programs

The government and affected communities are interdependent. The government should involve the affected communities not only in the planning process but also it is necessary to arrange some awareness programs in the flood prone areas. For this purpose, awareness programme should be held periodically. It is also very necessary to incorporate awareness programs in the syllabus for school going children.

Community should also implement certain measures of self-help hazard reduction activities. For this purpose community should be better equipped with natural hazard situation. They should form Community Based Organizations (CBOs), and Village Based Organizations (VBOs) to undertake the measures. Moreover, the community should built linkages for exchanging information among them and feed it to the higher-level authority.

Proper compensation policy

During field survey, it was observed that the affectees were not compensated properly. People used unfair means to get the compensation. Similarly the compensation price does not full fill the demands of the affectees. Such compensation policies should be introduced that every affectee could get the compensation according to their need with fair game. The disbursement of money should be distributed by involving the representatives of CBOs and VBOs (OXFAM 1996).

Construction of dykes and embankments

The construction of dykes and embankments along the river courses are utmost required, particularly near Bhambar, Bella and all other important villages. These dykes will ultimately control further bank erosion (Mustafa 1998).

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