



User's Perspective:

Application and Utility of Weather, Climate and Water Information in Sustainable Development

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Critical Need

“Improve long-range weather forecasting and monitoring, especially in Africa. Accurate long-range weather forecasting is taken for granted by farmers and purchasers in the developed world; in poor countries where yields depend on rainfall, poor crop projections amplify price swings. Better weather forecasting would enable people to plan ahead, and help anticipate needs for assistance.”

Robert Zoellick, President, World Bank Group

Financial Times Op-Ed: “Free Markets Can Still Feed the World”, 5 Jan 2011



A Farmer's Voice



“If I had better weather information, I would be able to plan farming better throughout the year.

....I would be able to **effectively utilize my resources** in ploughing, planting, weeding and harvesting of crops. I would also be able to **improve animal husbandry by timing the reproduction of goats and sheep** during rainy season when pasture is available. I would be able to **plan for hired labour**.

.....enable farmers **minimize risks and improve their credit worthiness** to the financial institutions thus access to more credit for expansion of production capacity.”



“I would like to receive weather information through:

- Modern information **technology such as SMS, voicemail**, email etc
- **Radio** (local fm stations) and TV
- Daily **newspapers**
- **Extension officers** from both public and private sector
- **Informal channels** (networking with other farmers)”



Growing Demand

- Since 1990s World Bank invests in modernization of NHMSs.
- Part of broader development support in sectors such as disaster reduction, agriculture and water resources management.
- World Bank clients (low and middle income country governments) increasingly requesting technical projects and analytical work to support NHMSs.
- World Bank current focus:
 - Improve assessment and monitoring of weather and climate.
 - Enhance early warning systems.
 - Strengthen internal analytical, advisory and implementation support.
 - Mainstream development of modern, sustainable, service-oriented weather and climate information and decision-support systems into operations.



Justifying and Leveraging Investment

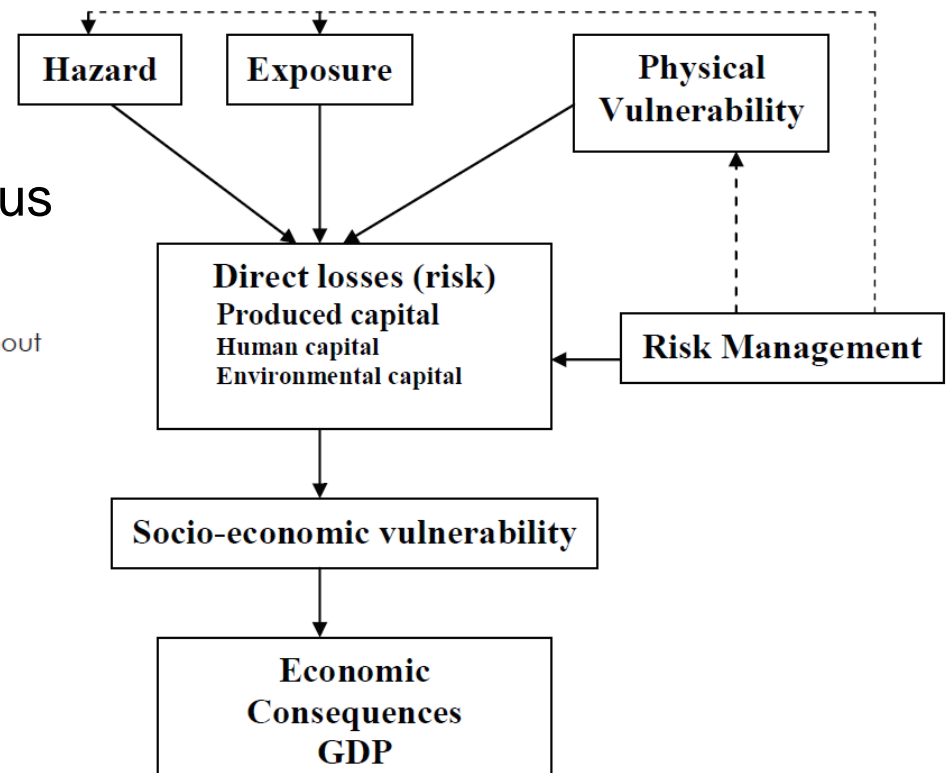
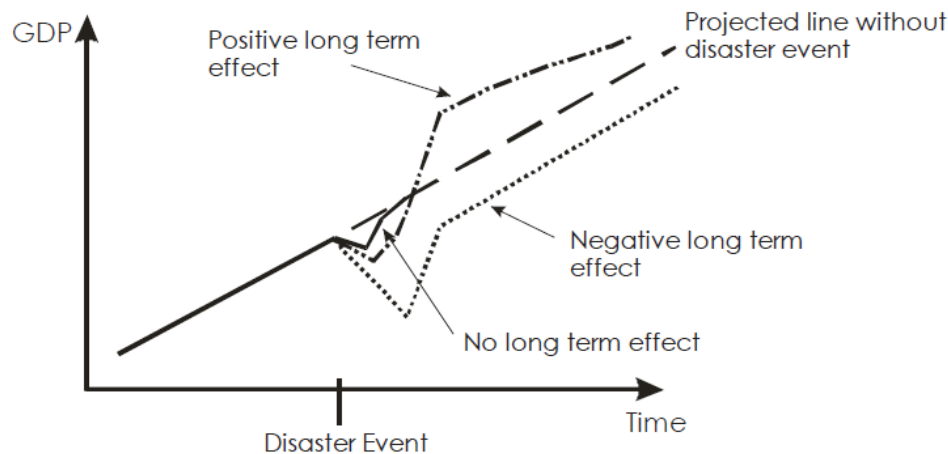
- Better estimates of the socioeconomic costs and benefits of NHMSs needed for financing approvals.
- Better communication of such results needed.
- Concerned NHMSs and governments directly requesting support for such analysis, for example in Central Asia, Nepal, Mozambique and Ghana.
- Investment examples:
 - Pilot Program for Climate Resilience (PPCR)
 - Central Asia Hydrometeorology Modernization Program (CAHMP)
 - Climate Change, Agriculture and Food Security (CCAFS)





Defining Benefits

- Minimize socioeconomic risks.
- Maximize potential opportunities.
- Importance to development – focus on minimizing risk.



“Ability of NHMSs to meet national service needs is put to its most critical test when an extreme hydrometeorological event occurs.”

(16th Session of the World Meteorological Congress, 2011)



Development Context Challenges

- Risk reduction benefits = avoided or reduced potential damages.
- Disasters are stochastic events, so benefits are probabilistic.
- Risk and benefits should therefore be assessed in terms of disaster probabilities and corresponding consequences.
- Account for changes due to current and future socioeconomic, land-use and other trends.
- Socioeconomic vulnerability is a multidimensional concept encompassing a large number of factors.
- But:
 - Lack of data.
 - Lack of expertise.
 - High resource demands.
 - Uncertainties in future conditions.
 - Exposure of people, assets and environment difficult to quantify.



Specific NHMS Challenges

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



Overcoming Challenges: Transparency

Consistent approaches/frameworks to identify and communicate:

- Analysis methods.
- Key data, their reliability and sources.
- Externalities and how these are incorporated.
- Assumptions and the basis on which they are made.
- Sensitivity analysis and their implications for the results.

Building the basis for evaluating the validity of the results:

- Issues such as willingness to take action, warning reliability and potential costs of taking inappropriate action.
- Distributional aspects.
- **Conservative analysis comparing the lowest potential benefits with the highest potential costs instills greater confidence.**



Example: Risk to Resilience Study (2008)

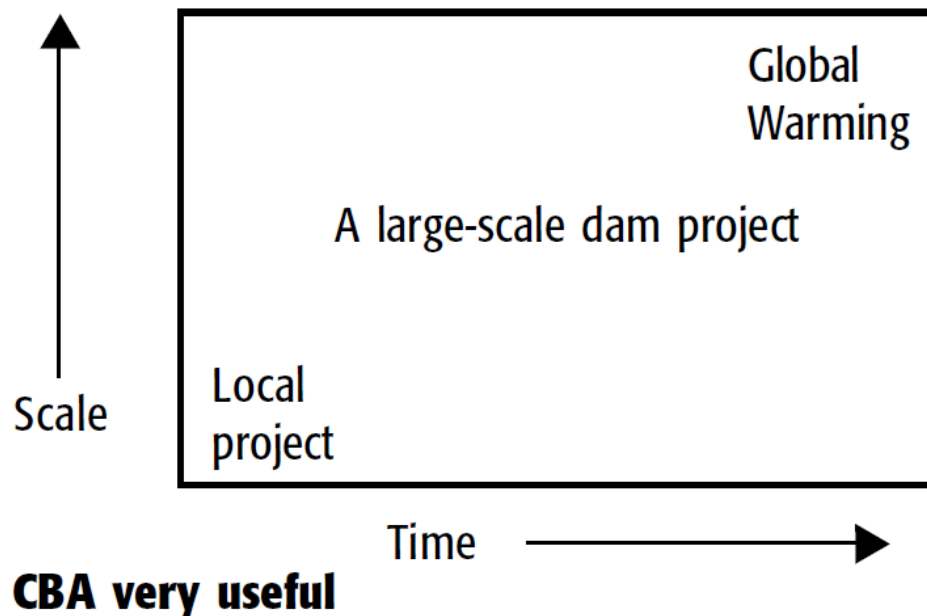
Key Data Required	Issues
Past flood losses	Secondary data incomplete, survey data likely not representative of full basin. Only two events available.
Maps of flooded areas	Some satellite photos available, insufficient resolution for analysis.
Basin topography	Topographical maps of insufficient and mismatched resolution. Only one cross-section available for the entire river.
Hydrometeorologic time-series	Rainfall data was available only for the Nepali side of the Rohini Basin, but its validity was unknown. Significant gaps exist in the streamflow data of the Rohini River and the record is short. Both rainfall and streamflow datasets had to be corrected and estimates used to fill significant gaps.
Embankment details including past performance	Failure data limited, specific maintenance information not available.
Demographic information	Recent census at village level but projected future trends only available at state level.
Ongoing flood risk reduction activities (explicit and/or autonomous)	Very limited information, some trends on autonomous risk reduction could be inferred from surveys (primarily housing dynamics).
Climate change projections	Downscaling of regional climate model results and transformation into changes in flood regime highly uncertain.



Least Regrets Strategy

As the scale and time horizon of projects and thus uncertainties increase, it is important to question the usefulness and robustness of cost-benefit analysis (CBA).

CBA of no use



‘Least regrets’ strategy for climate risk management = maximizing positive and minimizing negative outcomes.

Taking climate-related decisions or action that make sense in development terms anyway, whether or not a specific climate threat actually materializes.



Pragmatic Approach

Product	Purpose	Resources
Informational study	Provide broad overview of costs and benefits	◆
Pre-project appraisal	Identify most effective measures for further more detailed evaluation	◆◆
Project appraisal	Detailed evaluation of accepting, modifying or rejecting project	◆◆◆
Evaluation (ex-post)	Evaluation of project after completion	◆◆



Sector-specific Assessment

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;
- Estimated changes in preventable losses and costs of protective measures due to a more accurate and timely information/forecasts.

Data used to evaluate marginal effects from modernization for each sector and the integral effect for the economy.

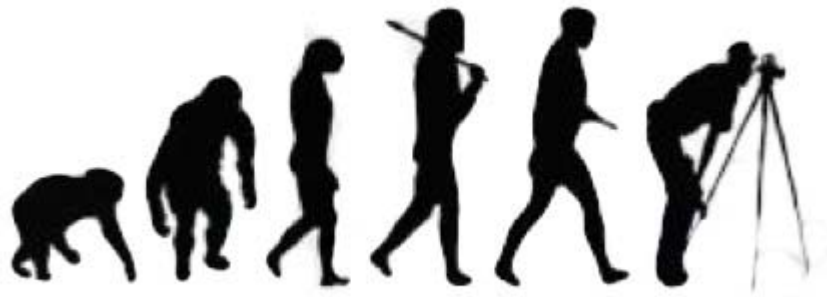
- Dependence on weather conditions and hazards, amount and quality of information used, and current efficacy of information uses.
- Potential demand for information types and presentation formats, accuracy and timeliness of each element/event forecast, requirements for optimal performance, recommendations and proposals on service improvement and customization.

Source: Tsirkunov, V., Ulatov, S., Smetanina, M., and Korshunov, A. (2008). "Customizing Methods for Assessing Economic Benefits of Hydrometeorological Services and Modernization Programmes: Benchmarking and Sector-Specific Assessment," *Elements for Life*, ed. S. Chacowry, Tudor Rose and WMO, p. 186-188.



Substantive Survey Blocks

- Hydrometeorological hazards influence by impact (type and degree) and damage significance (one-time and total);
- Relevance of forecast products and barriers to their uses;
- Information sources, types, and delivery channels and formats;
- Quality assessment of delivered forecast products;
- Requirements of NHMS products formulated with due regard for NHMS modernization;
- Assessment of and methodologies for estimating economic damage from hazards and extreme hazards; and
- Recommendations and proposals to the NHMS to improve and customize services.





Client Needs Assessment

Develop integrated modernization packages based on client needs assessments that:

- Identify the causes and factors of poor interaction between the NHMS and its users.
- Recommend to the NHMS the most efficient way to cooperate with users.
- Propose to users how to integrate and apply hydrometeorological information and formulate their needs for it.



Market-Driven Example

PepsiCo Potato Contract Farming in India

- Index insurance offered through ICICI Lombard
- 95% of contracted farmers elect to take the index insurance
- Premium (cost) = \$74/ha per year
- WRMS designed product, manages insurance aspect and installs & manages weather stations
- WRMS charges 5% of premiums for service = \$3.70/ha per year
- WRMS also recovers investments (weather stations) through:
 - Selling services to other companies and commercial farmers
 - Example: for private clients install weather station at half cost (\$512 instead of \$1,023) in exchange for access to the station's data
- Reality check: WRMS also benefits from IMD services

Source: IFAD & WFP (2010) *Potential for Scale and Sustainability in Weather Index Insurance for Agriculture and Rural Livelihoods*.



Looking Ahead

Implementation of Action 11 of the Madrid Action Plan (MAP) must be supported and strengthened.

•World Bank programme *Strengthening Weather and Climate Information and Decision Support Systems (WCIDS)*:

- Under development in consultation with WMO.
- Supports the MAP.
- Further refining and developing methodologies and capacities used internally and in partnership with government to assess NMHS services' socioeconomic benefits.

•Potential engagement with and/or benefits from broader efforts to quantify socioeconomic benefits, for example:

- GEO-BENE: Global Earth Observation – Benefit Estimation: Now, Next and Emerging (<http://www.geo-bene.eu/>)
- EUROGEOSS: A European Approach to Global Earth Observation System of Systems (<http://www.eurogeoss.eu/>)