Establishing an Integrated System

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There are a number of steps that should be followed in establishing an integrated flood forecast, warning and response system. These steps are very important and have been introduced in greater detail earlier in these Guidelines. The intent of this section is to provide a brief overview of these steps. In doing so, there will be some reiteration of previously introduced concepts and material.

The first step for a community, country or region is to conduct an assessment of the existing flood forecast programme. Each of the links or components of the forecast system should be evaluated as to its effectiveness.

After the existing system has been assessed, a new and improved system can be designed. The new system design should strengthen the weak links of the existing forecast system, meet the needs of the users, and provide sufficient accuracy and lead time to reduce flood losses to the maximum possible extent. Like any other project, the new forecast system will be subject to cost constraints and must therefore concentrate on those improvements that will yield the greatest benefits in terms of reducing human and economic losses.

Frequently financial institutions supporting flood forecast modernization projects will require an economic analysis or feasibility study to determine the benefits versus the costs of the project and subsequent programmes. Usually there are significant economic gains that can be realized by investing in an integrated flood forecast system. For example the U.S. National Oceanic and Atmospheric Administration National Weather Service (NOAA/NWS) is proposing investing $US 60 million in the Advanced Hydrologic Prediction Services (AHPS) project. The economic analysis demonstrated benefits of $US 360 million per year from reducing flood losses and from providing forecasts to the water management sector of the economy.

The following are steps required for establishing an improved integrated system. Each of these components should be considered in the overall design with emphasis on strengthening the weakest links within the existing system.

- Design improved meteorological observing network
- Design improved hydrological network (precipitation and stream gauges)
- Automate the meteorological and hydrological networks
- Establish real-time communication system to move data reliably from field to the forecast office
- Establish operational network maintenance plan
- Determine feasibility of existing and new ground-based radar for estimating quantitative precipitation products
- Determine feasibility of using geostationary and polar orbiting satellite products
- Integrate in-situ precipitation data with satellite and radar precipitation estimates
- Establish hydrometeorological database and management system
- Select hydrological and hydraulic models appropriate for river basin conditions and needs of the users
- Establish real-time linkages between databases and modelling system

- Link numerical weather prediction model products to the hydrological forecast system (Quantitative Precipitation Forecasts and Climate Forecasts)

- Determine the training needs for new hydrological forecast methods versus current forecaster knowledge

- Establish training programmes and materials

- Design real-time communications system to disseminate routine forecasts and warnings to target audiences (e.g., communities, media, mayors, government officials)

- Establish user group networks and protocols to interact with forecasters and system outputs to ensure forecast products are appropriately designed for the users

- Establish an "Operations Concept" that defines how the hydrological forecast centre will operate in routine operations as well as during major flood episodes in the improved system

- Establish response strategies with communities, emergency services, and civil protectorate organizations

Once the design of the improved integrated system has been completed, this design must then be incorporated into a project proposal with associated costs and time lines for approval by the various governmental entities involved, as well as by donor and financial institutions. Once approved, a detailed implementation plan must be developed. It should show how the various components of the new system would be completed and integrated into a sustainable forecast programme.

The science and technology required to produce a fully integrated flood forecast and response system are available today. There are many systems now operating that have achieved a high degree of integration and sustainability. Cooperation amongst levels of government, ministries, civil society and private industry is absolutely necessary to achieve an integrated programme. Interaction between meteorological and hydrological organizations is essential for establishing a viable flood forecasting, warning and response programme.