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Aspects of Socio-Economic Implications of Floods in Last Decades

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ABSTRACT: From the records of natural disasters, herein presented a socio-economic aspect of flooding consequences in last few decades of 20th Century. It is seen that flood is the most frequent natural disaster claiming loss of life and property compared to other natural disasters. It has been held that one third of all losses due to nature's furry is attributable to flooding. Flood damage has been extremely severe in recent decades and it is evident that both the frequency and intensity of floods are increasing. In an average flood claims a loss of more than 50 billion dollars (US) per year and 40000 victims per year in the last decades of the 20th Century in the world (Berga, 2000). Since the floods are frequent in India also, it looms large on its politico-socio-economic screen. Since the 1st Five Year Plan in India, a huge amount of money is being invested in flood protection, flood fighting and mitigation activities-both structural and non-structural. Non-structural measures like flood forecasting, flood information dissemination, flood zoning, flood mapping, administrative preparedness etc. need special attention in order to reach greater effectiveness in reduction of flood damages. Added to this, in the age of Information Technology the use of satellite imagery, GIS based work will be boons in the hands of the technocrats and flood managers in drawing blueprints for flood protection and prevention. The socio-economic analysis will certainly boost planning preparedness and flood prevention by preparing roadmaps for long-term and macro-scale policy decisions.

Keywords: Flood, Socio-Economic Implications, Flood Management, Disaster Reduction.

INTRODUCTION

Natural disasters are the greatest impediments to the mankind. Many civilizations have faced their vicissitudes in the past. Hence, natural disasters are the retardants that decelerate the socio-economic progress of the mankind. Thereby the rate of casualty and loss of property is phenomenal which can be attributed to many socio-economic as well as demographic and geophysical dimensions. So it has been rightly marked that "most of the natural disasters are incidences of either extreme hydro-meteorological events like floods, draughts, cyclones, tornados and hurricanes or of tectonic and geologic disturbances like volcanic eruptions, tsunamis, earthquakes etc. Of course, wild fire cannot be underestimated. Occurrences of such events throw the normal life out of gear with entailed consequences claming loss of life and property to the society. A complete escape from the wrath and furry is not possible but its amplitude of loss can be reduced with due preparedness (Sethi and Srivastava, 2007)".

Worldwide and mostly in India, floods are by far the most frequent, intense and recurrent catastrophe. Globally and regionally especially in south East Asia, floods are more vibrant in the labyrinth of natural disasters characterized by rising resonance and amplitude tuned to the rathless man-made interference with the natural environment and encroachment upon the natural drainage pattern; propelled by climate changes coupled with galloping population and rising activities. The natural hazards inflict an enduring impact on human life and disturbing the socio-economic metacentre.

The degree of devastation is more pronounced and nightmarish in 3rd world counties/and developing nation became of backwardness and burgeoning population coupled with lower level of technological development. So also is the case in India. Flood is an intense and recurrent natural hazard in the eastern and northeastern part of India drained by the Ganges, the Brahmaputra, the Barak and their tributaries (Basu, 2005). Ironically the belt is quite rich in natural resources-40% of the nation's mineral resources and 60% of its power potential. From the history of flooding it is revealed that this region suffered severe floods in 1954, 1974, 1975, 1976, 1984, 1987, 1988, 1993, 1998 and 2000 (Ghani, 2001). Herein presented a socio-economic analysis of the flood scenarios which cause an ending impact on humanity.

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REVIEW OF FLOODING INCIDENCES IN LAST DECADES OF 20TH CENTURY

It is well founded that extreme hydrometeorological events get their manifestation in shape of either intense flooding or severe drought. It has been held that "There is a strong scientific evidence of an increase in mean precipitation and extreme precipitation events, which implies that extreme flood events might become more frequent (Christensen and Christensen 2003; Kundzewicz and Schellnhuber, 2004; Barredo, 2007)". A brief review of the flooding events both on global as well as regional level are discussed in the following paragraphs to give a glimpse of the natural disaster.

Global Scenario

According to Asian Disaster Reduction Centre (ADRC), Data Book August 2002, the impacts of natural disasters (using the dependable data of Year 1975 to 2000) has been increasing (Figure 1). Moreover, the number of affected people and the consequent economic losses are also on the increasing trend (*Source: EM-DAT: The OFDA/CRED International Disaster Database - www.em-dat.net - Université Catholique de Louvain—Brussels—Belgium,* and maps and data available on worldwide web *http://ks.water. usgs.gov/Kansas/flood summary*). Although there are no standard criteria for selecting the flood events and defining their magnitudes for analysis, all the records considered here are only those that caused socio-economic damages and were reported. Table 1 presents the number of casualties, economic loss and people affected during 1900–2006 on global scale from flooding events. From the research (CRED 2002), it is seen that 50% of natural disaster are due to flood in the period 1900–2006. According to ADRC, Data Book August 2002, the people killed by natural disasters are mainly belong to Low (Less than $755) or Lower Middle Income ($756~$2,995) communities (Income Classification based on per capita Gross National Income (GNI), 2000; Source: World Bank), which is almost 95% of total people killed by natural disaster in the world during year 1975–2000 (Figure 2).

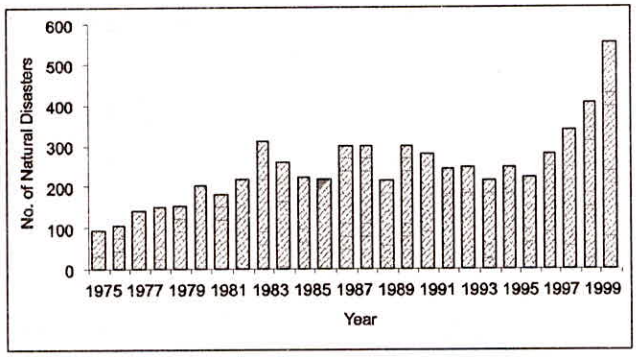

Fig. 1: Number of natural disaster occurred in the world (1975–2000)

(*Source:* CRED (Centre for Research on the Epidemiology of Disasters))

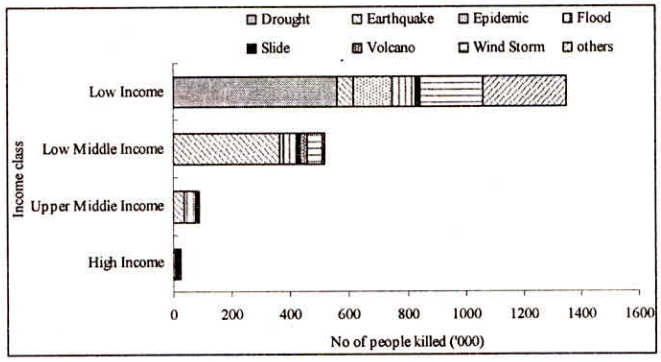

Fig. 2: Number of People Killed (Income Class/Disaster Type) (1975–2000) World Summary

(*Source:* Asian Disaster Reduction Centre (ADRC), Data Book August 2002)

Table 1: Worldwide Flood Events: 1900 to 2006

	No of Events	*Killed*	*Injured*	*Homeless*	*Affected*	*Total Affected*	*Damages US$*
Africa	503	19234	22521	4613022	35046001	39681544	3793325
avg. per event		38	45	9171	69674	78890	7541
Americas	733	100,708	41795	3321343	49697373	53060511	61649214
avg. per event		137	57	4531	67800	72388	84105
Asia	1173	6763850	1199184	99551858	2685223257	2785974299	207522238
avg. per event		5768	1022	84869	2289193	2375085	176916
Europe	408	9230	21775	1970976	12603227	14595978	80649494
avg. per event		23	53	4831	30890	35775	197670
Oceania	96	369	91	107400	463885	571378	2381911
avg. per event		4	1	1119	4832	5925	24812

(*Source:* Events recorded in the CRED EM-DAT. First Event: Jan/1900, Last Entry: May/2006)

Indian Scenario

India is marred by many natural disasters each year and flooding is the main one (Figure 3), almost 40.6% of total natural disasters. This is due to varied contours of topography, meteorology, physiography and characteristics uncertainty of monsoon coupled with kaleodoscopic socio-cultural and economic fringes.

Analysis of the flood events for the period of 1953–2000 reveals that the average area affected was about 7.38 million hectare (Mha) (Figure 4) including average crop area of 3.48 Mha; contributing to a total damage of Rs. 1376.08 Crores (Figure 5). Figure 6 presents the number of populations affected by flood. For the ease in comparison and perception Table 2 presents an abstract of the flood affected area, live lost and flood damages of India during 1953–2002.

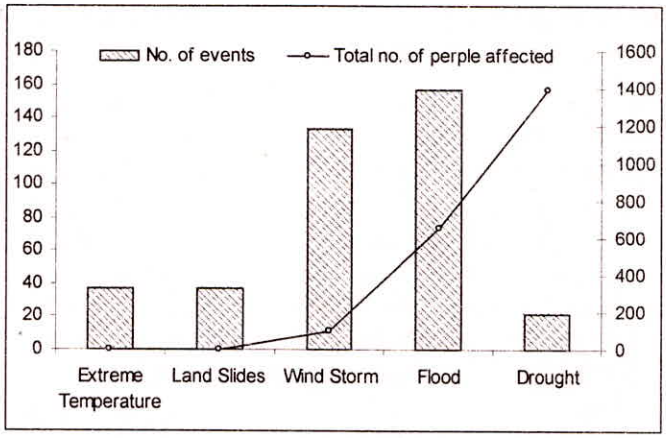

Fig. 3: Number of people affected due to various extreme events in India (1900–2004)

(*Source:* CRED (Centre for Research on the Epidemiology of Disasters))

Table 2: Flood Affected Area & Flood Damages in India (Abstract for the period 1953 to 2002)

Sl. No.	*Items*	*Unit*	*Average Flood Damage During*	*Maximum Damage (Year)*
1.	Area affected	Million Hectare	7.38	17.50 *(1978)*
2.	Population affected	Million	32.97	70.45 *(1978)*
3.	Human lives Lost	Nos.	1560	11316 *(1977)*
4.	Cattle Lost	Nos.	91555	618248 *(1979)*
5.	Cropped Area Affected	Million Hectare	3.48	10.15 *(1988)*
6.	Value of Damage to crops	Rs. Crores	596.97	2510.90 *(1988)*
7.	Houses Damaged	Million	1.19	3.51 *(1978)*
8.	Value of Damages of Houses	Rs. Crores	189.10	1307.89 *(1995)*
9.	Value of Damages of Public Utilities	Rs. Crores	566.24	3171.40 *(1988)*
10.	Value of Total Damages (Houses, Crops and Public Utilities)	Rs. Crores	1376.08	5845.98 *(1998)*

(*Source:* CWC, Govt. of India Report, 2004)

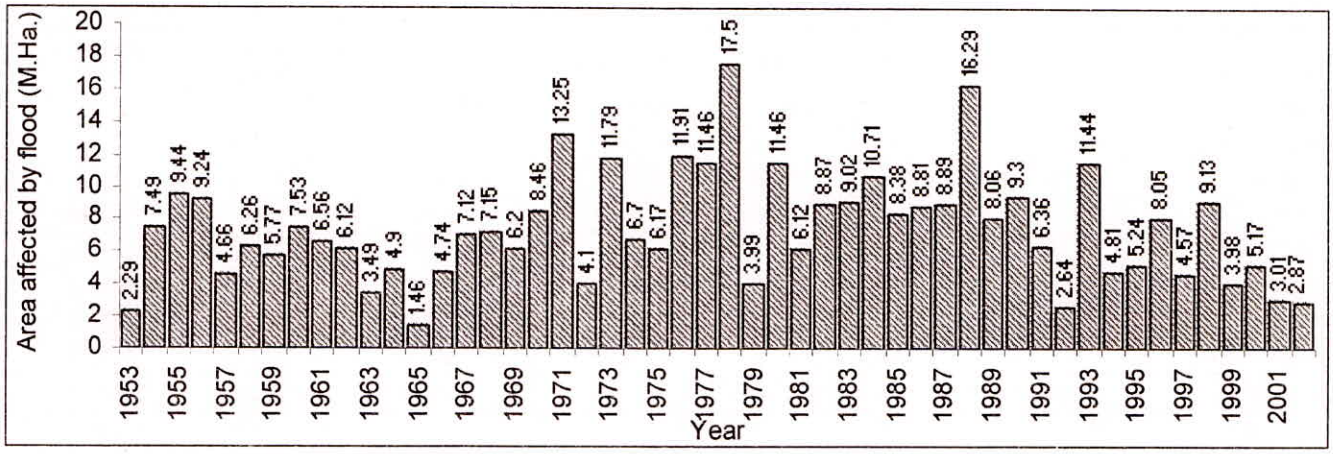

Fig. 4: Area affected by flood (1953–2002) in India

(*Source:* Central Water Commission (CWC), Govt. of India Report, 2004)

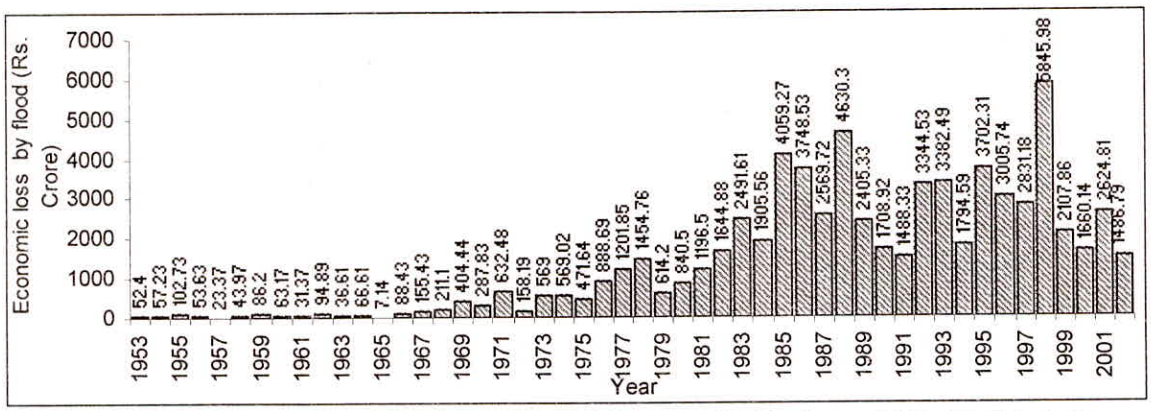

Fig. 5: Total economic loss (crop, house and public properties) by flood (1953–2002) in India
(*Source:* CWC, Govt. of India Report, 2004)

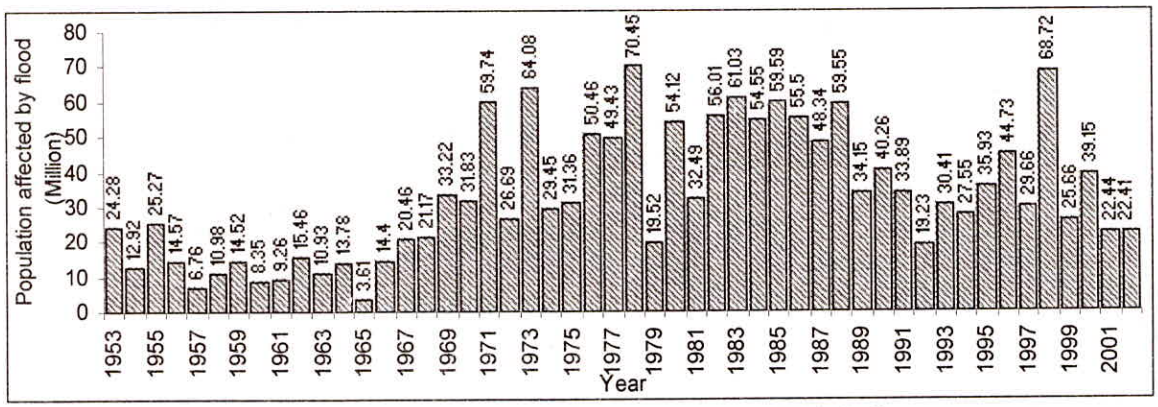

Fig. 6: Population affected by flood (1953–2002) in India
(*Source:* CWC, Govt. of India Report, 2004)

TECHNOLOGICAL ASPECTS (DATA MANAGEMENT)

In order to reach a greater effectiveness in the reduction of damages produced by the floods it is necessary to assess the flood control by way of a holistic vision. With this the problem is posed with a more critical vision and less optimistic, and with an integral approach as regards the basin and of alternatives.

The planning of the flood hazard reduction measures should be carried out as regards the basin, with a vision of the whole of the basin, and analyzing the incidence that each one of the measures has and the relations between them, as their effects downstream on the flood routing. On the other hand, the actions as a whole should be considered as a system of integrated measures, developing in each case the implanting of combined measures which contemplate the joint application of structural and nonstructural measures, it being necessary in many cases the development of zonings and land-use patterns downstream of the dam, and also the implantation of flood forecasting and flood warning systems, which are essential for the emergency action plans (Figure 7).

Comprehensive, standardized and georeferenced information on floods is a key need for decision-making, monitoring and assessment. Political and economic decision-making towards a strategy for flood-disaster reduction must be based on accurate documentation that contains, among other aspects, historic records of flood events. Historic data on floods losses and casualties are neither comprehensive nor standardized, indeed, historical information on floods is usually scattered. This creates difficulties for stakeholders due to the lack of a main database for data gathering and sharing. The problem has become even more complicated in the case of transborder basins shared between several states/countries. In fact, the issue of missing relevant global spatial and thematic information on floods and for long periods has been pointed out several times recently (e.g. UNDP 2004; Peduzzi *et al.*, 2005). Lately some efforts have been oriented towards the distribution of global information on flood disasters. The Emergency Events Database (EM-DAT) of the Centre of Research on Epidemiology of Disasters in Brussels (CRED) and United States Office for Foreign Disaster Assistance (OFDA) are some of the main public global databases

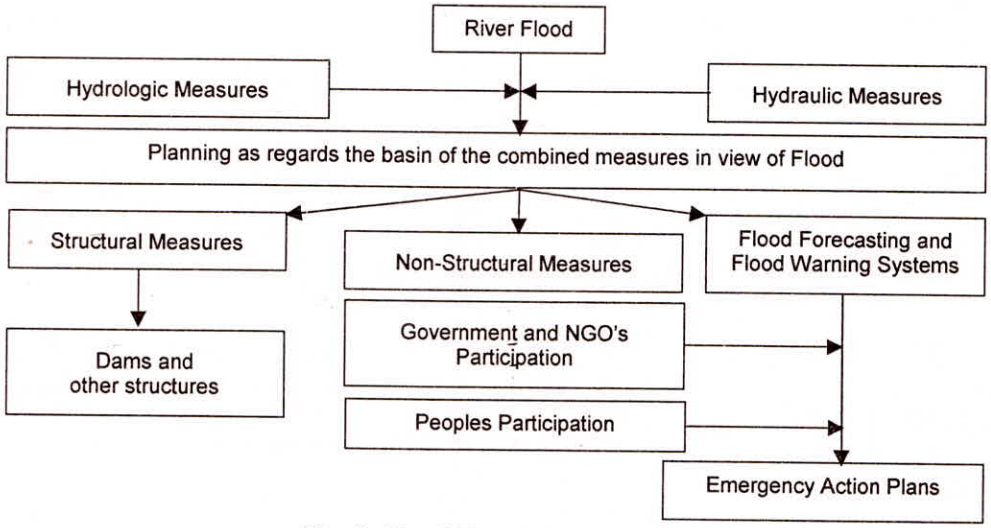

Fig. 7: Flood Management Frame

for natural disasters. It contains core information on several key indicators (e.g. casualties, damage, people affected) for natural and technological disasters, and covers a large period from 1900 to the present. Nevertheless, one of the main constrains of EM-DAT concerning floods is that the database does not provide georeferenced information of the reported events. In India, Central Water Commission (CWC) provides flood data, thought these data need proper execution of Remote Sensing (RS) and Geographical Information System (GIS) for relevant flood risk assessment.

SOCIAL ASPECTS

It is well held among the scientific community that "to each action there is an equal and opposite reaction" this concept is not inappropriate to a social science also. For any input that is extraneous and uncalled for to the environment causes on output that the system has to contend with. Flooding events also are not only a source of economic loss but also a spring of social turbulence, that impinge and inflict enduring starks on the society. The worst hits are the weaker and vulnerable section of the population because of their poverty, backwardness and lack of social and economic immunity. In this context it is worth referring to the meritorious work of Hewitt (1983), where it has been mentioned that the dominant paradigm in hazards and disaster research and practice is characterized by "a straight-forward acceptance of natural disaster as a result of 'extremes' in geophysical processes" and a technocratic view that the only way to address the hazards problematique was by public policy application of geophysical and engineering knowledge (Hewitt, 1983). For Hewitt, hazards are neither explained by nor uniquely linked with geophysical processes that may initiate damage. This does not imply that geophysical processes are not relevant, but too much causality has been attributed to them. More importantly, human conditions (particularly the awareness of and response to environmental hazards) are not dependent solely upon geophysical domains and their associated processes. Another scholarly work tells that "Instead, hazards are more dependent on the concerns, pressures, goals, and risk related decisions of society, not least being the effectiveness of measures taken to mitigate calamity (Tobin and Montz, 1997)". More importantly, as Hewitt portrayed, the causes, features and consequences of environmental hazards and disasters cannot be fully explained by conditions and/or behaviors peculiar to catastrophic events; these can be explained by everyday societal forces and patterns of living. The significant elements are social order, its everyday relations to the habitat, and larger historical conditions that shape society. In the 1990s, these perspectives were reinforced by Blaikie *et al.* (1994) with evidence from various parts of the developing world, Haque (1997) with his work on floods, riverbank erosion, cyclones and drought hazards in Bangladesh, Brazil and Canada, and several other analysts in this field (Mileti, 1999; Wisner, 1988; Davis, 1987).

Haque and Etkin (2007) shows that, during the last decade there has not only been a shift in thinking of causation of disaster loss in terms of human vulnerability, but also newer questions that have been asked regarding distinguishing between 'physical exposure' of people to threats and societal vulnerability, and linking them with propensity to hazards loss. Vulnerability is determined not by exposure to hazards alone, but also

resides in the resilience of the human–environment system experiencing the hazard. Cannon (1994) clarified societal vulnerability forcefully by stating that vulnerability must not be understood in terms of a given state or condition, but rather from a focus on the social, economic, political and cultural processes that make people or society vulnerable. For Cannon, "the vulnerability concept is a means of 'translating' known everyday processes of the economic and political separation of people into a more specific identification of those who may be at risk in hazardous environments". The argument suggests that disasters occur when an environmental hazard strikes vulnerable people. Hence, there is a link between the extent and types of vulnerability generated by people's conditions within political and economic systems and the manner in which society treats hazards in terms of prevention, mitigation, preparedness, response and recovery (Haque and Etkin, 2007).

From the perspectives of coupled human–environment systems, prevention and mitigation of hazards and disasters is possible not only by intervening into physical domains, but also (and probably more effectively) by changing and modifying societal forces, more specifically by reducing vulnerability and strengthening resilience. Cannon (1994) finds that the major determinants that make people vulnerable (i.e., social, economic and political factors, which determine the level of resilience of people's livelihoods and their ability to withstand and prepare for hazards) are rarely tackled. Institutionally, it has not changed much since. So all these scholarly works do merit the attention of Policy makers, social scientists, scientists, flood managers, NGOs for a concentrated and comprehensive approach to the social dimensions of flooding consequences. None the less the approach and action should hug to the social contours of flood plain topography through surreal policy directive, adequate investment, meaningful interaction between the affected community and the saviors, strong scientific R&D base, non-apathetic approach from Govt. on the back drop of Cross cultural contouring and socio-economic benchmarking.

ECONOMIC ASPECTS

The loss of property can be better indexed with respect to economic indices. Consequence of natural disaster is entailed with economic loss to the nation. The loss of economy due to flood and the natural disaster has been briefed up in the preceding paragraphs in global and regional level. The following paragraphs are directed towards analyzing this scene in Indian context. Since flood claims major chunk of life and property, the Govt. of India has taken a note of this aspect in shape of flood protection and mitigation allocating funds through the Five year Plans/Annual Plans. Table 3 presents the plan wise allocation by the State Govt. and union territories as well as Govt. of India and consequent cumulative benefit at 1993–94 price level. From the statistics it is observed that upto 7th Five year plan there was parallelism between cumulative funds allocation and consequent benefits. From Figure 8 it is inferred that after the 1980, the gap between the cumulative aid and cumulative damage due to flood has surpassed the total aid from the Govt.

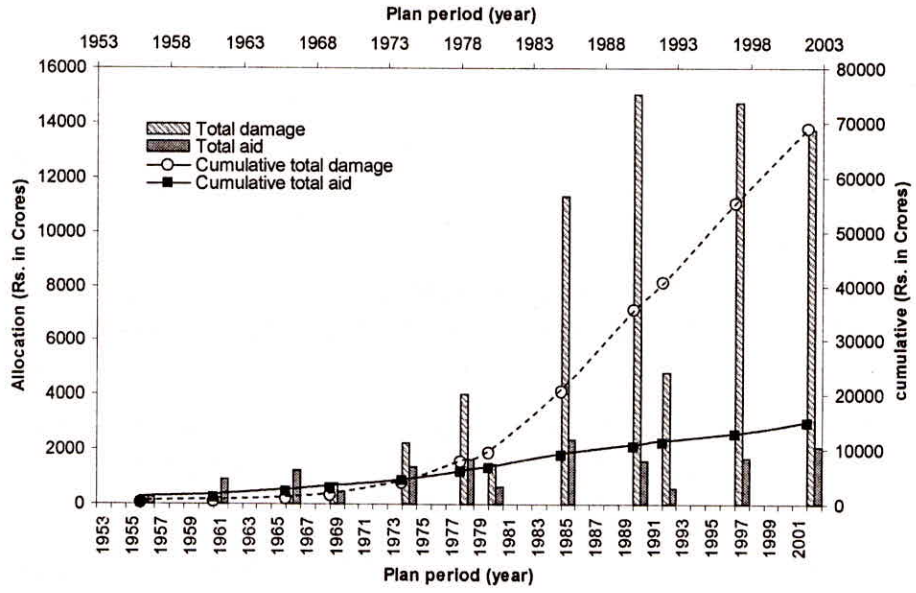

Fig. 8: Allocation against the flood damage by Planning Commission during 1951–2002
(*Data Source:* Central Water commission, Govt. of India Report, 2004)

Table 3: Planwise Expenditure and Cumulative Benefits (Area Protected) under Flood Management Programme (1993–94 Prices)

Sl. No.	Period	States and U.Ts (Rs. Crores)	Centre (Rs. Crores)	Total (Rs. Crores)	Cumulative Benefits (Area-protected in Million Ha. At the end of the period)
1.	First Plan (1951–56)	279.07	–	279.07	1.00
2.	Second Plan (1956–61)	892.94	–	892.94	3.24
3.	Third Plan (1961–66)	1221.09	–	1221.09	5.43
4.	Annual Plans (1966–69)	469.88	–	469.88	5.83
5.	Fourth Plan (1969–74)	1371.72	39.10	1356.82	8.04
6.	Fifth Plan (1974–78)	1346.93	311.94	1658.87	9.98
7.	Annual Plans (1978–80)	562.67	77.24	639.91	11.21
8.	Sixth Plan (1980–85)	1881.36	510.62	2391.98	13.01
9.	Seventh Plan (1985–90)	1337.20	274.90	1612.10	13.08
10.	Annual Plan (1990–92)	500.59	84.99	585.58	14.20
11.	Eighth Plan (1992–97) Anticipated	1489.87	205.32	1695.19	15.29
Expenditure upto March, 1997 (Total 1 to 11)		3168.15	530.86	12803.44	N.A.
12.	Ninth Plan (1997–2002) Agreed outlay	1231.26	389.60	1629.85	N.A.
13.	Annual Plan (1997–98) Actual	228.95	43.71	272.66	N.A.
14.	Annual Plan (1998–99) Actual	271.29	32.53	303.82	N.A.
15.	Annual Plan (1999–2000) Actual	564.53	44.87	609.40	15.81
16.	Annual Plan (2000–2001) Anticipated	347.49	76.59	424.07	N.A.
17.	Annual Plan (2001–2002) Proposed	335.52	76.01	411.52	N.A.
18.	Ninth Plan (1997–02) Anticipated	1800.53	283.88	2084.42	16.35

(*Source:* Central Water commission, Govt. of India Report, 2004)

This can be attributed to marry factors such as: (i) Governmental apathy to investment in the non-producing sector (ii) Exposure of resource bases both human and capital due to rising population and economic activity to flood prone areas (iii) Encroachment on flood plains and blockage to natural damage pattern (iv) Virtual price base economic benchmarking. So the need of the hour is to reduce this hiatus to control the floods by way of multisectoral approach, i.e. increasing allocation and reducing the flood damage by way of scientific analysis and forecasting of flood events, generation of strong data base and flood information dissemination and as well as documented policy directive without hit-and-miss entry.

CONCLUSIONS

From the analysis of the socio-economic aspects of flooding and review of the scholarly work of various articles, it is held that floods play their havoc bringing untold misery to the mankind. Given the complexity of different related dimensions, it is difficult to curb all flooding consequences in toto—rather a multipronged and concerted effort can reduce the severity and keep the devastation at bay not allowing to raise their ugly heads to unimaginable protrusion. The social aspect is too complicated as development, economic activities and undue interference go in tandem but it must be in a controlled, regulated and targeted fashion. In this context, the authors do advocate the role of science and technology as saviors to mankind in shape of data banking from GIS and satellite imagery, information dissemination, flood forecasting, flood routing, flood mapping, channel routing, river bank strengthening, integral reservoir operation, transbasin water dissemination, anti-erosion measure, catchment treatment. On the social front a lot of research should be directed to cross-cultural contouring, socio-economic benchmarking such the needy gets benefited. The role of Govt. & NGO imparts a major chunk of progressive dynamism in flood fishery and mitigation. A well neat policy platform free from political bias and unaltered by change in the political establishment should be framed to reduce resonance of flooding consequences.

The role of governmental machinery is well acknowledged in crisis mitigation—as such the administrative preparedness should be further reoriented under the changing socio-cultural millieu and technological innovations.

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