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Stability Analysis of flood bunds, A study on Geotechnical Health evaluation of embankments

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Flood constitutes one of the world's most serious environmental hazards. Flood bunds are the earthen hydraulic structures which are constructed along the River to control the Flood water to avoid damages to the infrastructure, crops, livestock and also loss of human lives. Pakistan which lies in the Indus Basin has been facing severe threats and losses from the floods since histories. About 6807km length of flood embankment has been constructed to safeguard against the floods in the country. Punjab has been worst hit province by heavy floods and rains causing heavy loss. Geotechnical Evaluation is vital for proper functioning of such structures. For the study purpose four bunds have been selected along River Chenab in D G Khan Irrigation Zone, having potential for embankment breaching. In-Situ tests are performed on the selected flood bunds to collect soil samples for laboratory testing and to measure the in-situ soil permeability. Based on field investigation and lab testing various parameters were selected for modeling the bund structure in the limit equilibrium based software Geo Studio (2012). The model is analyzed considering four different critical scenarios, (1) steady state at highest Flood level (2) Rapid drawdown from highest Flood level (3) steady state at extreme condition with 3 feet free board (4) Rapid drawdown from extreme condition with 3 feet free board. The safety of the flood bunds is evaluated in terms of safe exit gradient, factor of safety and river embankment breaching. Guide lines to avoid breaching of flood bunds are also discussed.

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