

# A new paradigm to access and interact with disaster-related data services

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#### Results from 2016 Annual Report

- Reach **14.9 million** people, and micro-, small, and medium enterprises with financial services
- Provide 2.0 million hectares of land with irrigation services
- Construct or rehabilitate 113,600 kilometers of roads
- Generate **4,287 megawatts** capacity of conventional energy and 2,461 megawatts' capacity of renewable energy
- Recruit or train 6.6 million teachers
- Provide **377 million** people with essential health, nutrition, and population services
- Cover **32.7 million** beneficiaries by social safety net programs
- Provide **42.2 million** people with access to an improved water source
- Provide **16.6 million** people with access to improved sanitation facilities
- Reduce **588 million** tons of CO2 equivalent emissions annually with the support of special climate instruments
- Support 36 countries in institutionalizing disaster risk reduction as a national priority

#### Typical Multiple Development Objectives in Water Resource Systems Triple Bottom-Line Needs

#### Economic





Social

•Access to basic service Poverty Alleviation/Jobs Livelihoods •Equity/Gender/ Affordability/ Vulnerable/Indigenous People •Reducing Resettlement/ Migration





•Fueling sustainable growth and shared prosperity •Investment net benefits, O&M •Commodity exports (e.g. pow agriculture) •Reducing imports •Enhancing regional cooperation...

#### Environmental



## Integrated, Multi-sectoral, Spatial Perspectives...



... Need to modernize integrated approaches to enhance sustainability...



# Disaster Management What's Broken?



## Information

- Data coverage and quality
- Widespread use of modern analytical tools
- Public access to data, tools, and knowledge products
- Learning from global good practice

## Institutions

- Technical capacity
- Meaningful stakeholder involvement
- Decision making
- Collaboration/ Partnerships

### Investments

- Investment synergy and coordination in a basin/watershed context
- Huge infrastructure deficit
- Inadequate monitoring and forecasting systems
- Poor office infrastructure and equipment







# Looking ahead...





## Modernization Essentials Information & Analysis

#### Data and Information

- Monitoring Systems (bottom-up and top-down) on glaciers, weather, snowpack, evapo-transpiration, soil moisture, agriculture, flooding, groundwater, land cover, water quality, energy systems, etc
- Information management systems (data rescue, spatial information systems, data platforms, open data services)

#### • Knowledge Services

- Portals, Mobile Apps, interactive e-books
- Knowledge products, online water cadasters and e-atlases, basin water accounting
- Forecasting modernization for weather, snowmelt, flows, and disasters
- Decision Support
  - *Planning* support (for allocation, new investments, impact assessment, climate risk analysis)
  - *Real-time* operations support; alert systems for targeted stakeholders such as water infrastructure (dam, irrigation, hydropower) operators, farmers, etc.



## Modern "Bottom-up" Monitoring tools







**Doppler Radar** 



**Snow Pack** 





**Shore-mounted Radar** 





Automatic Cableway System



**Groundwater Monitoring** 



Water Quality Monitoring

**Bridge-mounted Radar** 



Non-Contact Measurement of Stage &

Discharge

Field Kits



Laboratories

*Source of most graphics: Innovative Hydrology* 

## **Illustrative Options for Real-time Telemetry**



Automatic Collection & Real-time Transmission

(e.g. GSM/GPRS, Terrestrial Radio, Satellite Radio, Meteorburst, broadband, etc. or combination possibly with local data logger storage backup)



#### Top-down measurements from



"Space-based Rain Gauge" e.g. GPM



Figure 10 An example satellite image from the Global Rainfall Map Source: http://sharaku.eorc.jaxa.jp/GSMaP





Figure 11 Observed (Qo) and nodelled (Qm) runoff at Besham Olia, Upper Indus based on remotely sensed TRMM) snow cover and precipitation data.

Source: Immerzeel et al. (2009)

#### "Space-based Stream Gauge" e.g. AMSR

2001

003 2005 Version TPJO.1





#### "Space-based Reservoir Levels" e.g. TOPEX/JASON1&2/ENVISAT

# OSTM Interim CDP 20hr altin



+ Snowcover, Glaciers, Soil Moisture, Flooding, Temperature, Evapo-transpiration, Landcover, Water Quality, Productivity, and much more...

#### "Space-based Groundwater monitoring" e.g. GRACE



## Illustrative Visualization, Decision Support and Communication Tools



**Integration with Satellite Data** 



**Radar Floor Analysis** 



**Portals/Apps** 





...that can be integrated into a modern Data to Decision Services Platform (usable at global, regional, national, state, and local levels)



# Modernizing Institutions (Regional, National...)



# Flood Modeling

✓ ETA Model
✓ TRMM Sat.
✓ CMORPH Sat.
✓ USGS Sat.
✓ Observed Met.

Conversion of Rainfall Sat. to Catchment Rainfall (Sudan-FEWS)

Flow & WL Hydrographs

Flood Hazard Maps

e.g. Demonstration of Value of Regional Cooperation for flood forecasting and warning improvement in Sudan, Ethiopia, and Egypt.

**Upper Nile Rainfall Estimate** 

Hydrologic & Hydraulic Model (Sudan FEWS) HEC-HMS; HEC-RAS; LCM

✓ HEC-Geo-RAS✓ ARC-GIS



# A new world for "last mile" connectivity

- -Multiple media -Internet
- -Cellphones
- -Flags
- -Preparedness plans





allmm





CEGIS Flood Info: Lautara 7-Sep-2007 14:21 ++ (Courtesy Banglalink) Here,

- A = Source of flood forecast message
- B = Mauza name
- C = Date
- D = Time of sending message

E = Rise or fall of water level: One plus sign (+) means one bighat (22cm) rise of water level, one minus sign (-) means 1 bighat (22cm) fall of water level.

#### F=CourtesytoBanglalink





Flag hoisted at the community at Bhalkutia Mauza, Nagarpur Upazila showing rise in water level (blue flag) by 3 bighat



## **Go From Decisions to Data: Deciding on Coping with Floods**



## **Data Access and Visualization in the Public Domain**

An Exciting New World Ahead!



#### **Global Spatial Datasets**

(e.g. topography, historical climate, hydrology, climate change projections, land cover, snow, population, administrative areas, gridded GDP, and a range of other social, environmental, and economic indicators)



# Check it out!!! Spatial Agen;

#### A world of public domain data at your fingertips...



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# Packaging into Knowledge Products and Services...

- •Public Domain Datasets/Products
- •Hardcopy and Interactive Atlases
- •Reports/Presentations
- •Interactive Collaborative Portals/ Websites/ Toolkits/ Infographics
- •Mobile "Apps"
- •Multi-media, E-Books, ...



# **Visualizing Complex Data**

# **Climate Variability (within a year)**

Average monthly temperature in Africa region





cally, especially in the developing world, it has been solveredy difficult to understand the compase in a hubble context premety due to challenges in the information and institutional context. The of data is under foremention of the net file context datated or issues from the solvers with record or to data is under forementions.

# Thanks!



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