M.Sc. Thesis

ESTIMATION OF WATER BUDGET FOR AN IRRIGATION CHANNEL (A CASE STUDY OF 3L, 4L DISTRIBUTARIES OF AHMADPUR CANAL)

Advisor

DR. GHULAM NABI

Submitted By

Ahmad Mujtaba

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CENTRE OF EXCELLENCE IN WATER RESOURCES ENGINEERING

University of Engineering and Technology,

Lahore, Pakistan

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ABSTRACT

The estimation of groundwater budget for a region/area is most important factor in hydrogeologic studies of water related projects. A groundwater budget is an analysis of ground basin's inflow and outflow to determine the change in groundwater storage.

In this study, initially past trends of rainfall and temperature was analyzed from 1961 to 2011 using MAKESENS 1.0 i.e. Mann-Kendal and Sen's slope estimation. Increasing and decreasing trends were analyzed using this software. Spatial trend analysis of observed data of temperature and rainfall data was also done by using Inverse Distance Weighted (IDW) interpolation in ArcGIS software using averagely data of 5 years interval from 1961 to 2011.

Groundwater level data is analyzed using MS Excel by making graphs between months and their respective groundwater levels. A long-term water budget (1996 to 2015) was calculated by using hydrologic water balance equation, i.e. subtracting total recharge and total well withdrawals in Southern Punjab Pakistan. Firstly, Rainfall-Runoff was estimated by using Hydrologic Engineering Centre – Hydrological Modeling System (HEC-HMS). Model was calibrated for year 1996 and validated for 1997 and simulated from year 1998 to 2015. Evapotranspiration was estimated by Cropwat 8.0 model by using input data like windspeed (km/day), sunshine (hours), humidity (%), minimum and maximum temperature (^{0}C). The estimated evapotranspiration was maximum for summer months (June to September) and minimum for winter months (November to December). Streamflow recharge of 3L and 4L distributaries of Ahmadpur canal is estimated by using continuity equation and other general formulas. Total recharge was calculated by adding both stream flow recharge and precipitation recharge. Total well

withdrawals was estimated by multiplying number of wells to their averagely discharge. Number of wells in 1996 was 370 that increases to 935 in 2015 against a discharge of 0.7769 cusecs in 8 hours operation per day. Net budget was calculated by subtracting total well withdrawals into total recharge. Total water budget in 1996 was -1728.32mm and -2027.94mm in 2015. The result means that water level is decreasing day by day and it should be properly managed for its efficient utilization.