Strengthening weather and climate service delivery in the developing countries – first lessons and future challenges

Vladimir Tsirkunov, World Bank

Outline

- Bank assistance to NMSs-related sectors in Africa
- Introduction to NMS sector issues

- Bank Experience in NMS support
  - Cases of Hydromet Modernization projects
    - Russia Hydromet Modernization project
    - Poland Emergency Flood Recovery Project
    - Central Asia Regional Hydromet Modernization Project

- First lessons from modernization
  - Approaches
  - Issues and risks
  - Partnerships

- What can be done to strengthen Africa NMSs and improve service delivery?
- How to start?

Climate Observations and Regional Modeling in Support of Climate Risk Management and Sustainable Development

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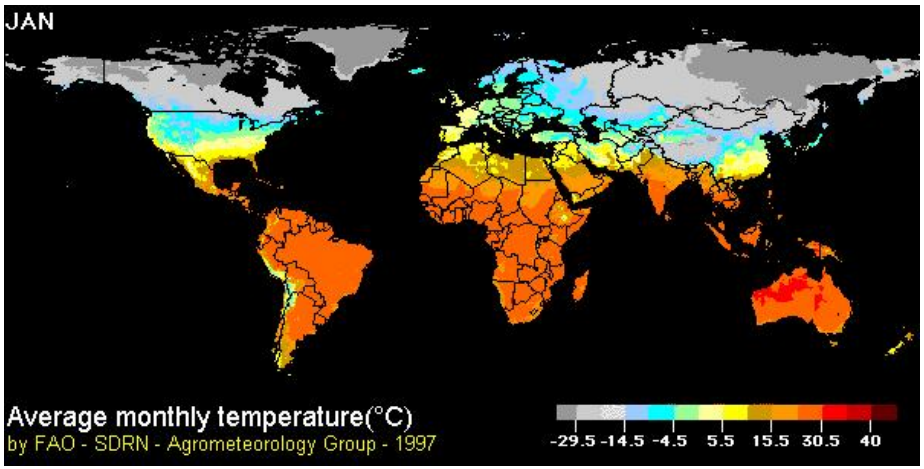
Links with World Bank Projects and Initiatives: An Operational Perspective

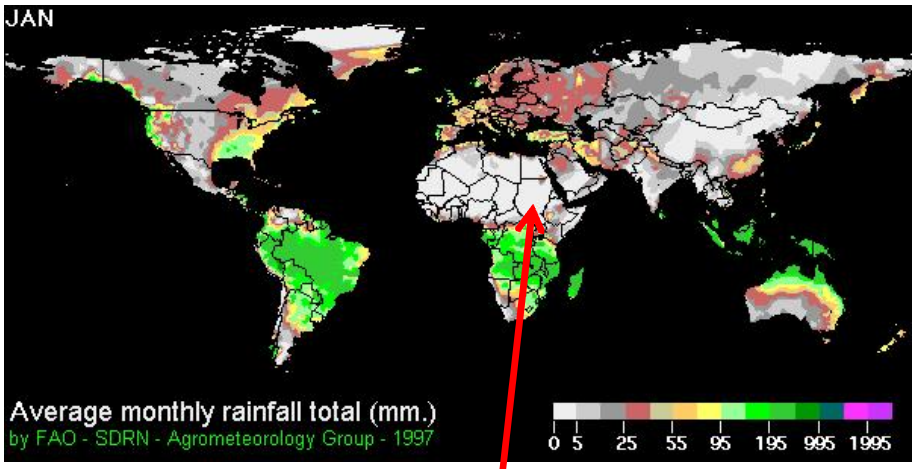
Carl Dingel

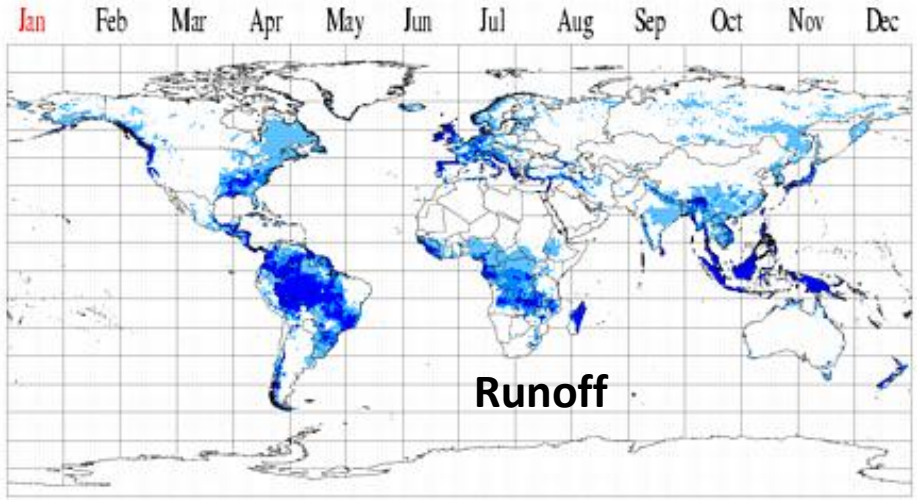
Monday, February 21 , 2011
ICPAC, Nairobi, Kenya

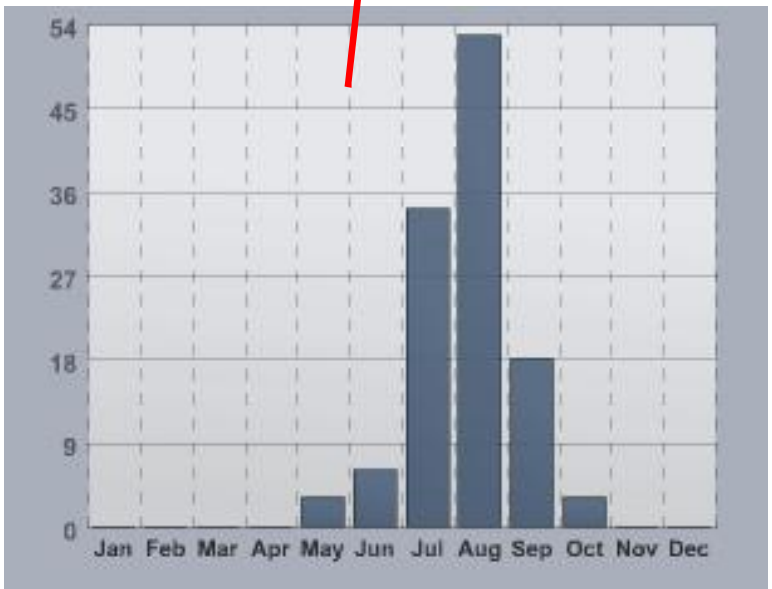
Current Climate Variability

Within a year



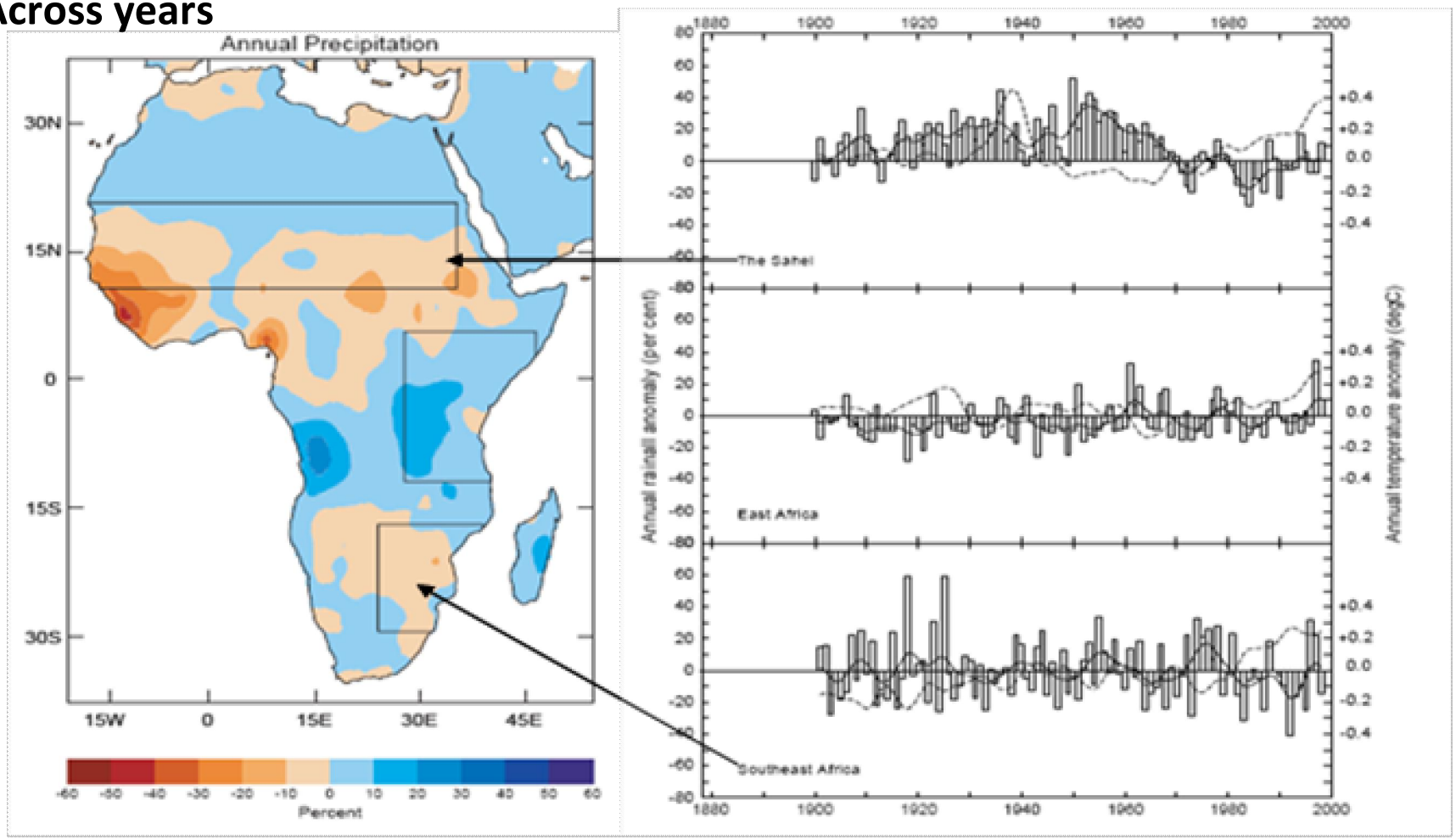






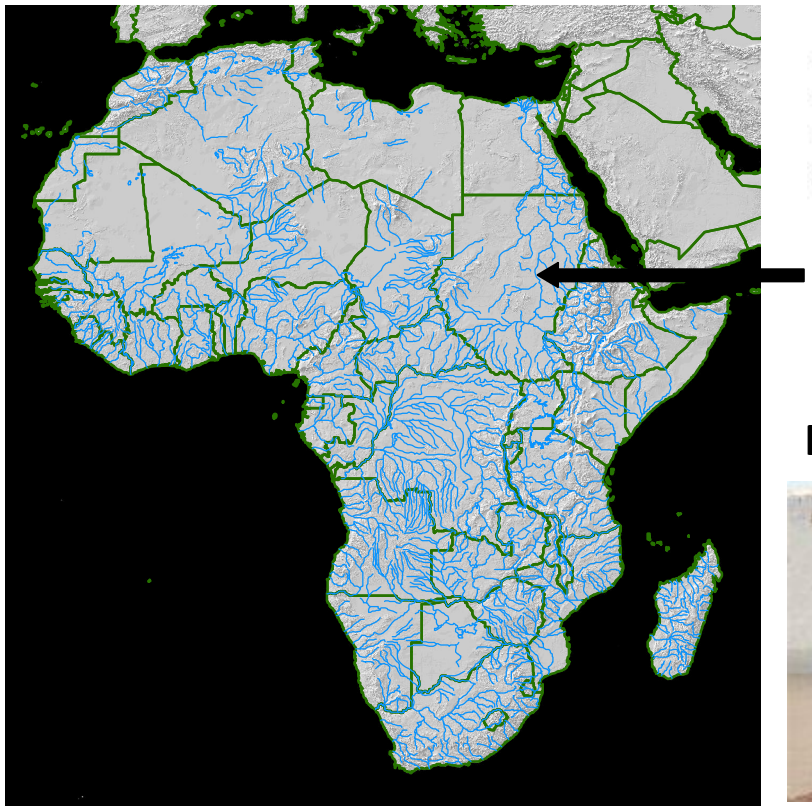
Current Climate Variability

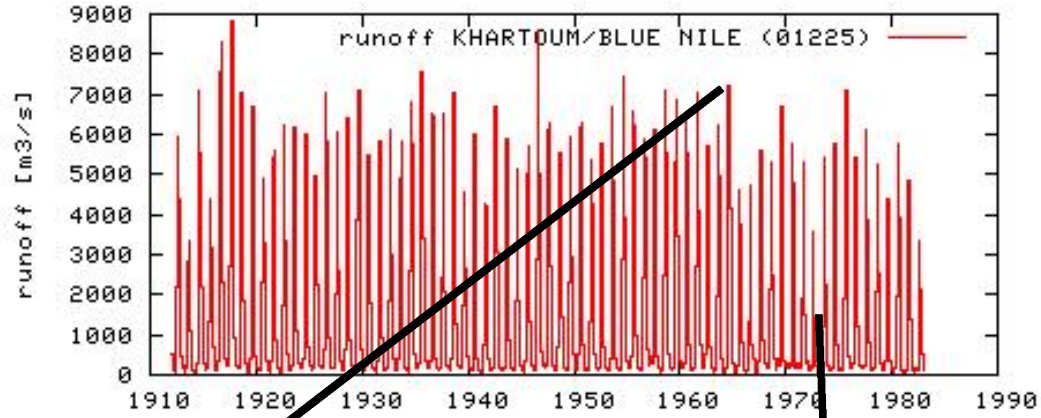
Across years



High vulnerability to natural hazards

High vulnerability to natural hazards

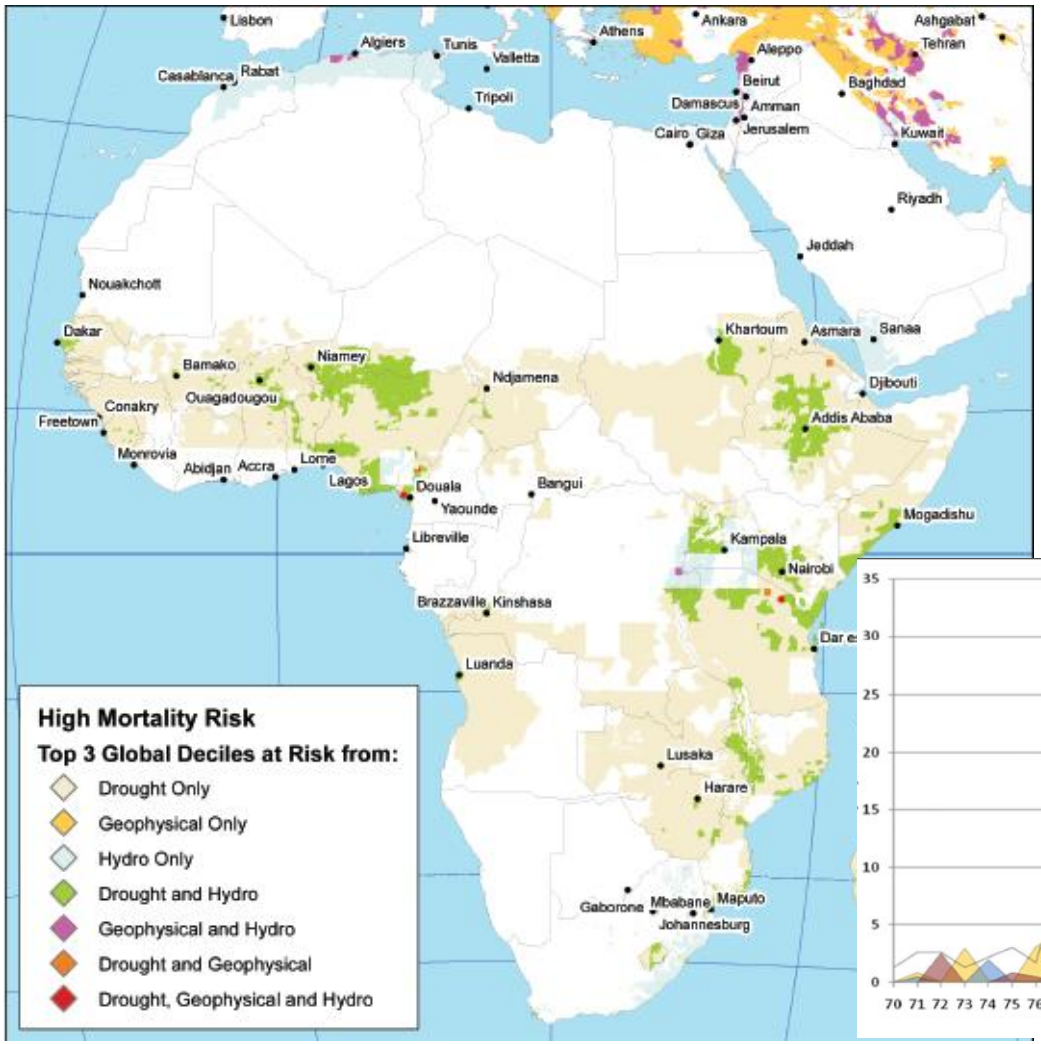




Floods

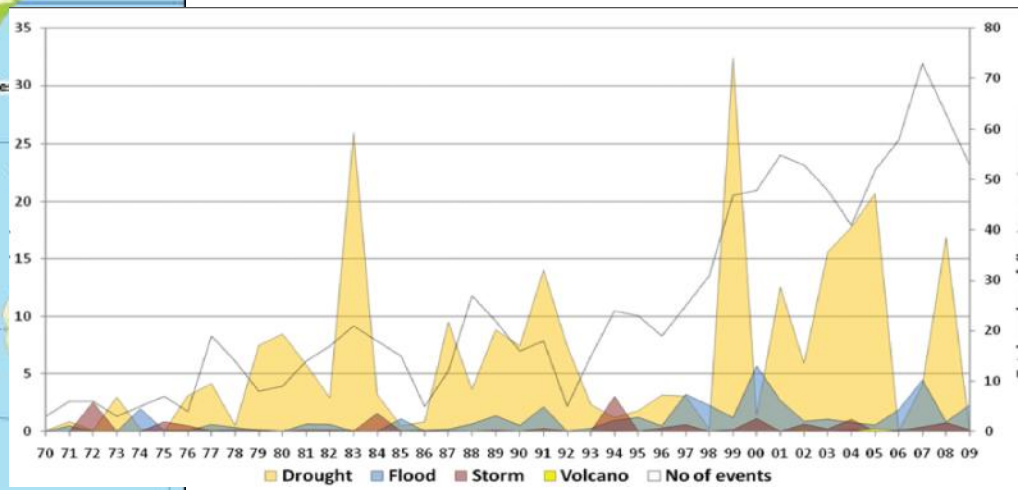
Droughts

High vulnerability to natural hazards



The majority of the disasters in Africa are hydro-meteorological

Increasing number of events and people affected



High vulnerability to natural hazards

The majority of disasters in Africa are hydro-meteorological

- Droughts: Sahel, Eastern and Southern Africa
- Floods: Causing damage in urban and peri-urban areas
- Coastal erosion and sea level rise: Urban coastal areas
- Cyclones: Madagascar, Indian Ocean Islands and Mozambique

High vulnerability and low capacities to manage natural hazards

- High dependence on rain-fed agriculture
- Highest urbanization rate worldwide, largely unplanned development
- Low capacity to plan and invest in adaptation to climate variability
- Low resilience of economies, limited infrastructure, no fiscal space

Higher magnitude and frequency of extreme events

Development impact of climate variability

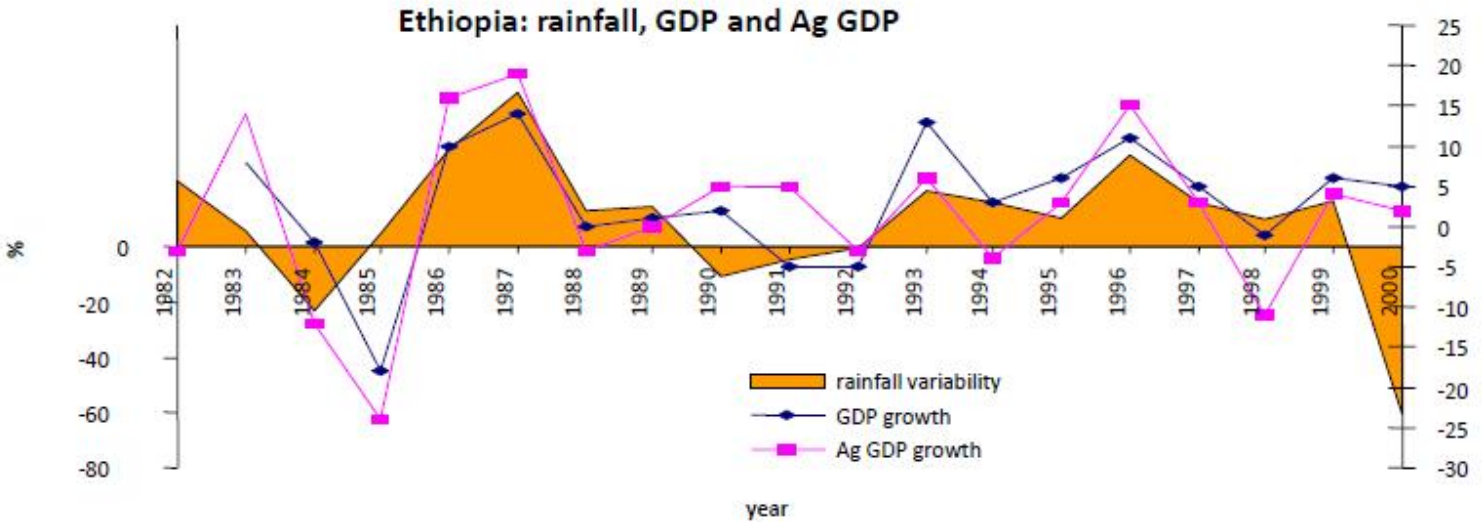
Water and Development in Africa

Productive …water for

- Food
- Energy
- Environment
- Livelihood

Destructive impacts

- droughts
- floods

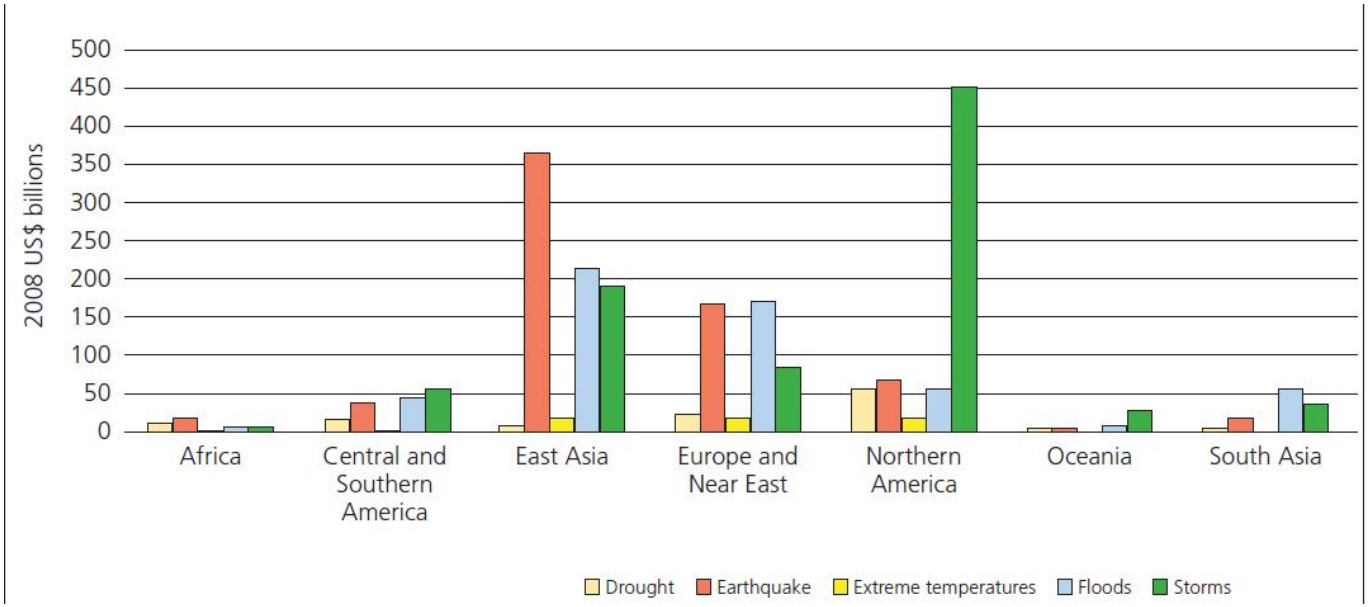


Development impacts of disasters

Costs of natural disasters

Costs for natural disasters (90-99) surpassed **650 billion US$**
Worldwide increase 15 times (compared to 50-59)

Worldwide damages caused by natural disasters in 2008



Development impacts of disasters

Many African economies have a limited resilience to natural disasters

- Fiscal resources and scope to invest in DRR is limited
- Competition with other demands (health, education)
- Small economies more vulnerable (e.g. SIDS)
- 33 countries in Africa HIPC

Immediate and long term negative impact

- The stock of capital and human resources damaged
- Productivity reduced by disruption of infrastructure
- Increased spending cause higher fiscal deficits / inflation.
- Reallocation of expenditures draw funds from investments
- Uncertainty discouraging investments
- Long-term social consequences

Development impacts of disasters

Economic Vulnerability to Droughts and Floods in Malawi

- Probabilistic risk analysis to evaluate the impacts of natural hazards
- Combined with macro-economic model to determine pot. impact on economy

- 1.7 percent of GDP is **lost on average each year** due to droughts / floods

- 265.000 more people fall into poverty
- Economic losses much higher in extreme droughts (1:25 years) = **-10.4 %** of GDP

Droughts	**RP5** (% of GDP)	**RP10** (% of GDP)	**RP15** (% of GDP)	**RP25** (% of GDP)	**AAL** (% of GDP)
Total GDP	-0.5	-3.5	-7.2	-10.4	-1.0
Agriculture	-1.1	-7.3	-14.9	-21.5	-2.0
Industry	0.0	0.0	0.3	0.7	0.0
Floods	**RP5** (% of GDP)	**RP10** (% of GDP)	**RP20** (% of GDP)	**RP50** (% of GDP)	**AAL** (% of GDP)
Total GDP	-1.7	-2.5	-3.2	-4.0	-0.7
Agriculture	-3.5	-5.1	-6.5	-8.2	-1.4
Industry	-0.6	-0.9	-1.2	-1.6	-0.2

Development impacts of disasters

Costs of natural disasters in Africa

- Damages: Direct costs for reconstruction (infrastructure, housing, agriculture)
- Losses: Indirect consequences (e.g. loss of revenues)

Example Namibia floods 2009

Damages: 136.4 million US$, Losses: 78.2 million US$

- Early recovery
- Reconstruction of damaged assets to their pre-disaster conditions

Investments required to build back better: 463 million US$

- Spatial risk management planning to relocate in safer grounds
- Climate resilient infrastructure
- More efficient water use for agriculture and flood protection
- Long-term Disaster Risk Management

Economic growth in 2009 reduced from 1.1 % to 0.5 % = 0.6 % decrease

Analytical work (I)

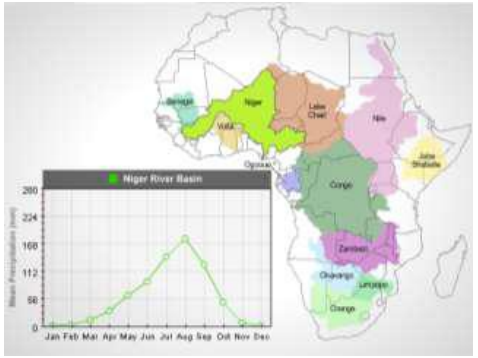
World Bank Strategy for Sub-Saharan Africa
The objective of this strategy is to provide a road map for the World Bank to address climate variability and change in Sub-Saharan Africa, with the aim of helping its SSA clients achieve climate resilient growth.

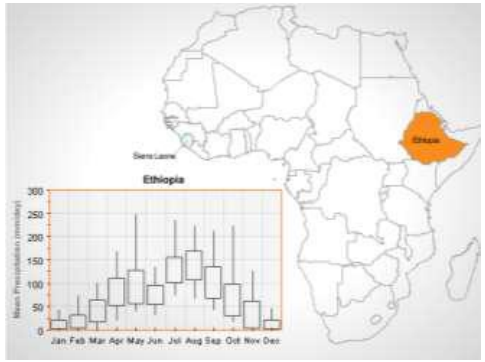
Water Resources and Climate Change in Africa: An operational Perspective
The development objective of this work is to help Bank staff and clients develop operational perspectives to mainstreaming climate vulnerability and adaptation. This is proposed to be done through a set of targeted activities including
(i) developing a knowledge base (spatial and temporal),
(ii) preparing operational guidance notes for representative river basins,
(iii) awareness building with regional/national partners in Africa and at WB.

Analytical work (II)

World Bank Strategy for Sub-Saharan Africa

- Knowledge Base (climate variability/change data/stats, historical coping case studies, GIS data, review of satellite use for flood/drought forecasting, institutional review, annotated bibliography, Basin at-a-glance)
- Operational Guidance Notes (overview, climate variability & change, basin planning, hydropower, irrigation, wetlands, multi-purpose storage)
- Dissemination/Outreach (interactive tools, integration with the World Bank Climate Portal, integration into CCDP/WBI training, etc.)
- **Horn of Africa AAA (with WMO / ICPAC)**

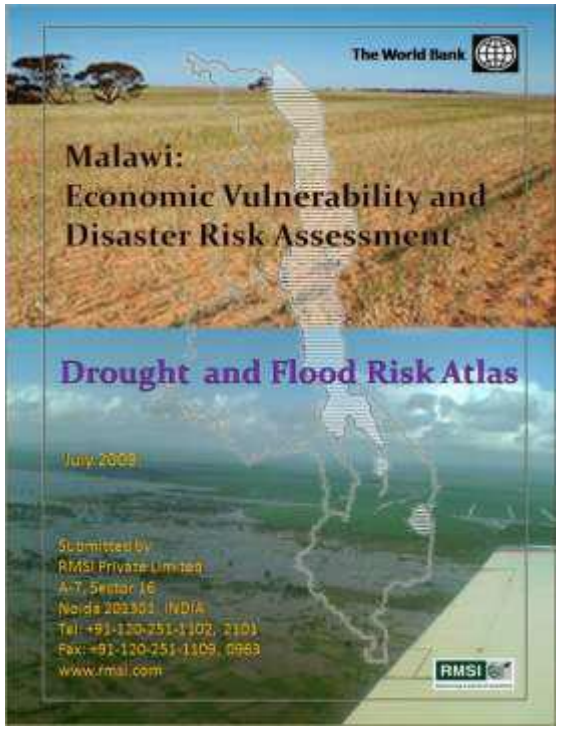




Analytical work (III)

Water resources: Integration into country activities

- Malawi (drought & flood risks)
- Mozambique (drought & flood risks)
- Namibia (LIDAR surveys)
- Rwanda (Climate sectoral guidelines)
- Zambia (Water Country Assistance Strategy)
- Kenya (Water AAA to feed into CAS)
- Uganda (Water AAA to feed into CAS)
- Ghana (Water AAA, model flood hazard assessment)



Disaster Reduction Management (DRM) activities (I)

Africa Region Disaster Risk Management Activities – with GFDRR

Post Disaster Assessments and Recovery Planning
- Flood events: CAR, Namibia, Burkina Faso, Senegal, Benin, Togo

Mainstreaming - Country Plans (starting…)
- 9 focus counties

Mainstreaming - Projects addressing CC (ongoing…)
- Eastern Africa, regional impacts of climate change (with WMO/ ICPAC)
- Economic vulnerability to droughts and floods (Malawi, Mozambique)
- Natural Hazards and Climate Change Risks in Dakar (Senegal)

Regional Cooperation
- Addressing regional impacts of floods in West-Africa
- South –South Cooperation on climate prediction and DRM (with ICPAC)

Focus Countries

1. Burkina Faso
2. Ghana
3. Ethiopia
4. Madagascar
5. Malawi
6. Mali
7. Mozambique
8. Senegal
9. Togo

DRM activities (II)

Country Programs

Priority countries identified for comprehensive engagement:

Burkina Faso, Ghana, Ethiopia, Madagascar, Malawi, Mali, Mozambique, Senegal, Togo

GFDRR funding up to **USD$ 5 million**, DRM activities over **3-5 years**

Components

- Country Risk Profile (Hazards and Vulnerabilities)
- Country DRM Framework (Institutions and Policy Framework)
- Country DRM Action Plan
  - Institutions and Policy
  - Capacity development
  - Reducing Underlying Risks
  - Strengthening Response Capacity
  - **Risk Assessments, Early Warning, Strengthening hydro-met services**

Introduction (I)

- Main task of National Meteorological and Hydrological Services (NMHS) is to deliver weather, climate and hydrological information and services

- Small, but important public sector
  - NMHS budgets usually are 0.01-0.05% of national GDP
  - Total annual public funding of NMHS globally exceeds USD 5-6 bln.

- Importance of weather, climate and hydrological information is growing due to the need to serve more elaborate societal needs, minimize growing economic losses and help in adaptation to climate change

- But NMHS capacity in many regions is not adequate and degraded some countries during the last 15-20 years

Introduction (II)

- **Reasons for degradation – considerable underfunding of NMHSs due to inadequate attention of the government, social and economic reforms, military conflicts**

- **Massive underfunding of NHMSs has led to:**
  - Deterioration of observation networks and outdated technology
  - 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**

- **Inadequate NMHSs capacity and lack of basic observation infrastructure are major obstacles for improvement of service delivery**

- **Modernization needs are exceeding traditional national budget instruments (need for a programmatic approach)**

Introduction (III)

- World Bank is committed to attract attention to this public sector and help our client countries to improve these services by:
  - helping NMHSs to raise their profile within the government using results of economic assessment, analytical work and successful experience in modernization of NMHSs
  - integrating support to NMHSs into broader development agenda and sectoral support programs
  - developing NMHSs modernization programs and implementing them jointly with the governments, WMO and other UN agencies, development banks and donors
- Targeted Global Facility for Disaster Reduction and Recovery (GFDRR) program on Strengthening Weather and Climate Information and Decision-Support System is launched in 2011 to scale up support to NMHSs

GFDRR Program for Strengthening Weather and Climate Information and Decision-Support Systems (WCIDSSs) (I)

- Main objectives:
  - improve identification, assessment and monitoring of weather and climate disaster risks and enhance early warning systems by strengthening WCIDSSs
  - provide analytical, advisory and implementation support to GFDRR and World Bank teams (Program will serve as a focal point or service center for World Bank teams)
  - mainstream development of modern, sustainable, service oriented weather and climate information and decision-support systems into World Bank operations

GFDRR Program for Strengthening Weather and Climate Information and Decision-Support Systems (WCIDSSs) (II)

- Program will be based on three pillar or interrelated groups of activities:
  - *Analytical Support and Knowledge Management;*
  - *Capacity Building and Technical Assistance;*
  - *Portfolio Development and Operations*

- Main beneficiaries
  - National NMSs/NMHSs in:
    - GFDRR priority countries (31) and countries with priority needs/opportunities
  - WB teams (in all regions plus ARD, URB, ENV, Water anchors)

- Main partners/stakeholders:
  - WMO, ISDR, global and regional forecasting and climate centers, interested NMSs in developed countries (US, UK, France, Finland, Japan, Spain, Italy)

GFDRR Program for Strengthening Weather and Climate Information and Decision-Support Systems (WCIDSSs) (III)

- Expected results (mid-term – 3-5 years)
  - Increased flow of investments to support strengthening EWSs and WCIDSSs
  - Improved quality of weather and climate services, better forecasts and early warnings, better integration of WCIDSS in DRM
  - Reduced economic losses attached to weather events
  - High rate of satisfaction with services provided by the Program expressed by recipients (GFDRR/WB teams and NMHSs)
  - Evidence of mainstreaming of WCIDSS in sectoral operations in agriculture, water resources, energy, climate adaptation;
  - More effective partnerships (WMO, ISDR, global forecasting centers, IFIs, etc.)

Examples of World Bank economic assessments and investment projects related to Hydromet support

Analytical work helps to identify the role of the sector in national economic development and attract attention of decision makers

- Making economic assessments of NMHSs services and communicating the results of the assessments to key decision makers proved to be very important tool in NMHS modernization

- Our team was using simple techniques based on comparison of expected reduction of losses due to better forecasts with the costs of hydromet modernization programs

- In all cases expected benefits of proposed NMHSs modernization were greater than modernization costs from 2-10 times in favor of benefits

    - Reduction of losses is only a part of expected benefits therefore investing in strengthening of NMHSs is more beneficial than our economic assessments indicates

If so evidently important, why economic analysis is not so widely used by NMHSs

- Lack of established techniques of economic assessment understandable to NMHS staff
- Lack of in-house economic expertise in NMHS
- Lack of baseline economic data, particularly data on losses from weather events
- Insufficient priority attached to the economic assessment by some NMHSs
- Poor feedback from clients/beneficiaries
- Lack of resources for studies

Methods of Economic Assessment

Assessing economic benefits of NHMS vs. costs

- "Benchmarking"
- Sector-specific assessment
- Benefit-cost analysis of potential modernization programs (Belarus, Georgia, Kazakhstan, Tajikistan)
- Households survey to evaluate willingness-to-pay for hydrometeorological information (Azerbaijan, Serbia)

Methods of economic assessment: Sector-specific assessment

Sector-specific assessment is based on the specially designed surveys of experts from weather-dependent sectors to receive:

- information on the level of direct and indirect losses from hazardous weather events and adverse weather conditions in a specific sector;
- estimated changes in the share of preventable losses and costs of protective measures due to a more accurate and timely hydrometeorological information and forecasts as a result of modernization programs.

The obtained data is used to evaluate the marginal effects from modernization for each weather-dependent sector and the integral effect for the economy.

Methods of economic assessment: “Benchmarking”

Why Benchmarking ?

- Limited data on economic losses from hydromet phenomena
- Financial and time constraints for more comprehensive surveys and studies

Main Benchmark parameters used in the analysis.

- Coefficient of preventable losses (assumed range 0.2 - 0.6)
- Total direct economic losses as % of GDP (0.1 - 1.0%)

Country-specific characteristics used for benchmarking.

- Meteorological vulnerability of the country
- Weather dependence of the economy
- Share of agriculture in GDP
- Status of NHMS

Some Results of Economic Assessments

Countries	Estimated cost of modernization program, Yr.2000$ million/ (exceedance of NMHS annual budget, times)	Investment efficiency, % (across 7 years), benchmarking	Investment efficiency, % (across 7 years), sector-specific assessment
Albania	4.0 (9)	438	320-680
Azerbaijan	6.0 (3.5)	430	1440
Armenia	5.3 (12)	210	1070
Belarus	11.5 (4)	530	480-550
Georgia	6.0 (13)	260	1050
Serbia	4.4 (0.8)	880	690
Ukraine	45.3 (6)	310	410-1080
Kazakhstan	14.9 (3.5)	540	-
Turkmenistan	19.5 (17)	413	-
Tajikistan	3.5 (17.5)	210	310-450

Case of self-standing Hydromet project. Russia Hydromet Modernization Project

- In 2003 the Russian government requested the Bank to prepare the project
  - Preparation started in summer 2003
  - The Loan became effective in December 2005
  - Completion is scheduled for October 2011
  - In 2009 government added USD 40M of its own funds

- The main development objective of the project is to increase the accuracy of forecasts provided to the Russian people and economy by modernizing key elements of the technical base and strengthening RosHydromet's institutional arrangements

- Set of performance indicators/outcomes built in the project design to evaluate the progress of implementation

- Design/composition of activities evolves in line with evolving priorities and constraints

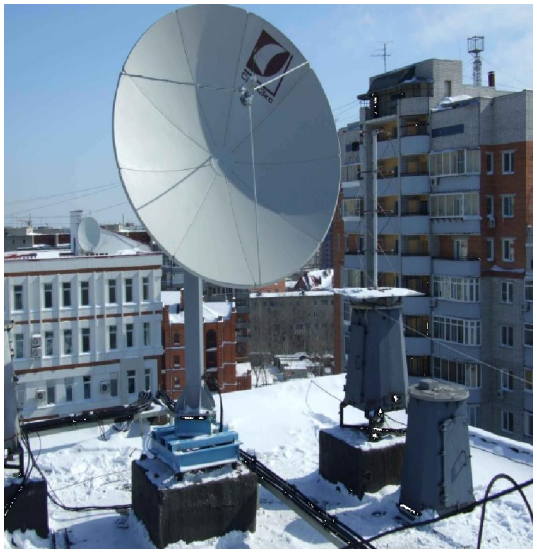
Russia Hydromet Modernization Project components	Hydromet Initial proposal, March 2003, in MUSD	Component costs after appraisal, August 2005, in MUSD	Component costs, September 2007, in MUSD	Component costs, 2010 in MUSD
Component A: Modernization of Computing, Archiving and Telecom Facilities	47.4	56.6	55.6	52.3
Component B: Upgrading of the Observation Network	33.2	63.2	64.9	100.6
B1. Surface Observation Network	0	28.6	35.1	63.5
B2. Aerological (Upper-Air) Network	20.1	7.0	12.3	12.2
B3. Meteorological Radars	13.1	11.5	0 (gov-t funding)	0 (gov-t funding)
B4. Regional Hydrometeorological Centers	0	6.5	6.9	6.5
B5. Hydrological Network	0	9.5	10.1	17.5
Component C: Institutional Strengthening, Improvements in the Dissemination and Emergency Preparedness	0	7.5	6.4	11.1
Component D: Project Management, Training, and Monitoring and Evaluation	0	6.0	6.4	8.1
Total	80.6	133.3	133.3	179.2

Observation and ICT Infrastructure (2005)

Hydrogen generation technology for upper air launching

Operational Data Exchange Devices

Russia Hydromet Modernization Project
(some of the project outputs)



Russia Hydromet Modernization Project

- Implementation difficulties
  - Technical complexity and scope of the project
  - Urgent investment needs are far exceeding available funds
  - Lack of experience in RusHydromet to run large scale programs
  - Lack of qualified staff
  - Lack of commitment to experiment with institutional and financial arrangements
- Slow implementation performance in first years
  - disbursed 6% and committed 30% of funds after 2 years
- Speed and quality of implementation improved towards the end of the project and all substantive indicators are already achieved
- Government is requesting the Bank to consider launching the second Hydromet project with estimated cost of USD 140M

Case of sectoral project (disaster reduction) Poland Emergency Flood Recovery Project

- Response to the worst flood in Poland's history occurred in 1997
- Total damage was about 2.4 percent of Poland's 1997 GDP

- One component of the project was designed to develop a monitoring, forecasting and warning system (cost - US$62 million)
- About 1000 meteorological and hydrological measuring stations installed
- Procurement of a supercomputer and development computing system for a high-resolution weather forecasting models

- Upgrade of data processing and transmission systems
- Introduction of Lightning detection system.
- Enhancement of weather radar system, 8 Doppler radars installed

- Development of a hardware/software platform that provides access to forecasts by users via telephone lines or the Internet (Client Service System)

Poland Emergency Flood Recovery Project

- Quality of services has improved as recorded by improved performance indicators and client satisfaction ratings

- Main issues and risks
  - late introduction of the Integrator in the project created significant difficulties
  - lack of government commitment to increase NMHS budget in line with operation and maintenance needs of a new system
  - difficulties to retain qualified staff

Poland Emergency Flood Recovery Project

Installation of antenna for receiving satellite data

Hydrological Post on Vistula river in Czernichowie

Case of regional hydromet project
Central Asia Hydromet Modernization Project

- GFDRR Study laid the grounds for the project preparation
- Broder Program identified jointly with partners (WMO, ISDR, Swiss, others)
- Government expressed commitment to support NMHSs
- Four Central Asia hydromets are primary beneficiaries:
  - Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan
- Financial resources mobilized by the Bank
  - grant/credit from the International Development Association (USD 20.5 million)
  - Pilot Program for Climate Resilience for Tajikistan (USD 7 million)
  - GFDRR grant for Kyrgyzstan (USD 1.4 million)

Central Asia Hydromet Modernization Program

- Creating partnerships on regional level to address regional issues

- Regional Workshop (Tashkent, November 2009) sponsored by WMO, ISDR, EU, WB
  - MOU and Agreed Program of regional activities (USD40M)
  - Leading regional organization (IFAS) as main champion
  - Working Group chaired by World Bank

- Regional investment program co-finance by WB (regional IDA, PPCR, GFDRR) and donors (UNDP, USAID, Finland, WMO, possibly, EU, Swiss, UN ISDR)

- WB project (USD 27 M) will be launched in the summer 2011

Study on Improving Weather and Climate Service Delivery in High-Risk, Low-Income Countries in Central Asia (GFDRR)

- Development of recommendations and prioritized plan of improvement of weather and climate service delivery to national users based on:
  - Assessment of natural hazards and climate variability
  - NMHSs (hydromets) capacity assessment
  - User needs assessment with emphasis on DRM and early warnings, agriculture, WRM and irrigation
  - Assessment of the economic benefits of potential NMHSs modernization

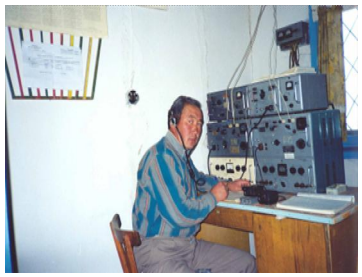
Annual average frequency of major hydrometeorological hazards and associated losses (M USD, 2006 prices)

Type of Event	Kyrgyz Republic		Republic of Tajikistan		Turkmenistan	
	Frequency of Occurrence	Average annual Economic losses	Frequency of Occurrence	Average annual Economic losses	Frequency of Occurrence	Average annual Economic losses
Floods and Mudslides	43.0	11.0	42.0	15.7	2.17	14.5
Drought	0.5	7.3	0.12	8.6	0.61	n/a
Spring and Autumn Frosts	2.0	7.5	n/a	n/a	9.9	n/a
Severe Frosts	n/a	n/a	1.1	0.4	4.3	n/a
Rainstorms	5.6	0.4	3.0	1.5	8.35	n/a
Hail	1.6	0.5	7.7	1.6	1.13	n/a
Snowstorms	2.6	0.2	3.0	0.6	0.91	n/a
Avalanches	15.1	0.3	26.6	0.8	0	n/a
Wind storms	4.5	0.1	8.1	0.8	28.4	0.2
Dust storms	0	-	0	-	22.0	n/a
Dust Cyclones	0	-	0	-	0.09	n/a
Dry hot winds	0	-	0	-	31.0	n/a
Total losses		27.3		29.8		n/a

Hydromet (NMHS) Capacity in Central Asia

NMHSs capacity to meet user and government needs is very limited

- Downward trend in quality and quantity of observations
- Obsolete equipment, lack access to modern forecasting methods
- All facilities are in a poor state



Deterioration of NMHSs Capacity

- Observation networks
  - Many stations closed due to lack of funds
  - Data from existing stations is unreliable

Component of observation network	Kyrgyz Republic		Republic of Tajikistan		Turkmenistan	
	Number, 2008 (Number, 1985)	% Reduction since 1985	Number, 2008 (Number, 1985)	% Reduction since 1985	Number, 2008 (Number, 1985)	% Reduction since 1985
Meteorological stations	32 (83)	62	57 (73)	22	48 (100)	52
Hydrological stations and posts	76 (147)	48	81 (138)	41	32 (58)	45
Upper air	0 (3)	100	0 (4)	100	0 (6)	100
Meteorological Radars	0 (1)	100	1 (4)	75	0 (1)	100
Agromet observation stations	31 (68)	55	20 (37)	46	48	15

Principal Findings

- Vulnerable to floods, mud flows, droughts, frosts, avalanches, hail, strong winds
  - Losses between 0.4 and 1.3% GDP per annum
- Annual preventable losses
  - Between $5.8M and $23.0M
- High priority investments in NMHSs support requires
  - between $6M and $30M

Key elements of proposed NMHSs modernization on the national level (KG and TJ)

- Engaging users in the modernization (creating partnership on the national level)

- Renewal of observation networks
- Building NMHSs capacity to deliver services that users want
- Establishing National Climate Service within Hydromet

- Integrating NMHSs modernization into broader development frameworks (DRM, energy, WRM)

Central Asia Hydromet Modernization Project

NN	Components/Sub-Components	Cost, US$
A	**Component A: Strengthening regional coordination and information sharing**	**8,500,000**
A.1.	Improvement of technical and organizational aspects of CA NMS information receiving, storage and exchange including information products developed based on the high resolution satellite data	1,680,000
A.2.	Improvement of the regional system of training, retraining and professional development in the field of meteorology, hydrology and climate	1,575,000
A.3.	Improvement of quality of services through better early warnings, weather forecasting and climate change assessments	1,595,000
A.4.	Integration of project systems and project management	3,650,000
B.	**Kyrgyz Hydromet modernization**	**6,000,000**
B.1	Institutional strengthening of NMS, improvement of human resources capacity and financial sustainability of NMS	845,000
B.2	Improving the hydrometeorological observation networks	3,800,000
B.3	Enhancing service delivery system	880,000
B.4	Project management costs	4750,000
C	**Tajik Hydromet Modernization**	**13,000,000**
C.1	Institutional strengthening of NMS, improvement of human resources capacity and financial sustainability of NMS	1,335,000
C.2	Improving the hydrometeorological observation networks	8,860,000
C.3	Enhancing service delivery system	2,255,000
C.4	Project management costs	550,000

Generic Issues and lessons of Hydromet Modernization Programs (I)

- Links with clients are often poor and their needs are not known to NMHSs
- NMHSs commitment to modernization is often driven by IT or technology developments, not by the client needs
- Developing better services as ultimate objective of modernization in most cases requires fundamental change in NMS business model
- Sustainability of investment is a major problem
  - Should be primary criteria for designing investments

Generic Issues and lessons of Hydromet Modernization Programs (II)

- Generic problems of public services in developing economies (low salary, lack of flexibility, uncertainties)

- Need for development a systemic (NMH-wide) “end-to-end” approach
  - Modernization of separate elements of NMS system often create bottlenecks and inefficiencies

- There is no universal or quick solution to improve NMHSs services
  - Need for a project flexible design and long-term engagement

- Lack of international experience how to modernize NMHSs using :
  - globally available NWP products
  - limited resources in an optimal way

- Coordination between donors is highly desirable

Generic Issues and lessons of Hydromet Modernization Programs (III)

- Approaches
  - Analytical work and economic assessments are entry points and basis for government engagement
  - Interrelated assessments leading to feasibility studies
  - Identification and implementation of investment project s
- Instruments - Loans, grants, co-financing
  - Self –standing projects, part of broader projects in DRM, agriculture, water resources management, regional projects
- Partnerships

Next steps

- Bank will expand its interactions with NMHSs:
  - Advisory role – convincing the government on high NMHSs societal and economic significance
    - Building partnerships with national decision makers and donors to highlight importance of NMHSs services, identify priority investment needs and facilitate financial support
    - Economic valuation of NMHSs services
  - Modernization of NMHSs "packaged" within larger sector initiatives in disaster reduction, water resources management, agricultural and public health projects
  - Creative use of new financial instruments of climate adaptation for NMHSs support (e.g. PPCR)

Round Table

- Is there any need for assistance from the WB?

- What can be done to strengthen Africa NMSs
  - are prerequisites to launch modernization in place?
    - Government support
    - Commitment to change
    - Funds for modernization
    - Technical assistance and support from partners

- How to start?