

Ph.D. Thesis/ Dissertation titled
**Flood moderation and water management study in an Indian
river basin through intra-basin/ inter-basin subsurface and
surface storage/ transfer**

By

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ABSTRACT

India is one of the few countries in the world endowed with substantial land and water resources. Being a country with predominantly monsoon climate, the rainfall is erratic, unevenly distributed in space, time and hence water scarcity in some parts/seasons and floods in other parts/seasons frequently occur. Sometimes, they also occur simultaneously. In order to reduce the adverse impacts of floods and droughts, intra-basin surface/ subsurface water management, followed by inter-basin subsurface & surface water transfer is proposed to ensure water availability within the basin first, followed by transfer of water from basins having excess water to the adjacent basins having deficit water during floods, purely on a short term basis.

In the present study, a sub-catchment of Subarnarekha River Basin is considered as the study area. For this basin/sub-catchment, watershed boundary is delineated. This study focuses on the proposal of Intra-basin/Inter-basin subsurface/surface storage/transfer during a portion of the flood period after creating some Intra-basin storage, by analyzing 45 years of daily discharge data starting from 1972 for the Jamsholaghat Gauge-Discharge (G-D) site in the basin. Thus, four purposes in the following order [viz., 1) moderation of basin flood peak; 2) creation of intra-basin surface/subsurface storage; 3) groundwater recharge and 4) short term mitigation of water scarcity in the neighboring basin(s)] are expected to be achieved through this proposed study.

Additionally, present research also focuses on water harvesting structure suitability study [using 3 additional thematic maps related to lineament density, soil depth & drainage density, which is over

and above the 6 thematic maps used by various researchers so far, related to Land use and Land cover (LULC), slope, runoff, lithology, curve number (CN) and hydrological soil group (HSG)] and groundwater potential zone study [using 4 additional thematic maps related to topographic position index, topographic wetness index, profile curvature & plan curvature, which is over and above the 10 thematic maps used by various researchers so far, related to lithology, slope, LULC, drainage density (DD), lineament density (LD), distance from river, rainfall, HSG, geomorphology and roughness] so as to identify suitable new locations for time tested water harvesting structures like check dams, subsurface dykes and relief wells. For check dams, it is found that 17%, 31%, 37% and 15% of the study area is having low, moderate, high and very high suitability, respectively. For subsurface dykes, it is found that 10%, 27%, 38% and 25% of the study area is having low, moderate, high and very high suitability, respectively. The study area is divided into four zones with very high, high, moderate and low groundwater potential, with each of these zones accounting for 22%, 45%, 26% and 7% of the study area consisting of the Jamsholaghat sub-basin, respectively.

Keywords: Interlinking of rivers, Watershed delineation, Intra-basin/ Inter-basin surface/ subsurface transfer, Intra-basin surface/subsurface storage, Subsurface dykes, Relief/ Recharge wells, Multicollinearity, Water harvesting structures, Analytical Hierarchy Process, Groundwater Potential Zones.