

World Meteorological Organization

Opportunities and Challenges for Development of Weather-based Insurance and Derivatives Markets in Developing Countries

By

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**First Session of Global Platform on DRR (June 5-7, 2007)
Side Event on: Catastrophic Risk Financing**

Risk Management Involves a Wide Range of Decisions and Actions

Risk Management

Risk Identification

- Historical hazard data and analysis
- Changing hazard trends
- Vulnerability assessment
- Risk quantification

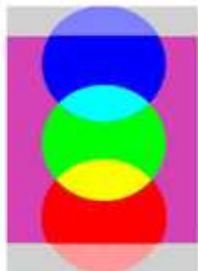
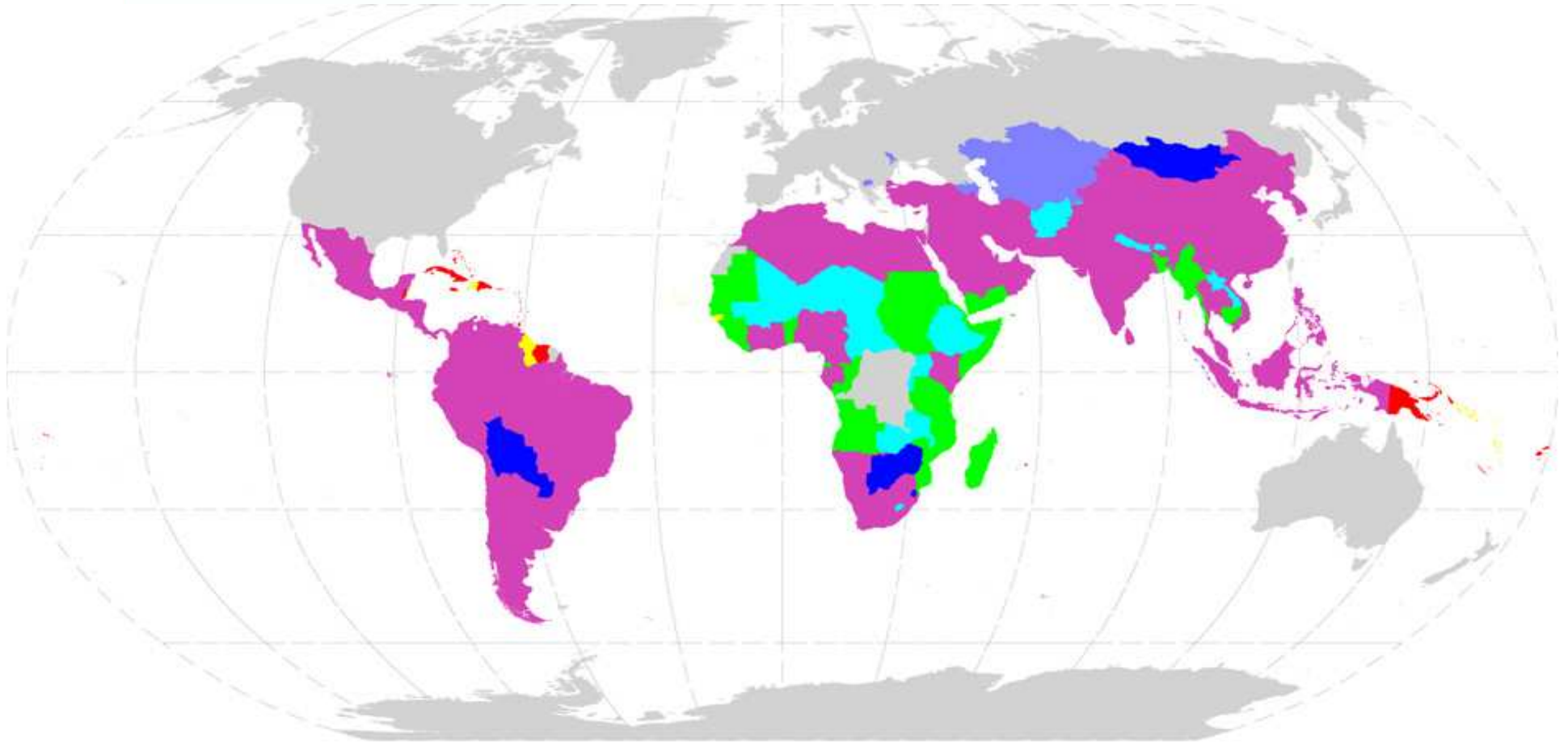
Risk Reduction

- Sectoral planning
- Early Warning Systems
- Emergency Preparedness planning
- Education and training

Risk Transfer

- Financial tools
 - Insurance
 - Weather derivatives
 - Cat bonds

United Nations Developing Country Classifications



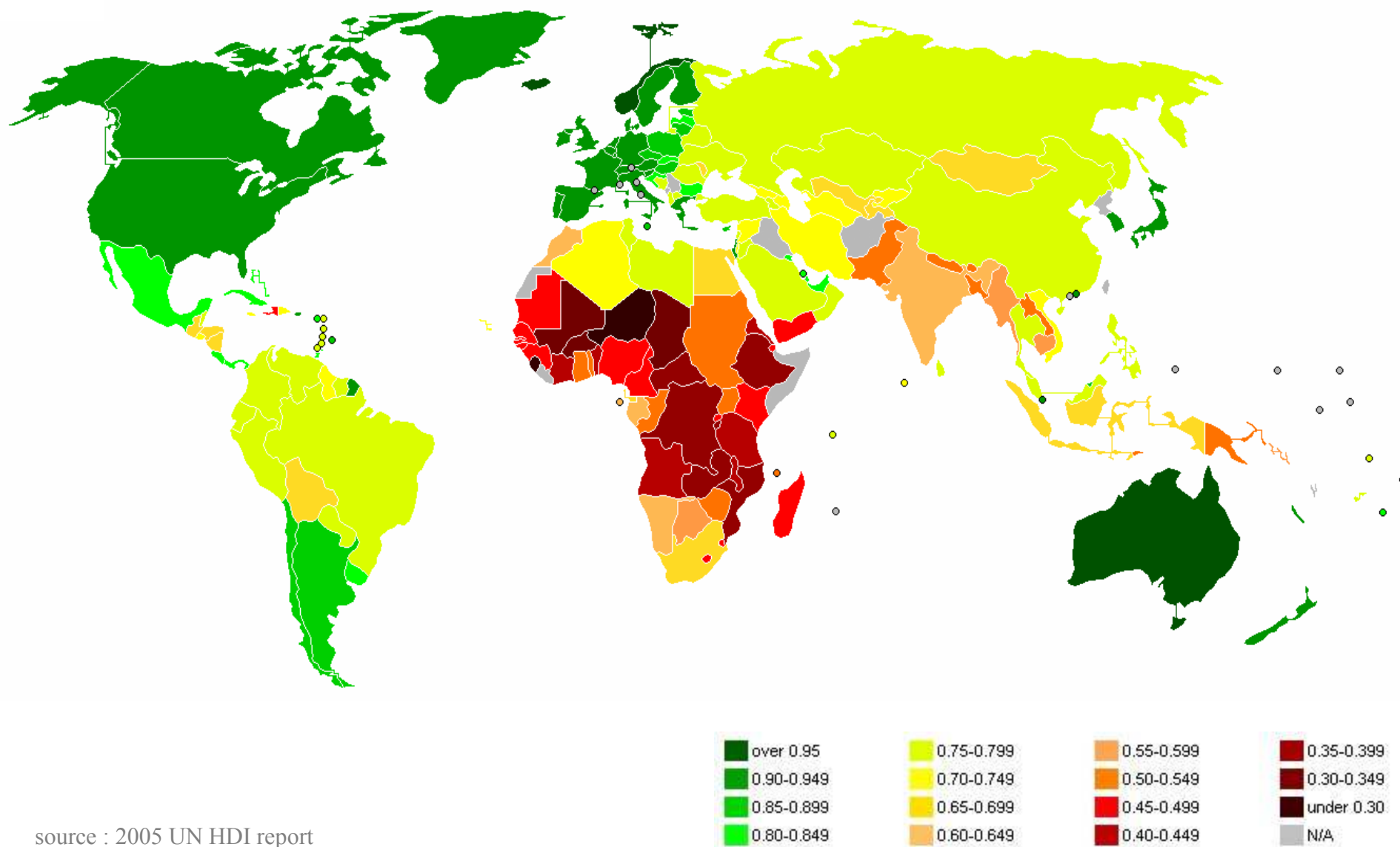
Land Locked Developing Country (LLDC)

Least Developed Country (LDC)

Small Island Developing State (SIDS)

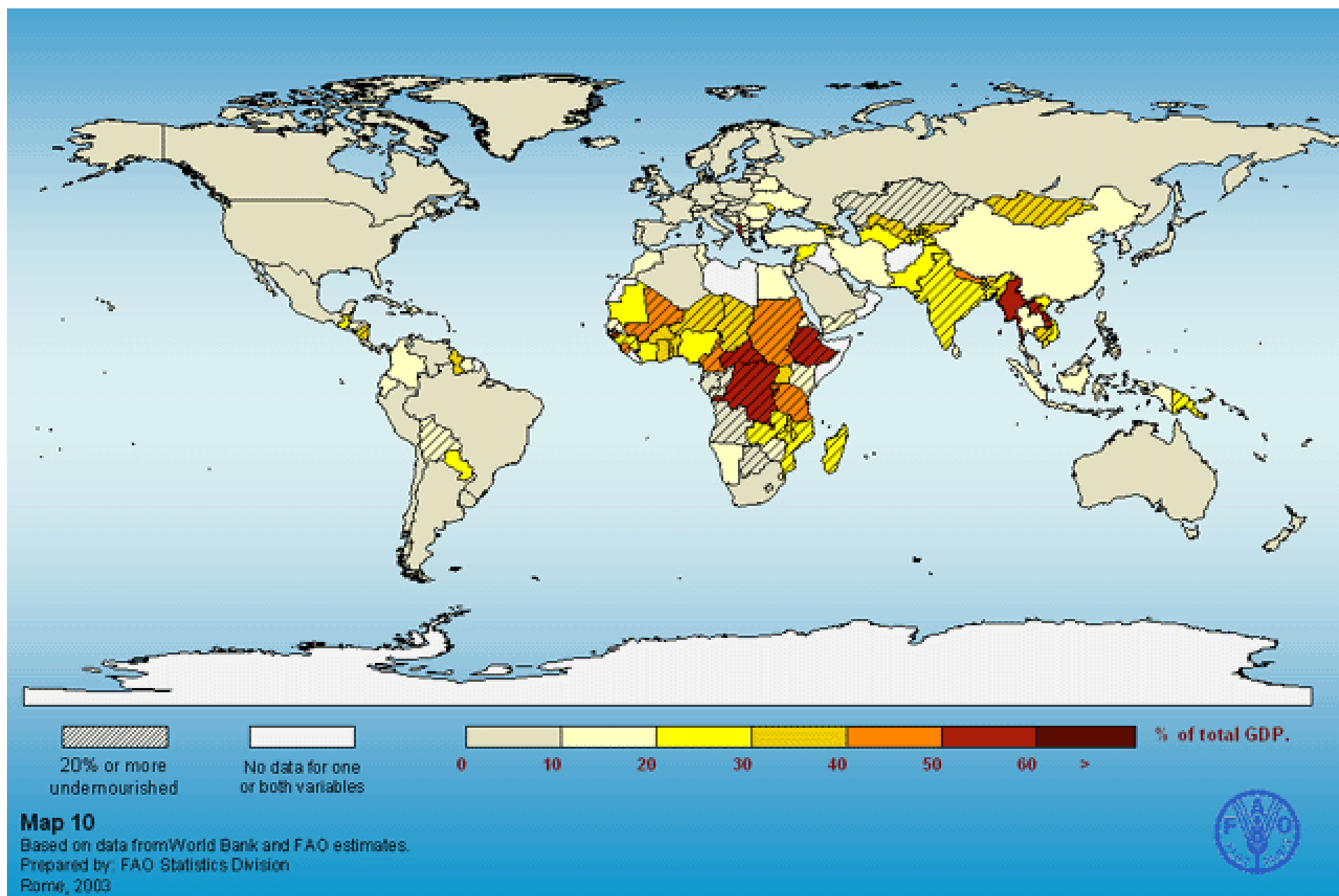
Developing countries

Human Development Index (2003)

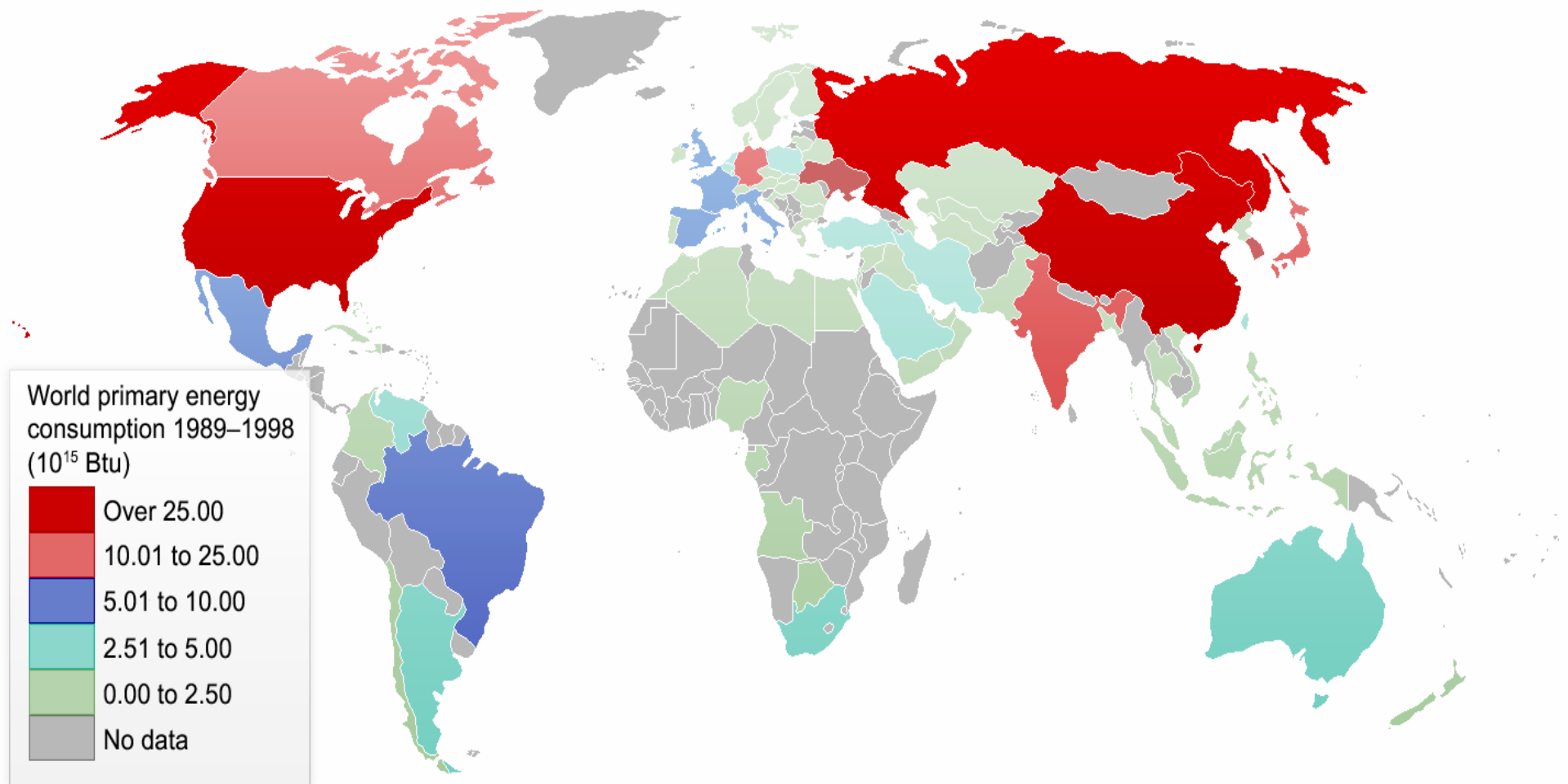


source : 2005 UN HDI report

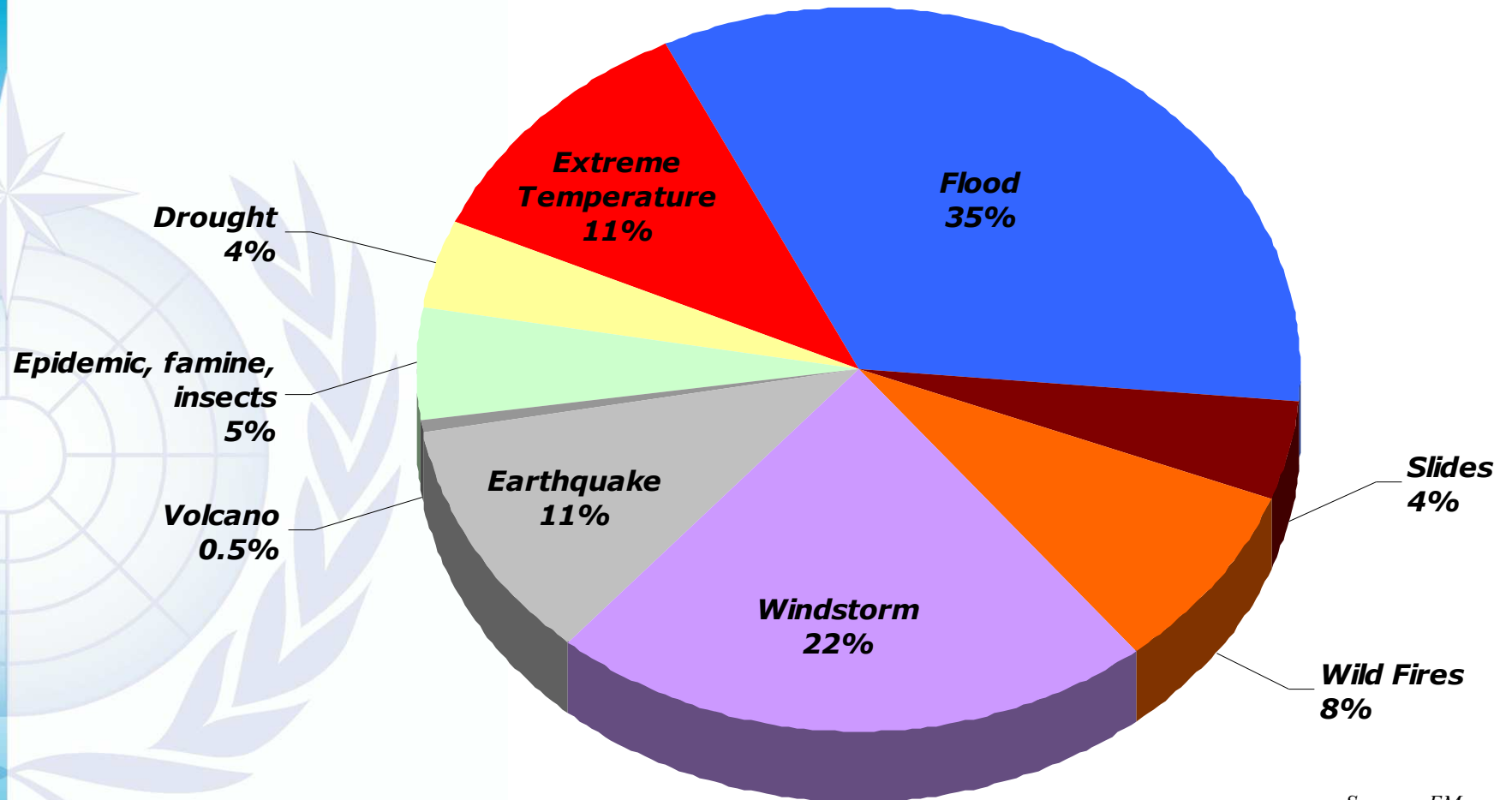
Agriculture as share of GDP (2000)



Global Distribution of Energy Consumption (1989-1998)



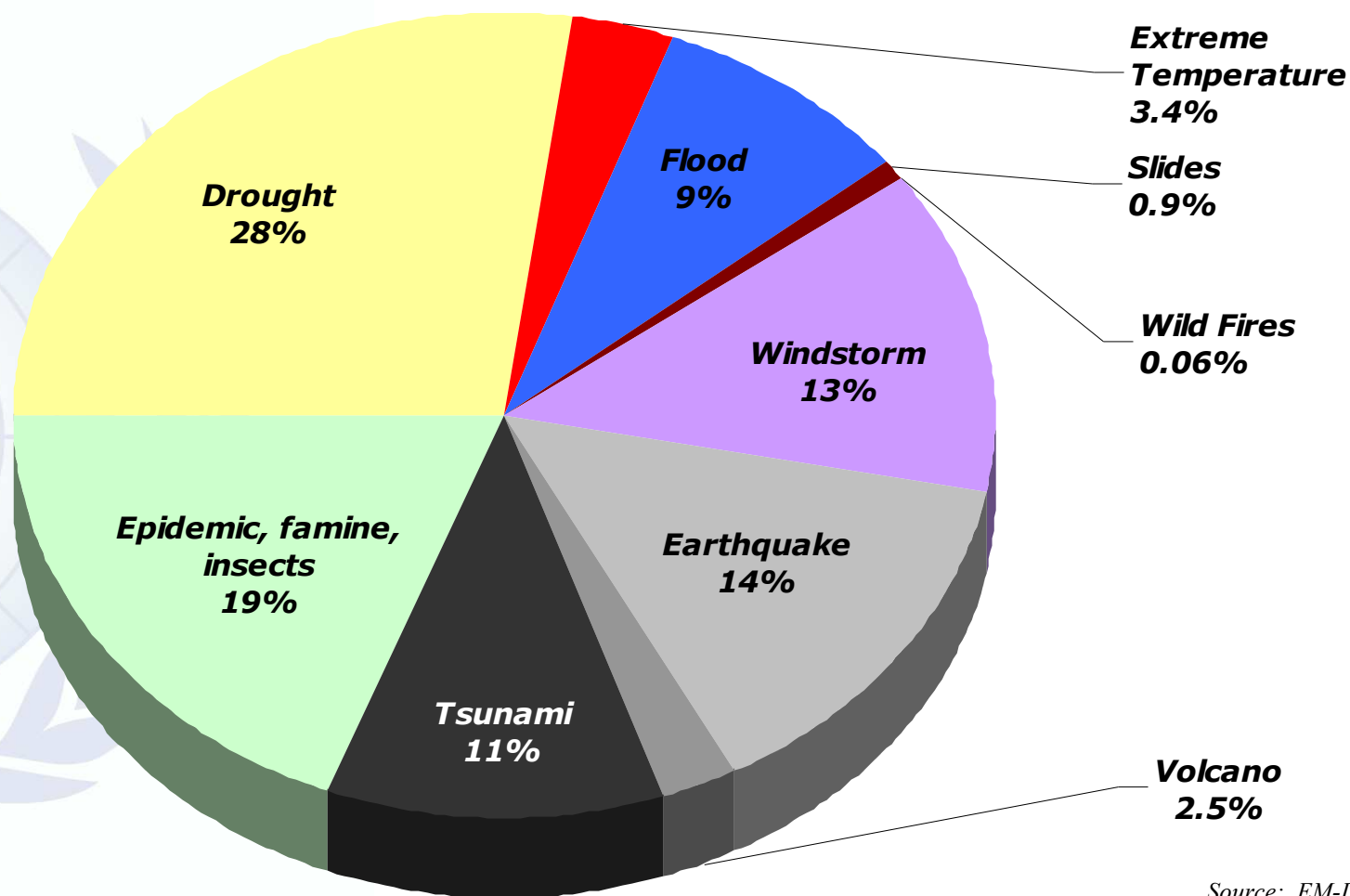
Number of Disasters (1980-2005)



Nearly **90%** of disasters are related to hydro-meteorological hazards.

Source: EM-DAT: The OFDA/CRED International Disaster Database
- www.em-dat.net
- Université Catholique de Louvain - Brussels
- Belgium

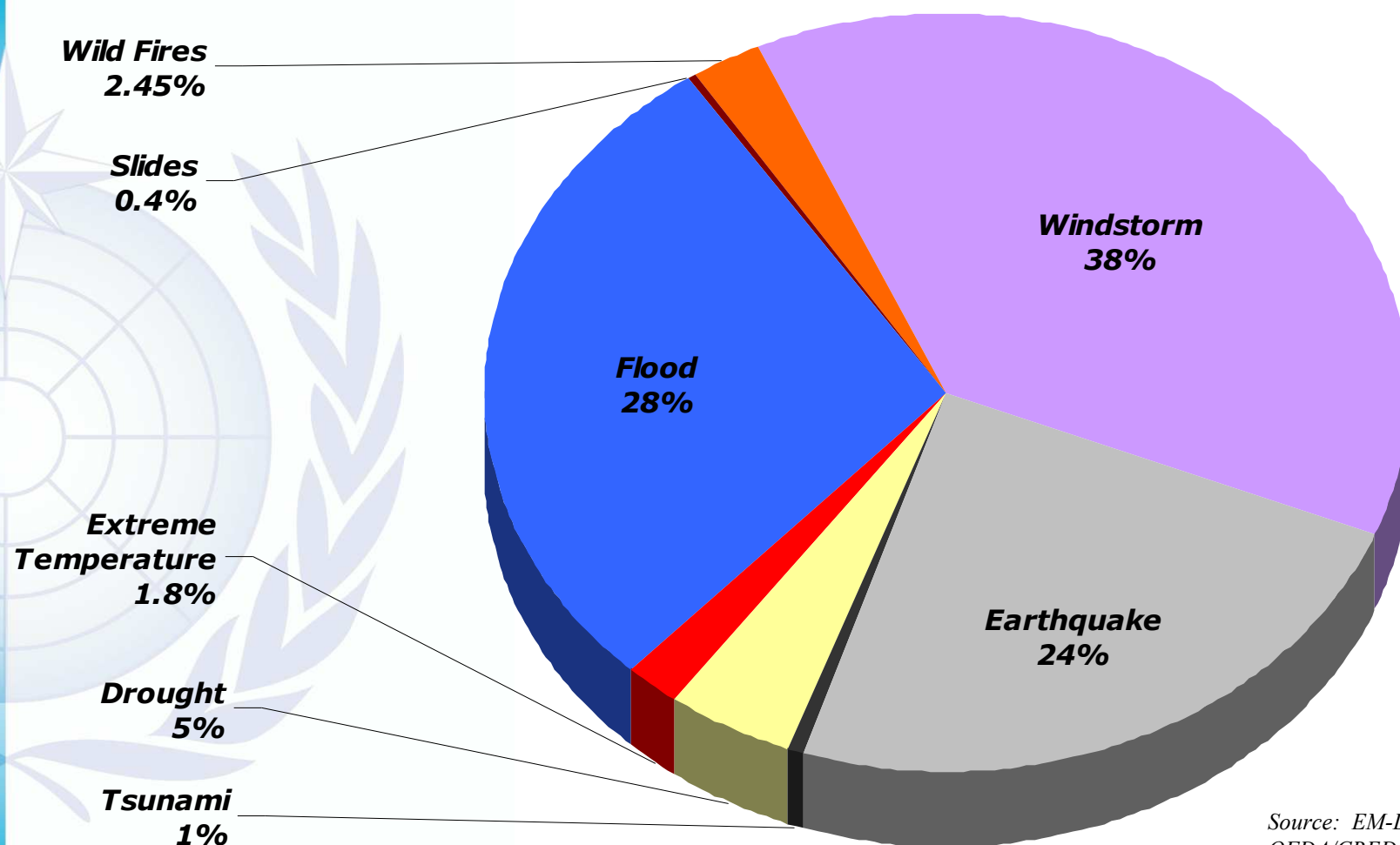
Loss of Human Life (1980-2005)



Nearly **70%** of loss of life are related to hydro-meteorological hazards.

Source: EM-DAT: The OFDA/CRED International Disaster Database - www.em-dat.net - Université Catholique de Louvain - Brussels - Belgium

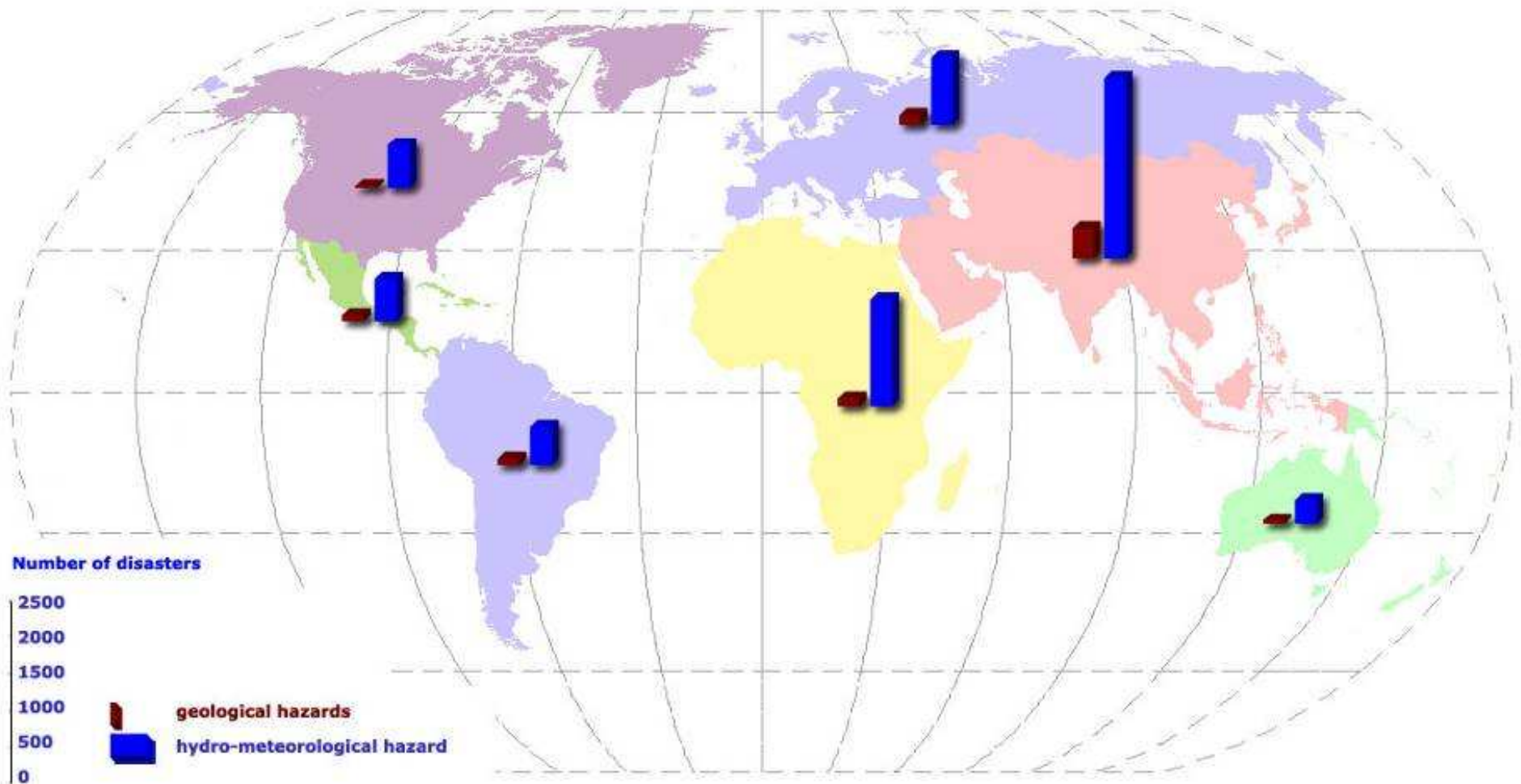
Economic Losses (1980-2005)



Nearly **75%** of economic losses are related to hydro-meteorological hazards.

Source: EM-DAT: The OFDA/CRED International Disaster Database - www.em-dat.net - Université Catholique de Louvain - Brussels - Belgium

90% of Disasters are Hydro-Meteorological (Number of Events, 1980-2005)



Meteorological and Hydrological Conditions Impact Across Various Economic Sectors, with Different Timescale and Intensity



**Agriculture &
Food Security**



**Infrastructures &
Transportation**



Tourism

Health



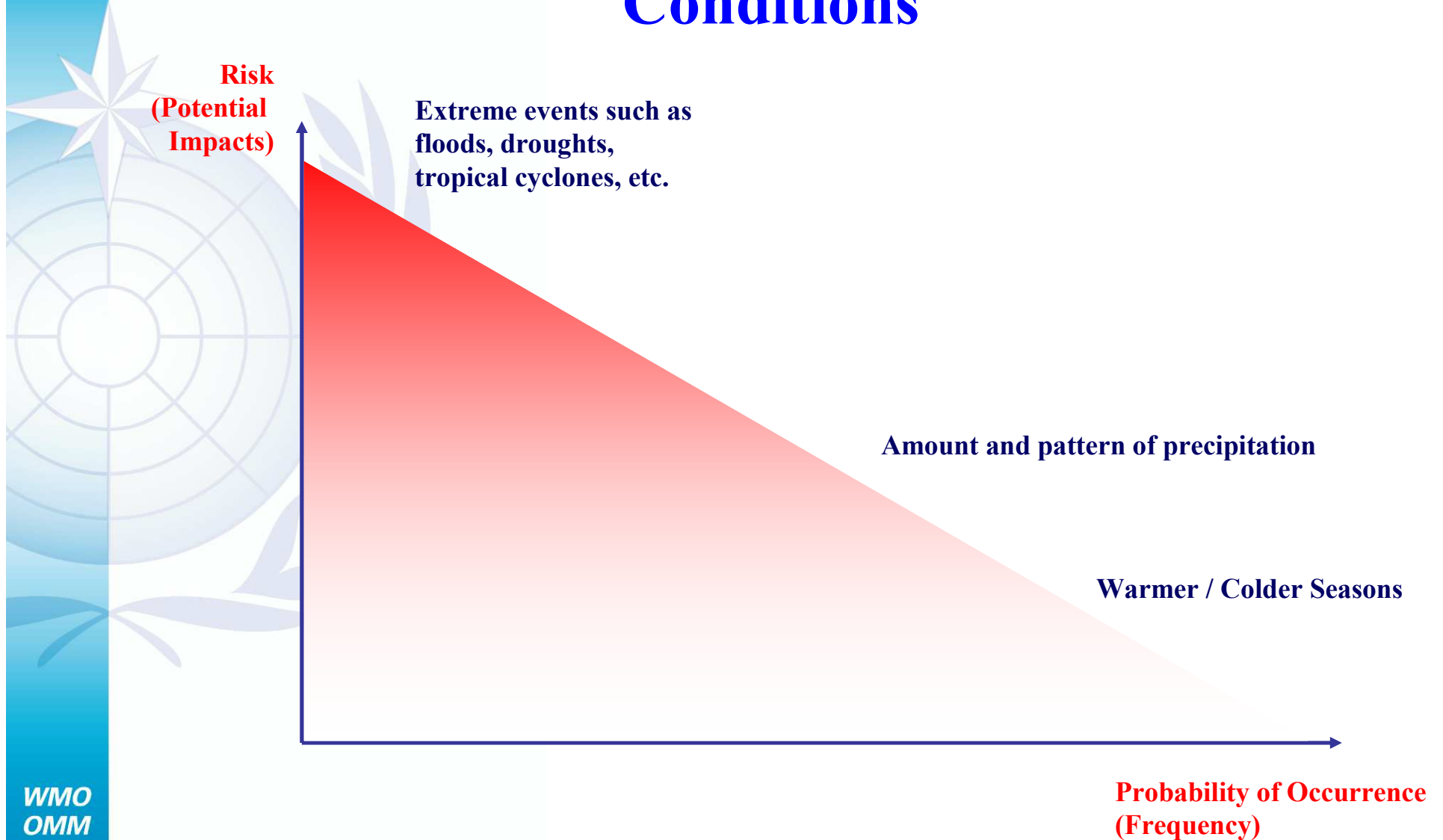
Industry & Energy




Water Resources



Many Sectors Are Heavily Exposed to Risks Associated With Hydro-Meteorological Conditions





Recent developments in weather derivatives and insurance markets have great relevance for developing countries, particularly for sectors such as Agriculture that are highly dependent on weather.

In Many Developing Countries

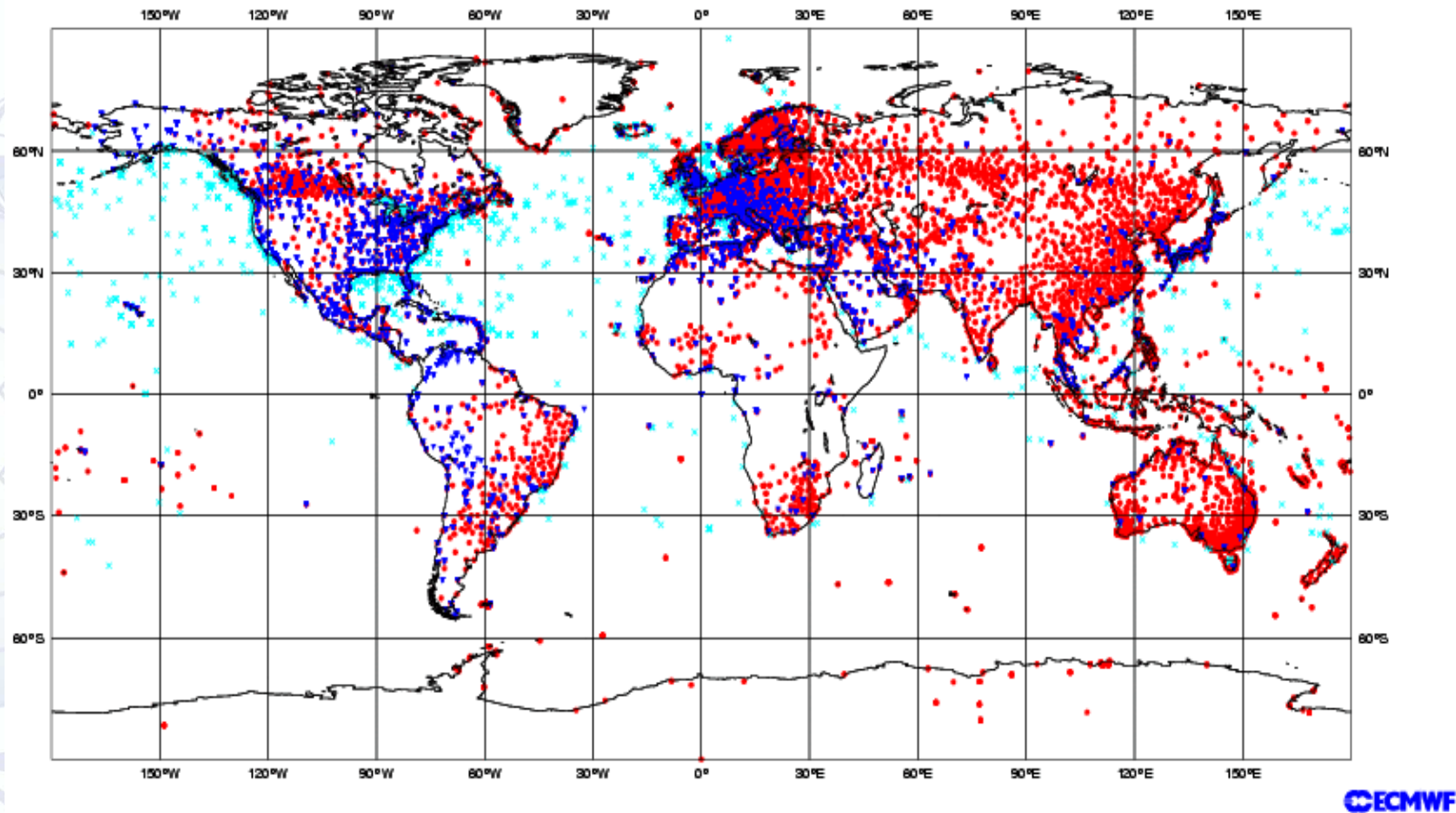
- Traditional insurance products are largely underdeveloped
 - Crop Insurance can be very expensive to administer
 - Individual yields and field inspections needed
 - Small size of the farms
 - Adverse Selection and moral hazard issues
- Innovative weather insurance mechanisms provide opportunity for risk transfer
 - Based on weather events/indices rather than actual crop losses
 - Assumption: weather events/indices are closely correlated with crop failure
 - Trigger weather events/indices can be verified independently
 - Easy to market (more players can participate in the market)

However, there are some important challenges for weather risk management in developing countries!

1) Need for reliable, verifiable and accessible hydro-meteorological data

- Status of historical meteorological and hydrological records
 - Temporal and geographical coverage
 - Need for data rescue activities
- On-going real-time observations and updates
- Tamper-proof weather stations
- Data accessibility and quality
- Use of new technologies (satellites)
 - Verification and enhanced estimates
 - Currently, challenge is lack of sufficient historical records

Need to Strengthen Observation Networks, Particularly in Developing Countries



Investments in observing networks is an investment towards improved risk management and development planning.

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2) Rainfall can vary significantly spatially

- For example:
 - Possible to have sufficient rain registered in a weather station of which rainfall contract is written and not have rainfall on the Farmer's nearby field
 - Farmer cannot collect insurance
 - Also possible to have no rainfall registered at the weather station and sufficient rainfall on the Farmer's nearby field
 - Opportunity to collect insurance when not deserved!

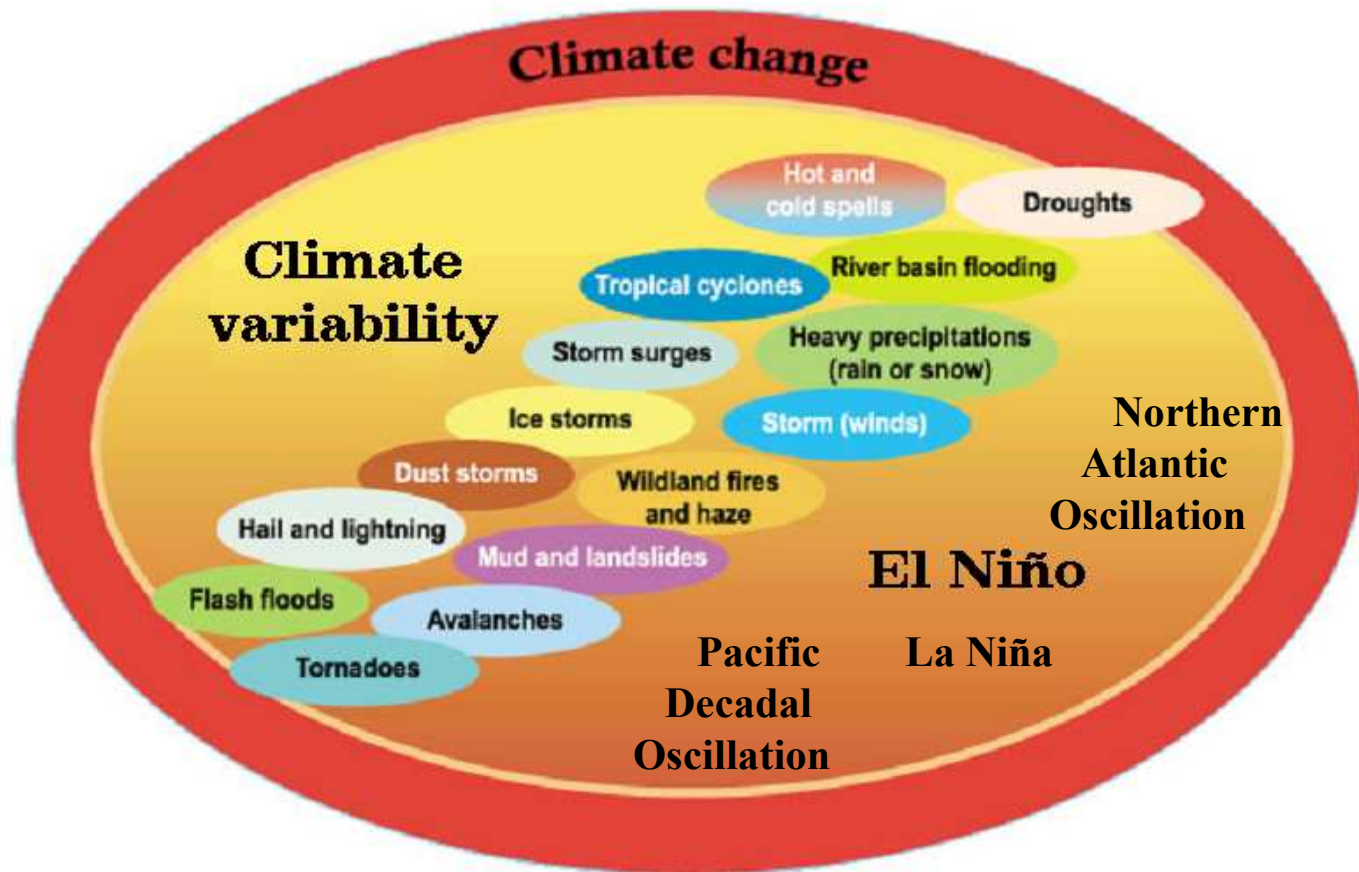
Need for Development of Weather-Related Indices

- Many standard indices such as Heating Degree days, Cooling Degree days, Growing Degree Day, Heat Index
 - Strong spatial and temporal correlations for temperature
 - Temperature strongly correlated to parameters such as energy demand, health, etc.
- In agriculture, many challenges to develop standardized indices
 - Lack of strong spatial and temporal correlation in precipitation
 - Different types of droughts caused by different factors (precipitation deficiency, soil moisture, surface and subsurface water supplies, socio-economic factors)
 - variations region by region

3) Portfolio diversification (Distribution of Risk and Opportunity)

- For example:
 - In case of a drought or flood with extensive coverage and impact across the board, it may be difficult to find someone with offsetting exposure, that means someone that can benefit from drought or flood conditions
- Cost efficiency of derivative markets increases by bringing together parties with opposite exposures
 - Risk in one region is opportunity in another

4) Changing trends in hydro-meteorological patterns



Past not a good representative of future trends...actuarial soundness of weather derivatives depend on the trends in the hydro-meteorological patterns!

5) Need to address the systemic nature of hydro-meteorological risks

- For example:
 - In case of a drought or flood with extensive coverage and impact across the board, all those covered by the policies have to be compensated at the same time.
- Mechanisms to spread this financial risks internationally are therefore required.
 - Critical role of international financial agencies such as the World Bank, reinsurance sector to bring capacity and diversification opportunities to this market

Contribution of National Meteorological and Hydrological Services to Design and Settlement of Weather Risk Contracts

- Availability, accessibility and reliability of historical and real-time meteorological and hydrological data (In situ and space)
- Technical support for data homogenization and analysis
- Reliable governmental authoritative data for contract design and settlement
- Forecasts and warnings for management of risk portfolios

At National Level Many Challenges Remain

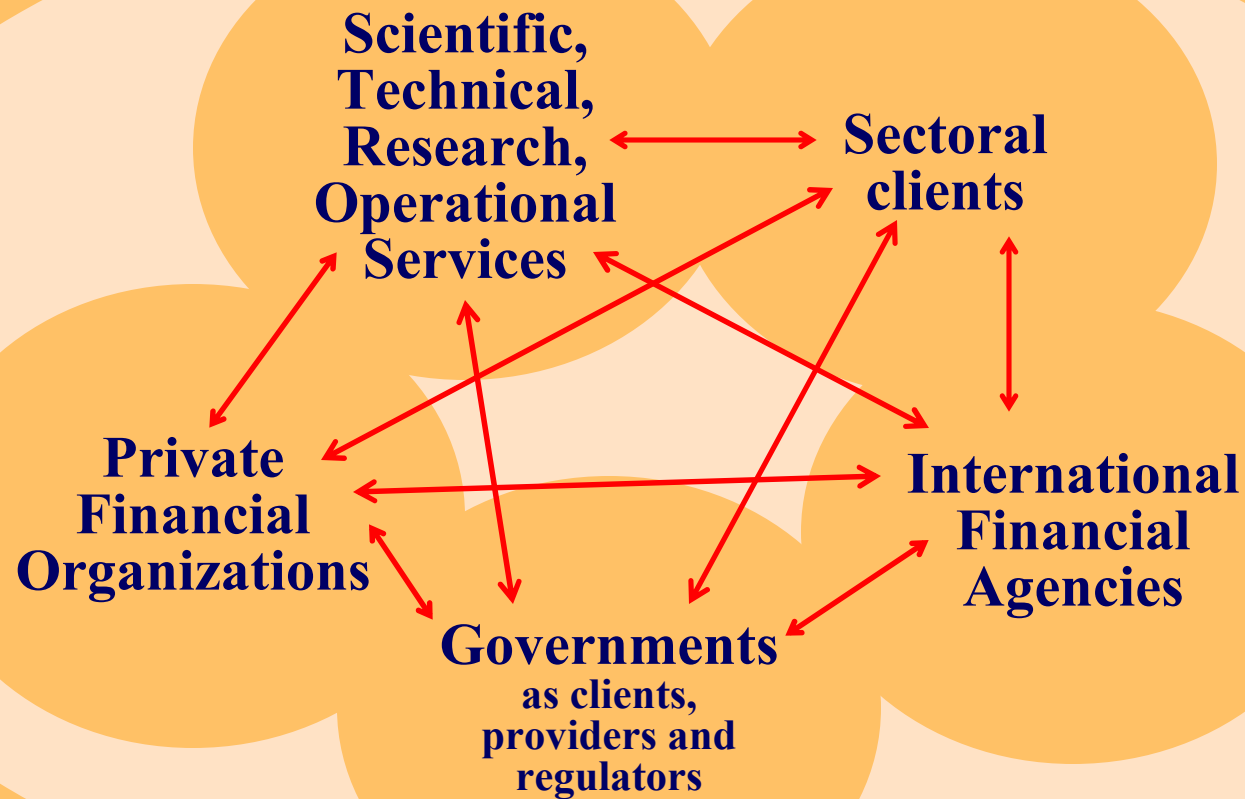
- Political recognition for benefits of investing in observing networks
- Institutional capacity
 - Operations and sustainability of observing networks
 - Data collection and management systems
 - Data rescue to translate massive amount of paper-based records into digital records
 - Quality control to ensure consistency and completeness
 - Capacity to archive large databases
- Availability of data to users
 - National data policies (commercial vs. public good)

Development of these capacities should be considered as an investment for enhanced risk management.

WMO Initiatives in Support of Weather Risk Market Development

- Advocacy at the ministerial level of the importance of meteorological and hydrological observing networks
- Working with the weather risk market to identify needs and requirements for hydro-meteorological products and services
- Technical capacity development of National Meteorological and Hydrological Services for providing relevant data and forecast products and services to this market
- Working with international partners on pilot projects in different countries
- Development of meteorological and hydrological standard indices (such as drought) that can be used in this market.

Need for Public-Private Partnerships



Thank you!

**For more information please
contact:**

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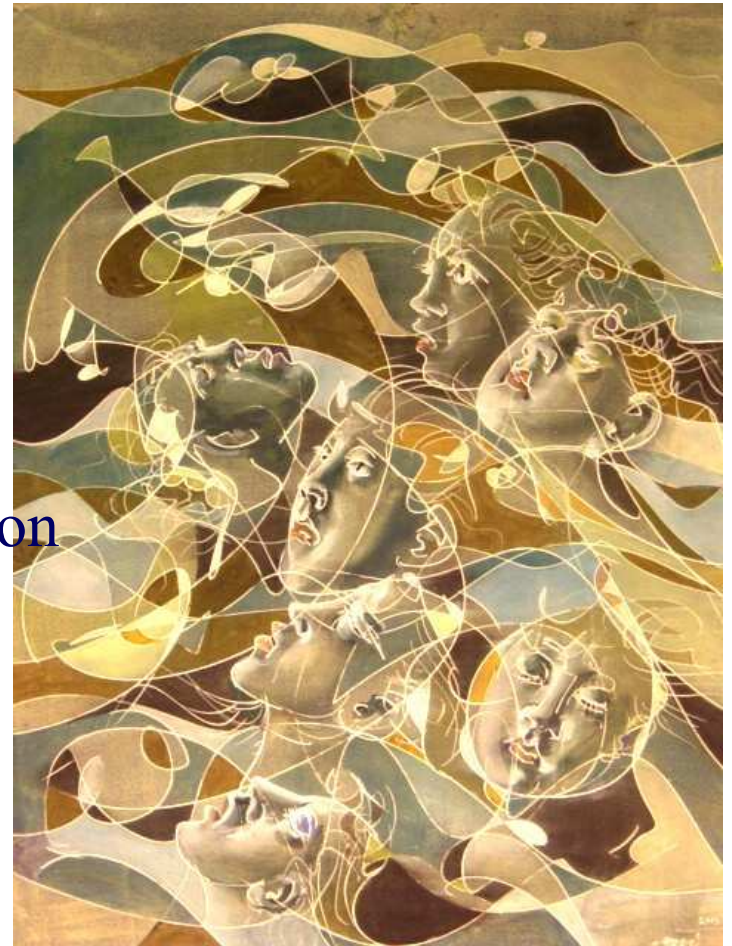
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Courtesy of Hans Erni

<http://www.wmo.int/disasters>