Integrated Flood Management

By

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Flood is one of the most damage causing natural disasters in the world. Every year floods exert a heavy toll on human life and property in many parts of the world. Flooding is not just confined to certain regions of the world but is a globally pervasive hazard. India experiences one of the highest frequencies of flood and the flood prone area in India has been increasing significantly. The annual average area affected by floods in India is 7.563 Mha. This observation is based on flood data for the period 1953 to 2000, with variability ranging from 1.46 Mha in 1965 to 17.5 Mha in 1978. The average annual direct damage due to flood is estimated to be US$ 240 million (Economic and Social Commission for Asia and the Pacific , 1995). The draft National Water Policy of our country (2012) states that protecting all areas prone to floods and droughts may not be practicable; hence, methods for coping with floods and droughts have to be encouraged. Frequency based flood inundation maps should be prepared to evolve coping strategies, including preparedness to supply safe water during and immediately after flood events. Communities need to be involved in preparing an action plan for dealing with the flood/drought situations. The National Water Mission of the National Action Plan on Climate Change (NAPCC) stress a need to develop flood management startigies for the country and for these to include plans for community based adaption.

For mitigation and management of flood hazard, two types of measures, i.e. structural and non-structural measures are generally adopted. While the structural measures continue to be necessary, increased emphasis should be laid on non-structural measures, which allow flooding, but ensure that damages are minimized. Traditionally, controlling floods has always been the main focus of flood management, with the emphasis on draining flood water as quickly as possible, or storing it temporarily, and separating the river from the population through structural measures such as dams and levees. Emergency management as a necessary response to the floods, as well as recovery measures, have been put as main challenges which need to be explored and implemented.

The Integrated Flood Management was first introduced in a concept paper in 2003 by World Meterological Organisation (WMO). The 'IFM Concept Paper' was revised in 2009 in consideration of emerging issues, such as risk management, urbanization, climate variability and change, and adaptive management. The concept of Integrated Flood Management has led to a paradigm shift: absolute protection from floods is a myth, and we should aim at maximizing net benefits from the use of flood plains, rather than trying to fully control floods. A proactive approach towards the management of floods over a traditionally reactive approach is rapidly gaining recognition among flood managers. The proactive approach does not treat floods only as an emergency or an engineering problem, but as an issue with social, economic, environmental legal and institutional aspects. The proactive approach is not limited to a post-event reaction, but includes preparedness, including flood risk awareness and response measures to flood management at different stakeholders' levels.

Integrated Flood Management (IFM) integrates land and water resources development in a river basin, within the context of Integrated Water Resources Management, with a view to maximizing the efficient use of floodplains and to minimizing loss of life and property. Integrated Flood Management, like Integrated Water Resources Management, should encourage the participation of users, planners and policymakers at all levels. The approach should be open, transparent, inclusive and communicative; should require the decentralization of decision-making; and should include public consultation and the involvement of stakeholders in planning and implementation. A holistic approach to emergency planning and management is preferable to a hazard-specific approach, and IFM should be part of a wider risk management system. This approach fosters structured information exchange and formation of effective organizational relationships. In integrated flood management planning, achieving the common goal of sustainable development requires that the decision-making processes of any number of separate development authorities be coordinated. Every decision that influences the hydrological response of the basin must take into account every other similar decision (WMO, 2009). An Integrated Flood Management plan should address the six key elements viz. (i) manage the water cycle as a whole; (ii) integrate land and water management, (iii) manage risk and uncertainty; (iv) adopt a best mix of strategies; (v) ensure a participatory approach; and (vi) adopt integrated hazard management approaches that follow logically for managing floods in the context of an IWRM approach.

In this paper, probabilistic and deterministic approaches of flood estimation for taking up structural and non-structural measures of flood management are described. Some of the studies, which are pre-requisite for IFM such as preparation of digital elevation model from the levels and contours and extraction of terrain from Cartosat-1 data; water availability analyses and development of flow duration curves; development of regional flood frequency relationships for gauged and ungauged catchments using L-moments approach; estimation of Probable Maximum Flood (PMF) and Standard Project Flood (SPF); dam beak flood inundation modeling; preparation of flood hazard maps showing flood inundation and flood depth for various returns periods for a river reach using coupled 1-D and 2-D hydrodynamic flow modelling; assessment of impact of climate change on design floods under hypothetical scenarios of climate change and estimation of safe grade elevation for the design flood for important establishments are presented. Further, scenario analyses for inundation at the project site simulated by coupled 1-D and 2-D hydrodynamic modelling considering the flooding due to upstream catchments floods, back water effect of a dam, local site rainfall and failure of upstream dams has been explained.