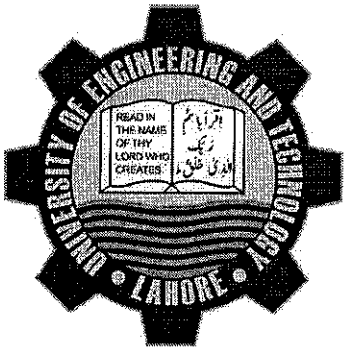
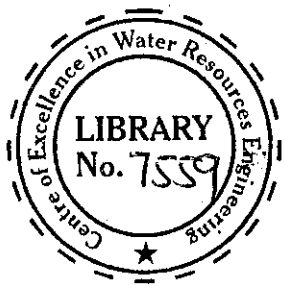
PROBABILISTIC CHARACTERIZATION OF PROPAGATION RATE AND LAG TIME BETWEEN DIFFERENT DROUGHT TYPES





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ABSTRACT

Droughts are the worst natural disasters that could affect people and the ecosystem more than any other natural disaster. It's a creeping phenomenon that is generally triggered by a severe lack of precipitation and it could prolong to hydrological, agriculture, and socio-economic droughts. Hence, the probable prediction of drought and its type's transition could play a vital role in sustainable water management and minimization of economic and human losses. Moreover, meteorological and hydrological droughts events have complex affiliations because they are influenced by watershed characteristics and climatic parameters, and meteorological events could convert into hydrological events after the lag time (L.T). The decisive calculation of the Lag time relationship between meteorological and hydrological events is very crucial for the reparation of hydrological events at a very early stage. Hence, the objective of this study is to carry out a probabilistic analysis of drought propagation between meteorological drought characterized by SPI (Standardized Precipitation Index) and hydrological drought characterized by SDI (Streamflow Drought Index) using the Bayesian network model. The results showed that during the study period (1983-2016), the Soan river basin experienced two severe droughts (i.e. 1998-2000 & 2009-2010) and a significant number of moderate and mild droughts. Both meteorological and hydrological events have a long and intense duration in sub-basin #2 (i.e.61 meteorological events and 46 hydrological events) as compared to sub-basin #1 (i.e.43 meteorological events and 36 hydrological events). The quantitative evaluation indicates that lag time varied with varying intensities of meteorological drought and the relationship between the duration of lag time and intensity is inversely proportional. The results also indicate that there is a higher

probability of longer lag time for meteorological droughts of medium intensity, whereas a lower probability of longer lag time for severe intensity. Furthermore, the response rate of hydrological drought to meteorological drought depicted that 65.12% and 75.41% of meteorological droughts were converted to hydrological droughts for sub-basin #1 and sub-basin #2 respectively. Conclusively this study could be a step forward to better understand drought propagation and could provide an initial indication for hydrological drought prediction and mitigation under changing climate conditions.