



WMO

World Meteorological Organization

Working together in weather, climate and water

Workshop on Multi-Hazard Early Warning Systems for Urban Areas

Dr Maryam Golnaraghi
Chief of Disaster Risk Reduction Programme

Session 2

10-12 December 2013

Radisson Europa Hotel and Conference Center
San José, Costa Rica



Agenda

- Managing risks associated with climate
 - Concerns, challenges and opportunities
- Harnessing WMO research and operational systems
 - Scaling up the development of meteorological and climate services
- Some thoughts on more systematic cooperation between WMO and World Bank

Central America

8 countries: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua and Panama.



Central America

Ranking disasters according to (a) deaths and (b) economic losses:
Top 10 costliest disasters (1970-2009)

(a)	Disaster Type	Year	Country	Number of Deaths
1	Storm (Mitch)	1998	Honduras	14'600
2	Storm (Fifi)	1974	Honduras	8'000
3	Storm (Mitch)	1998	Nicaragua	3'332
4	Mass Movement Wet	1973	Honduras	2'800
5	Storm (Stan)	2005	Guatemala	1'513
6	Flood	1999	Mexico	636
7	Flood	1982	Guatemala	620
8	Storm (Liza)	1976	Mexico	600
9	Flood	1982	El Salvador	500
10	Storm (Mitch)	1998	El Salvador	475

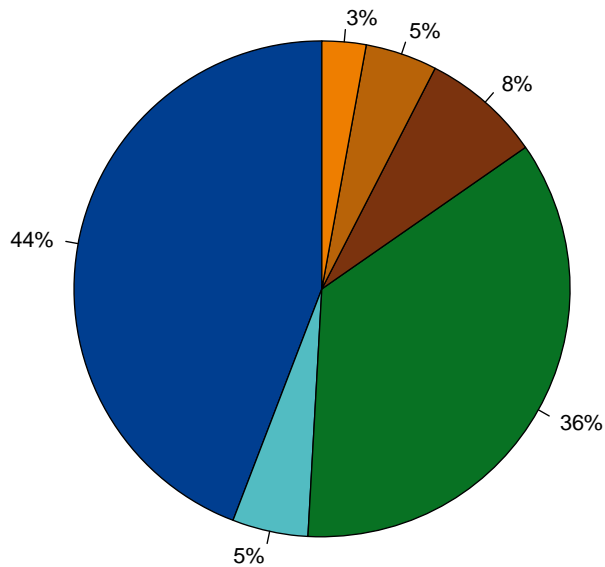
(b)	Disaster Type	Year	Country	Economic Losses (in US\$ billion)
1	Storm (Wilma)	2005	Mexico	5.66
2	Storm (Mitch)	1998	Honduras	5.15
3	Flood	2007	Mexico	3.20
4	Storm (Stan)	2005	Mexico	2.83
5	Storm (Arlene, Beatriz)	1993	Mexico	2.56
6	Storm (Fifi)	1974	Honduras	2.42
7	Storm (Roxane)	1995	Mexico	2.18
8	Drought	1996	Mexico	1.69
9	Storm (Mitch)	1998	Nicaragua	1.34
10	Storm (Ismael)	1995	Mexico	1.16

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

Central America

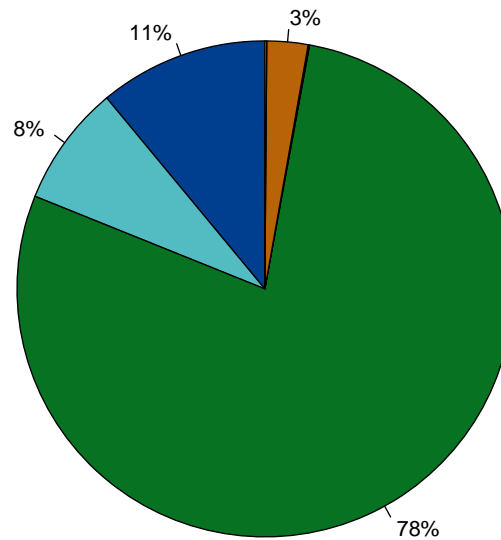
Distribution of (a) number of disasters, (b) deaths and (c) economic losses (1970-2009)

Total = 385 disasters



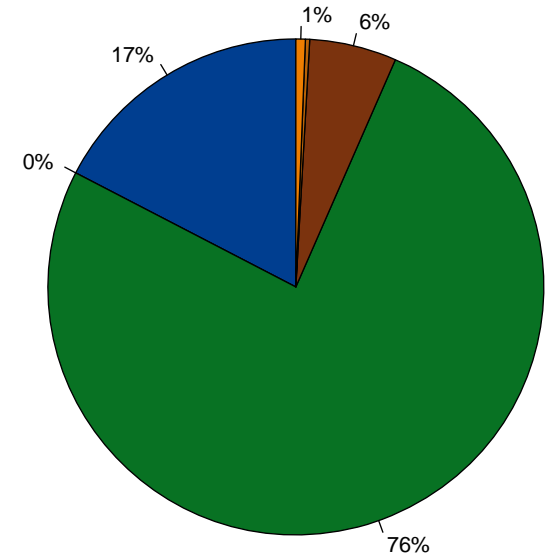
(a)

Total = 41,347 deaths



(b)

Total = US\$ 47.1 billion



(c)

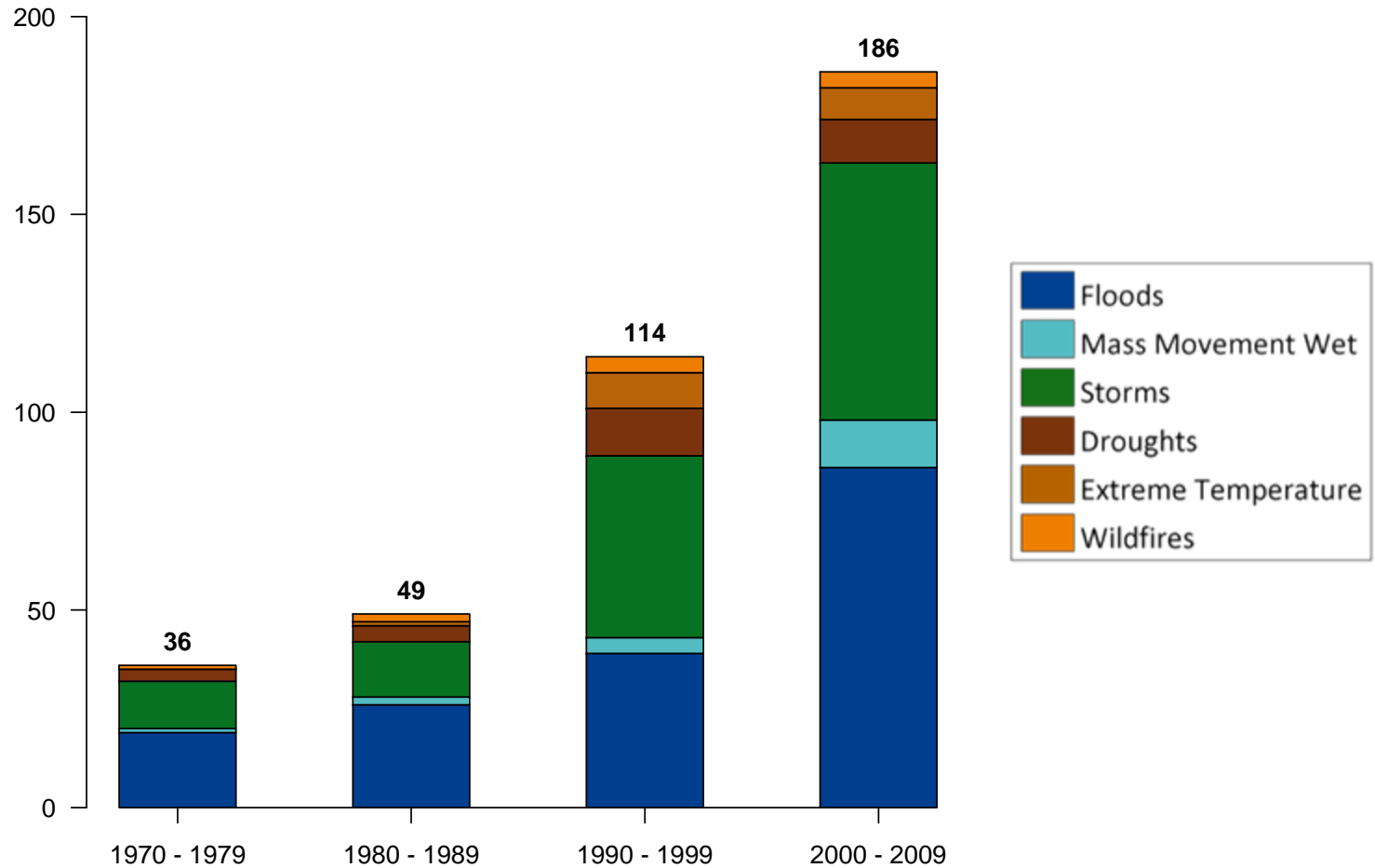
(in US\$ billion, adjusted to 2011)

■ Floods
 ■ Mass Movement Wet
 ■ Storms
 ■ Droughts
 ■ Extreme Temperature
 ■ Wildfires

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

Central America

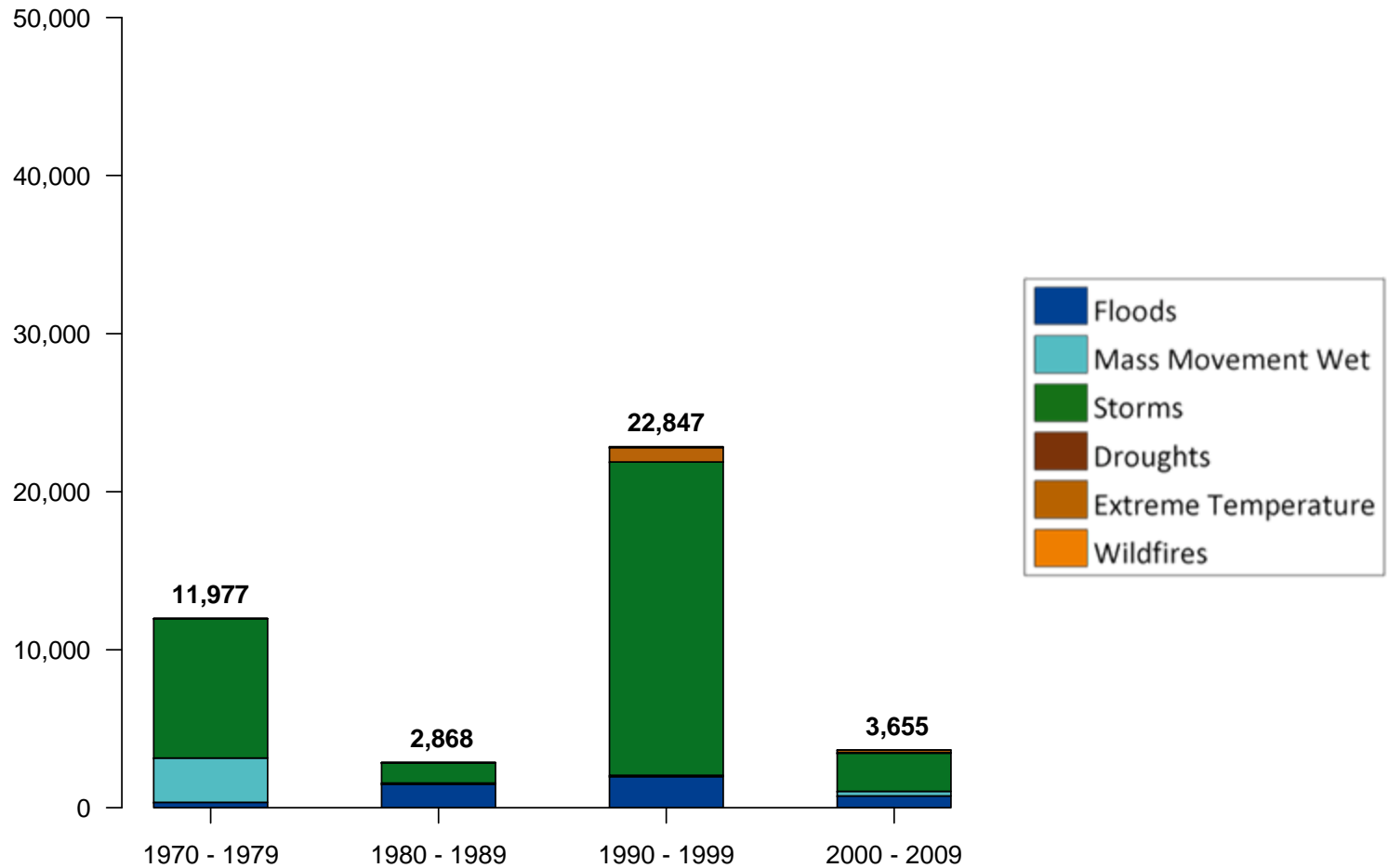
Disasters by decade by hazard type (1970-2009)



Source: EM-DAT: The OFDA/CRED International Disaster Database - www.em-dat.be
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Central America

Deaths by decade by hazard type (1970-2009)

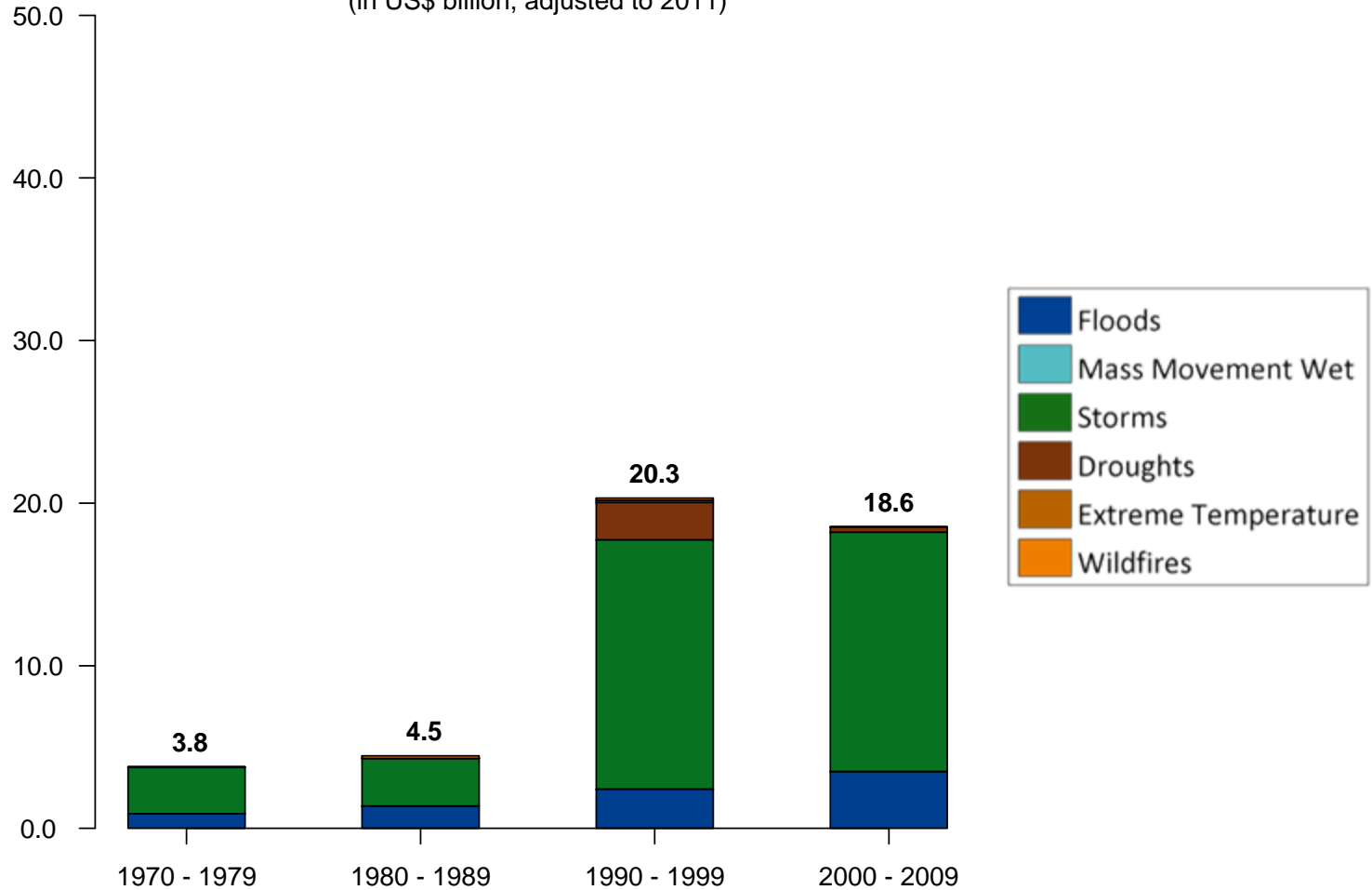


Source: EM-DAT: The OFDA/CRED International Disaster Database - www.em-dat.be
Université Catholique de Louvain - Brussels - Belgium

Central America

Economic losses by decade by hazard type (1970-2009)

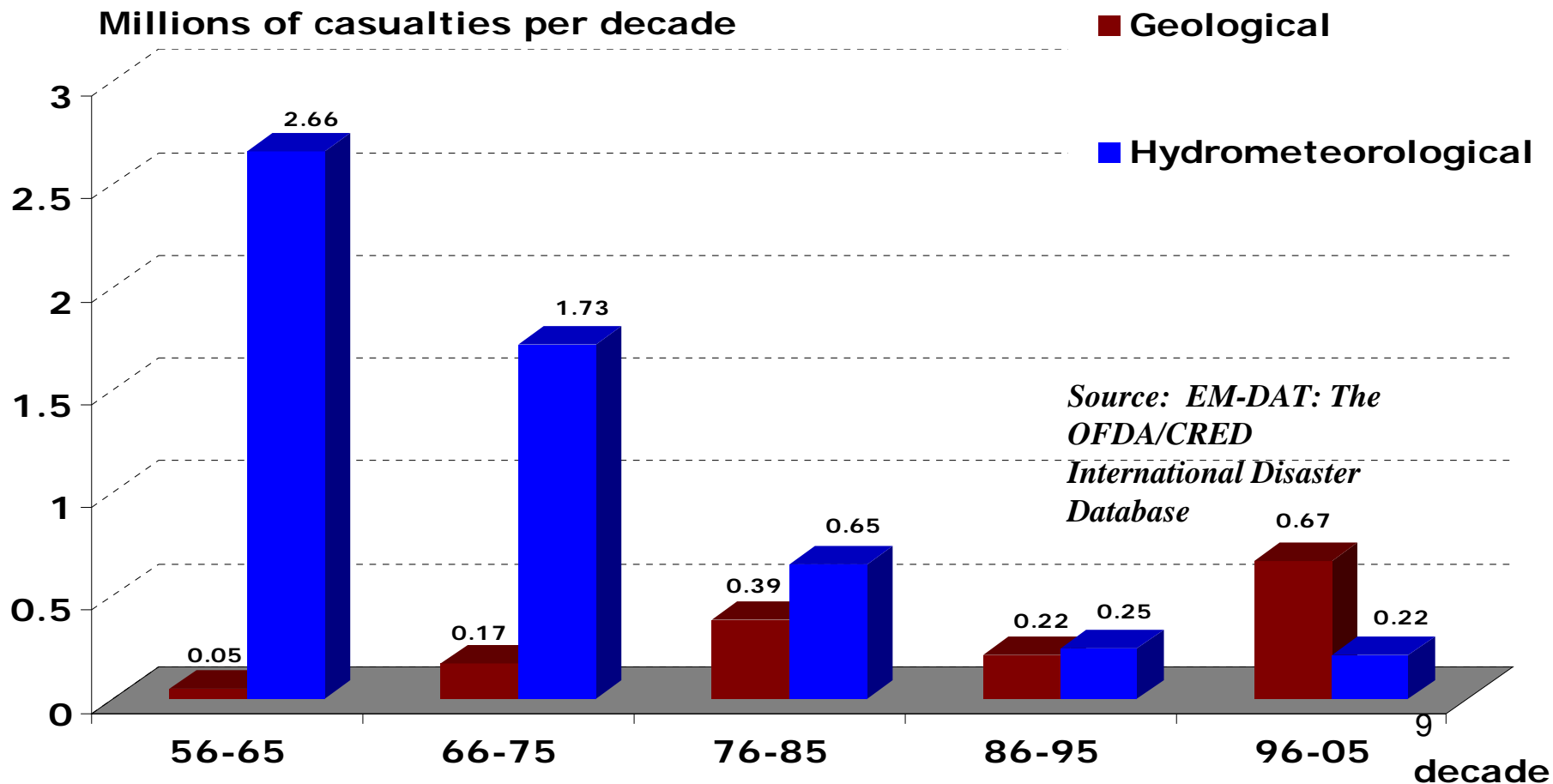
(in US\$ billion, adjusted to 2011)



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

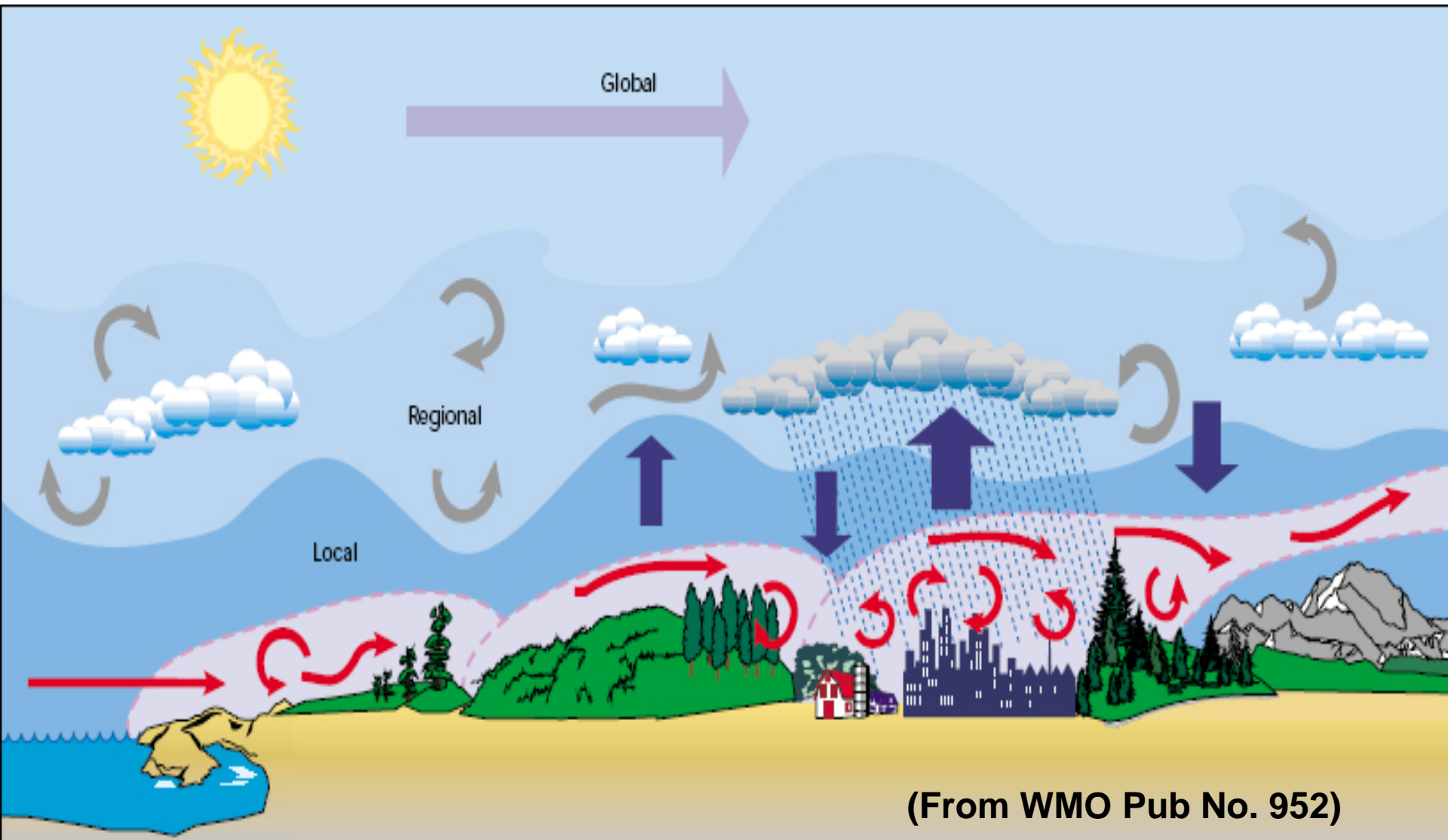
First the good news.....

Loss of life related to hydro-meteorological hazards generally falling!



Concerns...

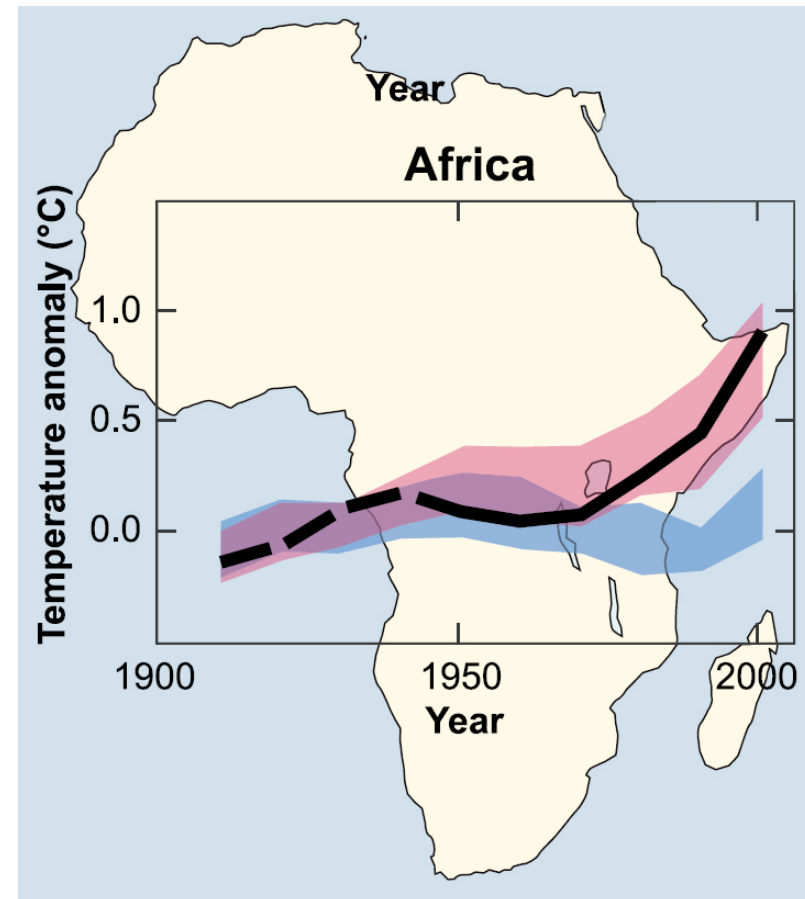
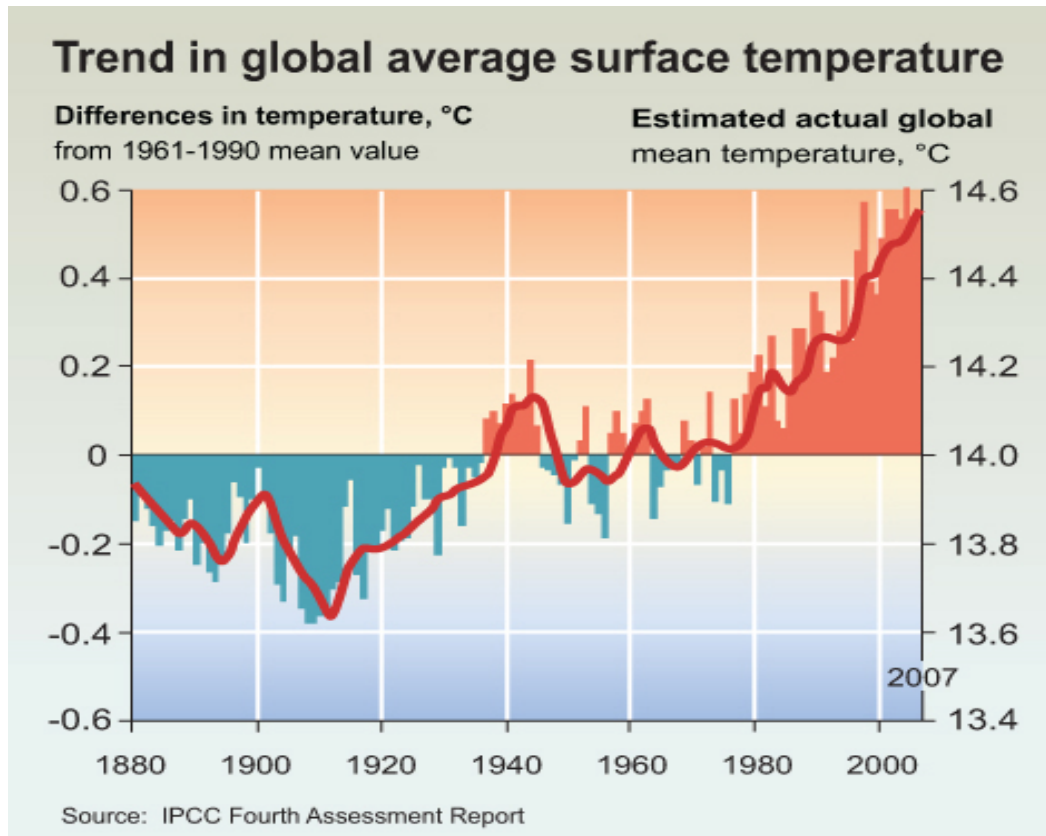
Multi-Scale Issue: Global, regional & local effects of climate affect different societies in different ways!



(From WMO Pub No. 952)

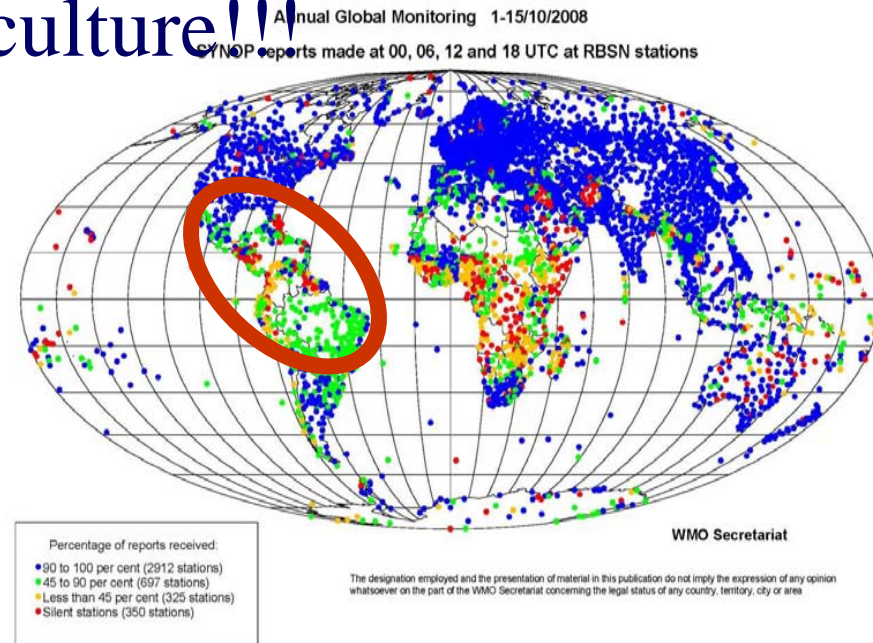
Concerns...

The past is no longer a trustworthy indicator of the future.....changes in location, severity and frequency of weather extremes!



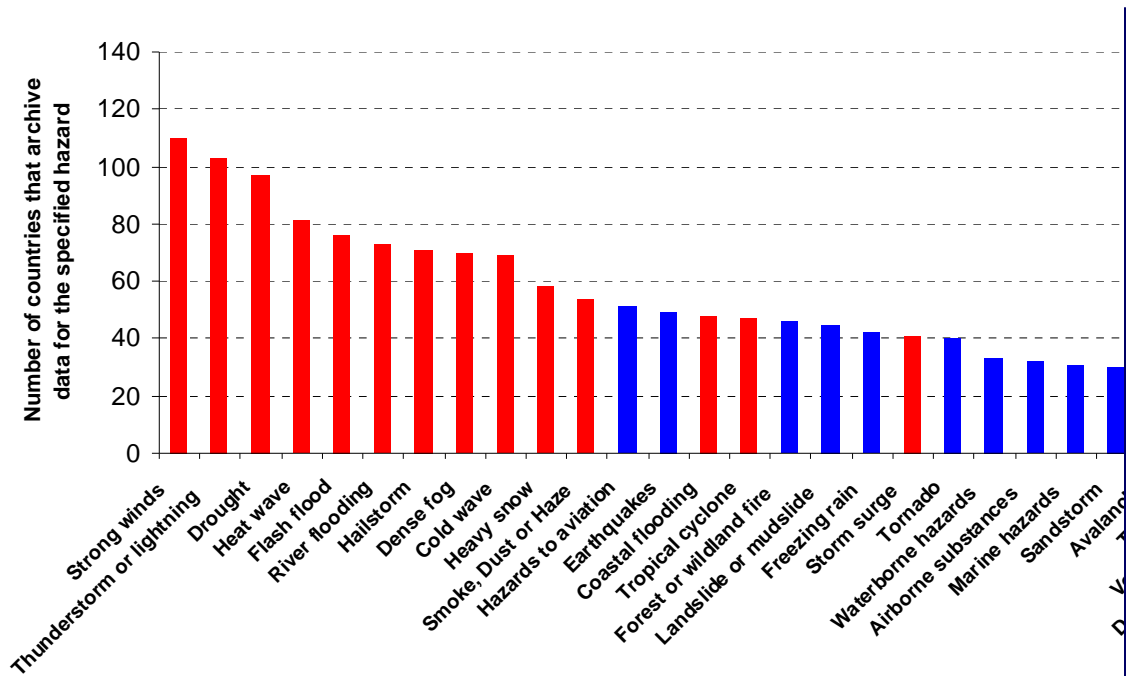
Challenges...

- Many countries need improvement and modernizations of meteorological infrastructure, institutional, technical capacities!
- Institutional capacities in meteorology, hydrology climate services are varied across countries!!
- Need for service oriented culture!!!
- Sustainability!!



Challenges

Over 80 % of National Meteorological Services....



- Not maintaining hazard data systematically
- Need data rescue & Data Management Systems
- Need Standards for:
 - Monitoring
 - Hazard database and metadata
 - Analysis tools
 - ✓ Statistical analysis
 - ✓ Climate modelling
 - Human expertise

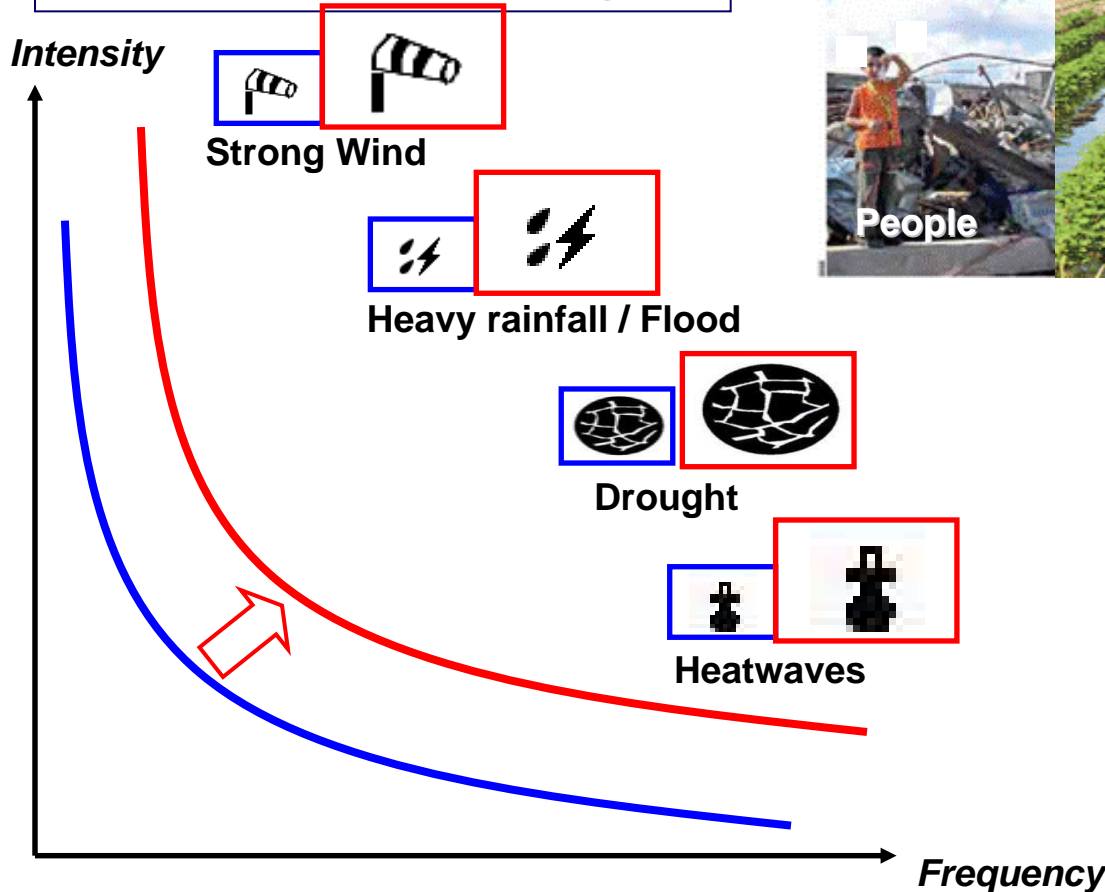
Source: 2006 WMO Country-level DRR survey

http://www.wmo.int/pages/prog/drr/natRegCap_en.html

Concerns...

Exposure and vulnerability on the rise across sectors ..a major development Issue...

Hazard intensity and frequency increasing linked to climate variability and change!

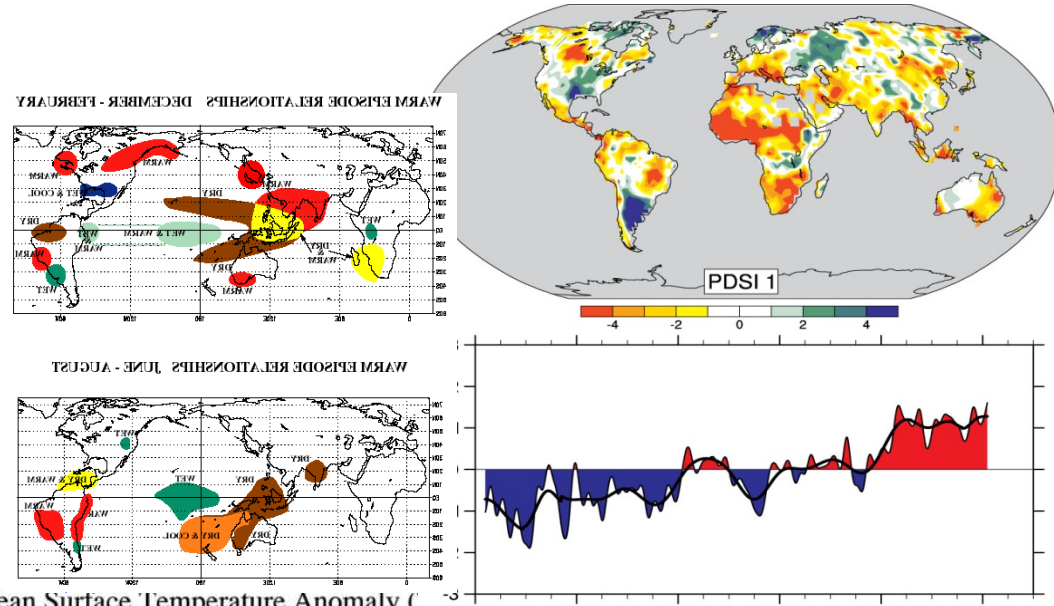
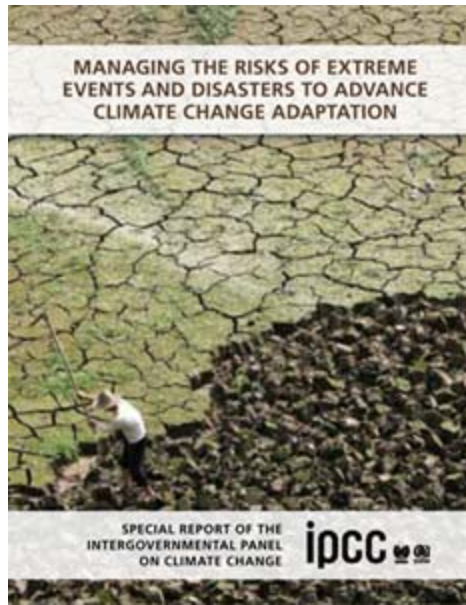


...need for informed risk management!

Opportunities....

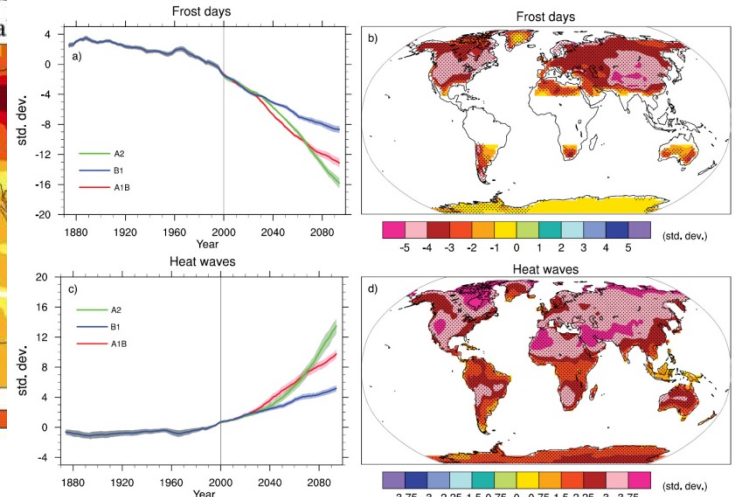
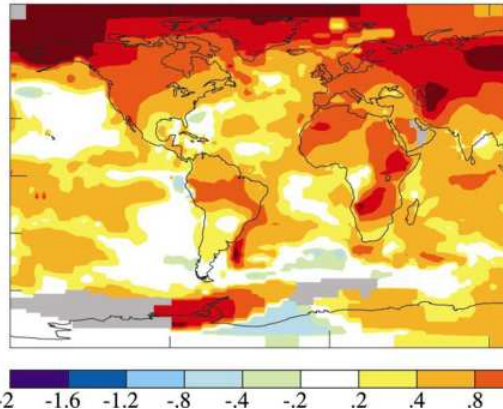
Continuous progress in understanding limits of predictability and forecasting...

Need for operational production and provision of relevant climate information at different levels!



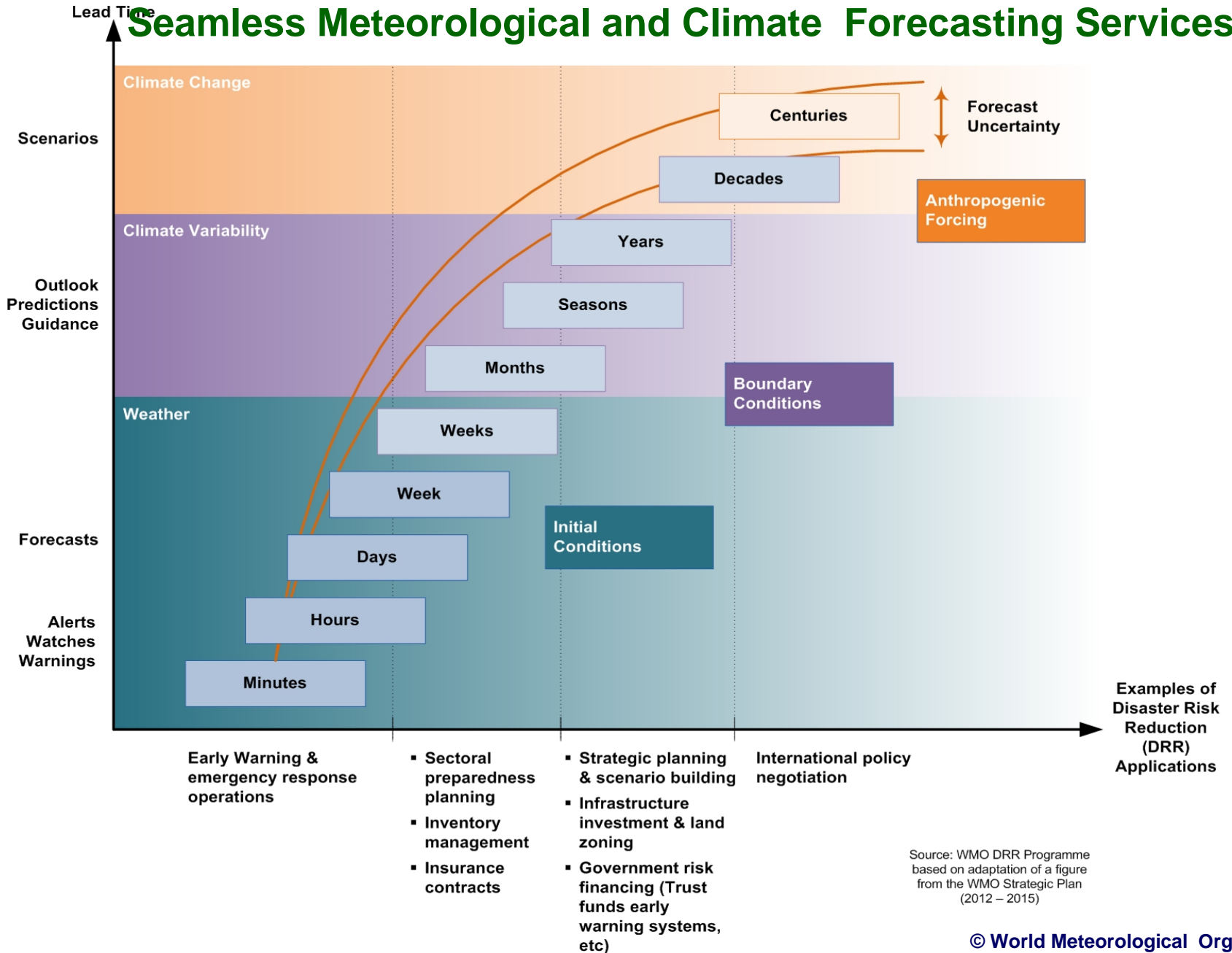
2001-2005 Mean Surface Temperature Anomaly (°C)

Base Period = 1951-1980



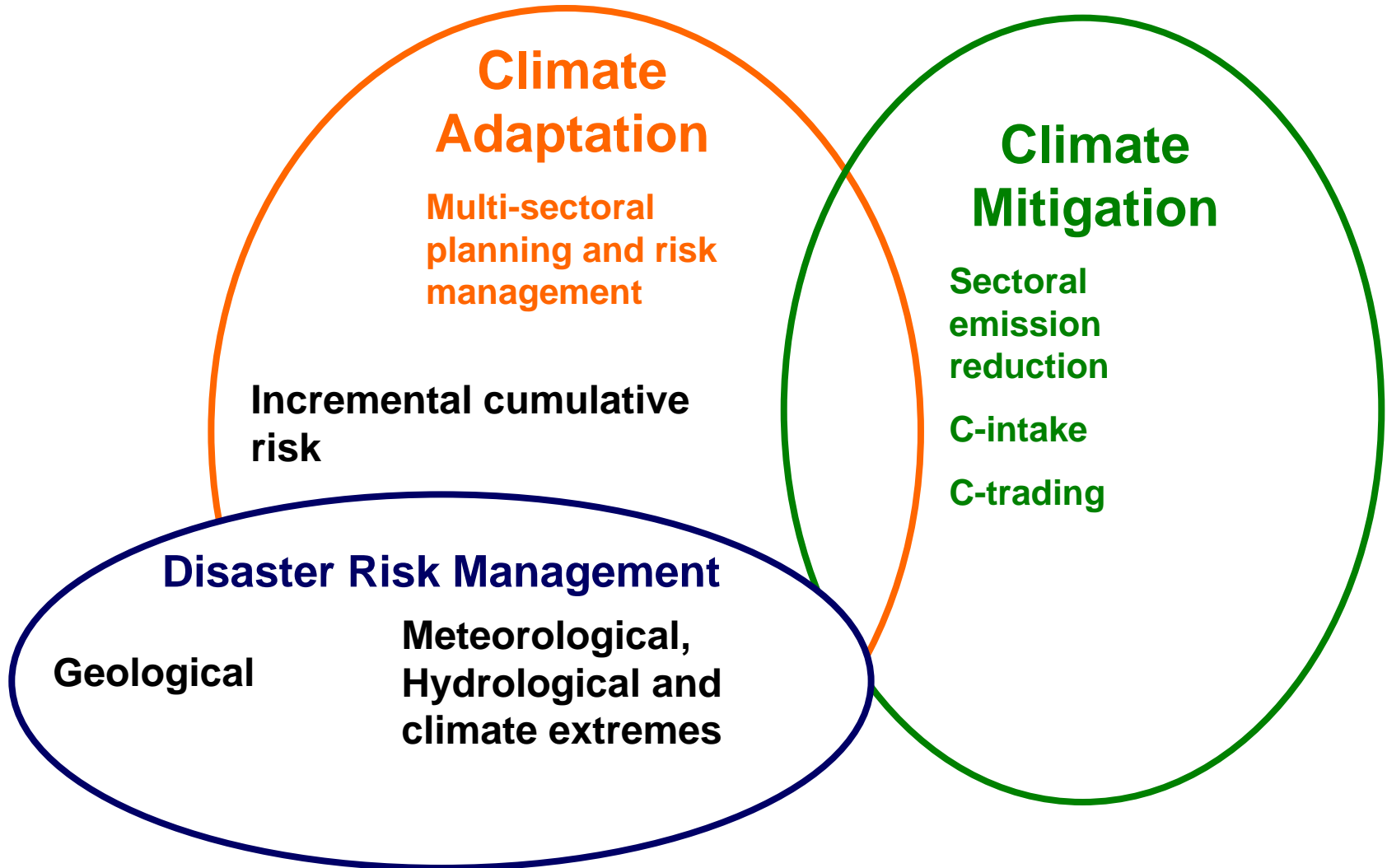
Opportunities.....

Seamless Meteorological and Climate Forecasting Services



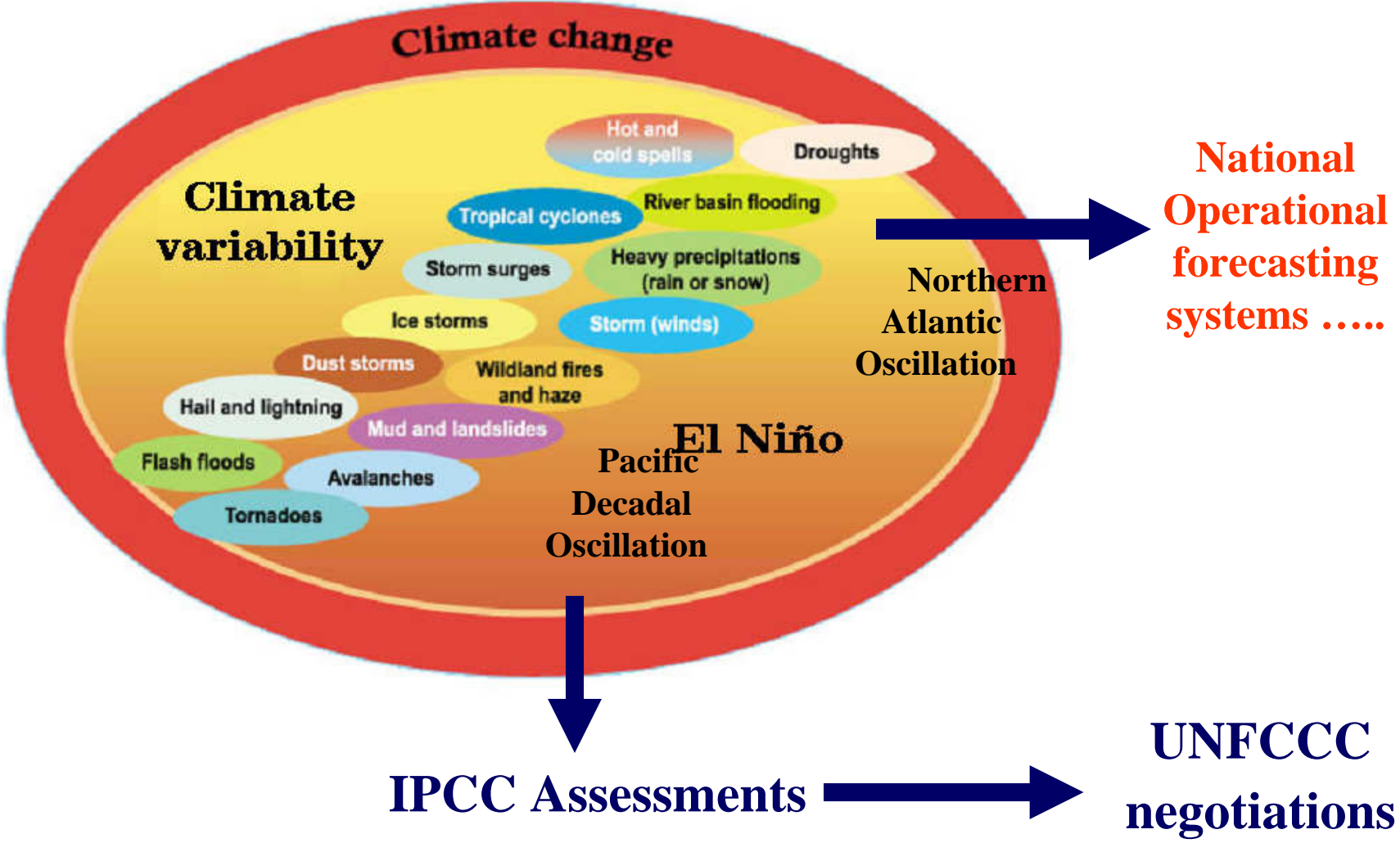
Opportunities

Decisions in Climate Mitigation, Adaptation and DRR are interlinked



From coordinated public science to operational forecasting of extreme events

World Climate Research Programme (WCRP)
World Weather Research Programme (WWRP)



60 Years of National, Regional and Global Coordination

Systematic Global Data Collection, Analysis and Forecasting



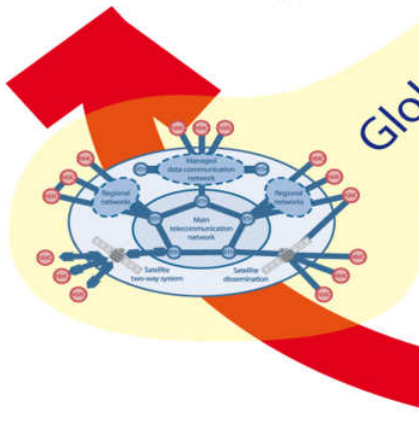
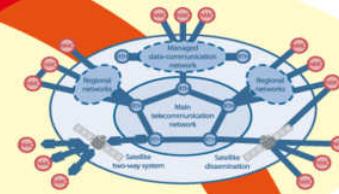
National Meteorological and Hydrological Services

Meteorological, hydrological and climate value-added products and warning advisories

Meteorological, hydrological and climate observations

191 Member States

Global Telecommunication System

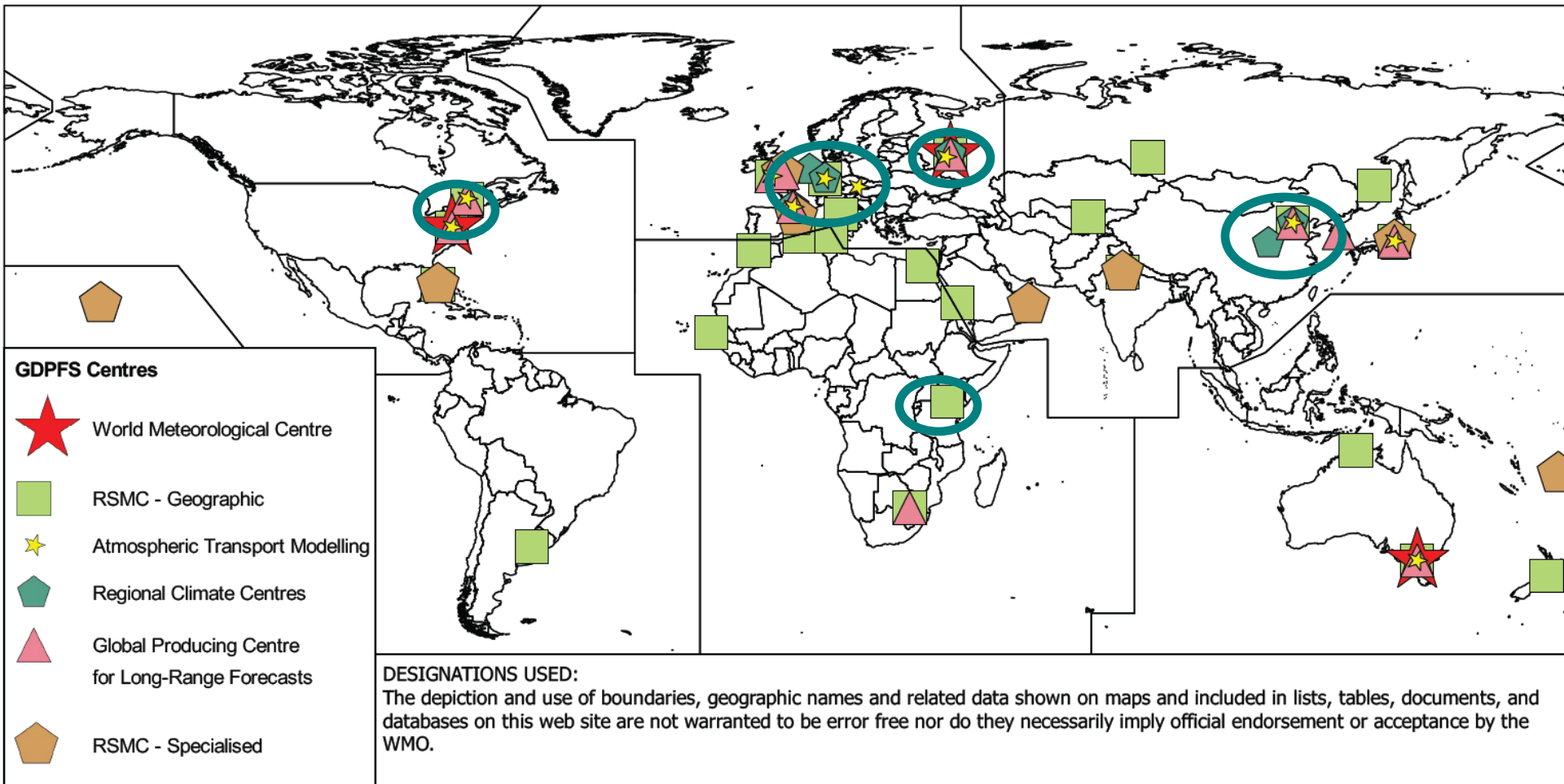


- Regional Meteorological Training Centres
- Drought Monitoring Centres
- Medium Range Forecasting Centre
- ▲ Tropical Cyclone Forecasting Centres
- Environment Emergency Response Centres
- Regional Meteorological and Hydrological Specialised Centres
- World Meteorological Centres

Global Data Processing and Forecasting System

WMO Actions

WMO Regional Climate Centers are being established ...



WMO Disaster Risk Reduction Programme (established in 2004)

Harnessing WMO Sponsored research,
expertise and operational capacities in
meteorology, hydrology and climate

for improving early warning systems and
preparedness, sectoral disaster risk
reduction, risk financing and transfer
decisions...

Hyogo-Framework for Action 2005-2015 in a nut shell...

Governance and Institutional Framework (Policy, Legislation, legal framework, institutional coordination)
(Multi-sector, Multi-level, Multi-Hazard)

Risk Assessment

Risk Reduction

Risk Financing and Transfer

QUANTITATIVE MULTI-HAZARD-MULTI-LEVEL, MULTI-SECTOR RISK ANALYSIS

Hazard, exposure and vulnerability databases

Statistical and forward looking approaches

PREPAREDNESS & RESPONSE:
early warning systems
emergency planning

PREVENTION and MITIGATION:
Sectoral Medium to long term planning (e.g. zoning, infrastructure, agriculture...)

Gov Investments, trust funds (ex-ante, post disaster)

CAT insurance & bonds

Weather-indexed insurance and derivatives

Other emerging products

Information and Knowledge Sharing
Education and training

2

1

3

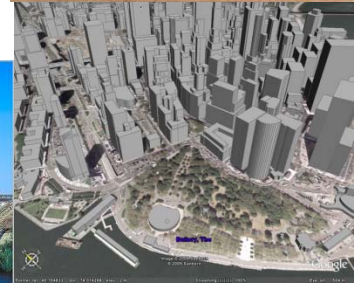
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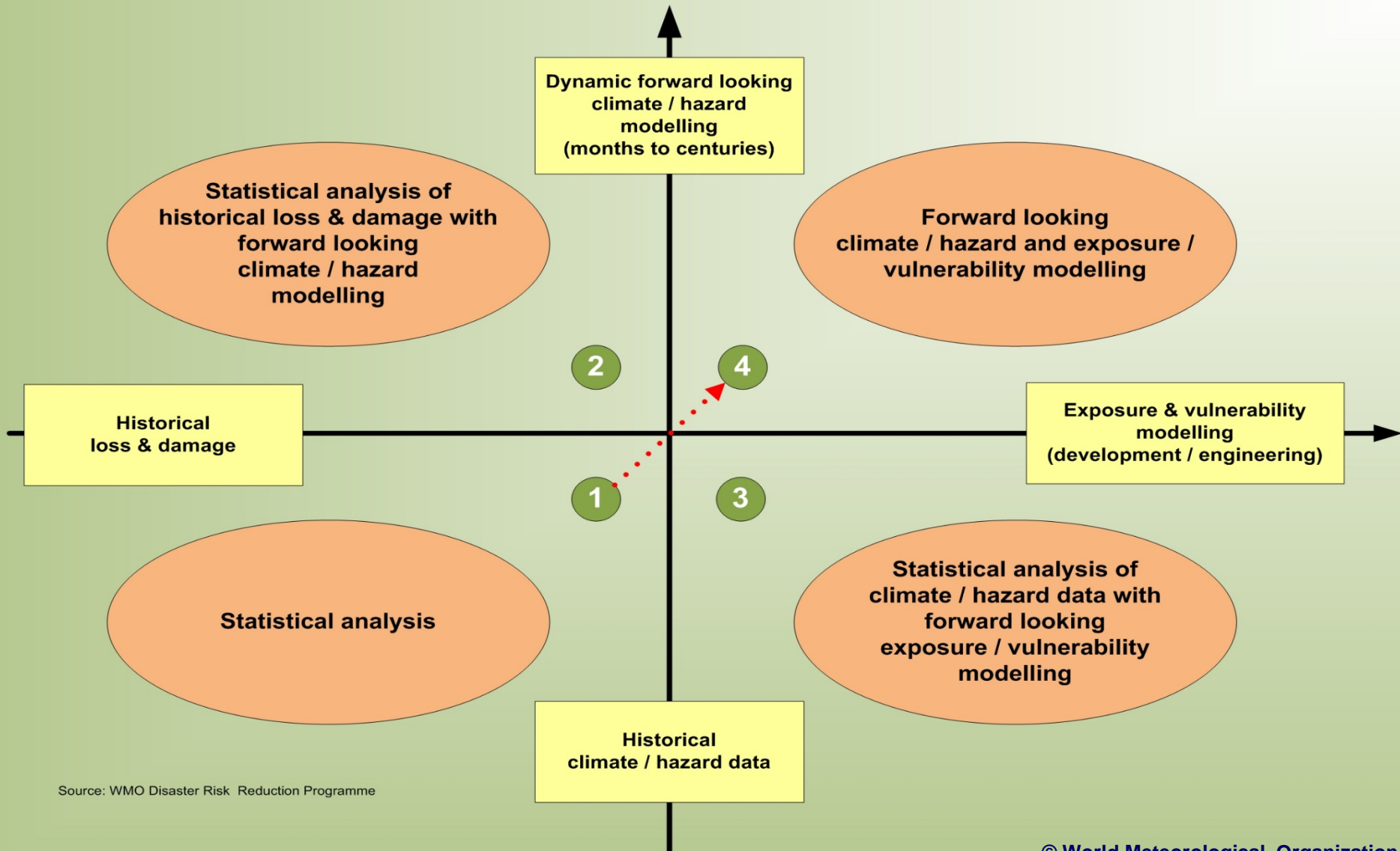
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A Multi-Sector, Multi Level Issue

- Policy and legislative process (Roles and responsibilities)
- Early Warning Systems development and on-going operations with Disaster Risk Management and local Communities
- Socio-economic sectors:
 - Land zoning
 - Infrastructure and urban planning
 - Financing /Insurance
 - Agricultural productivity and food security
 - Tourism
 - Health epidemics
 - Water resource management
 - Transport, etc...



Critical need for historical and forward looking multi-hazard data and analysis to support risk assessment...



Saving lives: Multi-Hazard Early Warning Systems

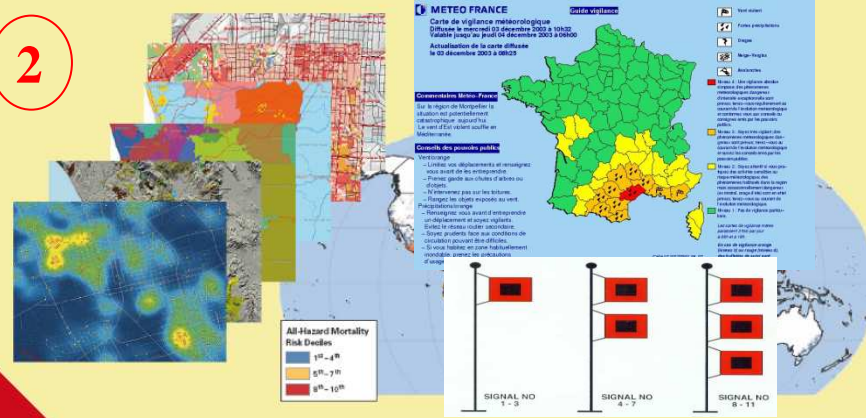
National to local disaster risk reduction plans, legislation and coordination mechanisms



Hazard Data and Forecasts

1

2



Risk Information



**Coordination
and
Collaborations**



**Communication and
Dissemination Mechanisms**

3

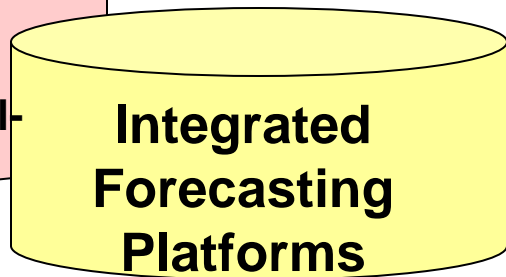
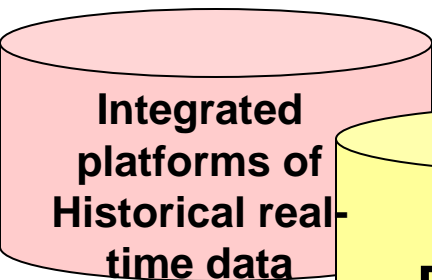
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**Preparedness and
Early Response**

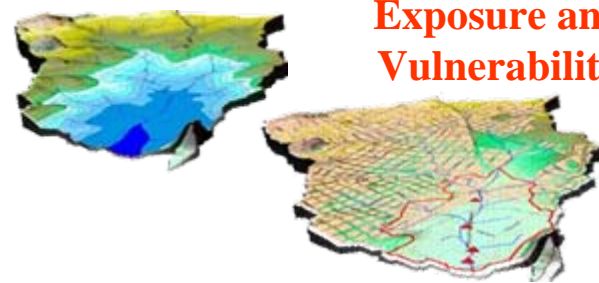
WMO Actions

Improving Meteorological, Hydrological and Climate Products and Services...

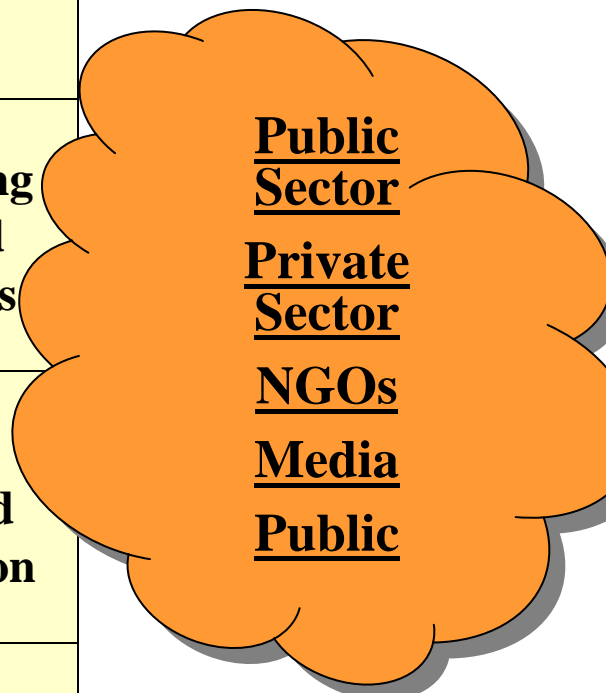
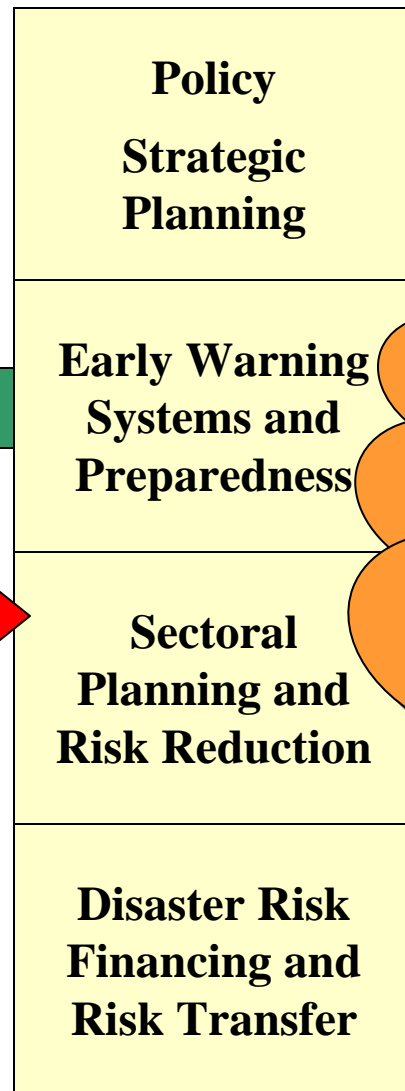


Hazard Analysis

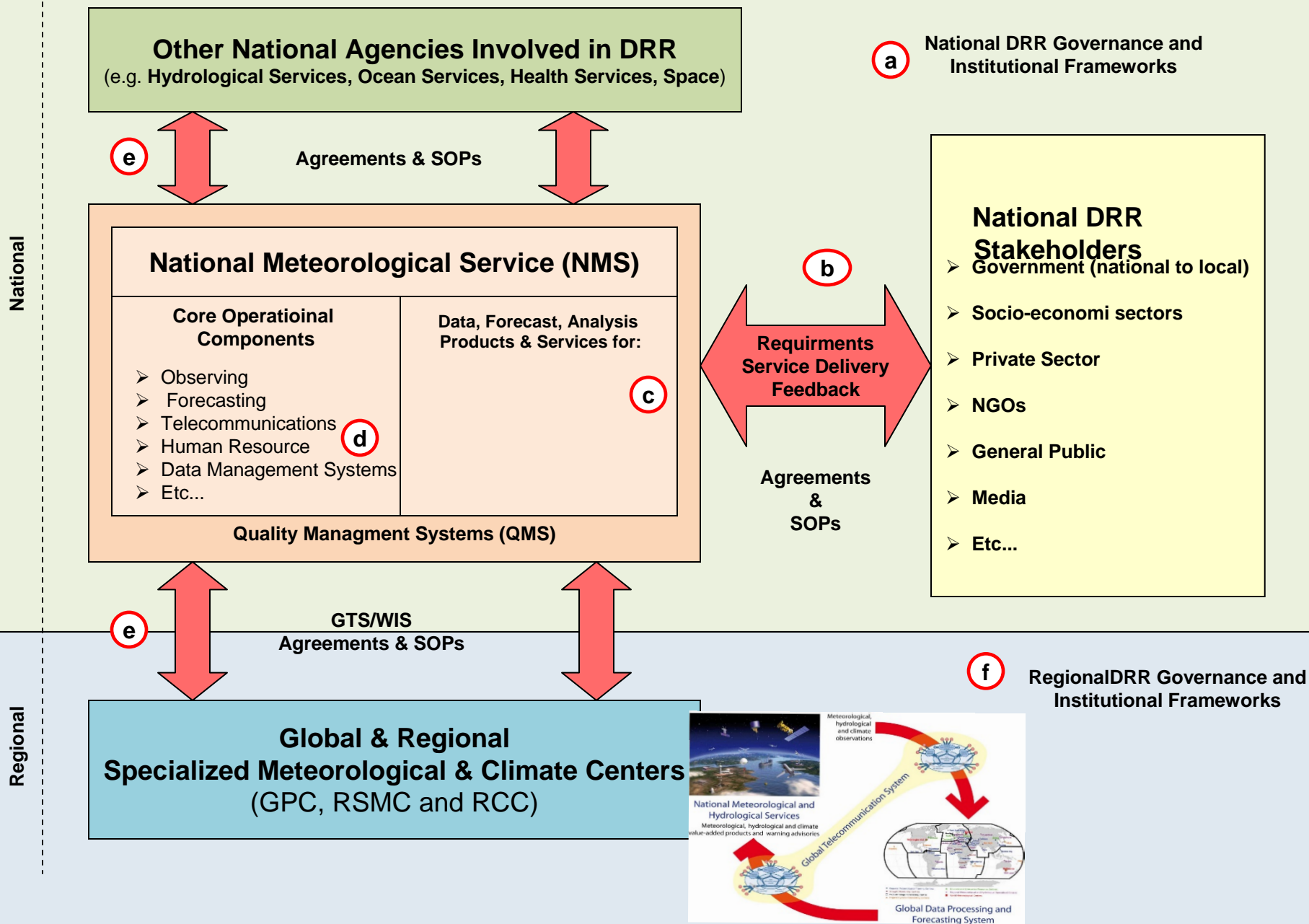
Exposure and Vulnerability



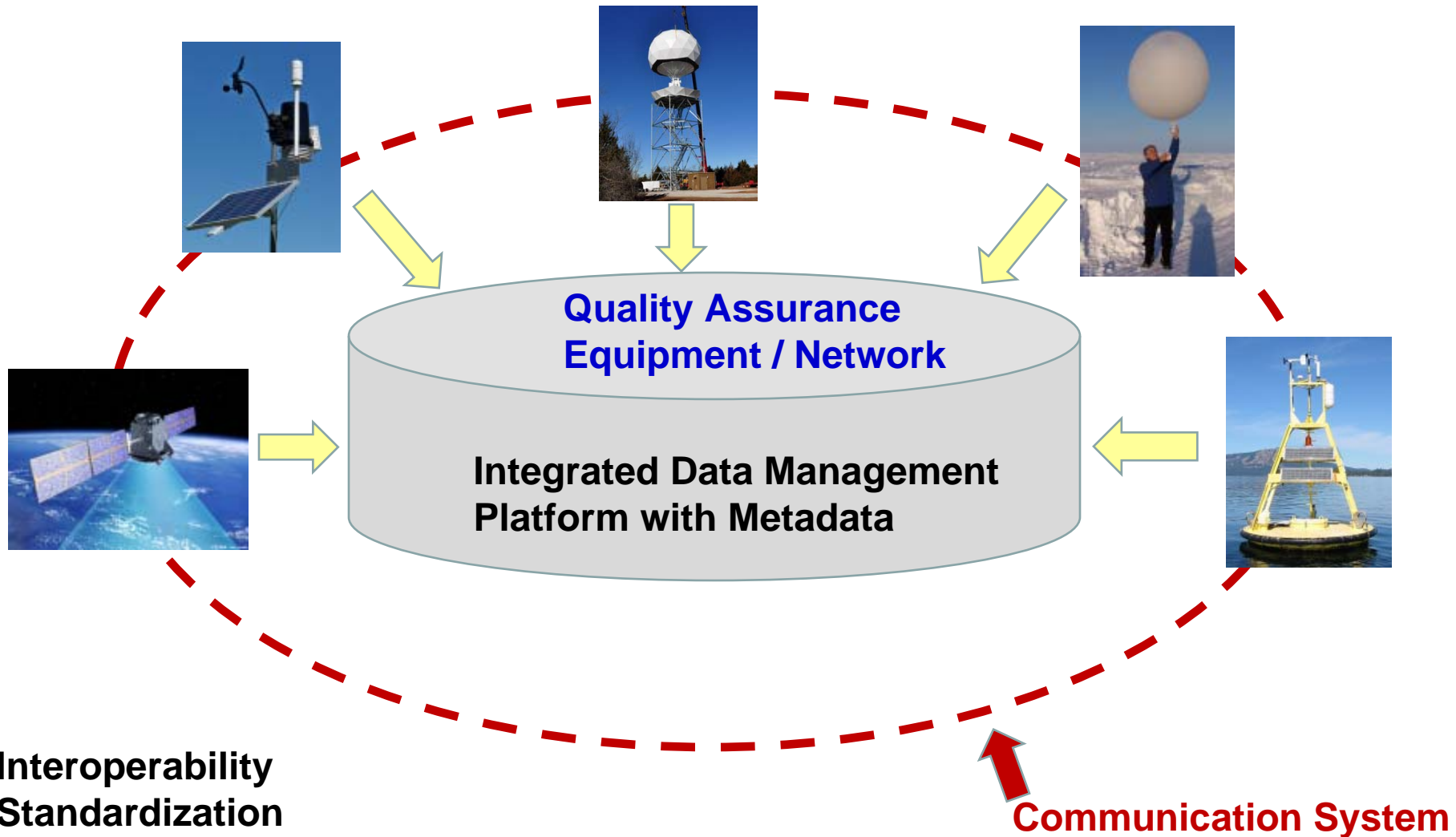
Sectors and Risk Analysis



Weather, Climate and Hydrological Services to support DRR Decision-Making



Concept: Integrated Data Platforms



- Interoperability
- Standardization
- Sustainability
- Technology Transfer
- Calibration and Quality Assurance

Concept: Integrated Forecasting and Service Delivery Platforms (Meteorological and Climate services)

Public & Media

Government Services

- National to local
- Disaster Risk Management
- Various ministries (finance and Planning, Agriculture, Health, energy..)

Commercial and industry Services

- Transport, Agriculture, Water, insurance

Product and Service Delivery Platforms and Service Delivery Models

Integrated Forecasting Platforms

Marine & Coastal

- Tropical Cyclone
- Storm Surges
- High Waves
- Etc.

Severe Weather

- Heavy precipitation (Rain & Snow)
- Severe Storms
- Etc.

Environmental

- Air Pollution / Air Quality
- Heat Waves / Health
- Etc.

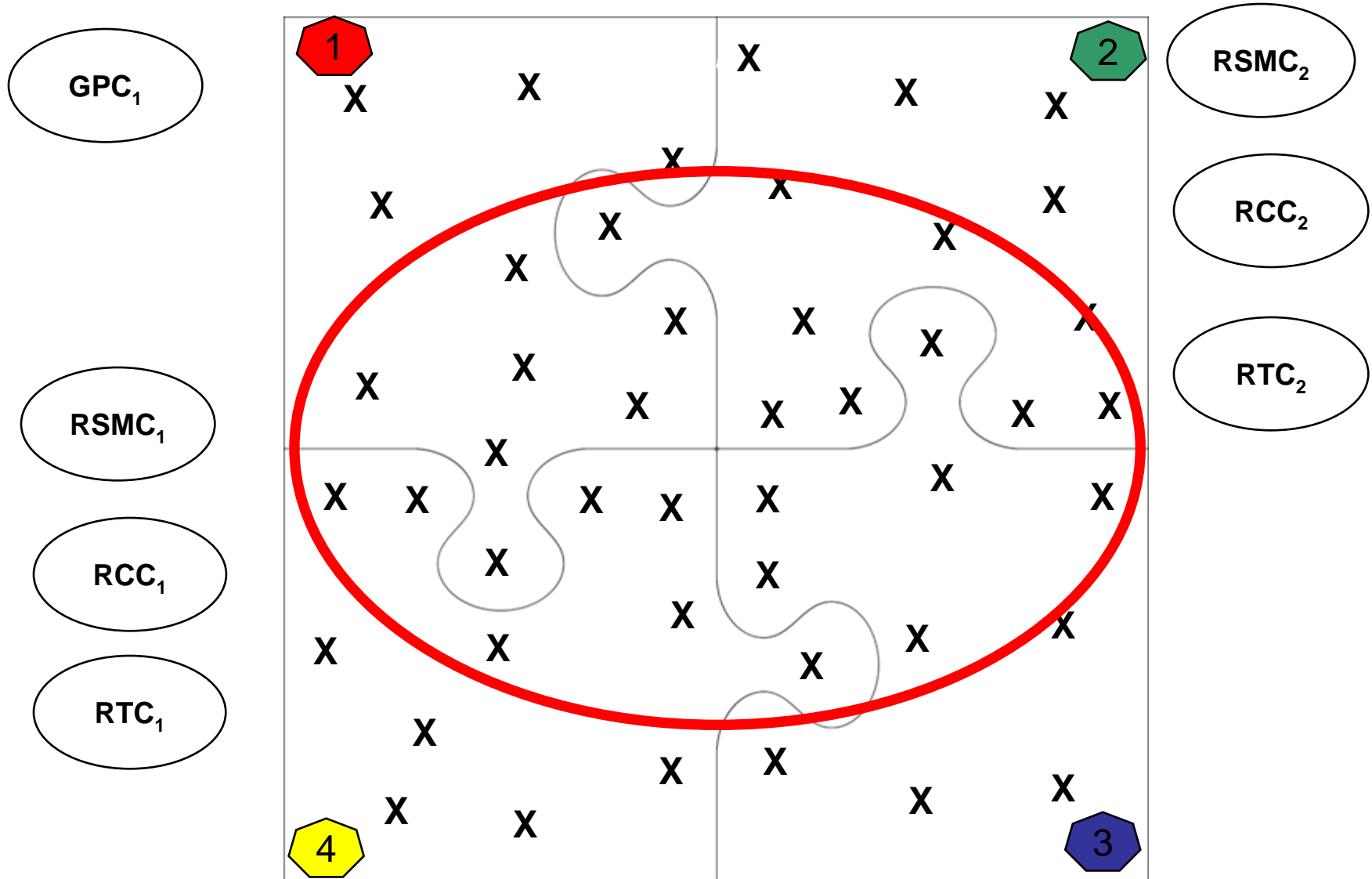
Emergency Response

- Nuclear
- Biological
- Volcanic Ash
- Etc.

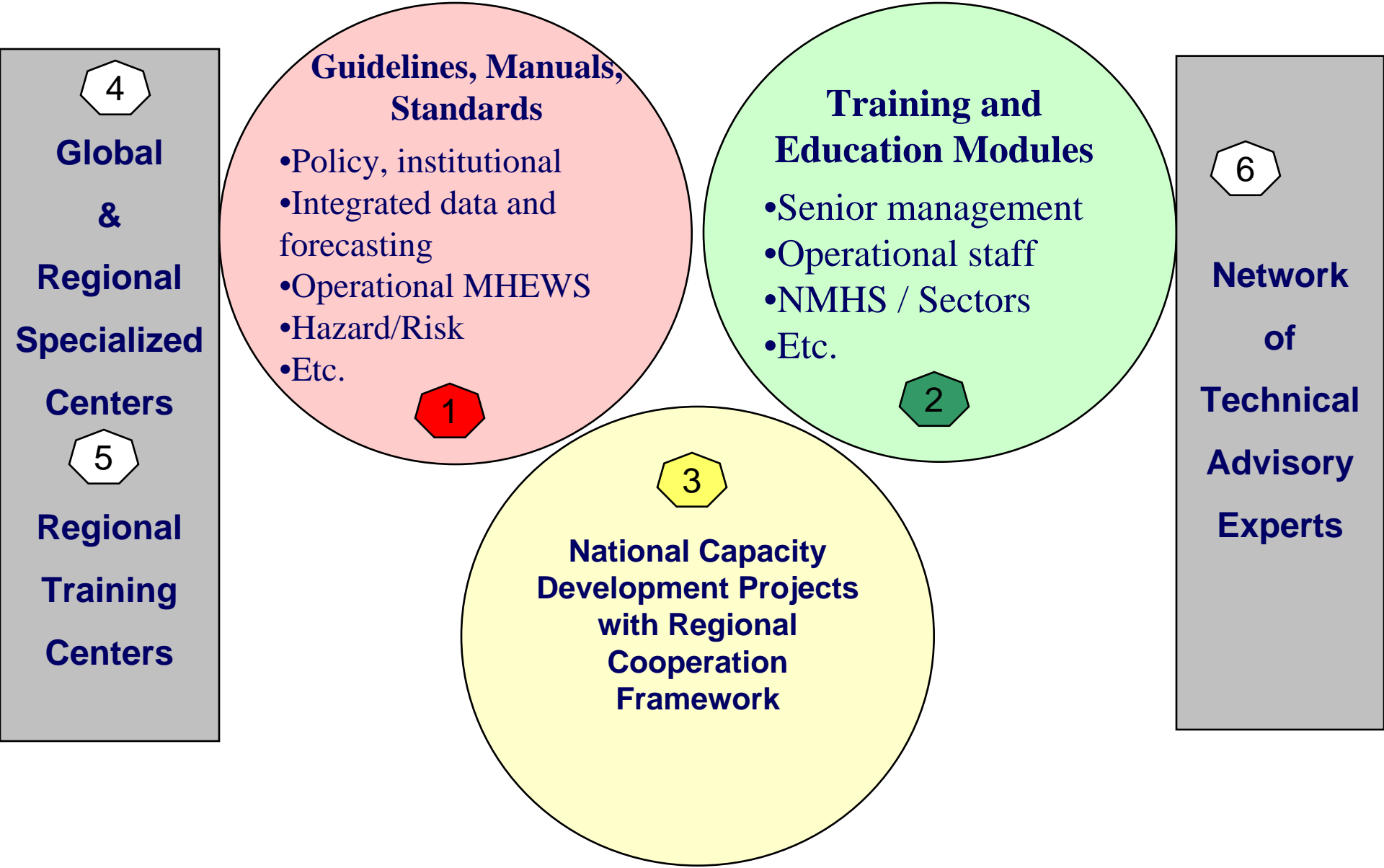
(Sub)Seasonal Forecasting

- Drought forecasts
- Etc.

Concept: Integrated Observing & Monitoring Networks with Regional Cooperation Framework



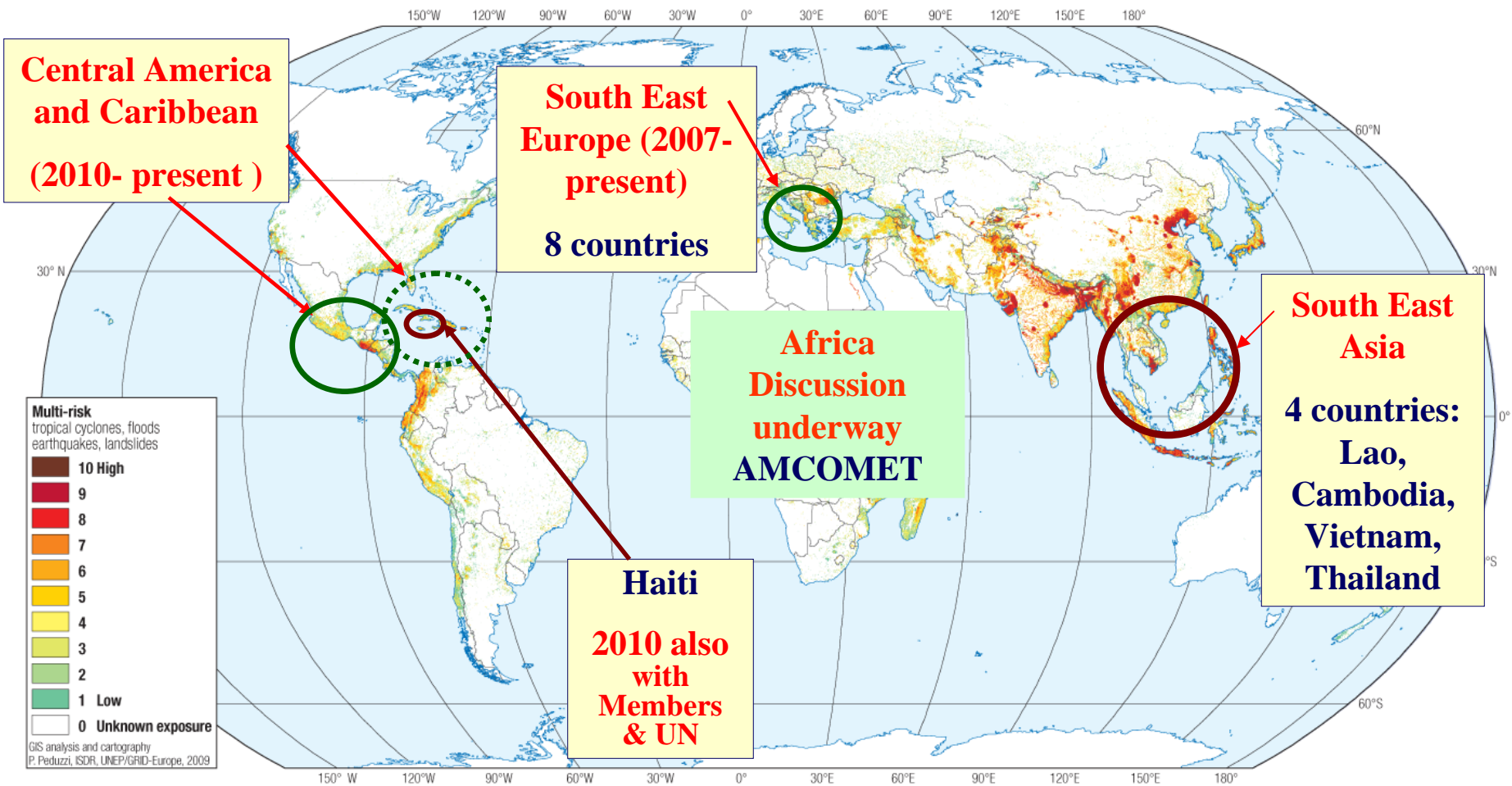
Concept: Building Blocks for Scaling Up (1/2)



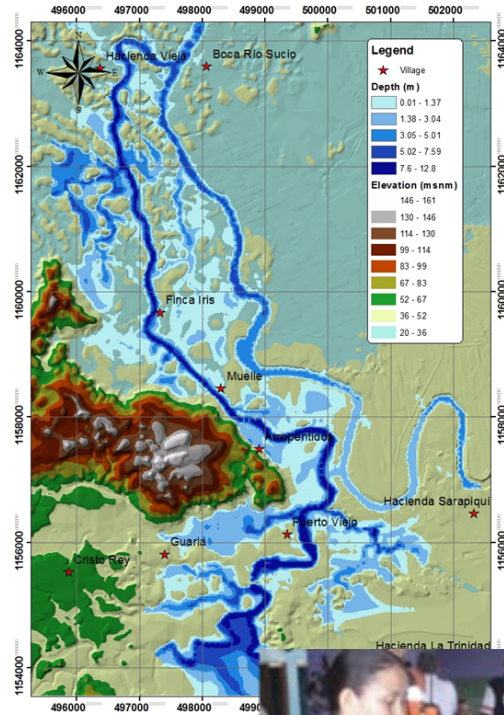
Comprehensive Phased National Capacity Development Projects with regional cooperation

Framework

Partners: WMO, World Bank, UN-ISDR, UNDP, Regional Socio-economic Groupings, Regional Centers.....



Building Community Resilience to Flooding in the Sarapiquí, Costa Rica



EWS procedures should be known by all organizations and institutions related to its implementation, and disseminated to communities to ensure a correct and timely response



Operation Center at CEC Naranjales during the



In the context of the EWS it is very important that communities be aware of their own vulnerabilities and capacities

Thank you



Global Framework for Climate Services



UN SYSTEM
DELIVERING AS ONE ON
CLIMATE KNOWLEDGE

For more information contact:

Maryam Golnaraghi

Chief

Disaster Risk Reduction

Programme

World Meteorological

Organization

Tel. +41.22.730.8006

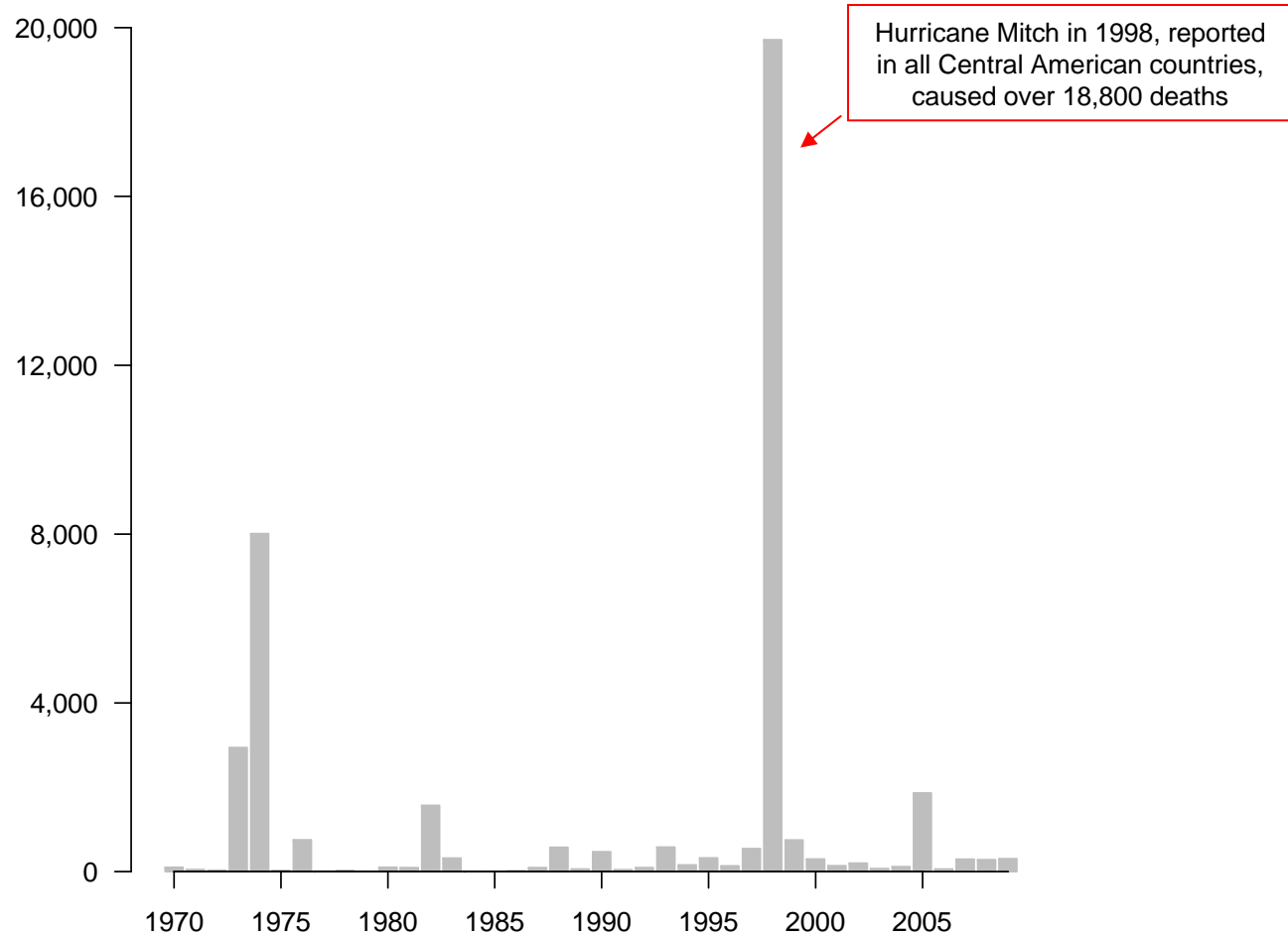
Email. MGolnaraghi@wmo.int

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



Central America

Annual number of deaths (1970-2009)

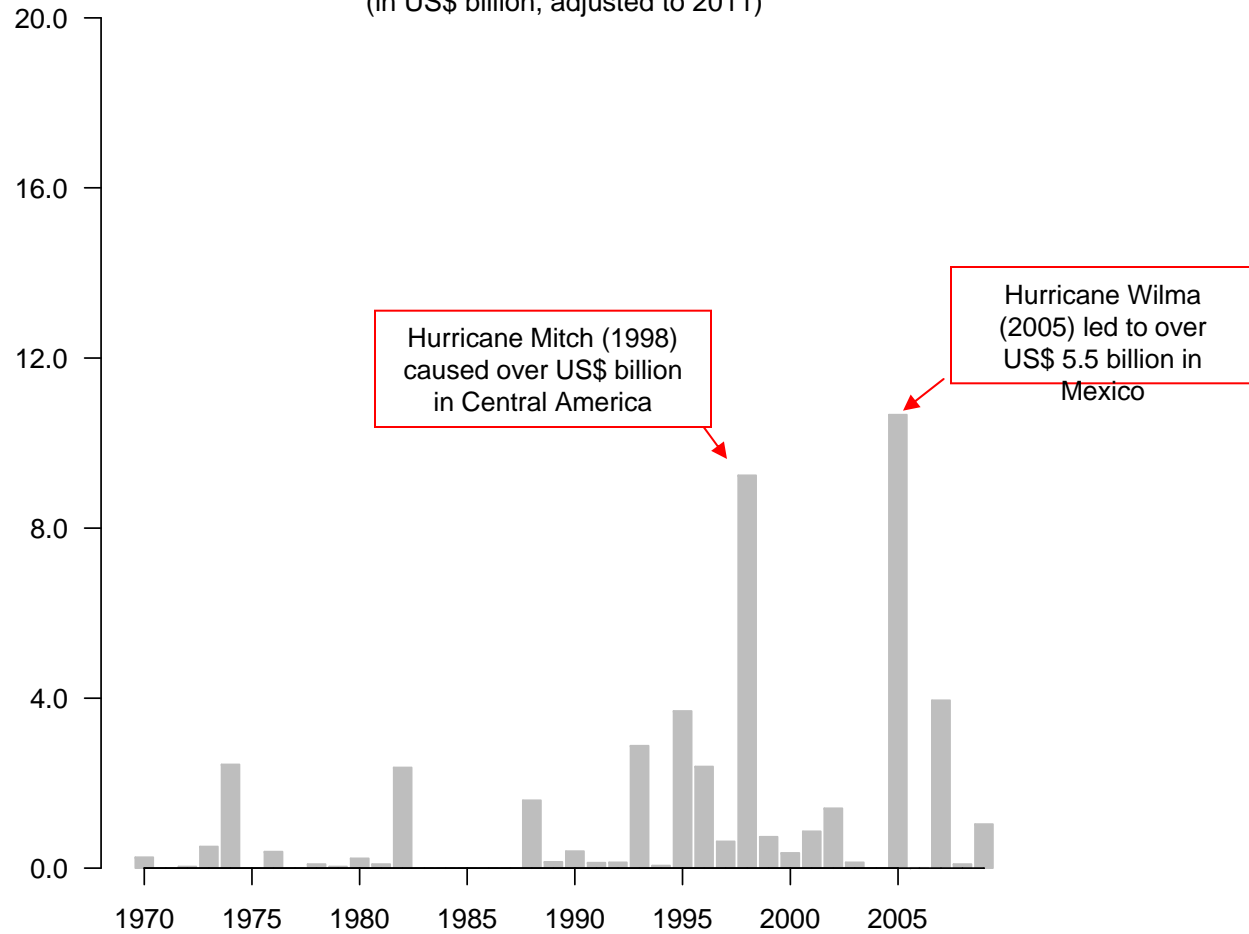


Source: EM-DAT: The OFDA/CRED International Disaster Database - www.em-dat.be
Université Catholique de Louvain - Brussels - Belgium

Central America

Annual economic losses (1970-2009)

(in US\$ billion, adjusted to 2011)



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

Challenges

Source: 2006 WMO Country-level DRR survey http://www.wmo.int/pages/prog/drr/natRegCap_en.html

- **XX%** of NMHS need amendments of national policies and legislation
- **XX%** of NMHS need modernization of meteorological infrastructure (e.g., observation networks, forecasting, telecommunication, data rescue,...)
- **XX%** of NMHS need technical and management training
- **XX%** of NMHS need multi-sectoral institutional partnerships, coordination



Meteorological infrastructure/systems... high return on investment!

Source: "Natural Hazard, UnNatural Disaster, Economics of Effective Prevention," World Bank and United Nation's Report (2010)

Priority Hazards

Source: 2006 WMO Country-level DRR survey
(http://www.wmo.int/pages/prog/drr/natRegCap_en.html)



Severe Storms, Droughts, **Flash and river floods**, forest and wild fires, heat waves and cold spells, **land- and mud-slides**, marine and aviation hazards, **tropical cyclones and storm surges**

Other: volcanic ash transport, air pollution, locust swarms, health epidemics, tsunami, etc...

WMO technical standardization process has been activated for DRR



For nearly 20 hazards (cascading effects)

- (1) Guidelines and standards for hazard monitoring, databases, hazard analysis for risk analysis (2013-2015)
- (2) Guidelines and standards for operational multi-hazard early warning systems (2013-2017)
- (3) Requirements for Disaster Risk Financing and Insurance (2013-2014)

Concept: WMO On-Line Help-Desk

Access to Comprehensive Guidelines, Manuals and Standards

