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PROBLEMS OF FLOOD CONTROL

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ABSTRACT

Flood may be defined as a social perception associated with sudden invension of unusually high levels of water resulting in widespread destruction and distress. Floods are caused due to intense and sustained rainfall. But various human activities in the catchment area and flood plain of the rivers compound the problem. Conventional flood control measures can definitely limit the damages to a great extent. However, they have their limitations. In the 21st century, pressure of population will compel planning process to attempt conservation and utilisation of our natural resources as a whole. This may bring in total utilisation of water and flood may lose its connotation of devastation and distress.

Flood may be defined as the distress perception of a society facing a sudden and unexpected invasion of unusually large quantities of water resulting in widespread inundation and unusually high levels of flow in areas, usually not subjected to such phenomena with consequent damages to life and property. Floods are associated with untold misery for millions of people who are already burdened with other mundane problems.

In the Post Independence era, consequent upon a number of devastating floods the Government was seized with the urgency of the problem and soon flood control projects singly or as a part of larger multipurpose projects had been launched on a massive scale. A large number of such projects have been completed,some more are under execution and still some more are being planned. Even then, every year floods are striking somewhere or other in the country with uncanny certainty and apparently with renewed vehemence spelling disaster for the hapless millions.

Instead of showing any tendency towards abatement,the scale of flood damages has recorded a sharp increase over the years. Consequently it becomes imperative to enquire into the nature and origin of floods in our country and to assess the utility of the present flood control measures in meeting the demands expected out of them.

As is well-known,flood in this country is inseparably associated with the monsoons when about 80% of annual rainfall takes place within a span of about four months(mid June to mid October roughly). Even during this period the bulk of the precipitation is concentrated around a few storms lasting for a few days when even 50% of annual rainfall may occur during a single storm and one day maximum may reach 25%.

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Following are given some relevant rainfall data of Alipore (Annual average rainfall)

Year	Total rainfall in mm during a storm	Corresponding max. rainfall in mm in a single day.
1978	735.30(28.95")	369.60(14.55")
	(29-9-78 to 1-10-78)	(28-9-78)
1984	710.80(27.98")	290.00(11.42")
	(2-6-84 to 9-6-84)	(6-6-84)

As a result of such intense rainfall, severe drainage congestion develops. The situation is aggravated due to a few other local factors. If the area is saucer shapped, which is not very rare, drainage becomes difficult even during an isolated rainfall.

However if the arterial drainage channel is also ruling high due to run-off from upland a stalemate ensues. In deltaic southern West Bengal ground slope is very flat(less than 6" per mile)and consequently drainage flow is sluggish. In this area a considerable reach of the outfall channels are subjected to diurnal tides and during spring tides when levels are higher drainage becomes still more difficult. So during sustained rainfall unusually high levels of flow are reached and consequently large areas are inundated, means of communication are disrupted and a veritable doom descends upon the land.

Deforestation has been a bane of modern day demands of society. Apart from disturbing the ecological balance in a large way it has modified the hydrological cycle in an adverse way. In an area devoid of vegetation, the minutest soil particles are directly hit by the force of the falling rain drops, which disturb the soil aggregates and bring about dispersal of soil particles, resulting in partial clogging of soil pores. Moreover in such an area strong currents are set up unobstructed in the forms of sheets and gullies sucking in substantial quantities of top soil. Specially in the hills where currents are far stronger due to steep slopes, the shooting streams plunge down the denuded slopes grabbing in their stride further soil particles including pieces of rocks and boulders to create devastating floods in the lower and faltter valley. The river itself becomes flashy in the sense that immediately after an intense spell of rainfall it swells up to a raging flood only to subside and shrink down to a trickle soon after. For best part of the year such a river remains insignificant only to create problems of flood for short spells. This state of affairs is favourable neither to the regime of the river nor to the prospect of utilisation for human benefit. Natural forest cover delays run-off, augments infiltration. In fact it creates an unseen underground detention reservoir during intense precipitation bringing down the flood peak, only to release later on to prolong and augment the dry weather flow. Recent studies have confirmed the two beneficial effects of forest cover viz; reduction of immediate run off and reduction of loss of soil. However extent of attenuation of flood peaks especially in case of calamitous floods which occur due to a sustained spell of intense rainfall is still debatable.

Of late there has been quite frequent land slides in the hills of North Bengal especially during the rains, disrupting the means of communication with the plains for days together. Sometimes a whole village crashes down the hill slopes into the river. The Himalayan mountains are considered to be quite unstable and given the fact that progressive deforestation is exposing more and more hill slopes to the might of the falling rain drops and the shooting run-off it becomes apparent that landslides will continue to occur with increasing vehemence in the years to come.

Apart from adding more brawn to the swelling flow in the form of rock and soil particles, a landslide may sometime throw a dam across the river. Water starts rising behind the dam until it touches the crest and spills over. This erodes the crest and reduces the dam height resulting in a violent onrush of down flow which brings down the dam itself and culminates in a rushing wall of water of tremendous height armed with rocks and boulders wreaking havoc down the valley.

Apart from loss of hillside slopes landslides may be instrumental in bringing about radical changes in the route of the river. Hill rivers while reaching the plains loose much of their carrying capacity ; Suddenly due to flattering of bed slope. As a consequence the sediment load they were carrying in the hilly reach suddenly becomes too heavy to carry and gets deposited progressively at these transition point. After a few years the old river bed becomes difficult to negotiate and a new route is charted out bringing in its wake large scale destruction. Small scale avulsion is quite common with the North Bengal rivers; however the one which took place in the Teesta during the destructive floods of 1787 changed the physiography of the countryside radically in as much as the Teesta suddenly forsook its channel towards the Ganga and turned its waters into a small branch running south-east into the Brahmaputra through fields and over the countryside."

Sediments also create problem for detention reservoirs where water is sought to be stored for flood detention or other purposes. Most of our reservoirs are located in the hills in gorges to obtain adequate storage space without inundating large areas. The swift flowing hill streams loaded with enormous quantities of sediment while meeting the placid pool of the reservoir sheds bulk of its load into the reservoir itself. Progressive sedimentation reduces the storage capacity of the reservoir resulting in loss of benefits. While designing a reservoir some allowance is made to meet this anticipated loss of storage capacity. An idea about the actual loss of storage space in a number of reservoirs in the country in comparison with the anticipated loss can be formed from the statement given below :-

	Reservoirs	Year of impounding	Annual rate of silting in ha m/100 sq.km.	
			Assumed	Observed
1.	Bhakra	1959	4.29	6.00
2.	Panchet	1956	2.47	10.00
3.	Maithon	1956	1.62	13.10
4.	Mayurakshi	1955	3.61	16.56
5.	Nizamsagar	1931	0.29	6.65
6.	Matatila	1958	1.43	4.38
7.	Lower Bhawani	1953	N.A.	4.19
8.	Shivajisagar	1961	N.A.	15.24
9.	Tungabhadra	1953	4.29	6.54
10.	Hirakud	1956	2.52	3.57
11.	Gandhisagar	1960	3.61	3.71
12.	Machkund	1956	3.90	2.57
13.	Ramganga	1974	4.29	18.20
14.	Kangsabati	1965	3.27	3.76
15.	Ghod	1966	3.61	15.40
16.	Dantiwada	1965	3.61	5.14
17.	Ukai	1971	1.47	10.90
18.	Tawa	1974	3.61	6.38
19.	Beas Unit-II	1974	4.29	14.30
20.	Narmada	Under Constn.	1.55	5.62
21.	Mahi Stage-II	-do-	1.29	8.17

From the table which needs updating it appears that except for the Machkund reservoir there has been a far higher rate of sedimentation in all the storage reservoirs than initially anticipated. Evidently loss in storage reduces the flood moderation capacity of a reservoir even where there is no exclusive storage reserved for flood storage.

Earthen embankments have been found to be a cheap and ready means to prevent inundation since long. Marginal embankments thrown along banks of rivers provide a positive bulwark against overflow of rivers in spate. However they may also be instrumental in cutting off large spill areas which had been so far available to the rivers for spilling over during high stage flow Spill areas serve as areas for shedding of sediment and once the river is left without these areas there is likelihood of sedimentation of the river bed itself inducing higher and higher flood levels for the same flood flow. As this process continues, higher and stronger embankments are required until a stage is reached where it is no longer possible to offer protection against floods by means of earthen embankments. When a breach occurs in such an embankment the fury of the flood is converged at a point and a velocity around 120 Km/hr. may not be unusual. No crop can possibly survive such a devastating attack.

In the case of tidal reaches of rivers, when upland supply becomes scarce, channel deterioration occurs faster. In tidal flow, flow tide takes less time than ebb tide and consequently velocity is faster during flow tide than ebb tide. As a result more sediment enters the channel from the sea-side than that which comes out and sedimentation occurs on the river bed. If the spill areas are shut off in such cases as has been done in the Sunderbans area of South Bengal, where reclamation has been

done with marginal embankments even when delta building was going on. So the drainage channels in this area have recorded a sharp deterioration and provide a poor drainage system. During floods from upstream this system fare badly specially when spring tides create further problems of drainage.

Dwindling of upland supply to rivers in Southern Bengal has been the result of a natural process associated with the shifting of the main flow of the Ganga from the Bhagirathi to the Padma. The process which started about a few centuries back is presumably still con i ing. Before the Farakka Barrage came up the Bhagirathi had been without supply from the Ganga for most part of the year and had bbeen almost reduced to a tidal estuary . With the deterioration of the Bhagirathi, which is the main drainage artery, all the feeder channels like the Mayurakshi, Ajoy, Damodar on the right bank and the Mathabhanga, Jalangi, Churni etc. on the left bank started deteriorating also. The left bank rivers also lost upland supply progressively when their offtakes on the Padma gradually became silted up. As pointed out earlier the outfall channels in the tidal zone, having been starved of upland fresh water started losing their vitality. As a result the whole of South Bengal save and except high lands became flood prone. The point near Katwa where the Ajay meets the Bhagirathi, capacity of the latter is about 1,00,000 cusecs, whereas the Ajoy itself have very often thrust a discharge of 3,00,000 cusecs into it. The enormity of the problem can be easily imagined. For weeks together a large area remains inundated. In the tidal zone apart from tidal lockage, occassional storms have created storm surges, which delays drainage.

Present day flood control measures aim at reduction of flood damages damages or where this cannot be done at attempts to make it less unbearable. The measures mainly fall into two groups. The first group i.e. (A) structural measures comprise (1) channel improvement diversion or by-pass etc.

These measures can be taken locally to tackle localised problems and has been found to be useful in case of drainage congestion of local isolated pockets. Diversion or by-pass can be resorted to only in case of protection of urban areas.

(2) Anti-erosion works :

These works are also adopted to protect urban areas or areas of historical or cultural importance. Agricultural area can hard be protected through these measures because of prohibitive cost.

3) Embankments : Earthen embankments have been recognised as a cheap and ready means of flood protection throughout the world. But its ill effects should also be considered when planning for such works.

4) Detention or storage reservoirs D.V.C. offers an example of construction of storage reservoirs to achieve a number of purposes including flood moderation. However although a sizeable volume of water is detained in the dams yet apparently damage due to floods have not shown much respite . This is due to the following reasons :-

(a) Reservoirs can detain run-off from the catchment limited to the location of the dam which is usually a gorge in the mountanious region. If the flood affected area is far down below, then a large uncontrolled catchment below the dam remains which alone may generate sufficient run-off to cause floods even if the release from the dams is negligible . During 1978 floods, the D.V.C. reservoirs were able to moderate an inflow of 8 lakh cusec to an outflow of 1.6 lakhcusecs. Unfortunately the contribution from the uncontrolled catchment synchronised and summed up a staggering 4 lakh cusecs in the lower valley which could carry hardly 1 lakh cusecs. The result was downright devastation. It also brought out the fact that even if the release from the D.V.C. system had been nil, the uncontrolled catchment could have, generated on its own a flow of about 2.5 lakh cusecs, which is enough in itself to inundate large areas in the lower valley. Moreover the fact remains that the full flood storage potential of the D.V.C. dams cannot be utilised at present due to non-acquisition of lands in the reservoir area of Maithon & Panchet Dams corresponding to the maximum reservoir levels.

(b) Presumably no reservoir can be economically built exclusively for flood control except in rare cases. Consequently a host of other purposes viz. municipal and industrial water supply, irrigation, hydropower generation, pollution abatement, fish and wildlife conservation, recreation; all of which need storage of water, are clubbed together with flood control which needs an empty reservoir to store flood water. So a continuous struggle goes on to determine the priority of use.

Moreover, very little release is made from such reservoirs except during floods when the release suddenly becomes very high. In the deltaic area, the channels having been starved of a regular upland supply start deteriorating. This factor enhances the ravages of floods when the detention reservoirs are compelled to release large volumes of flood discharge downstream.

(c) A false sense of security develops after construction of a dam with the consequent encroachment of human habitation on flood plains hitherto considered unsafe. So when the flood strikes the extent of damage gets enhanced

5. Watershed management :

This includes measures like afforestation, contour bunding, terracing, strip cropping, gully plugging etc. All these measures detain the run-off to some extent although their contribution towards soil conservation is much more important

There are the administrative measures also which are as follows :

(i) Flood forecasting and warning: Rainfall records are collected from strategic points in the catchment area and transmitted to a centralised forecasting station, where the rainfall data are prosessed and flood forecast message is prepared and disseminated to concerned authorities.

On receiving flood warning the administrative authorities are expected to plunge into a series of activities according to certain prescribed code. Evacuation of people from endangered area to a safer place with provision of food and shelter is a common step.

(ii) Relief & rehabilitation :

This is a common feature after every flood and voluntary organisations also take an important part in this sphere.

(iii) Crop Insurance :

This measure is intended to provide for some compensation of damages due to floods in lieu of payment of premia. This has not been introduced in our State so far.

(iv) Flood plain zoning :

The flood plain is divided into a number of zones according to their proneness to flood and consequently their specific use is codified. This measure if conscientiously applied can well reduce flood damage and can put the flood plain to the best possible use.

It is apparent that with the adoption of these measures we can reduce the flood damages to a great extent if we can plan our schemes carefully and can execute them with social awareness and administrative acumen. However it needs hardly any further proof to establish that the rate of deforestation has gone on uncontrolled for too long and that something must be done immediately to check this reckless outrage and to start refurbishing the denuded area. Recently there has been some criticism of undue penchant for large projects or the part of engineers.This is largely unfounded. However there is no harm in planning smaller detention reservoirs in upland catchment to suit certain specific requirement. In the coming century the country will have to provide food and fibre for population of at least 90 crores.This will compel us to conserve and utilise every drop of our water resource.

This will only mean we will have to think of large scale transfer of water resource in time and place. The panoramic scheme of National Water grid and Great Water garlands mooted by Dr.K.L.Rao and Shri D.J.Dastur may come up for re-examination along with projects for storage of monsoon flood in the Ganga Basin aquifers Successful implementation of such projects may radically remove the panic of floods as it is perceived today. But before these projects are implemented it will be necessary to examine the likely social, economical and last but not the least the environmental repurcussions which may occur. These may be of such magnitude and ferocity that if not taken care of earlier may precipitate disasters of bigger magnitude. However it is hoped that with the wave of concern for environment now evident in society coupled with the advancement in technology specially in computer science it is almost certain that management of water resources along with the management of other natural resources like land, flora and fauna etc. will become thoroughly efficient process aimed at the greatest good of the largest number of people. The word flood will probably shed most of its sense of debacle and devastation.