



## Innovative technologies for enhancing dam safety and water management in India

Multi-purpose water reservoirs and dams play a major role for water supply, irrigation and flood protection in India. In order to ensure long-term operation and safety of the dams, adaptation planning, maintenance, repair and retrofitting are needed. DAMSAFE is a demonstration project sponsored by the Dutch Partners for Water program and supports decision making in a long-term integrated approach. The DAMSAFE consortium consists of the Dutch based research organisation Deltares (coordinator) and the Dutch companies SkyGeo and Royal Eijkelp and the Spanish company iPresas.

### DAMSAFE

The water reservoirs in India are of vital importance to the cities and urban areas. They provide water for irrigation of the land (food production), are used to generate electricity (water and energy) and offer protection against flooding (safety). Often, the dams are aging, but are also facing different circumstances than when designed, due to changes in land use, socio-economic developments and climate change. The goal of DAMSAFE is to contribute to enhancing dam safety and

water management in India. Innovative tools help in forecasting reservoir inflow and outflow, thus increasing reservoir performance and more controlled release of water in the environment. They allow assessment of the dam condition resulting in optimization of Operation and Maintenance (O&M), while rapid and risk based assessment of dam safety provides information for emergency response and improved risk reduction.

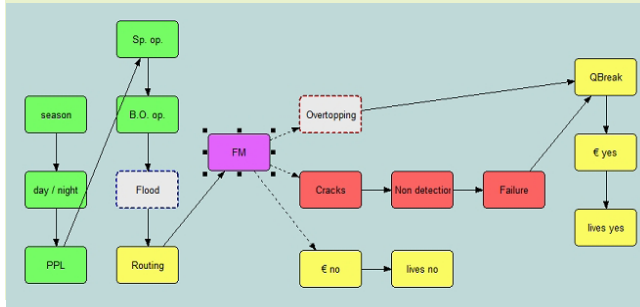


Figure 1 Bhadra embankment dam

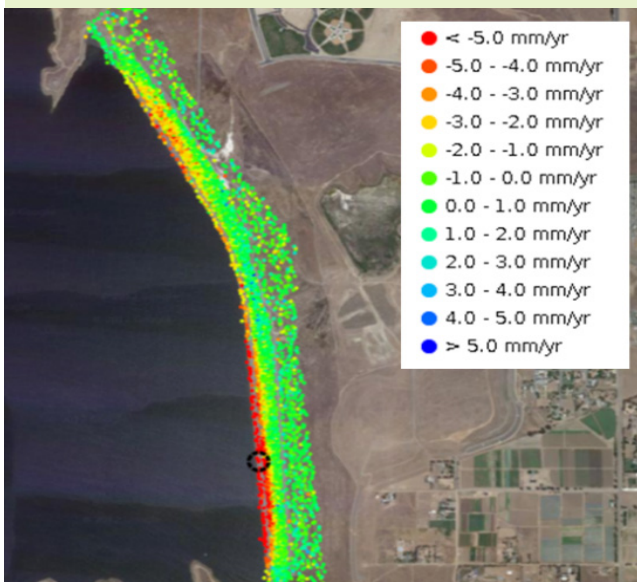
## Innovative Technologies

Different technologies, that have been developed and proven elsewhere, provide high quality and reliable information to the end-user. They are implemented in an integrated manner in DAMSAFE.

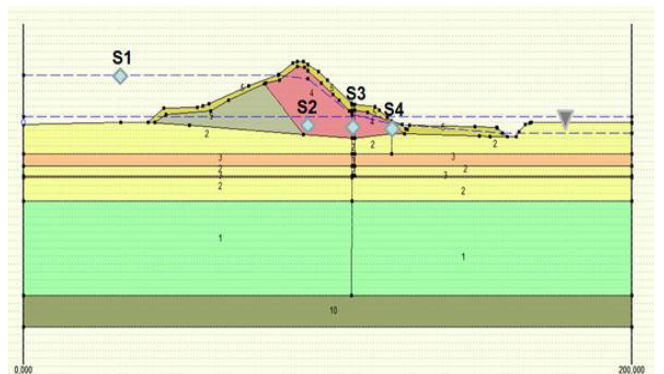
A risk model for the pilot dam is conducted to support risk-informed dam safety management. Results from the risk model are used to evaluate existing risk, compared with international tolerability recommendations, and to identify, analyze and prioritize risk reduction measures and study their impact on risk reduction of planned actions.



Persistent Scatterer Interferometric Synthetic Aperture Radar (PS-InSAR) is a radar technique used to generate maps of surface deformation with millimetre precision. In combination with dam safety modelling, it provides information on long-term risks and prioritizing in Operation and Maintenance (O&M) efforts. It also detects anomalies as an indicator for the need of short term in-situ inspections.



The online monitoring system enables monitoring of the weather (e.g. rainfall), the dam, the surface water levels and water quality in the reservoir.



FEWS DAM-Live is an online monitoring system that provides safety assessments of a dike or dam. Real-time data of water levels obtained from sensors installed along its profile are constantly imported and processed for stability analysis.

The platform can perform also predictions of the stability of the dike or dam based on input water levels obtained from the hydraulic/hydrological modelling suite SOBEK.

# Deltares

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