

# Consequences of Natural Disaster

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*Received November 14, 2007; revised and accepted April 10, 2009*

**Abstract:** The phenomena of flood, a normal part of river's life cycle, is always considered to be an extreme event because its after-effects are misery, deaths, damages and destruction. The intensity of any disaster is weighed in terms of the quantum of damages done to the society. The purpose of this paper is to analyze the consequences of flood disaster in Patiala district. The intensity and magnitude of flood damages has also been explained. The present study is based on the secondary data culled from the publications of Government of Punjab in the post-independence era. Both the socio-economic and ecological consequences of the natural disaster are conferred. During this period Patiala district experienced the most severe flood in its history in the year 1993. A case study of the impacts of 1993 flood has also been discussed to highlight the severity of the disaster. It is evident from the study of floods in Patiala district that floods are causing mass scale destructions to the property and infrastructure of the district. The frequently occurring disaster is also threatening human lives apart from damaging the ecological web of the district. The social and economic benefits of inhabiting flood plains are outweighed by the severe consequences of the floods.

**Key words:** Flood, Patiala, ecosystem.

## Introduction

Natural phenomena of metrological and geological origin frequently, and with varying intensity, cause disasters. Disasters have negatively affected mankind since its very beginning. The degree of damages suffered by the population in any given disaster depends on the intensity of the natural phenomena, the proximity of human settlement to the location or path followed by the phenomena and the degree of prevention and preparedness achieved by such human group. Similarly, the phenomena of flood, a normal part of river's life cycle, is always considered to be an extreme event because its after-effects are misery, deaths, damages and destructions (Ahmed, 2008).

Flood damages mean the destruction, partial or complete, of property or of life. Apart from loss of human beings and cattle wealth, destruction of rural and urban property, damage to facilities and utilities and the loss of agricultural crops, the flood damages include economic losses arising from disruption of normal economic

activities and the low productivity in the flood hit areas. Destruction or losses associated with floods also include the expenditure on measures for mitigation and providing relief and rehabilitation (Parkash, 1994).

Mankind has no control over the location, time and space and intensity of natural phenomena causing disasters resulting into colossal loss. World-wide count for population affected and economic losses due to natural disasters cross million dollars annually. During 1991-2005, natural disasters affected 34.7 billion people whereas economic losses assessed were of 1192.95 billion US dollars throughout the world. India ranked eighth in terms of economic damages with a loss of 23.60 billion US dollars caused by natural disasters.

Among the several natural disasters floods are the major threat to humanity. Floods alone affected 20.1 million people in the world and caused a damage of 366.43 billion US dollars during the same period. In the year 2005, 168 floods hit the world affecting 74.3 million people and 6135 persons lost their lives (<http://www.em-dat.net>).

India, the second largest country of the world in terms of its population, is highly vulnerable to floods due to the large river systems, each of which being capable of causing severe floods and associated damages. The problem is of gigantic dimension because of hydro-meteorological conditions and erratic nature of the Monsoon System. National Flood Commission (Rashtriya Barh Ayog) has estimated that about 40 million hectares of area is vulnerable to floods in India. On an average about eight million hectares of area is affected by floods annually throughout the country, causing a total damage to crops, houses and public utilities worth Rs. 980 crores (Ministry of Water Resources, 1996). Even after taming the major rivers and adopting various flood control measures, devastating floods hit one or the other area of the most developed riparian state of India i.e. Punjab.

The State has been drained by three perennial rivers namely Satluj, Beas and Ravi and one seasonal river known as Ghaggar. Apart from these there are several small seasonal streams, which are tributaries to these four major river systems. Though the problem of floods in the major river basins has been tackled through construction of reservoirs supplemented by embankments, even then the State witnesses floods annually. Located in the south western parts of Punjab along river Ghaggar, Patiala district is designated flood prone due to high frequency of floods. The main cause of floods and associated miseries here is river Ghaggar and its tributaries.

Data on flood occurrence, and its effect upon people, are primary inputs to analyse the temporal and geographical trends in disaster impact. Flood losses, systematically registered in historical databases, provide the basis for identifying where, and to what extent, the potentially negative outcomes embedded in the concept of risk is realized. They help to understand where, and to whom, flood risk becomes a major impact. They also provide the basis for risk assessment processes, a departing point for the application of disaster reduction measures.

### **Objective and Methodology**

The purpose of this paper is to analyze the consequences of flood disaster in Patiala district. The intensity and magnitude of flood damages has also been explained. The present study is based on the secondary data culled from the publications of Government of Punjab in the post-independence era. After partition, particularly from 1960, the government started recording floods. As a result, detailed information related to floods and

associated damages are available. Both the socio-economic and ecological consequences of the natural disaster are conferred. During this period Patiala district experienced the most severe flood in its history in the year 1993. A case study of the impacts of 1993 flood has also been discussed to highlight the severity of the disaster.

### **Socio-Economic Consequences**

After partition the low lying areas of Ghaggar flood plain in Patiala district received a large number of migrants stimulated by availability of cheaper land. People migrated to these areas to improve the size of their land holdings. Land was reclaimed on mass scale for agriculture along the flood plains of river Ghaggar throughout the district. The government provided several infrastructural facilities like irrigation and chemical fertilizers, extension services etc. for the reclamation of land and development of agriculture but protection from floods was totally ignored. As a result the Patiala district had to suffer huge losses of the crops and property year after year which is evident from Table 1. As in 1960, 1063 villages with 2098 square kilometres of area and about 4.5 lakh people were affected while 15 persons and 209 cattle heads lost their lives and 19,086 houses were damaged. The total loss of property and crops assessed was worth Rs. 440 lakhs approximately.

Likewise in 1962, 1257 villages with 1631 square kilometres of area and about seven lakh people were affected while six persons and 227 cattle heads lost their lives and 14,283 houses were damaged. Total loss of property and crops during 1962 floods was estimated to be Rs. 496 lakhs. Again in 1968, seven persons lost their lives due to heavy floods while a loss of Rs. 158 lakhs to the property and crops was reported. Similarly, in 1971, five persons and 137 cattle heads lost their lives and loss of Rs. 54 lakhs to crops and property was assessed. The authorities claimed that though they had adopted best preventive measures to control the floods even then the people have to face the devastation frequently. In 1983, 12 persons and six cattle heads lost their lives due to severe floods while 68 villages were inundated, causing a loss of Rs. 384 lakhs to the crops and property (Table 1).

Once again in September 1988, severe floods claimed 10 lives and 200 cattle heads while 341 villages were affected by flood water. About 715 square kilometre area of the district was inundated. In 1988 the district had faced problem due to the faulty design of Satluj Yamuna Link (SYL) canal which is across the gradient and the aqueducts provided on it for seasonal chores were inadequate and incomplete. The assessment of loss to

**Table 1: Patiala district: Flood damages**

<i>Nature of damages</i>	<i>1960</i>	<i>1962</i>	<i>1964</i>	<i>1968</i>	<i>1971</i>	<i>1978</i>	<i>1983</i>	<i>1988</i>	<i>1993</i>	<i>1996</i>	<i>2004</i>	<i>2006</i>
No. of villages/ towns affected	1063	1257	538	269	264	279	68	341	678	771	321	345
Area affected (in sq. kms)	2098	163	1428	293	309	230	720	741	1713	253	230	178
Population affected (in '000)	448.6	709.1	263	169.3	92.6	80	164.5	20.3	1110	94.5	12.4	405.9
Human lives lost	15	6	2	7	5	-	12	10	114	1	13	-
Cattle heads lost	209	227	52	-	137	29	6	200	5943	-	396	-
Houses damaged (No.)	19086	14283	1915	1187	685	5621	9274	21799	30992	-	12392	2
Houses damaged value (in lakh Rs.)	131.63	13.17	4.54	6.16	2.25	26.93	48.22	113.72	537.85	-	220.09	5.00
Damage to area under crops (in '000 hectares)	142.4	163.1	37.3	28.5	211.7	15.8	5.7	74.1	35.1	1.3	22.9	17.8
Percentage of damaged area to total cropped area	26.39	31.19	7.79	5.91	42.65	2.35	0.84	10.52	6.64	0.22	3.90	3.29
Crop value (in lakh rupees)	307.91	482.36	152.51	151.59	51.72	358.30	336.06	253.00	133.35	42.72	932.90	1591.66
Total loss (in lakh rupees)	439.54	495.53	157.05	157.75	53.97	385.23	384.28	366.72	671.20	42.72	1152.99	1591.71

*Source:* Statistical Abstract of Punjab, 1960-2007.

the property and crops was about Rs. 366 lakhs. The available records indicate several geographical factors that were responsible for the crippling floods but the anthropogenic factors cannot be ignored.

In July 1993, the district experienced most devastating flood breaking all historical records of damages and loss of property. This was the worst flood in the history of Patiala district, because 114 persons and 5943 cattle heads lost their lives; besides 676 villages and two towns were inundated. The Patiala city itself had experienced most severe flood of its history. About 70 per cent of its area and 80 per cent of its population were affected. Violent rainfall in the catchment area of river Ghaggar and Patiala Nadi and their numerous tributaries made all water channels overflow causing a loss of Rs. 671 lakhs.

After 1993 flood, administration geared up and started flood protection measures on mass scale. People of Patiala district also became more aware regarding flood protection measures. It is well said that floods cannot be controlled; they can only be managed. In 1996 flood hit more villages in comparison to 1993 flood, even then flood losses were not much intense. Only one human life was lost and all the cattle heads and houses of the

district were saved. However, crops worth Rs 42.7 lakhs were damaged in the district.

Again in year 2004, flood water of river Ghaggar affected 321 villages, inundating 230 square kilometres of area. Total loss to property and crops of Rs 1153 lakh was caused alongwith the loss of 13 human lives. Similarly, 345 villages with an area of 178 square kilometres were affected by the flood in 2006. More than four lakh people were affected and 17.8 thousand hectares area under crops was damaged. An assessment of loss to property including crops of Rs 1592 lakh for the year 2006 was made by the district administration.

The analysis of the frequency and magnitude of floods in the Patiala district revealed that the economic as well as social consequences of floods are increasing day by day. Not only the direct losses are increasing but several indirect losses are also hampering the growth and development of the district. The trauma of passing again and again through the disaster alone is irreparable.

### **Ecological Consequences**

Floods have their own ecological consequences. But it is very difficult to assess the ecological impact of floods

on the areas of their occurrence because no data is available concerning environmental aspect of the floods. At the same time it is very essential to observe the effect of floods on the flora and fauna of the areas affected by flood because these may disturb the delicate ecological balance if the frequency of floods is very high. Taking into consideration these limitations and essentialities, the environmental aspects of the flood are discussed.

Natural disasters adversely affect the biological communities inhabiting the surface of earth. Biological communities and abiotic components interacting with each other form ecosystem—a fundamental unit of ecological study (Singh, 1995). Flood, the most common natural disaster, disturbs the functioning of the whole ecosystem. Such disasters check the process of photosynthesis, breakup food chains and food webs, disturb the productivity of plants and animals thus resulting in extinction and evolution of species of plants and animals. The ecological imbalance is the major consequence of flooding.

Patiala district has a good wealth of plant species. The district with 15,000 hectares area recorded under forest during 2000-2001 stands fourth in the state. Even Patiala city is called 'City of Gardens'. The stagnation of flood water in some areas for a considerable time caused destruction of the flora of that area. The vegetation with low height like grasses, weeds and valuable herbs are under direct threat during floods apart from the falling of trees. The data regarding such damages for the Patiala district are not available, even then losses were considerable.

The destruction of vegetation means the destruction of the habitat of many species of animals as vegetation provides habitat to a number of species of animals besides providing food. Hence, survival in a destructed habitat

is impossible which leads to the extinction of several species.

Further, there are several species of animals which have a particular productivity period. If flooding occurs in that period population of such animals is likely to be affected to a great extent. On the whole, a number of species of animals like insects, rodents, snakes etc. were badly damaged.

### Case Study of 1993 Flood

The 1993 flood was the most severe flood in the history of Patiala district. The explanation of 1993 flood will help us to better understand the consequences of a natural disaster in terms of intensity and losses. If other statistics such as volume of water, its depth and speed are missing, the extent of flood in a particular area can be used as fairly good indicator to understand the magnitude of flood and associated damages because the damages associated with flood are generally directly proportional to the extent of flood. An area of 1713 square kilometres of Patiala district was affected which was 47.22 per cent of the total area of the district and 20.3 per cent of the total area affected in the state (Table 2). It means that about half of the district was submerged under water. Out of the total 4695 villages affected by floods in the state, 678 were in Patiala district which accounted for 14.3 per cent of the total villages affected in Punjab (Table 2). Apart from the villages, the two major towns of the district, i.e. Patiala city the district headquarters and Rajpura Township were also badly affected.

About 70 per cent of the Patiala city was under 3-8 feet of water. Seeing the havoc brought by the flood of 1993, even the soul of Baba Ala Singh would have repented at the selection of this place to build a capital for Phulkian family. The district headquarters remained

**Table 2: Flood damages: 1993**

<i>Nature of damages</i>	<i>Punjab</i>	<i>Patiala district</i>	<i>Share of Patiala district (in per cent)</i>
Area affected (in sq. kms)	8444	1713	20.3
Villages affected (in numbers)	4695	678	14.3
Population affected (in numbers)	2717584	1110000	40.8
Human lives lost (in numbers)	316	114	36.1
Cattle head dead (in numbers)	8609	5943	69.0
House damaged (in numbers)	146388	30992	21.2
House damaged (value in Rs. lakhs)	2556.95	537.85	21.0
Crops area damaged (in hectares)	212104	35814	16.9
Crops damaged (value in Rs. lakhs)	1809.94	133.35	7.4
Total damages (Rs. in lakhs)	4366.8	671.2	15.4

Source: Statistical Abstract of Punjab, 1994.



cut off from the surrounding areas for about three days (Dhillon, 1998).

During any natural calamity it is the population that suffers the most not only because many people lose their lives but also because they have to face huge socio-economic consequences even if they survive. Therefore, the number of persons affected by floods can provide estimate about the magnitude of the consequences of the flood. Human population suffered a lot during the flood of July 1993. Throughout the State, 2,717,584 persons were affected by flood out of which 1,110,000 were confined to Patiala district alone which accounted for 40 per cent of the total population affected (Table 2). In other words the floods affected about 70 per cent of the total population of Patiala district in the month of July 1993. It was for the first time in the history of Patiala district that such a large number of people were affected by any natural calamity. Patiala city suffered the most as more than 80 per cent of total population was badly affected (Mangat, 1994).

Again out of the total loss of human lives (316 persons) in the State, 114 persons lost their lives in Patiala district (Table 2). It indicates that more than one third of the total human lives were lost in Patiala district. This loss was irreparable. In Patiala city alone, 23 persons lost their lives.

Floods not only cause havoc by washing away human beings, cattle, vegetation, soils, etc. but most of the property like machinery and equipment, wooden materials, clocks, food grains etc. are destroyed even with a little touch of the flood water. Similarly materials like medicines, paper, books and moisture sensitive equipment get damaged even when there is excess of moisture in the air. Thus, not only the flooding water but even the presence of water for a longer duration damages the property. The overall loss to public and private property assessed was Rs. 671.2 lakh for the Patiala district, which accounted for 15.4 per cent of the total loss experienced by the State (Table 2). In the Patiala district 30,992 houses were damaged by the flood water in 1993. The total value for damaged houses assessed by the district authorities was Rs. 537.85 lakhs for the Patiala district which accounted for 21 per cent of the total loss suffered by the state.

Immediate impact of any flood is on the crops, particularly in the flood plain areas of a river valley where people cultivate land upto the edge of the valley. Such damages are very severe when river channels are confined within the embankments and there is a breach in the embankment. Because, by constructing embankment even the low-lying active flood plain areas are extracted

from the river valley and brought under cultivation or other type of uses. Patiala district recorded damage to 35,814 hectares cropped area which accounted for 16.9 per cent of the total loss in terms of cropped area damaged reported in the state (Table 2). Water remained in the fields for considerable time which resulted in crop damage worth Rs. 133.35 lakhs. Rice is the principal commercial crop in the district, which suffered most resulting into economic loss of the people. Apart from rice, fodder and sugar cane were also damaged. Shortage of fodder itself was a severe problem after the flood.

Apart from crops the flood water of July 1993 had severely damaged agricultural infrastructure mainly tubewells and other machinery. Once water entered into the deep wells, it damaged the electric motors. Several wells meant for installation of pumping sets collapsed due to the flood water. Apart from it, tractors, diesel engines and other agricultural implements were damaged by flood water.

Milch cattle are considered to be the back-bone of the rural economy because in rural areas milk production is the main source of income. During the flood of 1993, 5943 cattle heads were lost in Patiala district, while 8609 cattle heads were lost in the State as a whole. Thus, Patiala district shared about 69 per cent of the total cattle heads loss experienced by the state as a whole (Table 2). It was a major set back to the rural economy.

Rotting carcasses, damaged food grains stored in the houses, shops and godowns, siltation of sewerage line and garbage produced in the houses and dumped on the road sides created not only foul smell but health hazards in the localities affected by flood. Dangerous chemicals brought by the flood water from the industrial stores or wastes, hospitals etc. also create health hazards particularly related to skin problems. Thus on the one hand the flood creates the health hazards and on the other destroys medical infrastructure. Therefore, survival after the flood is usually precarious. The major threat of such natural calamities is the outbreak of epidemics. Though no major epidemic was recorded in the Patiala district, even then people had to face several kinds of health problems. The sultry weather with high relative humidity and the unhygienic food and drinking water after flooding caused several kinds of diseases like cholera, diarrhea and typhoid etc. As a result, more than 250 cases of cholera and gastro-enteritis were reported from different parts of the Patiala city alone (*The Tribune*, July 7, 1993).

Availability of drinking water both in urban and rural areas was a major problem. The Patiala city remained without drinking water for more than 72 hours. A bucket

full of water was sold at Rs. 20 in the city (*The Tribune*, July 15, 1993). Medical stores, equipments, drugs etc. worth thousands of rupees were destroyed. On the whole, health infrastructure all over the district was hit badly.

During 1993 flood infrastructural facilities were badly damaged in Patiala district. It was estimated that over 7000 kilometres of state and main roads, 950 kilometres of national highways and 3000 kilometres of village link roads were damaged in Patiala district (*The Tribune*, July 23, 1993). The damage to the rail track was also intensive in Patiala district. Railway track was totally washed away at different points, suspending rail traffic for several weeks. The electrical infrastructure was also severely damaged. There was a complete blackout in the several parts of the district, for several days. It took months to regain the smooth functioning of the electricity in some parts of the district (Gill, 1993).

Similarly, telecommunication and postal services were also among the several casualties in flood ravaged Patiala district. While uprooted and twisted poles with wires entangled disrupted tele links, washed out bridges and breaches in rail tracks and roads had affected mail delivery. Many post office buildings had been flooded leading to their closure in the district. Administration had to spend a huge amount on compensation and providing relief to the people apart from maintenance and reconstruction of the whole infrastructure.

### Conclusion

Consequences of natural disasters are always horrible. By washing away human beings, cattle, houses, crops and other properties, floods creates misery all around. It is evident from the study of floods in Patiala district that

floods are causing mass scale destructions to the property and infrastructure of the district. The frequent occurrence of this disaster is also threatening human lives apart from damaging the ecological web of the district. The social and economic benefits of inhabiting flood plains are outweighed by the severe consequences of the floods. The case of July 1993 flood of Patiala district is best example to learn lessons.

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