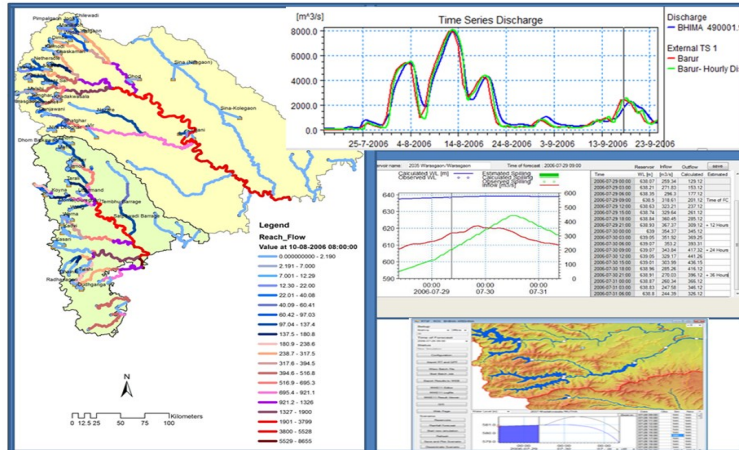


Real Time Streamflow Forecasting and Reservoir Operation System for Krishna and Bhima River Basins in Maharashtra (RTSF & ROS)

The Krishna and Bhima basins in Maharashtra covering an area of 69,967 sq. km experience highly variable rainfall both in space & time ranging from 6000 mm in upper catchments to 400 mm in rain shadow areas (lower catchments). The basins experience floods regularly. Sangli & Kolhapur districts in Krishna basin and Pune & Solapur districts in Bhima basin have experienced severe floods several times during recent decade. Floods of 2005 and 2006 have caused heavy damages to the assets and loss of lives were reported.

There are 46 medium and major reservoirs in the basin which are multipurpose including hydropower, irrigation, domestic and industrial uses. These reservoirs are operated with rigid schedules as single entities based on the historical hydro-meteorological data and experience gained. These methods are often not adequate for establishing optimal operational decisions, especially where integrated operation of multiple reservoirs for flood management is contemplated. In addition, manual data observation and transmission results in a considerable time lag, between data observed in field and its communication to decision making level which sometimes leaves little time, for flood forecasts.

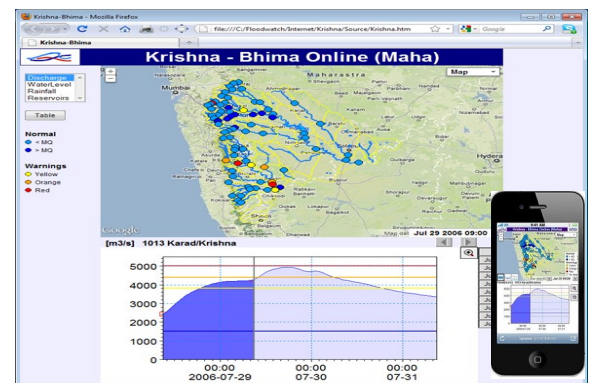


The Water Resources Department of Maharashtra are now equipped with the Real Time Decision Support System (RT-DSS) with a web-based real time streamflow monitoring and forecasting and reservoir operation system for flood management in the Krishna and Bhima basins in Maharashtra.

The Real Time Hydro-met network with 300 telemetry stations installed under the project provides rainfall, reservoir water levels, gate positions, river water levels and discharge along with other climatic parameters required for RTDSS models, which consist of hydrological, hydrodynamic and real time flood forecasting modules.

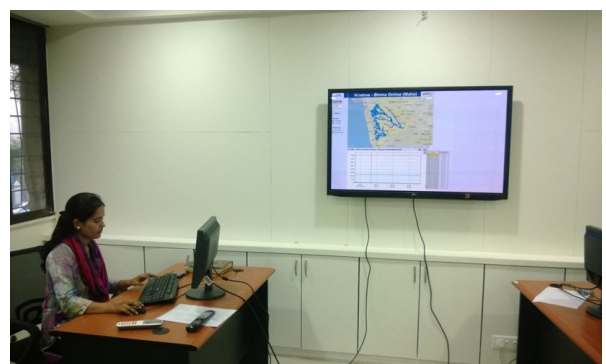
The RTDAS is fully integrated with the Knowledge Base System (KBS) developed for the Krishna and Bhima River basins, which consists of a comprehensive database of historical hydrological and GIS data. In addition to typical database functions, KBS is capable of performing a variety of data analysis including statistical analysis. The KBS is linked to the Real Time Reservoir Operation and Forecasting models.

The RTDSS is built on the MIKE11 modelling system which comprises the hydrological rainfall-runoff



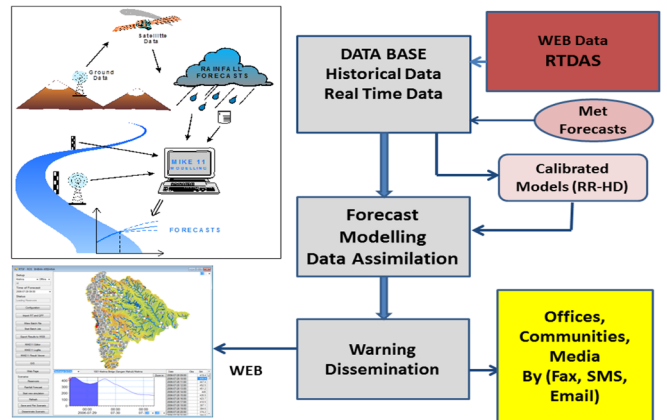
model, the hydraulic river routing model based on a fully dynamic solution of the St. Venant's equations, the data assimilation process used in real time flow and flood forecasting. The RTDSS has now been fully tested by WRD, Maharashtra with support from DHI, the project consultants. with real time data from RTDAS during the monsoon of 2013.

The communication and information management system developed in the project, consist of three main components: Flow/Flood Warning Reports and Dissemination thru SMS and E-mails, the RT-DSS Website and the main communication Web Portal (Krishna Bhima Online).

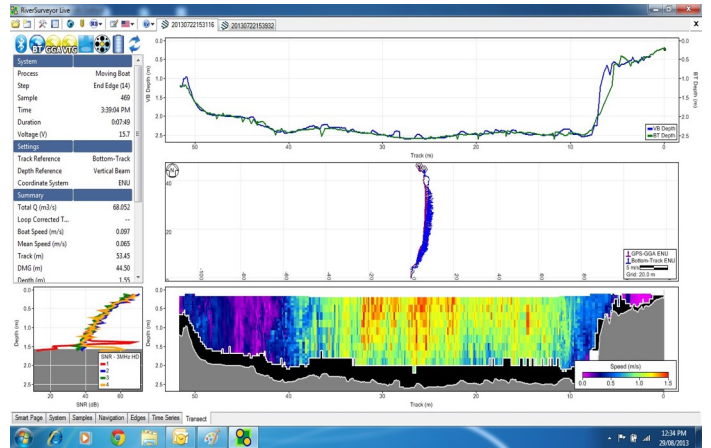




Real Time Weather Station



Overview Of RTSF & ROS



Accurate Discharge Measurement By ADCP.



Reservoir Water Level Sensor (RADAR)



The Chief Engineer & Executive Engineer of WRD (Maha) discussing flood information at the control room