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Assessment of flood effect on semi-arid special investment region using 1D hydrodynamic modeling

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The present study evaluates floods of semi-arid region with flat topography. The flood water spread over hundreds of square kilometer being delta region of Sukhbhadar River. The government of Gujarat aims to develop study region which spreads over 920 sq. km as Dholera Special Investment Region (DSIR). The study area is highly prone to flooding due to confluence of number of rivers namely Sukhbhadar, Lilka, Utavli and Padalio and tidal ingress from Gulf of Cambay.

Sukhbhadar River enters the DISR area near village Kashindra and flows through the Town Planning Scheme -TP1 and one of its tributaries Adhiya River, originating from village Cher flows through the Town Planning Scheme - TP2 of DSIR and meets the Sukhbhadar River at village Khun. The Sukhbhadar River is one of the major river passing through TP1 and TP2. The Sukhbhadar Dam is one of the major Dam on the Sukhbhadar River and it is approximately 100 km upstream of the study area. The average annual rainfall on the downstream side of the Dam and of DSIR region is 701 mm. In the year 2019 August there was heavy rainfall. The releases from the Sukhbhadar Reservoir and rainfall resulted into catastrophic floods in these regions of DSIR. As DSIR is special region proposed to develop for industrial activities, floods may cause millions of dollars damages in future. In the present study 1- Dimensional Hydrodynamic modelling has been carried out for recent flood of year 2019. MIKE 11 software is used to model 1D unsteady flow for this event. The shape file of the Sukhbhadar River reach from Sukhbhadar Dam to DSIR region is given as input and cross sections at regular interval of 100 m are generated from AW3D30 DEM. Sukhbhadar Dam release hydrograph is given as upstream boundary condition and predicted Tidal data of Bhavnagar is given as downstream boundary condition. It has been observed that from Sukhbhadar Dam to 55481.3 chainage slope is 1 in 698. For 55481.3 to 1611.33 chainage the slope is 1 in 3591. The area of DSIR is almost flat. As observed during recent flood of year 2019, entire DSIR area (920 sq km) was fully inundated. It has been felt that strong mitigation measures are required to cope up with these flooding situations. In the present analysis embankment or retaining wall on either bank of the river has been considered as one of the flood mitigation measure. The height of retaining wall to prevent these DSIR areas vary from 1 m to 25 meters up to 2500 cumec releases from the dam. This solution may not be economical hence it is proposed

to take advantage of parallel natural streams and ponds to conserve flood water. This solution seems to be more practical and economical. The paper analyze flood of DSIR region as without proper flood measures it is difficult to develop this region.