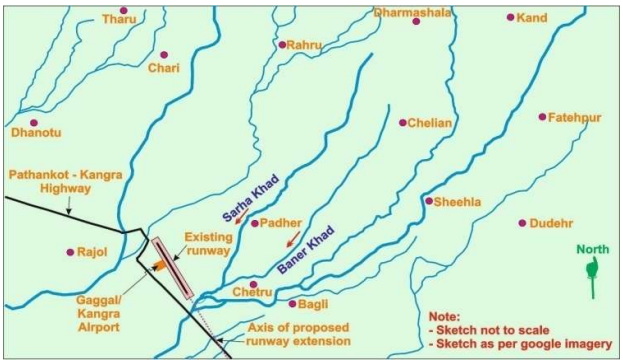
CENTRAL WATER AND POWER RESEARCH STATION

MATHEMATICAL MODEL STUDIES TO ROUTE THE FLOOD THROUGH THE PROPOSED BRIDGE BELOW THE PROPOSED EXPANSION OF KANGRA AIRPORT RUNWAY ACROSS RIVER MANJHI/SARAH KHAD AND TO EVOLVING SUITABLE RIVER TRAINING WORKS FOR MANJHI/ SARAH KHAD IN SHAHPUR, DIST. KANGRA, HIMACHAL PRADESH.



STUDY OVERVIEW

To enhance regional air connectivity and tourism in Himachal Pradesh, the Government of H.P. has proposed an extension of the existing runway at Kangra Airport, Dharamshala, to accommodate larger aircraft such as ATR-72, Q-400, and Airbus A-320. The proposed extension involves construction over Manjhi Khad, a key tributary of River Beas. To ensure hydraulic safety of the proposed runway infrastructure, the Central Water and Power Research Station (CWPRS), Pune, conducted 2D and 1D mathematical model studies to route the flood below the proposed bridge across river Manjhi/ Sarah for the proposed runway and to recommend suitable river training and bank protection measures for the said rivers and its tributaries.

APPROACH

2D Mathematical Modeling: 2 D model was developed to simulate the flood routing and water levels for 200-year return period flood, particularly focusing on the hydraulic behavior in the vicinity of the proposed bridge below the runway.

1D Modeling (HEC-RAS): Supplementary 1 D model was used to determine hydraulic parameters and to design suitable river training/ bank protection works for Manjhi Khad, Sarah Khad, and associated tributaries.

Hydrological Analysis: Historical rainfall and catchment characteristics were used to derive different period flood frequencies.

KEY FINDINGS OF STUDY

Flood Clearance: The 2D model results confirmed that the High Flood Levels (HFL) along the deep channel and left flank was well below the proposed runway formation level RL 761 m even for the 200-year flood scenario. This ensured safe flood conveyance through the bridge.

Bridge Configuration: The revised bridge design, with a length of 380 m along the flow and 350 m across the Manjhi./ Sarah Khads is found to be hydraulically adequate and is recommended for on-site implementation.

Runway Embankment Protection: To safeguard the embankment:

- Stone-filled gabion crates up to HFL + freeboard are recommended.
- A launching apron: 5 m wide with crate dimensions of 1.5 m (L) × 1.5 m (B) × 0.5 m (T) in a single layer is advised adjacent to the toe wall.

Protection of Spring Water Khuls: The hill-side irrigation canals (Khuls) that run downstream of the runway require additional protection measures. In continuation to the bank protection works, specific protective arrangements for these Khuls are recommended to ensure uninterrupted irrigation water supply and prevent damage due to altered flow patterns.

IMPACT/SIGNIFICANCE/OUTCOME

- The study confirms the hydraulic feasibility and safety of the proposed runway extension across Manjhi Khad.
- The findings support engineering design validation for critical components such as bridge span, runway elevation, and embankment protection.
- Ensures uninterrupted flood passage while maintaining structural integrity of the proposed extension.
- Facilitates sustainable infrastructure development, balancing aviation needs with local hydrology and irrigation systems.
- Lays the foundation for secure and expanded air connectivity, boosting tourism and economy in the region.