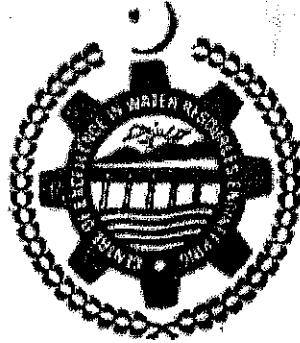


THESIS

**EFFECT OF CHANNEL IMPROVEMENT ON WATER LEVELS  
FOR KABUL RIVER UNDER FLOOD CONDITIONS**



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Submitted By:

Ms. Qudsia Latif  
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## ABSTRACT

The floods in Kabul River are a recurring feature and create problems for the general public in the densely populated areas of district Nowshera, Charsada and its surroundings. Economic growth has suffered serious set back due to hazardous floods in river. Public and private properties are damaged and colossal losses are inflicted. Various structural alternatives to combat flooding include flood protection dikes, flood bypass channels and channel section modification etc.

This study is under taken to evaluate the flooding hazard in Kabul River (confluence to Charsada, 76 Km) under various flood conditions. Values of flows for low, medium, high and very high floods are 1261, 1318, 2805, 5610 cumecs respectively (44500, 46500, 99000 and 198000 cusecs).

Further the affect of proposed Kalabagh dam (backwater, sedimentation) on Kabul river flooding hazard is also studied. The prospect of flood alleviation through channel modification at constricted places is evaluated for Kabul River. The channel section modification is restricted to widening of section and bed levels are not altered.

The flood and channel cross section data is obtained from respective offices. Google Earth software is used to augment the cross section data. HEC-RAS computer model is used to determine the water surface profiles under various flood and geometry conditions. Water surface levels are compared with NSL and or Maximum allowable water levels to determine the flooding hazard.

Banks of Kabul River are sandy though there are occasional rocks in the steeper sections just u/s of the confluence. Bed elevation at upstream cross section is 296 m and at down steam cross section is 266 m, resulting in elevation difference of 30 m between

these two cross sections for the total length of 76 km. Kabul River has steep slope in u/s reach from Charsada to Nowshera and then slightly flat towards confluence point. The average river bed slope is 0.00039m/m. Average width of river in u/s section is 577 m and in d/s section is 198 m. Average depth of river in study reach is 5 m. Pir Sabak, Akora, Nowshera and Charsada are densely populated areas on bank of Kabul River.

Kabul River from Confluence to Charsada is safe from flooding for low and medium flood flows. U/s 10 Km reach of Charsada is critical for high flood flows for average water surface depth of 0.42 m (0.27 m-0.38 m) above NSL. While water levels for 43 Km reach from Nowshera to Charsada are showing threat of flooding for very high flows. Water levels in this section rise above NSL for average depth of 1.10 m (0.37 m-1.76 m). The backwater effect of Kalabagh dam at reservoir top water level of 915 ft and bed rise due to sedimentation has insignificant effect on water levels over the present flooding threat.

Under channel modification 15 cross sections in upper 43 Km reach identified as a threat for flooding and are widened. Cross sections are widened for 17 Km reach length for average width of 168 m (22 m –500 m) and for 26 Km u/s reach length average increase of width is 522m (255m –766m). Results show that after channel modification, water levels become below for high flood flow condition for 10 Km reach length of Charsada for average depth of 1.48 m (1.23 m – 1.66 m). It is also noted that water levels remain also below for very high flood for critical 43 Km reach length for average depth of 0.94 m (0.21 m – 2.1 m). This makes whole study reach length of 76 Km safe against flooding even for very high flood flows.

The study concluded that Kabul River is generally safe under present condition for low, medium and high flood flows. U/s 43 Km reach from Nowshera to Charsada show critical condition for very high floods due to d/s constriction at Nowshera. Backwater and sedimentation effect of Kalabagh dam has insignificant effect on flooding at Nowshera. Channel modification by widening completely removes the flooding threat in the study reach.

It is recommended that as channel modification has lot of potential for flood abatement and this must be considered along with providing dykes or other conventional approaches. This study is based on limited geometric data which can cause results to be not without errors, so it is recommended to formulate a new model on more elaborated/complete details of the study area to substantiate/firm up/validate the results of the present study. River regime is likely to be effected due to changes in flow velocities after widening the sections so further study to ascertain the sustainability of wider sections due to river sedimentation / erosion may also be carried out. Moreover effect of Attock gorge as well as coinciding flood flows of Indus River should be studied in conjunction of backwater effect of KBD on flood levels at Nowshera.