

# Flood Risk Management Plans and engineering solutions for the Parvati River Valley, Himachal Pradesh, India

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Nested in the majestic pines of Himachal Pradesh, lies the Parvati Valley. The very place whose beauty Shiva is said to have named after Parvati; an eye catching landscape in Himachal Pradesh, which attracts thousands of visitors each year.

During the floods of 2022; the mesmerising valley in Kasol, was ravaged by floods; the region experienced high level of inundation, causing damage to property, infrastructure, crops, and ecosystems, including erosion of soil, displacement of wildlife, and contamination of water sources, also leading to significant disruption and loss of life in affected communities.

In times of such disasters one should remember The Ready to Respond Framework which stresses on the importance of a structured system designed to ensure that communities are prepared to quickly and effectively react to emergencies or crises, often encompassing elements like pre-emptive planning, resource allocation, training, communication protocols, and established response procedures, allowing for a swift and coordinated response when needed.

Disaster management initiatives in the area should be comprised of measures that are in the main areas of action closely linked to the cycle of flood risk management: Prevention, Protection, Preparedness, Awareness and Recovery.

Flood risk management plans (F.R.M.P.) address all aspects of flood risk management focusing on prevention, protection, preparedness, including flood forecasts and early warning systems and taking into account the characteristics of the particular river basin or sub-basin.

Flood risk management plans include also the promotion of sustainable land use practices, improvement of water retention as well as the controlled flooding of certain areas in the case of a flood event.

*Prevention:* encompasses legislative institutional, organizational measures and it includes measures like reviewing and updating flood risk management plans, coordinating territorial planning strategies with F.R.M.P.

*Protection:* such as natural water retention measures - associated to watercourses, wetlands, and natural lakes, change or adaptation of land-use practices, structural protection measures new reservoirs development, development of diverting channels, local embankments, measures to increase population resilience, adaptation of the defence structures at the climatic changes, etc.

*Preparedness:* in the form of monitoring, forecasting and flood warning, activities of flood event preparedness exercise with inter-institutional participation, etc.); such as

Public Awareness to increase the awareness of the community and it includes adequate public activities of information and promotion of public participation, activities for education and training of the population;

And lastly Recovery spanning emergency response actions, damage evaluation and recovery, improvement of post event documentation and analysis process.

*Flood Preparedness:* The communities coping with recurring flood with time develops a sort of herd immunity and adapts itself to some best practices arising out of the traditional wisdom.

The above may be summarized as below:

### **Structural solutions**

- *Dams:* Store excess water and release it gradually to prevent flooding downstream.
- *Flood walls:* Constructed to protect against flooding.
- *Flood barriers:* Placed around vulnerable entry points to prevent water from entering during heavy rain or storm surge.
- *Flood relief channels:* Man-made channels to divert water from flooding.
- *Embankments:* Constructed to protect against flooding.
- *Dykes:* Constructed to store extra water during flood periods.
- *Reservoirs:* Constructed to store extra water during flood periods.

### **Non-structural solutions**

- *Land-use planning:* Includes zoning ordinances and codes.
- *Flood forecasting:* Includes advanced warning systems.
- *Flood insurance:* Helps protect against flood damage.
- *Flood proofing:* Helps protect against flood damage.
- *Evacuation:* Helps protect against flood damage.
- *Channel clearing:* Helps protect against flood damage.
- *Upstream land treatment or management:* Helps protect against flood damage.

### **Other approaches**

- Planting vegetation to retain excess water.
- Terracing slopes to reduce slope flow.
- Conserving land in or around the floodplain.