

WATER RESOURCES MANAGEMENT IN THE RIVER BASINS OF PENINSULAR INDIA UNDER EXTREME HYDROLOGICAL CONDITIONS

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Global climate change may have serious impacts on the frequency, magnitude, location and duration of hydrological extremes. The impact can be favourable and unfavourable in different parts. However, such extremes are serious challenges to food and water security and life of millions of poor in developing countries such as India. India has an extensive area of drylands potentially threatened by desertification. Almost one-third of the country falls under semi-arid climate, a vast area of which is rich agricultural lands. Agriculture and water management in this zone are vital for India, as the population has reached 1.1 Billion and is still increasing to reach 1.5 Billion in few decades. Life of millions of rural poor has been traditionally linked to agriculture and the setbacks in agriculture lead to social issues like urban migration and extremism. Monsoons over India undergo wide inter-annual fluctuations either or not related to global anomalies. Changes in rainfall seasonality and soil moisture conditions affect water availability and food production, with its impacts on all facets of life. Water resources are already under stress from the environmental degradation, overuse and misuse. Globalisation and associated industrialisation, urbanization, rural unemployment, and urban migration add to this. Increasing water needs lead to social issues such as disputes over sharing among different states and users and over allocation priorities. New issues may arise and existing ones may worsen with further extremes in hydrological conditions. Assessing the impacts and developing strategies to face the situation become important in this context, for which a detailed analysis of the extremes in hydrometeorological conditions and their impact on the environment and society is necessary.

In this study, extremes in hydrological conditions over the river basins of peninsular part of India during the last 100 years have been analysed using the modified hydrological model, and their connection with global anomalies have been examined. Peninsular India has typical geographical and social setup. The 1200 Km long Western Ghats Mountain runs parallel to the west coast, producing heavy rainfall along the west coast, but making the interior peninsula dry by preventing the moist-laden air from the Arabian Sea. Several rivers originate in the Mountain, most of them wastefully flowing into the Sea. Some of the rivers flow east and there exist a number of disputes over the sharing of their water. Issues worsen during extreme years. Depressions and cyclones are common in the northern coasts, and their frequency and intensity are changing. This region has witnessed large anomalies in rainfall and changes in rainfall seasonality in recent years. Anomalies and change in seasonality of rainfall and their impact on water availability have been assessed, and possible change in water availability in a predicted change in climate in near future has been estimated. Trends in aridity and proneness to floods and drought in different states have been analysed using the criteria adopted by the meteorological department and the central water commission. Results show that rainfall is becoming more seasonal in certain area, increasing the risks of both floods and droughts. Water availability will be drastically reduced in near

future. Impacts of climate change and hydrological extremes are already evident in many parts. Change in cloud type and drop size result in increased sedimentation in the rivers of Kerala State. Increasing intensity and frequency of tropical storm contaminate the coastal aquifers and cause salinity intrusion in rivers far inside mainland. These changes will have far reaching impact on agriculture, rural job security and economy. States in the region have to find adequate financial resources and to develop appropriate water policy, climate change adaptation policy and an efficient implementation mechanism to meet challenges associated with extremes. Current conservation and management measures are quite inefficient due to various social and political reasons. Government machinery is often slow and corrupt and there is lack of cooperation among the different government agencies involved. The major project already under way to interlink rivers to minimise impacts of floods and droughts invites environmental and social issues. Guidelines for a policy and management strategy have been provided, considering the social, economic and environmental conditions.