NHMS Development and World Bank

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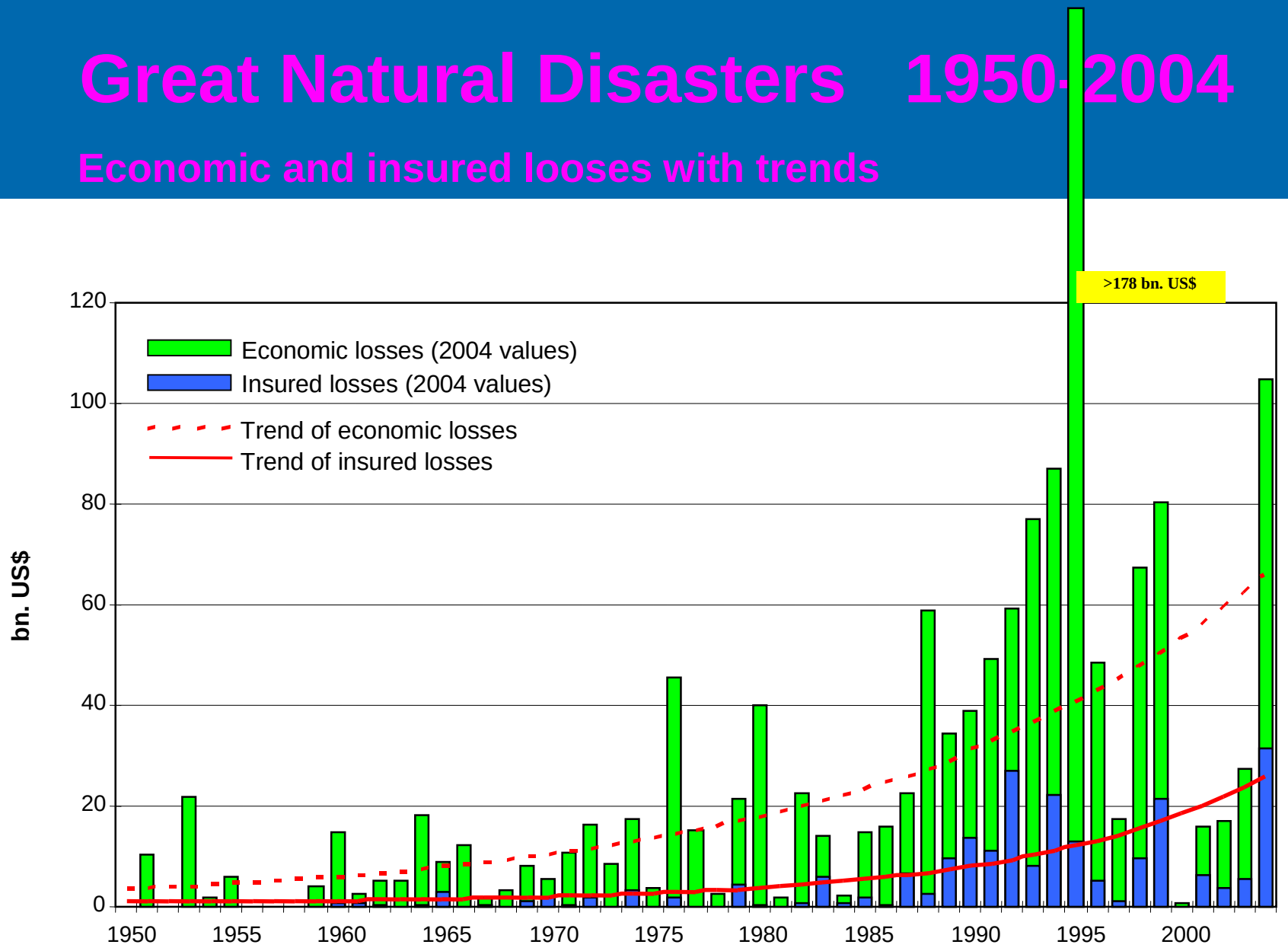
- Brief overview of the Bank's activities in weather and climate
- Europe & Central Asia (ECA) Region. Examples of WB operations
  - Russia Hydromet Modernization
  - ECA Weather and Climate Study
- How the Bank can contribute to NHMS development

Economic impact of natural disasters is on the rise

- *There is a definite trend in increasing impact of natural hazards, particularly related to weather and hydrological events*
- *Between 2000-2004, 80% of reported natural disasters were triggered by hydro-meteorological hazards*
- *Flood-related disasters and wind-storms and account for 60% of the total economic losses*
- *300% increase in number affected during 1990-1999 by floods and storms*
- *ECA countries are vulnerable too*
  - *Major floods in Romania (2003, 2006), Bolgaria (2006), Georgia (2005), Ukraine (2004), Russia (2000, 2002)*
  - *Landslides in Kyrgizstan, avalanches in Georgia and Russia*

Great Natural Disasters 1950-2004

Economic and insured looses with trends



National Meteorological and Hydrological Service (NMHS) is important public sector

- NMHS are delivering weather & hydrological forecasts and warnings for public and economy
- Improvement of NMHs performance is important for reaching national development objectives and MDGs
- The importance of having well performing NMHS is growing (increase of economic losses, climate change risks)
  - but this is often overlooked by national governments
- There are many signs of deterioration of NMHS capacity in ECA which lead to “excessive” economic losses due poor NMHS performance
- NMHS constitute a unique global system under umbrella of WMO
  - but there is growing gap between developed and developing countries
- The Bank in cooperation with WMO can play more important role in modernization of NMHS infrastructure and capacity building

Bank's record of operations in hydrometeorology

- Bank invested many billions in hundreds of projects in water resources management and disaster mitigation/prevention, some of them have hydromet components or activities
  - **Afghanistan – 2003:** Emergency Irrigation Rehabilitation, 13% for hydroposts, met stations, telecoms.
  - **Aral Sea – 1998:** Water and Environmental Management, ~ 15% for hydrology, to support international water sharing agreements
  - **Turkey – 1998:** Emergency Flood and Earthquake Recovery, ~20% for improved forecasting.
  - **Latin America and Caribbean – 1997:** Emergency Recovery and Disaster Management, ~ 7% to collect and disseminate weather information and warnings
  - **Mexico – 1996:** Water Resources Management Project, ~ 22% for meteorology and similar for hydrology

Bank's record of operations in hydrometeorology

- But there were relatively few investments in meteorology
  - Agrometeorology
    - **East Timor – 2004:** Third Agricultural Rehab, <5% of total for an agromet component
  - Climate adaptation
    - **Latin America and Caribbean – 2003:** Mainstreaming Adaptation to Climate Change
  - **El** Niño/Seasonal Forecasting
    - **Peru – 1997:** El Nino Emergency Assistance, ~8% for development of an up-to-date weather forecasting system
  - Few projects where NHMS were major beneficiaries
    - **India, Turkey, Mexico, Romania, Poland**

Russia Hydromet Modernization project – first integrated modernization of national NHMS

- Annual direct economic losses in Russia caused by weather events are in the range of USD 1-2 billion and have a tendency to grow
- Percentage of non-predicted “dangerous weather events” (DWE) among all recorded DWE increased from 11.2% in 1994 to 23.1% in 2001
- Major Roshydromet infrastructure was not upgraded since mid-1980s
- Severe underfunding led to overall degradation of the service
- In 2003 government requested the World Bank’s support

The oldest Operational CRAY on the Planet

Operational Data Exchange Devices

Data Storage Facility (Obninsk)

Hydrogen Generation Technology

Routine hydrological measurements, Amur River, November 2003

The project will pilot new approaches, concepts and instrumentation in RHM

- Institutional development program
- Sustainable Financing and Resource Management
- Performance based activities
- Capacity Building Program
- Client satisfaction surveys
- Automatic and semi-automatic networks
- Doppler radars
- New hydrological networks and models
- Modernization of warning systems
- Web delivery of forecasts to clients

WB has an opportunity to mobilze a financial development “package”

- Economic study to evaluate value of hydrometeorological information and benefits of the project
  - Showed that each dollar invested in hydromet modernization will help to avoid $5-10 losses
  - Helped to increase government contribution
- USD 133 million WB project including USD 80M loan
- Facilitated bilateral technical assistance from NOAA and MSC
- GEF project for climate vulnerability and climate adaptation assessment

Project components	RosHydromet initial proposal (March 2003), costs in MUSD	Final project cost (August 2005), in MUSD
Component A: Modernization of Computing, Archiving and Telecom. Facilities	**47.4**	**61.7**
Component B: Upgrading of the Observation	**33.2**	**56.7**
B1. Surface Observation Network	**0**	**23.5**
B2. Aerological (Upper-Air) Network	**20.1**	**11.5**
B3. Meteorological Radars	**13.1**	**6.6**
B4. Regional Hydrometeorological Centers	**0**	**7.0**
B5. Hydrological Network	**0**	**8.1**
Component C: Institutional Strengthening, Improvements in the Dissemination and Emergency Preparedness	**0**	**7.8**
Component D: Project Management, Training, and Monitoring and Evaluation	**0**	**6.2**
Total	**80.6**	**133.3**

ECA Study of Weather and Climate Services (2005-2007)

- The study is undertaken in five broad areas
  I. Capacity overview of ECA NHMS (19 countries)
  II. Studies of economic benefits of hydromet services in a subset of countries
  III. Studies of weather warnings effectiveness in a subset of countries
  IV. Review of regional cooperation opportunities in two sub-regions
  V. Climate change adaptation proposals in two countries

Studies of economic benefits of hydromet services

- Five IDA countries (Caucasus, Balkans)
  - Azerbaijan, Georgia, Armenia
  - Albania, Serbia
- Three techniques of economic assessment
  - “benchmarking”
  - sectoral assessment
  - WTP or “contingent valuation” based on households survey – Azerbaijan, Serbia
- National workshops
- Primary input of national hydromet and sectoral experts

Studies of economic benefits
"Benchmarking"

- Suggested in case of insufficient data
- Based on cross-country evaluation of direct economic losses (conservative estimates)
- Excel imitation model
  - coefficient of preventable losses (0.2-0.6)
  - total losses as % of GDP (0.1-1.1%)
- Direct economic losses are dependant on
  - Weather vulnerability of the country
  - Weather dependency of the economy
  - Status of NHMS

Parameters	Armenia	Azerbaijan	Georgia
Basic characteristics for comparative analysis			
Meteorological vulnerability	**RH – 2***	**RH – 2***	**H - 1***
Weather dependence	**RH - 73%**	**M - 60%**	**RH - 62%**
Status of NHMS	**B - 2***	**B - 2***	**B - 2***
Basic economic parameters **(USD mln. 2000)**			
Average annual GDP – for 2000-2004	**2 500**	**6 500**	**3 478**
Average annual NHMS funding	**0.45**	**1.7**	**0.75**
Results of economic assessment			
Average annual losses - total (USD mln.)	**34.0**	**46.5**	**49.2**
Losses avoided at current NHMS status (USD mln.)	**9.0**	**18.4**	**9.1**
Coefficient of preventable losses	**0.209**	**0.283**	**0.16**
Efficiency of NHMS (%)	**2003**	**1082**	**1208**
Assessment of potential benefits from NHMS modernization from " bad" to "good"			
Economic effect of modernization (USD. mln)	**2.4**	**7.1**	**2.1**
Investments (USD. mln)	**5.3**	**6.0**	**6.0**
Economic efficiency of Investments	**1:3.2**	**1:8.3**	**1:2.5**

Studies of economic benefits

Sectoral Assessment - Caucasus

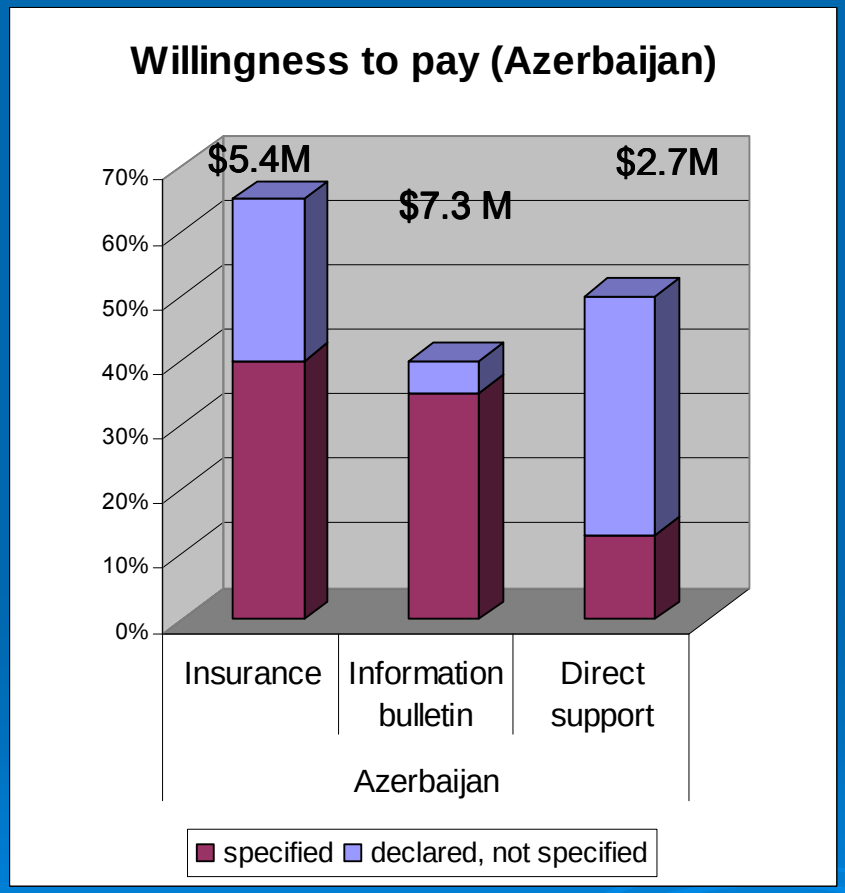
- Selection of main weather dependant sectors in each country and sectoral experts
  - agriculture, water resources/reclamation, energy, transport
- Collection of data based on specially developed sectoral questionnaires
- Assessment of losses which can be avoided after major NHM improvements
  - Estimates of economic efficiency of NHMS modernization are 1:9.5 -1:12.8 (higher than in “benchmarking”)
- Communicating results at national workshops with key agencies (January 2006) and regional workshop (Tbilisi, March 2006)

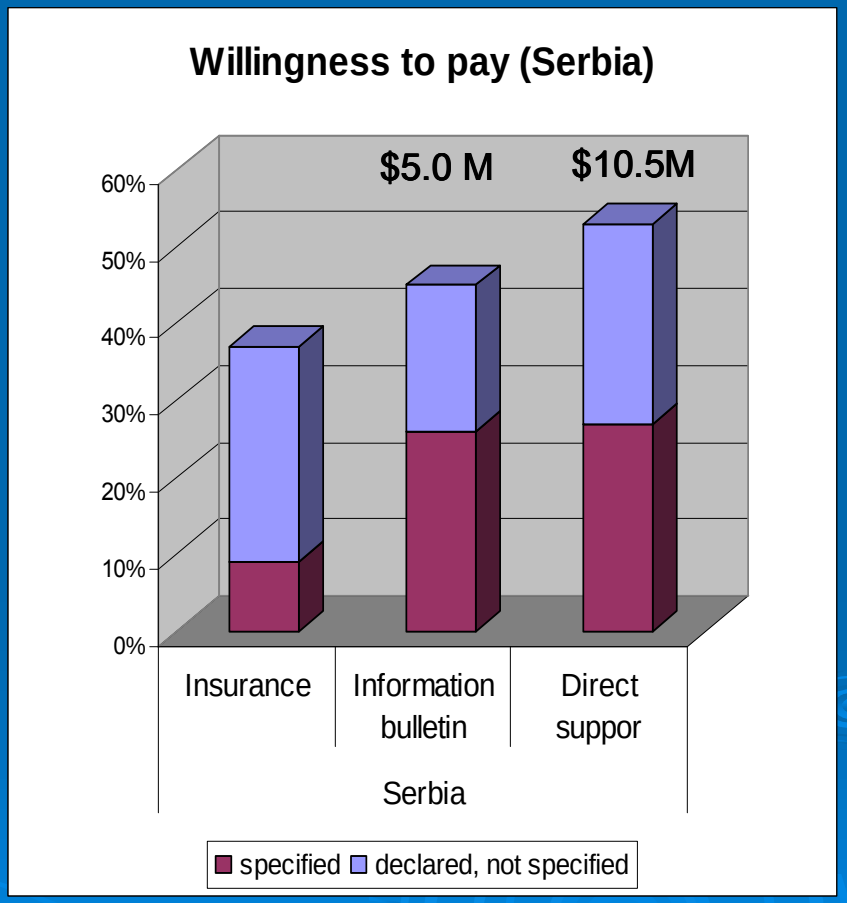
Studies of economic benefits

Households surveys (Azerbaijan, Serbia)

- No precedents in ECA
- Telephone questionnaire developed by social science experts
- Representative sample of 400 respondents spread around the country
- Native language, trained interviewers
- 3 estimates of willingness to pay for NHM

Willingness to pay for HMI
(and conservative valuation of the cost of weather information)





Expected outputs

- For the clients
  - Better understanding of economic benefits of NHMS
  - Better ability to attract government support for NHMS
  - Better understanding of regional cooperation benefits and climate change alternatives
  - Better chances for NHMS modernization with IFI assistance (loans, grants)
  - Improved capacity, reduced losses, saved lives
- For the Bank
  - Improved “in house” expertise for better project preparation in water resources, hazard management
  - Opportunity to scale-up globally (Africa)

What role WB can play in supporting NHMS

- Bank has strong presence in most countries and good contacts with economic/political decision making authorities
- Ability to manage large and complex investment projects
- Low corruption risks due to rigorous procurement and financial management routines
- Experience in capacity building and institutional strengthening
- Ability to attract additional donor funding

How to move forward in improving NHMS globally

- Need for better coordination between WMO, World Bank (and other international financial institutions)
- Need a global investment and donor funding strategy
- Large scale piloting
  - Creation of regional NHMS centers serving regions/several countries
- Bank can help to pool donor resources and can act trustee of donors in implementation major project