



RISK REDUCTION MEASURES FOR HYDRAULIC STRUCTURES



With intensified monsoon patterns and rising flood risks across Pakistan, **immediate government-level action is critical to safeguard hydraulic infrastructure** such as canals, barrages, flood embankments, headworks and drainage systems. The following urgent measures are advised for all provincial and local authorities

Embankment Strengthening & Slope Protection

- Conduct emergency repair of eroded or damaged canal/dyke embankments using earth filling, boulder pitching or geotextile mats.
- Lay gunny bags or sandbags in critical reaches prone to overtopping or piping



Inspection & Desilting of Channels

- Undertake urgent mechanical/manual desilting of main and branch canals, distributaries and drainage channels to restore flow capacity.
- Clear outfalls and cross-drainage structures near urban and peri-urban zones.

Critical Structure Safety Audit

- Conduct rapid assessment of structural stability of head regulators, fall structures, bridges and aqueducts.
- Reinforce or barricade structurally distressed components to prevent collapse or uncontrolled release.



Emergency Stockpiling & Logistics

- Pre-position sandbags, gabion baskets, plastic sheeting, boulders and fuel stock at critical vulnerable sites.
- Establish mobile response units with excavators, pumps and repair crews near flood-prone hydraulic assets.



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Strengthen Floodgates & Control Mechanisms

- Test and repair sluice gates, canal regulators, flap gates and escape structures to ensure operational readiness.
- Secure manual control levers, lock systems and raise gate plinths where water backflow is expected.



Clear Encroachments Near Hydraulic Assets

- Remove unauthorized construction or dumping around canal banks, spillways and flood channels to restore safe buffer zones.

Deploy Surveillance & Real-Time Monitoring

- Install water level gauges and temporary telemetry systems at vulnerable hydraulic sites for 24/7 flood monitoring.
- Use drones or CCTV where feasible to monitor embankment breaches or overflow zones.



Develop Standby Diversion & Breach Plans

- Identify temporary canal diversions or controlled breach sites to relieve pressure from overtopped embankments or barrages.
- Prepare action protocols for quick opening or closure of escape structures.



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Engineered Vegetation

- Deploy engineered vegetation solutions (such as deep-rooted grasses and shrubs) along dyke and levee embankments, utilizing plant species known for their soil-binding properties.
- This biological reinforcement minimizes surface erosion, reduces the risk of undermining due to water scouring.

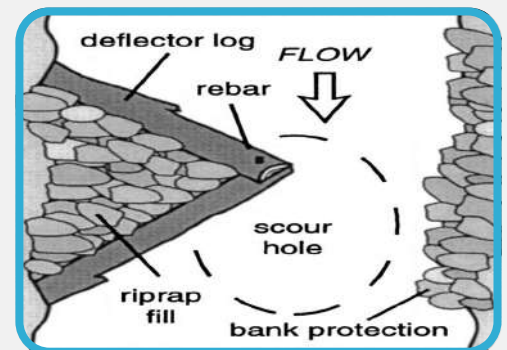


Engage Local Communities in Watch Duties

- Activate local watch-and-warning committees near vulnerable hydraulic structures for early reporting of seepage, erosion or unusual flows.

Debris Deflectors

- Install debris deflectors or booms upstream of weirs, utilizing locally sourced materials such as steel or timber, to mitigate the accumulation of debris and prevent blockages.



Overflow Channels & Relief Valve

- Construct overflow channels or relief valves at critical points in the dyke and levee systems to manage excess water during extreme flood conditions, preventing overtopping and breaches