



WRMA



WMO



WORLD BANK



WFP

**Report of the Expert Meeting on  
“Requirements of the Catastrophe Insurance  
and Weather Risk Management Markets for  
National Meteorological and Hydrological  
Services’ Products and Services”**

**WMO Headquarters (Geneva, Switzerland)  
5 - 7 December 2007**

## **Background**

1. The World Meteorological Organization (WMO) held a 3-day expert meeting on "Requirements of Catastrophe Insurance and Weather Risk Management Markets for NMHS Products and Services", at its Headquarters in Geneva, Switzerland, from 5 to 7 December 2007.
2. The meeting:
  - (i) Discussed the role of WMO and NMHS in financial risk transfer mechanisms such as catastrophe insurance and weather and climate risk management markets;
  - (ii) Discussed the requirements for meteorological, hydrological and climate products and services in support of financial risk transfer markets;
  - (iii) Identified capacities, challenges and gaps and needs of NMHS in effectively serving these markets and provided recommendations on the way forward as to how WMO, in collaboration with its partners, could assist NMHS in serving these markets more effectively.
3. The meeting involved representatives from the World Bank, the World Food Programme (WFP), the Weather Risk Management Association (WRMA) and the reinsurance sector. Furthermore representatives from the National Meteorological and Hydrological Services (NMHS) of 13 countries from all six WMO regions participated.
4. The agenda and list of participants are attached as annexes I and II. All meeting documentations and presentations are available at:  
<http://www.wmo.int/pages/prog/drr/events/cat-insurance-wrm-markets-2007>
5. During the meeting the following topics were discussed:
  - (i) Background on the catastrophe (CAT) insurance / bond and weather risk management markets and role of different stakeholders;
  - (ii) Agricultural catastrophe risk - identification of requirements for meteorological, hydrological and climate-related products and services;
  - (iii) Physical asset catastrophe risk - identification of requirements for meteorological, hydrological and climate-related products and services;
  - (iv) Accumulated risk due to deviations from normal conditions -identification of requirements for meteorological, hydrological and climate-related products and services;
  - (v) NMHS role in contributing to the CAT insurance/bond and weather risk management markets – provider perspectives;
  - (vi) Implications of Climate Variability and Climate Change and Newly Emerging Insurance Concepts (Climate Insurance Initiatives).
6. The discussions were facilitated through:
  - (i) Thirteen examples were discussed to understand agriculture catastrophic risk, physical assets catastrophic risk, and accumulated risks to several sectors associated with the deviations of meteorological, hydrological and climate conditions from normal and identify requirements of these markets for meteorological, hydrological and climate-related products and services.
  - (ii) Six examples of various models used by NMHS to serve these markets were presented by NMHS representatives from the Royal Nederland's Meteorological Institute (KNMI), the United States NOAA- National Climate Data Center (NCDC), Météo-France, Australia Bureau of Meteorology (BOM), Malawi Meteorological Service, Ethiopia Meteorological Service, Brazilian EMBRAPA Informática Agropecuária.

## **Main Outcomes:**

7. The following main outcomes were achieved:
  - (i) Better understanding of risks associated with meteorological, hydrological and climate-related conditions (extremes and deviation from normal) in various sectors and financial products developed for transfer of these risks.
  - (ii) Better understanding of the role of NMHS and their capacities, gaps and needs to serve these markets.
  - (iii) Documentation of requirements of the catastrophe insurance and weather risk management markets for meteorological, hydrological and climate related products and services.
  - (iv) Identification of major hurdles for development and sustainability of these markets linked to meteorological, hydrological and climate-related products and services.

## **Overall Conclusions:**

8. The discussions led to the following overall conclusions:
  - (i) Many sectors are at risk to meteorological, hydrological and climate factors (extremes as well as deviation from normal) reflected through extensive economic losses.
  - (ii) A comprehensive risk management programme would involve a combination of activities to understand and quantify risk (risk identification and assessment), reduce risk (early warning systems, emergency planning and preparedness, and sectoral planning), and transferring risk (catastrophe insurance/ bond markets and alternative risk transfer). Thus, financial risk transfer markets (CAT insurance and weather risk management) are a component of a comprehensive risk management solution to be implemented through the public and private sectors in a country.
  - (iii) Since 1997, approximately USD 50 billion worldwide has been available in the insurance and reinsurance markets through the issuance of insurance-linked securities (ILS) (e.g. CAT bonds, credit and motor insurance, collateralized insurance and ILWS, etc) of which USD 25 billion in natural catastrophe risk from non-traditional investors. The majority of these ILS investors, who participate in these markets are through the United States (63%), Europe (24%), Bermuda (9%), and Japan (4%). Development of these markets has primarily focused in the United States, Europe, Japan, Australia and New Zealand.
  - (iv) In some developing and developed countries, development of these markets have been significantly hindered by lack of accessibility to meteorological, hydrological and climate data, due to:
    - a. Restriction in data policies for open exchange of data;
    - b. Very high prices;
    - c. Inability of the NMHS to deliver products due to lack of observing networks or data management capacities.

Furthermore, settlement of the contracts requires provision of near real-time data. It was discussed that in some countries, NMHS did not have the resources to perform quality-assurance services in a timely fashion, and in some instance, release of quality-assured data was delayed by months if not years.

- (v) Over the last five years, the World Bank and WFP have been facilitating the development of risk transfer markets in the developing and least developed countries, with examples including:
  - a. Ethiopia – In 2006 the World Food Programme, in response to the Ethiopian governments concern that they were in a cycle of disaster response rather than managing risk, designed the Ethiopia Drought Insurance pilot project to secure a reliable, timely and cost-effective way of funding emergency operations and to protect the vulnerable populations. This project has led to significant investments in automation, further expansion of the observing network and data management systems of the Met Service of Ethiopia.
  - b. Malawi – The World Bank initiated a pilot weather insurance programme in 2005/6, utilizing index-based weather insurance policies as a means to manage the weather related risk of providing credit to farmers. The experiences there point to the potential impact, sustainability and scalability of index-based risk management programs for farmers given certain enabling conditions. This successful pilot catalysed the inclusion of USD 1.1 million for weather observing infrastructure and communication support to the MMSD within the World Bank’s Agricultural Development Programme Support Project (ADP-SP) with the Government of Malawi that begins later in 2008.
  - c. India – The Agriculture Insurance Company of India Limited (AIC) was formed by the government of India, in 2002, to serve the needs of farmers better and move towards a sustainable actuarial regime. The company i) provides insurance coverage and financial support to the farmers in the event of failure of any notified crop as a result of natural calamities, pests and diseases ii) encourages the farmers to adopt progressive farming practices iii) helps stabilise farmer incomes particularly in disaster years.
- (vi) Development of these markets requires viable legal and financial frameworks, and active partners from the private insurance and reinsurance sectors. The World Bank and WFP are working as facilitators to develop these markets, for example:
  - a. World Bank initiatives – Caribbean Catastrophe Risk Insurance Facility, Global Facility for Disaster Risk Reduction, Disaster risk Management Loan for IBRD Eligible Borrowers, Global Index reinsurance Facility and the Global Catastrophe Mutual Bond
  - b. World Food Programme initiatives – WFP /IFAD partnership (China, Global Weather Risk Market Making), and the Ethiopia Drought Insurance pilot project
- (vii) A fundamental requirement for development of risk assessment and financial risk transfer markets is the availability of historical and real-time systematic and consistent observations of meteorological and hydrological parameters, complemented with other forecast products, providing information on expected patterns of hazards and conditions from the next hour to longer time frames. This must be complemented with tools and methodologies for hazard analysis, mapping and probabilistic risk modelling tools.

- (viii) Hazard events are characterized by magnitude, duration, location and timing. The fundamental requirement is the availability of, and access to, high quality historical meteorological and hydrological data. These defining characteristics provide a basis for extracting information on hazard frequency and severity from observational datasets. This requires:
  - a. Ongoing, systematic and consistent observations of meteorological and hydrological parameters;
  - b. Quality assurance and proper archiving of the data into temporally and geographically referenced and consistently catalogued observational datasets; and
  - c. Ensuring that the data can be located and retrieved by users correctly and easily.
- (ix) Risk characterization would require that hazard information be complemented with socio-economic information related to impacts of disasters. Surveys and reports by United Nations and international development and financial institutions indicate that in most countries, the concept of risk identification needs to be mainstreamed in the development planning in both public and private sectors at policy to operational levels. I
- (x) Specifically, at the national level, many challenges remain, including the need for:
  - a. Modernization and/or installation of new automated instrumentation and observing networks for monitoring meteorological and hydrological conditions;
  - b. Technical capacity and resources for maintaining observational networks;
  - c. Data Rescue Programme to translate massive amounts of paper-based records into digital form;
  - d. Ongoing quality control to ensure consistency and completeness of the records;
  - e. Data-collection and management systems and capacity to archive large databases; and
  - f. Ensuring that the data are available to all users and “user-friendly” service delivery;
- (xi) In 2006, WMO carried out an assessment survey to evaluate capacities, gaps and needs of the NMHS in serving different decision-making processes for disaster risk management. Of the 139 countries that participated in this survey, nearly 90% indicated the need for strengthening of their observing networks, capacities for maintenance of standard hazard databases and metadata, maintenance of sectoral disaster loss data and methodologies for risk modelling to support development planning in different economic sectors. Given the pervasive nature of hydro-meteorological hazards and increasing levels of vulnerability, ability to manage these changes will require continuing and renewed commitment to maintaining the observing networks, basic data, and hazard forecasting capacities needed for identifying and managing risks.
- (xii) The WMO assessment survey and discussions at the meeting further stressed significant heterogeneity in the capacities of NMHS worldwide to serve these markets, and limited resources of NMHS to dedicate to the development of products and services to address needs of these new emerging markets. There is need for renewed focus and commitment to strengthening observing networks, automation of weather stations, effective data collection and management systems, ability to archive large databases, initiation of data rescue programmes, and development of effective service delivery mechanisms, particularly in the developing countries. Furthermore, there is need for tools and methodologies for

data quality assurance, and data analysis, complemented with technical training and capacity development of staff of the NMHS to effectively serve these markets.

- (xiii) Intensity and frequency of various hydro-meteorological hazards are likely to increase, as projected by the fourth assessment report of the Intergovernmental Panel on Climate Change (IPCC)<sup>1</sup>. This will lead to increased vulnerability, especially in the least developed and developing countries.
- (xiv) Given the demographic expansion in urban and coastal areas, appropriate planning and disaster risk management is now a critical component of climate change adaptation and sustainable development but this could be further complemented with financial risk transfer mechanism for better management of the risks. Munich Re has initiated, through a consortium of partners, the Munich Climate Insurance Initiative (MCII) as a mechanism to reduce the risks associated with impacts of extremes linked to climate change. Specifically this initiative seeks to, i) develop insurance-related solutions to help manage the impacts of climate change especially in developing countries ii) conduct and support pilot projects for the application of insurance-related solutions, iii) promote insurance-related approaches in cooperation with other organizations and initiatives, iv) and identify and promote loss reduction measures. This model is still at development stages is being further debated and developed through various consultations.
- (xv) There are several examples in developed and developing countries where NMHS are servicing these markets systematically and actively. However, depending on the national data policies and NMHS capacities, different service delivery models are used to serve these markets, such as:
  - a. Open-data policy: Examples of models of the Netherlands and Brazil were discussed
  - b. Data cost-recovery policy: Examples of models of Australia and the United States were discussed.
  - c. For-profit policy and partnership model with private sector: Example of Meteo-France was discussed
- (xvi) There is a need to improve climate information to better quantify risks associated with climate variability and climate change. Beyond historical and real-time observations, there is need for integration of information on the future trends of hazards into risk modelling estimates. Through the internationally coordinated World Climate Research Programme, a joint programme of WMO, UNESCO and ICSU (which underpins the IPCC Assessment Reports), efforts are underway improve climate models better quantitative information on the changing patterns of hazards from climate variability and climate change.
- (xvii) There is need for increased climate research funding in areas with direct decision-making implication to ensure that latest scientific information is best utilized in decision-making processes. Development of these capacities should be considered as an investment towards enhanced risk management, climate adaptation and socio-economic development in disaster-prone countries.

---

<sup>1</sup> IPCC's (IPCC is a joint initiative of WMO and UNEP in 1988) Fourth Assessment reports on increasing frequency and severity of droughts, extreme temperatures, severe precipitation and severe storms.

## ***Recommendations and Way Forward***

9. The meeting made the following recommendations:

- (i) The results of this meeting to be published formally as a reference for future collaboration of WMO with the World Bank, WFP, WRMA and reinsurance sectors. This should include case studies, and guidance on requirements for products and services as well as service delivery models to assist NMHS to better understand the needs and requirements of the financial risk transfer markets.
- (ii) WMO to raise awareness among NMHS of the emergence of these markets, related opportunities for their capacity development, particularly in developing and least developed countries.
- (iii) WMO to follow-up with the World Bank, WFP, WRMA and reinsurance sector to develop a concrete work plan with clear deliverables and timelines for support of these markets and present it to the relevant WMO advisory, governing and implementing bodies for review, approval and implementation.
- (iv) WMO to work with the World Bank and WFP to facilitate participation of NMHS in these markets in countries where these markets were being considered in a more immediate timeframes.
- (v) The meeting recommended that WMO could host annual or bi/annual meetings of representatives from the catastrophe insurance and weather risk management markets and NMHS to advance the work initiated in this expert meeting. Goals of such a meeting would be to review the current state of the financial risk transfer markets and to identify emerging needs, gaps and opportunities with regard to meteorological, hydrological and climate products and services.



WRMA



WMO



WORLD BANK



WFP

## EXPERT MEETING ON REQUIREMENTS OF THE CATASTROPHE INSURANCE AND WEATHER RISK MANAGEMENT MARKETS FOR NATIONAL METEOROLOGICAL AND HYDROLOGICAL SERVICES

5-7 December 2007, WMO Headquarters, Geneva, Switzerland

### AGENDA

#### Day 1 - December 5, 2007 (WMO Press Room, Ground Floor)

##### Session 1: Opening Session

- 9:00 – 9:20      Opening Statement
- *Michel Jarraud, Secretary-General of WMO*
- 9:20 – 9:25      Background and Introductory Remarks
- *Maryam Golnaraghi ( WMO )*
- 9:25- 9:30      Introduction of Chairpersons and Adoption of Agenda
- *Maryam Golnaraghi (WMO)*

##### Session 2: Background on the Catastrophe (CAT) Insurance / Bond and Weather Risk Management Markets and Role of Different Stakeholders

**Chairman (Session 2): Dr. Rajiv Mehta**

*In this session, background information on CAT Insurance and Bond markets as well as Weather Risk Management Markets will be discussed particularly related to how these markets work, who are the stakeholders and beneficiaries, , prominence of these markets in different regions and countries, size of these markets, growth opportunities and developments, insurance capacity pool, linkage to meteorological, hydrological and climatic conditions, customized versus standardized products and implications for products and services of National Meteorological and Hydrological Services.*

- 9:30 – 11:00      **Panel 1: Catastrophe Insurance and Bond Markets (Linked to extreme conditions)**
- *Willis Re/WRMA – “Background on CAT Insurance“*
  - *Swiss Re – “CAT Reinsurance and Bonds Markets, and Investors”*
  - *World Bank – “World Bank’s Initiatives”*
  - *World Food Programme – “WFP’s Initiatives”*
  - *Ministry of Agriculture - India – “Overview of Agriculture Insurance in India”*

**Format:** 15 - minute presentations followed by discussion session.

11:00 – 11:30      Coffee Break



- 11:30 – 12:45 **Panel 2: Weather Risk Management Markets** (Accumulated risk due to deviations from normal conditions)
- Willis Re/WRMA – “Background on Weather Risk Management Markets”
  - Swiss Re – “Current Weather Risk Management Markets and Developments”
  - Chicago Merchantile Exchange - “Standardized contracts”
  - Paris Re – “Customized contracts”

**Format:** 15 minute presentations followed by discussion session.

12:45 – 14:00 Lunch (WMO Cafeteria - Attic)

### **Session 3: Agricultural Catastrophe Risk - Identification of Requirements for Meteorological, Hydrological and Climate-Related Products and Services**

**Chairman (Session 3): Dr. Rajiv Mehta**

*In this session, through case studies provided by the users, the meeting will discuss requirements of different markets (i) the catastrophe insurance and bond markets and (ii) weather risk management markets for meteorological, hydrological and climate-related information, product type, content, format, exchange and accessibility, and service delivery and relation with users.*

**Format:** Case study discussions will be lead by partners in coordination with the representative National Meteorological Service, based on prepared documentation, short presentation to introduce the case study and discussion on the concrete requirements for NMHS products and services.

- 14:00 – 14:45 **Case Study 1:** “Drought Risk Management in Ethiopia” –WFP and Ethiopia Meteorological Service
- 14:45 – 15:30 **Case Study 2:** “Southeastern Europe Disaster Risk management Project” – World Bank
- 15:30 – 16:00 *Coffee Break*
- 16:00 – 16:45 **Case Study 3:** “Millennium Village Project” –Swiss Re
- 16:45 – 17:30 **Case Study 4** “Malawi Drought Risk Management” – World Bank and Malawi Meteorological Service
- 17:30 – 18:00 **Chairman - Summary of sessions 2 and 3**
- 18:30-19:30 **Welcome Cocktail (WMO Attic)**

## **Day 2 – December 6, 2007 (Room C2, Basement Floor)**

### **Session 4: Physical Asset Catastrophe Risk -Identification of Requirements for Meteorological, Hydrological and Climate-Related Products and Services**

**Chairman (Session 4): Mr. Warren Isom**

- 9:00 – 9:45 **Case Study 5:** “Traditional CAT Insurance and Development of CAT Bond Markets post Hurricane Andrew” - Willis Re
- 9:45 – 10:30 **Case Study 6:** “World Bank Flood Initiatives” - World Bank
- 10:30 – 11:00 *Coffee Break*
- 11:00 – 11:45 **Case Study 7:** “UK Flood CAT Bond” – Swiss Re and RMS
- 11:45 – 12:30 **Case Study 8:** “Caribbean Catastrophe Risk Insurance Facility” - World Bank
- 12:30 – 14:00 *Lunch*

**Session 5: Accumulated risk due to deviations from normal conditions -Identification of Requirements for Meteorological, Hydrological and Climate-Related Products and Services**

**Chairman (Session 5): Mr. Warren Isom**

14:00 – 14:45 **Case Study 9:** “Heating Degree day Contracts” – Willis Re

14:45 – 15:30 **Case Study 10:** “European Agricultural Risk” – Paris Re and Météo –France

15:30 – 16:00 *Coffee Break*

16:00 – 16:45 **Case Study 11:** “Indian Agricultural Risk” - Galileo Re

16:45 – 17:30 **Case Study 12:** “Wind Power Risk Contracts” – ABN AMBRO and KNMI

17:30 – 18:00 **Case Study 13:** “Hydro Electric Power risk” – Swiss Re

18:00 – 18:30 **Chairman - Summary of sessions 4 and 5**

**Day 3 – December 7, 2007 (Room C2, Basement Floor)**

**Session 6: NMHS Role in Contributing to the CAT Insurance/Bond and Weather Risk Management Markets – Provider perspectives**

**Chairman (Session 6): Dr. David Grimes**

8:30 – 10:00 **Panel 3:** Discussion on the role of and challenges and opportunities for NMHS in servicing financial risk transfer markets.

- *KNMI*
- *US - NCDC*
- *Météo-France*
- *Australia Bureau of Meteorology*
- *Malawi Meteorological Service*
- *Ethiopia Meteorological Service*
- *EMBRAPA Informática Agropecuária*
- *Willis Re/WRMA - User Perspective*

**Format:** 10-minute Presentation by NMHS on their experiences and successes in serving the financial risk transfer markets, 5-minute interventions and recommendations by the users, followed by discussion session.

**Session 7: Implications of Climate Variability and Climate Change and Newly Emerging Insurance Concepts (Climate Insurance Initiatives)**

**Chairman (Session 7): Dr. David Grimes**

10:00 – 10:30 Munich Re “Introduction of Munich Climate Insurance Initiative”

10:30 – 10:45 *Coffee Break*

10:45 – 11:45 **Panel 4:** Discussion on implications of climate variability and change for the CAT Insurance and Weather Risk Management Markets

- *Willis Re/WRMA*
- *Munich Re*
- *KNMI*
- *USA*
- *BOM - Australia*
- *CMA – China*

**Format:** 10-minute Presentation by followed by discussion session.

11:45 – 12:15 **Chairman – Summary of sessions 6 and 7**

12:15 – 12:30 Next Steps and Closing of the Meeting