# An online system for rapid and simultaneous flood mapping scenario simulations - the Zambezi FloodDSS

Alexander Schulz (1), Jens Kiesel (1), Harald Kling (2), Martin Preishuber (2), and Georg Petersen (1)

(1) HYDROC GmbH, Siegum 4, 24960 Siegum, Germany, (2) Pöyry, Hydropower and Renewable Energy, Water Resources Division, Laaer-Berg-Straße 43, 1100 Vienna, Austria

The Zambezi is the fourth largest river basin in Africa. Catchment hydrology is very complex due to significant spatio-temporal variations in precipitation and retention in surface water bodies including Lake Malawi, various large natural floodplains and swamps as well as the two large artificial reservoirs Lake Kariba and Lake Cahora Bassa. The Zambezi DSS, a free web-based system, can be used to simulate catchment hydrology under various climate scenarios and user defined reservoir operation rules. Since the Mozambican part of the river is prone to flooding, causing loss of life and considerable damages, the DSS can provide discharges along the river as an input to hydraulic scenario simulations and flood mapping.

However, a dynamic link to a server-based hydraulic model would compromise the DSS as a fast and open online system: Using this coupled system, hydraulic simulations and flood mapping would have to be carried out for each simulated scenario, which is a time consuming, computationally intense process and difficult to implement in an online system which is used by multiple users, each creating multiple flood maps simultaneously. We thus developed a different approach to dynamically derive flood maps along the main channel of the Zambezi within Mozambique for any scenario produced by the Zambezi DSS: The HEC-RAS model has been used to simulate physically possible range of discharges for more than 200 flow events at more than 1900 cross sections. Each event is converted to an inundation map, which is cut into inundation polygons at every cross section and saved with the according discharge and water level value in a database. The database is extended by polygons showing reservoir surface area extents of existing and future dams depending on reservoir water level. This database is dynamically linked to the Zambezi DSS and flood inundation maps are produced for any possible DSS-scenario using hydraulic plausibility constraints.

Internal flood map generation takes below 10 seconds, while the display depends on the internet connection speed. Comparisons with flood remote sensing data show very good agreement. Limitations include the assumption of subcritical and steady flow, 1-dimensional flow in the Zambezi Delta and the poor availability of topographic and bathymetric data as well as dikes. All simulations are based on globally available datasets and thus transferable to any basin worldwide. The system can potentially be upgraded to an early warning system, computing discharge and respective inundated area. The Zambezi FloodDSS is available at servers in Mozambique (http://zdss.ingc.gov.mz) and Austria (http://hydro.poyry.at/zambezi).