

THESIS

**HYDROLOGIC MODELING FOR EFFECTIVE MANAGEMENT OF
HILL-TORRENTS OF PAKISTAN:
A CASE STUDY OF DARABAN HILL-TORRENT (D.I.KHAN)**

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ABSTRACT

Hill-Torrent fed Irrigation System constitutes major portion of the country's Dry-land farming system and covers all four provinces with varying extents/or magnitudes. It differs significantly from modern surface and groundwater irrigation systems. In the modern irrigation systems, flows are normally according to the design parameters, whereas in hill-torrent fed irrigation systems flows fluctuate widely in space and time. This system of farming is characterized by extreme events of floods and droughts. These extremes also vary temporally and spatially. Due to steep slopes of hill torrents, flood-flows move with high velocity, which results in damages to crops, irrigation system, infrastructure etc, and some time to human lives also. These hill torrents have lot of potential for development of agriculture to meet the shortage of food and other raw materials for agro-based industries, if managed wisely.

The Piedmont plains of D.I.Khan Division are surrounded by the mountains of Suleiman Range on the north-west and by the Indus River towards the south-east. The branching and looping channels of the torrents make the diversion of flows a complex enterprise. Daraban hill-torrent originates from Koh-e-Aspana (White Mountain) which is situated 48 km from Tuman Sain Abakhel and Tuman Shiranian and catchment area is about 417.374 sq.mile. Floodwater of Daraban hill-torrent is distributed in three branches i.e. on South Gud, on North Shakh Shumali named as Toya and on the middle Lohra.

In recent years, advancement in Geographical Information Systems (GIS) has opened many opportunities for enhancing hydrologic modeling of watershed systems. The advanced modeling technique, Geospatial Hydrologic Modeling Extension (HEC-