Hindu Kush Himalayan Hydrological Cycle Observing System (HKH-HYCOS)

Guna Paudyal
gnpaudyal@gmail.com

WMO Global Hydrological Status and Outlook System (HydroSOS)
September 26-28, Entebbe, Uganda
Outline

The HKH-Region: Flood issues

HKH-HYCOS Programme:
- Pilot Real Time Observation System
- Regional Flood Information System
- Regional Flood Outlook
- Transboundary Flood Outlook-Koshi R.
The HKH region: flood issues

The KHK region consists of large river basins of China (Tibet), Afghanistan, Pakistan, Nepal, Bhutan, Nepal, India & Bangladesh.

The Ganges and Brahmaputra are two very large river systems of South Asia with a catchment area of 1.5 million sq. km.
Out of a total population of over 1 billion in HKH region, 500 million are poor and disadvantaged.

Millions of people suffer from annual floods which are widespread and of transboundary in nature, thousands loosing lives.

Damages to infrastructure in billion dollars

Alarmingly significant loss of livelihoods
The recent Floods of 2017 were devastating in South Asia: 800 people killed, 240 million affected,

National Governments & International agencies have spent billions of dollars in structural flood mitigation, but with limited success.

It has now been realized that monitoring of hydro-met events and providing forecasts and early warning can play an effective role in reducing the impacts of flood disasters.

=> HKH-HYCOS Programme initiated in 2012 by the International Center for Mountain Development (ICIMOD) with cooperation from WMO.
Five major components: HKH-HYCOS programme:

1. Framework for cooperation
2. Establishment of Regional flood observation network
3. Development of Regional flood information system
4. Development of Transboundary Flood Outlook
5. Creating Public awareness & capacity building
The overall process

Regional Centre, ICIMOD

Field real-time hydro-meteorological data acquisition
- Field sensor
- Raw data
- Preliminarily processed data

National FF Services

Data processing
- National flood information systems

Other data
- Forecast data

Regional Flood Information System
- Regional flood outlook (P, WL, Q)

Other data acquisition
- Hydro-meteorological (GTS etc.)
- Soil, Land cover, river schematics
- SRE, QPF, Weather Forecast, snow cover etc.
Overall Objectives of The HKH – HYCOS:

to minimise the loss of lives and property by reducing flood vulnerability in the HKH region

‘Making Information Travel Faster than Flood Waters’
Observation network

- 33 real-time hydro-meteorological stations and data sharing installed in four countries (Bangladesh, Bhutan, Nepal & Pakistan)
Old manual gauge

HYCOS Real Time Radar WL

INDIA

Bangladesh
Regional flood Outlook
The Ganges- Brahmaputra Basin (G-B) as a pilot system

1.50 million sq.km
Combination of real time observations and Satellite rainfall estimates

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rivers</td>
<td>31</td>
<td>15</td>
</tr>
<tr>
<td>Catchments</td>
<td>53</td>
<td>33</td>
</tr>
</tbody>
</table>
The Overall Regional Flood Outlook system

National RTDAS

HKH HYCOS

DATA BASE
Historical Data
Real Time Data

WEB data
QPF Met-forecasts
Calibrated Flood Model

Forecasting Model

COMMUNICATION
Real-time Flood Information

National & regional flood information portals
The outlook which, in essence, is a regional flood forecast based on a mathematical model describing the precipitation-runoff process in the catchments and hydrodynamic flood routing along the river system.
Case study: 14 - 16 August 2014

GFS rainfall forecast on 12\textsuperscript{th} Aug 2014 07:00

14 Aug  

15 Aug  

16 Aug  

Pilot regional flood outlook results 2014

Legend
- Red: Danger Level
- Yellow: Alert Level
- Blue: Monthly average Level
Operational forecasts: 2014
(major river basins of Nepal)
Dissemination of Flood Outlook
<table>
<thead>
<tr>
<th>Station/River</th>
<th>Warning Level</th>
<th>Hours after Time of Forecast</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Averag</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
Forecast lead time for Bangladesh
Impact of The HKH-HYCOS programme:

- National Governments inspired to install over 500 real time hydro-met stations in Nepal, Bhutan, Pakistan, Bangladesh (World Bank and UNDP actively supporting)
- Development of National Flood Information systems including real time flood forecasting and early warning systems
- Benefits of Regional Data sharing and transboundary flood information being realized by the riparian countries.
- Regional Transboundary flood outlooks used in flood disaster management
- Lower riparian countries using the regional flood outlooks in increasing lead time of flood forecasts.
- Regional and National capacities improved in flood monitoring, modelling & in dissemination of community based early warning
- Improved awareness, reduced loss of lives during heavy floods (2017)
Thank you