

## **LOWER MEKONG RIVER BASIN (LMRB) REGIONAL FLASH FLOOD EARLY WARNING SYSTEM – A PROJECT FUNDED BY THE U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT OFFICE OF FOREIGN DISASTER ASSISTANCE**

*Robert W. Jubach, Hydrologic Research Center, San Diego, California USA*

The following presents a summary of the project for the LMRB that will be demonstrated and discussed during the poster session. A demonstration of the computational system as well as a poster summarizing the LMRB Flash Flood Early Warning System will be provided.

As in many parts of the world, flash floods are destructive in the countries of the LMRB. Because of concerns over flash floods in the region, the Hydrologic Research Centre through funding support provided by the U.S. Agency for International Development/Office of Foreign Disaster Assistance (USAID/OFDA) will be implementing a regional flash flood early warning system for the LMRB beginning in the spring of 2006. The system will be designed to provide needed data and information at temporal and spatial scales appropriate to the numerous small flash flood prone streams in all affected countries within the basin. Rather than implement a series of systems based on in-situ automatic and/or manual hydrometeorological monitoring networks, the USAID/OFDA program will implement a system based on remote sensing of critical meteorological parameters and available global and local spatial data sets. For example, global spatial data sets are under development by the U.S. National Oceanic and Atmospheric Administration, the U.S. Geological Survey, the Mekong River Commission (MRC) and others and provide static estimates of topography, land use, and soils, and dynamic remotely sensed estimates of rainfall, evapotranspiration, and vegetative indices.

USAID/OFDA's specific goal and vision for the flash flood early warning system for the LMRB under its Asia Flood Network Program (a program to transfer U.S. flood-related technology and assistance to Asia) is to implement a complete early warning system comprised of three primary elements as noted below:

- **Implement a computational system for flash flood guidance** - a computational system will be installed that supports a data base containing historical and static data, operates a hydrologic model for estimating flash flood thresholds, tracks soil moisture, displays data and information, ingests real time rainfall and other data, and communicates guidance information to the appropriate users in each of the LMRB countries. The computational system will be installed in the MRC FMDC with outputs transmitted to each country where warnings will be developed and disseminated per appropriate protocols.
- **Develop protocols for guidance dissemination** - Protocols for flash flood warning dissemination will be developed that are consistent with the 1995 Agreement concerning main stem Mekong River forecasting responsibilities, the overall Flood Management Plan, riparian capacities, existing agreed-to procedures for data and information exchange, and the extant relationships between the MRC and the riparian countries. Moreover, lessons learned from guidance-information dissemination implemented by the OFDA-MRC flood-referencing project will be considered, as well.
- **Provide Training** - The appropriate training of the MRC and riparian country staff will be a critical aspect of the system. Training and system documentation will be keys to sustaining the system.

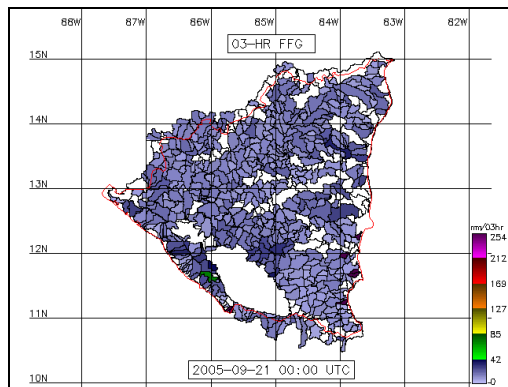
The system is designed as a diagnostic tool for meteorological and hydrologic services to analyze weather-related events that can initiate flash floods (e.g., heavy rainfall, rainfall on saturated soils) and then to make a rapid evaluation on the potential for a flash flood for a location. The system

provides values of **flash flood guidance** and **flash flood threat** for small stream basins – the basins most prone to flash flooding. (Note: **flash flood guidance** is defined as the amount of rainfall for a given duration over a small basin needed to create minor flooding (bankfull) conditions at the outlet of the basin. **Flash flood threat** is defined as the rainfall of a given duration in excess of the corresponding flash flood guidance value. The **flash flood threat** then becomes an indication of areas where flooding is imminent or occurring and where immediate action is or will be shortly needed.)

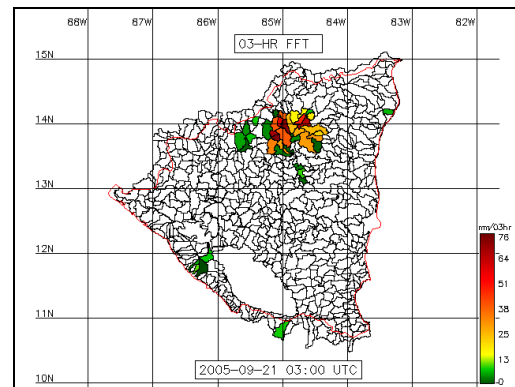
The system is not based on simply identifying areas of heavy rainfall. The technical method that will be used to produce this guidance is the same that has been proven over the last 30 years via operational application by the U.S. National Weather Service. This method is based on physically-based hydrologic modelling involving soil water accounting. Evaluations of the threat of flash flooding will be done over hourly to six-hourly time scales. Satellite rainfall estimates will be used together with available in-situ rainfall gauge data to obtain bias-corrected estimates of current rainfall volume over the region. It is planned to use these bias-corrected satellite rainfall data to update soil moisture estimates and to evaluate flash flood threat.

A similar regional system has been successfully implemented for the seven countries in Central America and has been operational for two years. The LMRB system will be modelled after the Central America system which has the base node in Costa Rica with system products and data made available to the other six countries from the computational server via the Internet. The other six countries need only a PC and Internet connectivity at a minimum to obtain real time system products and data.

#### Example System Products (from the Central America System)



Example 3-Hour Flash Flood Guidance Product



Example 3-Hour Flash Flood Threat Product