Need to scale up international support for hydromet (NMHSs) modernization in the developing countries

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Why weather, climate and hydrological (hydromet) information important to national security and economic development?

Both developed and developing economies are very sensitive to weather and climate
Developing economies are the most vulnerable

Between 1980 and 2011, the global financial losses from floods, droughts and storms was more than US$3.5 trillion

Between 1970 and 2010, natural hazards killed 3.3 million people

Many developing countries lose more than 1% of GDP annually due to hydrometeorological hazards

Assessments show that 5-10% of these losses and deaths could be avoided by making full use of warnings issued by a well-functioning National Meteorological and National Hydrological Services (NMHSs or Hydromet)

NMHSs also provide vital information to support economic development in Agriculture, Water Resources, Transport, Energy, Climate Adaptation, Environmental Protection, Public Health…

Challenges

- **National Meteorological (NMS) and Hydrological (NHS) Agencies is a backbone of global weather and climate observation system**
  - Small but important **public sector**
  - NM(H)S budgets usually are **0.01-0.05%** of national GDP

- **NMHSs capacity in many countries is not adequate and significantly degraded during the last 15-25 years**

- **Massive underfunding of NHMSs has led to:**
  - Poor observation networks and outdated technologies
  - Lack of modern equipment and forecasting methods
  - Insufficient R&D support
  - Erosion of a workforce, lack of trained specialists
  - **Poor quality of services**

- **Consequences – considerable increase of "excessive" economic losses, increased risks, losses of lives which could've been avoided**

Table 5. INAM´s Operational Network of stations

Category	Stations Type	Year		
		1975	2000	2010
Surface Network	▪ Synoptic	29	16	29
	▪ AWS	0	0	12
	▪ AWOS	0	0	5
	▪ Climatologically	125	27	50
	▪ Rain gauges	282	8	--
	▪ Agrometeorological	21	6	14
Upper Air Network	▪ Radiosonde	3	1	0
	▪ Pibal Wind	0	0	0
	▪ Radar	3	0	2
Geophysics Network	▪ Seismic stations	0	0	0
	▪ Geomagnetic stations			
Oceanographic Network	▪ Tidal Stations	0	0	0
	▪ Sea water temp. Measuring stations	0	0	0
	▪ Wave/swell measuring stations	0	0	0
Other Networks	▪ Ozone stations	0	0	0
	▪ Air radioactivity stations	0	0	0
Total				

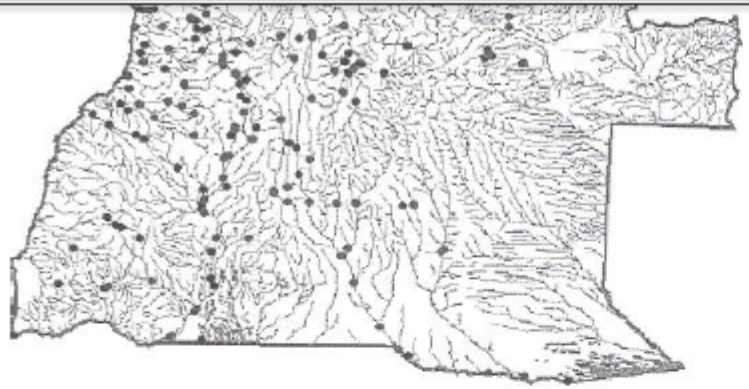
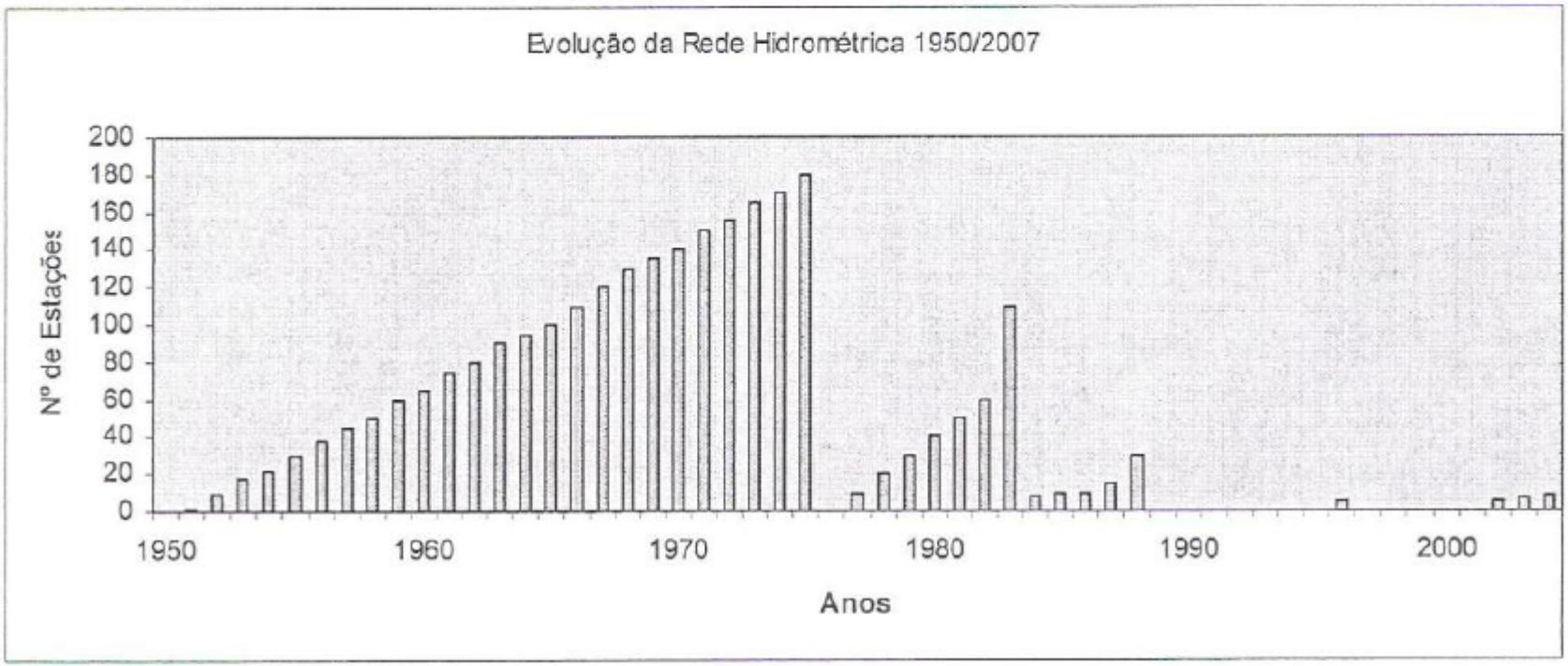


Figure 4 Existing hydrometric network stations in 1974



Challenges

- **International support for NMHSs modernization and capacity building is growing but much more has to be done**
  - The capacity gap between the most advance NMHSs and NMHSs in LDCs is growing
  - Total number of countries where NMHSs need modernization and significant investment exceed 100, most of them (over 50) are located in Africa

- **Conservative estimate of high priority modernization investment needs in developing countries exceeds USD 1.5-2 billion**
  - In addition *minimum USD 400-500 million* per year is necessary to support operations of the modernized systems (staff costs + operating and maintenance costs). These recurrent costs should be covered by national governments but few are ready to do this

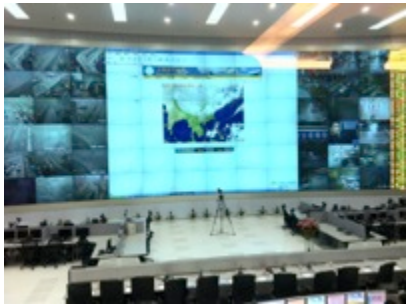
- **The amount of international support for NMHSs is significantly below high priority needs**
  - The is no "official" record of donor support to NMHSs but it is likely to be below USD 200 million

- **Sustainability record of international support and investment efforts in NMHSs modernization is poor due to:**
  - Lack of government understanding of NMHS's value and commitment to maintain NMHSs operations
  - Inadequate project design (support for few elements which are often not connected)
  - Technical complexity and small size of the projects

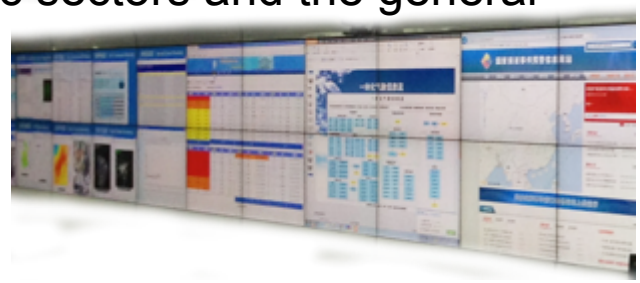
What do effective NMHSs require?

They must meet the standards established by the World Meteorological Organization (WMO), including:

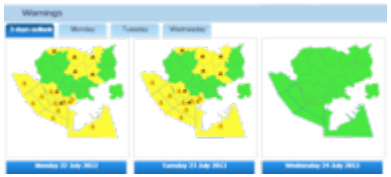
A technically competent and sufficient workforce to meet service and production demands



The ability to communicate effectively with all users of weather, climate and hydrological information including disaster management, transport, WRM, agriculture other economic sectors and the general public



A well maintained, fully operational national hydrometeorological observation network



The capacity to forecast routine and high impact weather and hydrological events using data from national networks, numerical weather predictions shared by WMO global and regional centers that meet users' requirements

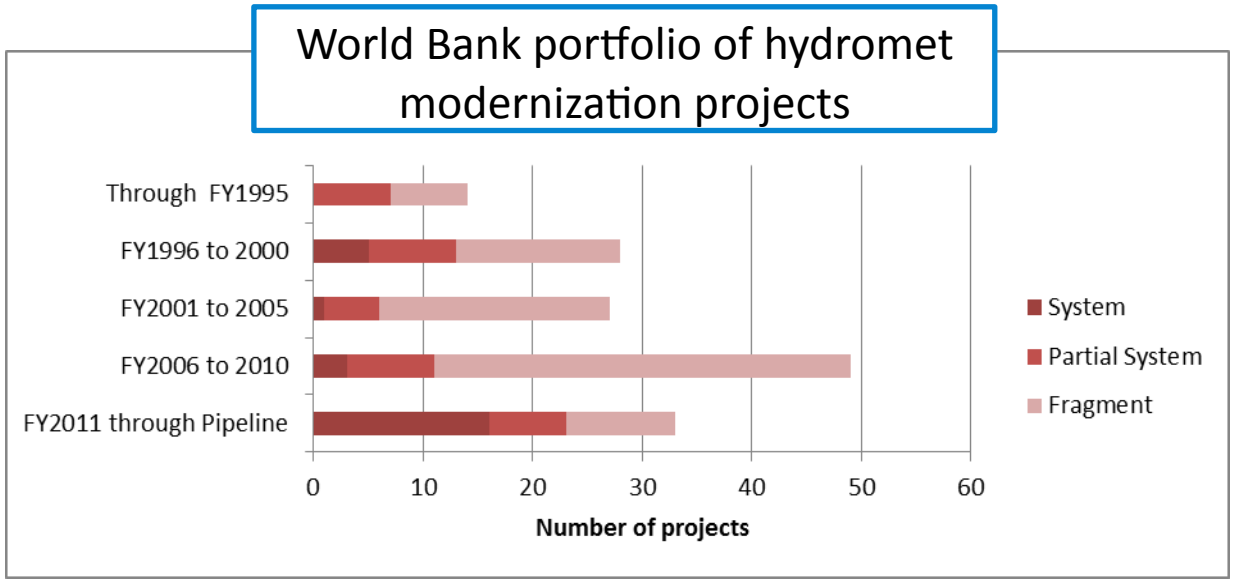
On-going government support for basic operations and maintenance

World Bank support to hydromets

- Since mid-1980s the Bank has prepared and implemented over 150 operations with some elements supporting NMSs and NHSs

- The number of operations supporting hydromet modernization and their scope considerably increased since mid-1990s, over USD 400M hydromet investments in active projects

- New set of projects is under development and they are taking into account lessons learnt in implementation



World Bank is trying to transform this situation

… to something closer to this

Portfolio Development and Operations

Project/component title	Funding (USD)	Stage
Central Asia Hydrometeorology Modernization Project	27.7M (IDA/ PPCR)	Implementation
Mexico. Modernizing the National Meteorological Service to Address Variability and Climate Change in the Water Sector in Mexico	105 M (IBRD)	Implementation
Vietnam. Managing Natural Hazards Project. Component 2: Strengthening Weather Forecasting and Early Warning	30 M (IDA)	Implementation
Nepal. Building Resilience to Climate Related Hazards	31 M (PPCR/ IDA)	Implementation
Russia. Hydromet Modernization Project – II	140M (IBRD)	Implementation
Mozambique. Strengthening Hydrological & Meteorological Information Services for Climate Resilience	21M (PPCR/IDA/ NDF)	Implementation
Malawi. Shire River Basin Management Program	20+M(IDA/GEF)	Implementation
Yemen. Climate Information System and PPCR Coordination	19M (PPCR)	Implementation
Sahel Disaster Resilience Project (Burkina Faso and Mali)	100M (IDA)	Pre-Appraisal
Democratic Republic of Congo. Strengthening Hydro-Meteorological and Climate Services	15-20M (IDA)	Pre-Appraisal
Nigeria. Water Resources and Irrigation Management	20+M (IDA)	Identification
Myanmar. Ayeyarwady Integrated River Basin Management Project	35M (IDA)	Identification

MOZAMBIQUE. CLIMATE RESILIENCE: TRANSFORMING HYDROLOGICAL AND METEOROLOGICAL SERVICES PROJECT

Program Component	GoM	PPCR	GFDRR	IDA	NDF*	Total
A. Strengthening Hydrological Information Management	1.00	8.80		0.50		10.30
A1. Institutional strengthening & training		1.60				1.60
A2. Enforcement of quality control & standards		0.30				0.30
A3. Physical hydrological monitoring networks		3.00				3.00
A4. Transmission and management of data		1.80				1.80
A5. Hydrological modeling, forecasting & Flood/EWS		1.20				1.20
A6. Hydrological information products		0.90				0.90
B. Strengthening Weather and Climate Information Management	0.50	4.20	0.45		6.00	11.15
Technical Assistance (Long- and Short-term)					2.20	2.20
B1. Institutional strengthening					0.30	0.30
B2. Organisational Development & Training					0.15	0.15
B3. INAM Quality Management System					0.05	0.05
B4. Physical meteorological monitoring networks		1.60			2.85	4.45
B5. Transmission and data management		1.00			0.00	1.00
B6. Meteorological modeling, forecasting & extremes/EWS		0.90			0.25	1.15
B7. Meteorological information products		0.70			0.20	0.90
C. Piloting resilience through delivery of improved weather and water information		2.00				2.00
C1. EWS in Zambezi, Limpopo and Incomati River basins		0.70				0.70
C2. Forecasts to farmers in Gaza and Inhambane provinces		0.60				0.60
C3. Alerts to fishermen in Inhambane		0.40				0.40
C4. Innovations for inter-agency delivery of data		0.30				0.30
Total Program Contribution	**1.50**	**15.00**	**0.45**	**0.50**	**6.00**	**23.45**

Nepal Pilot Program for Climate Resilience: Building Resilience to Climate Related Hazards

NN		Cost, US$
A	**Institutional Strengthening, Capacity Building and Implementation Support of DHM**	**4,540,000**
B.	**Modernization of Observation Infrastructure and Forecasting**	**16,250,000**
B.1	Technical modernization of the observation networks	10,000,000
B.2	Modernization of DHM communication and ICT systems	1,950,000
B.3	Improvement of the numerical hydrometeorological prediction system	400,000
B.4	Design and pilot operation of an environmental monitoring network	1,200,000
B.5	Refurbishment of DHM offices and facilities	2,700,000
C	**Enhancement of the Service Delivery System of DHM**	**4,200,000**
C.1	Introduction of Public Weather Service (DRM, agriculture, media, civil aviation, health, energy, water resources)	1,400,000
C.2	Improvement of DRM operations including development of "end-to-end" EWS in two basins	1,600,000
C.3	Improvement of service delivery to communities including introduction of mobile applications	400,000
C.4	Improvement of the national climate service	600,000
D	**Pilot DHM climate and weather information for users in agriculture - Agricultural Management Information System (AMIS).**	**6,000,000**
	Total	**31,000,000**

Our experience has shown…

1. Modernizing NMHSs in developing countries is a high-value investment (economic benefit to costs are in the range 1:2 to 1:10)

2. The financing and scope of NMHSs' modernization programs must be sufficient to be transformative but sustainable

3. There is a need for clear legal and regulatory frameworks for providing weather, climate, and water services

4. Large-scale modernization programs should typically include

- institutional strengthening and capacity building
- modernizing observing infrastructure and forecasting
- Enhancement of the service delivery system

5. Modernization of NMHSs should be considered within the wider regional and global context

Potential Approach for NMHSs modernization (I)

- Two level of engagement – national and regional/global

•NMHSs should be the center of support, try to change NMHSs culture

•"Educate" and convince government /instruments – CBA, MOF/ MOE, reach commitment on NMHSs support

•Building partnerships with main clients, delivering services

•Size makes a difference, need to build full size integrated system

•Reducing risks of failure /sustainability, capacity building, long-term commitment

•Investment instruments (packaging with major sectoral WB investments – DRM, WRM, CC/CA, Agriculture, etc.; special programs)

Potential Approach for NMHSs modernization (II)

- **Regional/global level**

- In partnership with WMO provide better access and seeking efficiencies through better access to global and regional products
  - SWFDP, GFCS, etc.

- Improve coordination between donors, develop investment plan (pre-feasibility study) and define complementary investments

- Develop special investment program for NMHSs support in Africa

World Bank GFDRR Hydromet program

- **The World Bank – in close partnership with WMO and other donors - is scaling up its support to hydromet modernization**

- **GFDRR Hydromet Program plays a role of a focal point and service center of hydromet modernization activities in the Bank. The Program has three pillars:**

  - **Analytical Support and Knowledge Management**
    - "Weather and Climate Resilience. Effective Response through National Meteorological and Hydrological Services" (2013)
    - "Assessing the Socio-Economic Benefits of Meteorological and Hydrological Services" supported by WMO – USAID – GFDRR (2014)
  - **Capacity Building and Technical Assistance**
  - **Support to Portfolio Development and Operations**

Capacity Building and Technical Assistance

Shanghai (CMA/SMS)

March 2012, October 2013

Washington DC, NWS-WMO-GFDRR

June 2013