M.Sc. THESIS

ASSESSMENT OF SPATAIL AND TEMPORAL HYDRO VARIABILTY OF INDUS BASIN

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Submitted By:

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2010-PG-EHY-65

For the Degree of

MASTER OF SCIENCE

IN

ENGINEERING HYDROLOGY

CENTER OF EXCELLENCE IN WATER RESOURCES ENGINEERING
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2014

ABSTRACT

Changes in flow quantity are likely to raise tensions among the provinces, in particular with the downstream areas (Sindh province), with regard to reduced water flows in the dry season and higher flows and resulting flood problems during the wet season. Water resources estimation under changing flow regimes circumstances is important for planning and operation of water related project. Due to changing climatic condition hydrological parameters are changing under the influence of climate change, which resulted in the changing pattern of flow regimes. There is large variation of flow at different location in Indus basin irrigation system.

The objective of present study was to analyze the assessment of spatial and temporal hydro variability of Indus basin. The data of nine stations was collected from Surface water Hydrology Project (SWHP), WAPDA and Irrigation department of Punjab from 1961-2011. The mean monthly maximum, minimum and average mean discharge was computed from the daily maximum, daily minimum and daily mean discharge. Average daily discharge was based on the arithmetic average of daily maximum and minimum discharge. The seasons were divided as three month and six month. The six month seasons are as winter (October to March) and summer (April to September) and three month seasons are as winter (December, January, and February), spring (March, April and May, pre-monsoon), summer (June, July and August, monsoon) and autumn (September, October and November, post-monsoon). Annual mean is the average of January to December monthly means. Trends were investigated for temporal analysis of six river gauging stations of one station on each river of Indus river system for the period 1961-2010. The analysis was also done for 25, 15 and 10 years time span. For spatial analysis 6 gauging stations were taken two stations on each river Indus, Jhelum and Ravi respectively. Trends and variation were

investigated by applying the Mann-Kendall test and Sen's method. Trend was tested at different significant level 99.9%, 95% and 90%.

The overall analyses indicate that there is more flow variation on seasonal basis as compared to the annual basis. It was concluded that Sutlej and Ravi river discharge has shown decreasing trend during Annual Mean, Min. and Max discharge as well as during all six and three month season. Sutlej river first half more decreasing trend in discharge and Ravi river second half more decreasing trend in discharge. The Kabul river showed decreasing trend during annual mean and maximum discharge where as annual mean minimum discharge shown increasing trend. It was concluded that for Chenab, Jhelum and Indus river annual mean, maximum and minimum discharge showed decreasing trend. The rate of decreasing is more during 1986-2010 time span as compared to the 1961-1985, whereas during seasonal analysis winter (O-M), winter (D-F) and spring (M-M) shown increasing trend in discharge and summer (A-S), summer (J-A) and autumn (S-N) season shown decreasing trend in discharge. In spatial analyses of Indus and Jhelum river, summer season are more decrease in discharge at higher elevation point namely kharmong and chinari respectively where as winter season is more increase in discharge at higher altitude in Indus river and more decrease in discharge in Jhelum at higher altitude for the time span 1986-2010. During spatial analysis of Ravi, it was concluded that summer seasons are less decrease in discharge at higher elevation point namely Jassar whereas winter seasons are more increase in discharge at lower elevation point than higher elevation point. During draught and flooded period analysis it is concluded that every decade must experience one or two years as dry period as well as one or two years as wet period. It was also concluded that time span 2000-2004 was driest period in the history of Indus basin.