Non-structural Flood Management - Cost Effective Options

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Abstract

It has been an established fact that floods have an intricate relationship with environment degradation which could be appropriately termed as manmade disaster rather than a natural disaster India being one of the richest in water resources, is continuously suffering from the menace of floods and droughts due to poor management of this rich resource. Inspite of increased allocation of funds and its expenditure on flood protection measures during Eighth Five Year Plan, the struggle to deal with the disaster has become more difficult, structural measures have although been successful in providing incidental relief but non-structural and decentralised measures like flood plain zoning, flood proofing predictions and forecasting could prove to be much more cost effective and people participatory than the structural measures Paper highlights the facts on flood situations in India and measures taken so far by the Government of India

Unplanned, development has been the major cause of floods and poor water resource management in India. Landuse planning has never been integrated into the watershed management and eco-systems for exposed planning of a development programmes Cost of structural measures have been exorbitant and always evaluated as much larger than the benefits realised over a period of time. Hence, for sustainable future, the paper emphasises need for decentralised mechanisms of using non-structural measures like flood plain zoning and prediction – systems to take preventive actions. It highlights need for risk assessment through identification and mapping of risk prone areas and distribution of population in resonance with the water resource management programme.

Introduction

It is aptly said that "Flood are acts of God, but acts of man cause flood damage". It is natural for a river to over-flow its banks in the event of heavy rainfall in its upper catchment and spill into the flood plains, which are basically its right of way. Extensive and often unplanned use of flood plains, disregarding the basic fact that it is a part and parcel of the river, leads to flood damage. Thus, the uncontrolled and indiscriminate development of flood plains due to pressure of population can be considered as one of the main factors responsible for the ever increasing flood damage reported from different parts of the country in spite of substantial investment in the flood sector during the last four decades

Due to financial constraints, no flood control structure can be constructed to provide total or absolute protection against all conceivable magnitudes of floods. Moreover not all 'flood-prone' areas are amenable to protection through conventional flood control measures due to a variety of reasons. In some situations it may not be economically justified to build flood control structures, as the cost would far exceed the benefits, in other cases it may result in false sense of security leading to extensive economic activity in the area It is, therefore, necessary to suitably "manage floods" with a view to reduce the damage potential and property losses and minimise if not avoid loss to lives of humans and cattle. It is possible to achieve this by a suitable blend of structural measure like embankments etc., together with non-structural measures like flood plain zoning and flood forecasting and warning.

Flood Plain Management

The structural measures have been emphasizing on the attempts to modify the floods The non-structural measure on the other hand lay stress on attempts to modify the susceptibility to flood damage and attempts to modify the loss burden. **They strive to keep the people away from flood waters, bearing in mind the stark reality that the flood plains in fact, belong to the river and that the floods are not only a curse, but also a blessing in disguise in some ways.** It contemplates use of flood plains judiciously, simultaneously permitting vacating of the same for use of the river whenever the situation calls for This technique allows the use of flood plains reducing the hazard, while retaining its beneficial effects.

In view of cost effectiveness of the non-structural measures and speedier implementation, as more and more human encroachments and activities are taking place in the flood plains in our country, the main thrust is now on the non-structural flood management measures.

The non-structural measures can be broadly grouped under two categories as follows:

Flood Plain Management which would comprise of:

- Flood Plain Zoning
- Flood Proofing including Disaster Preparedness and Response Planning
- Flood Forecasting and Warning

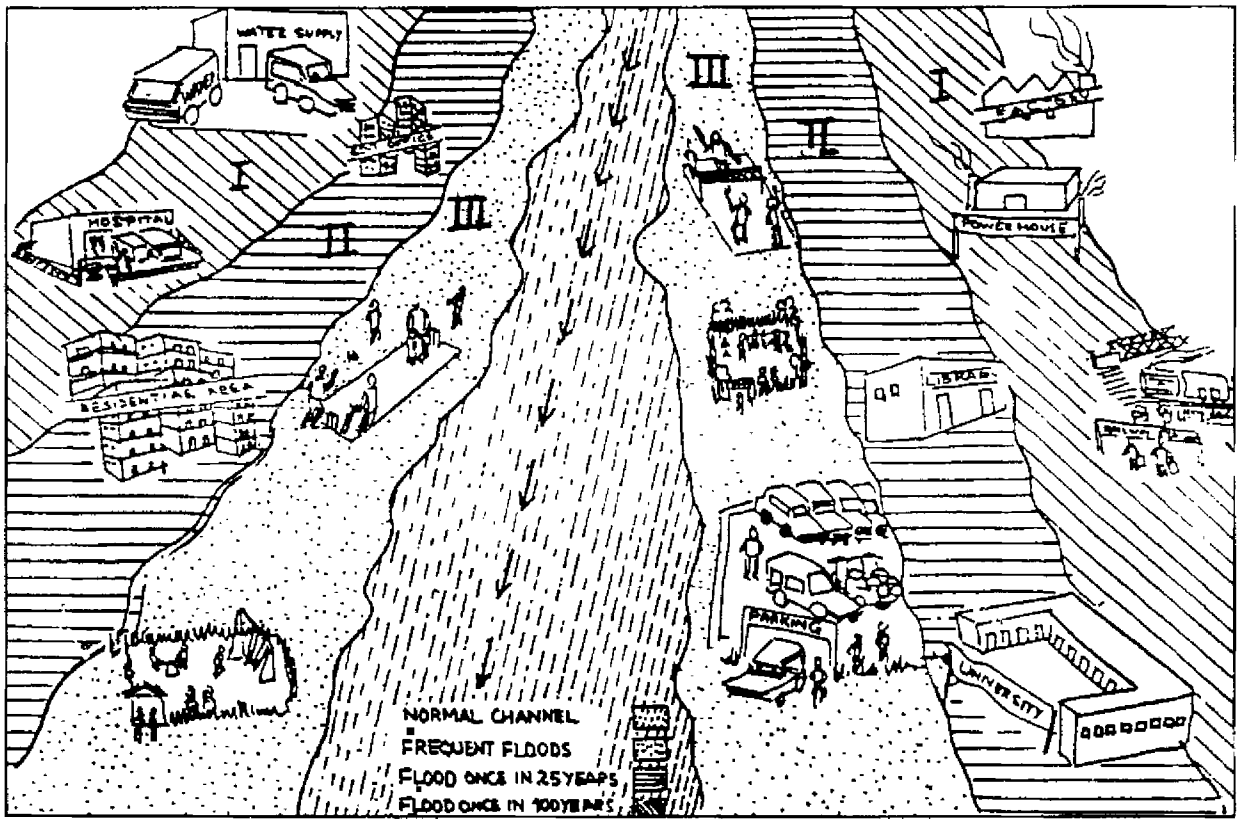
Modifying Loss Burden

- Disaster Relief
- Flood Fighting including Public Health Measures
- Flood Insurance

Of all the non-structural measures for flood management which rely on the modification of susceptibility to flood damage, the one which is gaining increased/ sustained attention of the planners and acceptance of the public is the flood forecasting and warning. Other measures particularly the flood plain zoning have to be tackled with more vigor so that a long-term solution to flood problem can be achieved in conjunction with structural measures wherever necessary.

Concepts of Flood Plain Zoning

The basic concept of flood plain zoning is to regulate the land use in the flood plains in order to restrict the damage by floods, which are bound to occur from time to time. (Refer figure 1 and 2) Flood plain zoning, therefore, aims at determining the locations and the extent of areas likely to be affected by floods of different magnitudes/ frequencies and to develop those areas in such a fashion that the resulting damage is reduced to the minimum



FLOOD PLAIN ZONING

It therefore, imposes limitations on indiscriminate and unplanned development of both the unprotected as well as protected areas. In the former case, boundaries of restricted areas are established to prevent indiscriminate growth, while in the protected areas only such categories of development can be allowed which will not involve unduly heavy damage in case the protective measures fail. Flood Plain Zoning can certainly help in minimising flood damage while ensuring that the valuable flood plains are simultaneously put to developmental use.

Flood plain zoning is not only necessary in the case of floods by rivers but is also useful in reducing the damage caused by drainage congestion particularly in urban areas, where on grounds of economy and other considerations, urban drainage may not be designed for the worst possible conditions and presupposes some damage during storms whose magnitude exceeds that for which the drainage system is designed

Broad Methodology

The steps involved in implementation of flood zoning measures could be broadly indicated as follows:

1. Demarcation of areas liable to floods.

2. Preparation of detailed contour plains of such areas to a large scale (Preferably 1:5000) showing contours at an interval of 0.3 to 0.5 meters.

3. Fixation of reference river gauges and determination of areas likely to be inundated for different water levels and magnitudes of floods.

4. Demarcation of areas liable to flooding by floods of different frequencies like once in two years, five years, ten, twenty, fifty and hundred years. Similarly areas likely to be affected on account of accumulated rainfall like, 5,10, 25 and 50 years

5. Delineation of the types, of use of which the Flood Plains can be put to in the light of (1) and (4) above with indication of safeguards to be ensured.

In the existing developed areas possibilities of protecting/ relocations/exchanging the sites of vital installation like electricity sub-stations/power houses, telephone exchanges etc., should be seriously examined, so that these are, always safe from possible flood damage. Similarly, the pump station of tube-wells for drinking water supply should be raised above the high flood levels corresponding a 100 year flood.

Similarly, possibility of removing buildings/structures obstructing existing natural drainage lines should be seriously considered. In any case, with immediate effect unplanned growth shall be restricted so that no constructions obstructing natural drainage, resulting in increased flood hazard is allowed.

In future buildings, the following regulations may be stipulated :

a) Plinth levels of all buildings should be nearly 0.75 to one meter above the drainage/flood submersion lines

b) In the areas liable to floods, all the buildings, a stairway should invariably be provided to the roofs so that temporary shelter can be taken there. The roof levels of the single story buildings and the first floor level in double story buildings should be above flood levels of 1 to 100 frequency so that the human lives and the movable property can take temporary shelter there when necessary during the periods of floods.

Attempts in the past

The need for flood plain zoning has received recognition at various levels in the past As far back as in 1973-74 Central Water Commission prepared guidelines for flooc

plain zoning which were approved by the Central Flood Control Board. Since the implementation of these guidelines needed statutory backing, Central Water Commission also prepared a model draft, which was circulated by then Ministry of Irrigation in 1975 to all the states for enacting legislation.

The Rashtrtiya Barh Ayog (1980) in its report also recommended that Flood Plain Management measures should be undertaken where-ever necessary legislation exists and suitable legislation enacted in other states. However, the response from states except Manipur has not been encouraging Manipur enacted a legislation in 1978 which came into force in December,1985.

Flood Proofing

Flood proofing measures help greatly in the mitigation of distress and provide immediate relief to the population in flood prone areas. It is essentially a combination of structural change and emergency action, not involving any evacuation The techniques adopted consist of providing raised platforms for flood shelter for men and cattle and raising the public utility installation above flood levels.

In case of urban areas, certain measures that can be put into action as soon as a flood warning is received involve·

installation of removable covers such as steel or aluminum bulk heads over doors or windows, permanent closure of low level windows or other openings, keeping store counters on wheels, closing of sewer well, anchoring machinery, covering machinery with plastic sheet, seepage control, etc.

Flood proofing also tends to encourage persistent human occupancy of flood plains Flood proofing measures taken in the past in India consisted of raising of a few flood prone villages, above pre-determined flood level and connecting them to nearby roads or high lands Under this programme, several villages were raised in Uttar Pradesh in West Bengal and Assam also, land fills were attempted in villages to keep houses above flood levels in some areas even though nearby agricultural lands were liable to inundation. The programme of raising of villages taken up in the Second Plan Period, was subsequently discontinued because it was observed that this metnod did not provide any protection at all to the surrounding agricultural areas.

Flood Forecasting and Flood Warning

Out of the various non-structural measures, "Flood Forecasting & Warning" is recognised as one of the most important, reliable and cost effective methods Central Water Commission organises flood forecasting at 157 stations in the country of which 132 are for water stage forecast and 25 for inflow forecast for certain major reservoirs. River stage forecast of 132 stations covers 62 river basins/sub basins. The Flood Meteorological Offices (FMO) also provide information regarding general meteorological situation, rainfall amount of last 24 hours and neavy rainfall warning for the next 24 hours for different regions and range of quantitative precipitation forecasts for various river basins to the respective flood forecasting centres of Central Water Commission. All the data is also simultaneously transmitted to the circle headquarters supervising forecasting works for overall scrutiny, monitoring, analysis and compilation. The final forecasts are then communicated to the concerned administrative and engineering authorities of the State and other user agencies connected with flood protection and management work on telephone or by special messenger/telegram/wireless depending upon local factors like vulnerability of the area and availability of communication facility etc.