Risk identification, monitoring and Early Waning: Tools and Practices

By

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95% of natural disasters, 98 % of casualties and more than 45 % of economical loses are related to Climate or Meteorological / Hydrological hazards.

Source: EM-DAT: The OFDA/CRED International Disaster Database - www.em-dat.net - Université Catholique de Louvain - Brussels - Belgium
## Conclusions from 4th IPCC Assessment Report
### WG II for Africa

<table>
<thead>
<tr>
<th>Phenomenon</th>
<th>Likelihood</th>
<th>Major projected impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased frequency of <strong>heat waves</strong></td>
<td>Very likely</td>
<td>Increased risk of heat-related mortality</td>
</tr>
<tr>
<td>Increased frequency of <strong>heavy precipitation</strong> events</td>
<td>Very likely</td>
<td>Increased loss of life and property due to flooding, and infectious, respiratory and skin diseases</td>
</tr>
<tr>
<td>Area affected by <strong>drought increases</strong></td>
<td>Likely</td>
<td>Increased risk of food and water shortage</td>
</tr>
<tr>
<td>Intense <strong>tropical cyclone activity</strong> increases</td>
<td>Likely</td>
<td>Increased risk of deaths, injuries, water- and food-borne diseases; Disruption by flood and high winds; Potential for population migrations, loss of property</td>
</tr>
<tr>
<td>Increased incidence of <strong>extreme high sea level</strong></td>
<td>Likely</td>
<td>Increased risk of deaths and injuries by drowning in floods; Potential for movement of populations and infrastructure</td>
</tr>
</tbody>
</table>
Increasing Risks under a Changing Climate

Intensities and frequencies of hazards are increasing:

- Strong Wind
- Coastal Marine Hazards
- Tropical Cyclones
- Heavy rainfall / Flood
- Heatwaves

Exposure is increasing!

Need for disaster risk management
In Summary, Disaster risks are increasing, due to:

– Increasing intensity and frequency of hydrometeorological hazards;

– Increasing value of exposed elements due to development and demographic expansion.

Disaster risk management is a critical component of climate change adaptation.
We cannot avoid hazards
...but we can Prevent Them from Becoming Disasters

One Dollar spent on disaster preparedness can prevent 5 - 10 Dollar of disaster-related losses

Source: World Resources Institute
Brief Overview of WMO
- Specialized Scientific and Technical Agency of the United Nations Responsible for Observing, Monitoring, Detecting, Forecasting and Warnings of Meteorological, Hydrological and Climate Conditions

- 188 Members, Represented by the Heads of the National Meteorological and Hydrological Services at the
Mandate for Natural Hazards related to Weather, Climate and Water …

Primary mandate for: Severe storms, tropical cyclones (hurricanes and typhoons), storm surges, floods, cold spells, heat waves, cold waves, droughts, volcanic ash transport, air pollution, Sand and dust storms, etc.

Contributing to: Forest fires, locust swarms, health epidemics, tsunami, etc…
DRR Strategic Foundation


WMO Strategic Plan 2008-2011

WMO Strategic Goals in Disaster Risk Reduction
1. Analyzing and providing hazard information for risk assessment

2. Strengthening and sustainability of multi-hazard early warning systems

3. Delivery of timely and understandable warnings and specialized forecasts -- driven by user requirements

4. Strengthening WMO/NMHS cooperation and partnerships with disaster risk reduction organizations

5. Public outreach campaigns
WMO Action Plan for implementation of its Disaster Risk Reduction Programme

Implementation through **regional and national projects**, with following end results:

1. Modernized NMHSs and observing networks.
2. Strengthened national operational multi-hazard early warning systems.
4. Strengthened NMHSs cooperation and partnerships with civil protection and disaster risk management agencies.
5. Trained management and staff of NMHS
6. Enhanced ministerial and public awareness
National Disaster Risk Management Framework
New Paradigm in Disaster Risk Management (DRM)

Risk Identification
- Historical/real-time hazard databases, analysis and modeling of changing hazard trends
- Exposed assets & vulnerability
- Risk quantification

Risk Reduction
- PREPAREDNESS: early warning systems
- emergency planning/response
- MITIGATION AND PREVENTION: Medium to long term sectoral planning (e.g. building resilient infrastructure)

Risk Transfer
- CAT insurance & bonds
- Weather Risk Management
- Other emerging products

Information and Knowledge Sharing
- Education and training

Governance and Organizational Coordination and Cooperation
139 National Meteorological and Hydrological Services participated:

1. Role of NMHSs in planning, legislation and coordination mechanisms;
2. Monitoring, data management, forecasting and warning services;
3. Development and delivery of products and services and warnings;
4. Cooperation and coordination with other agencies and ministries.
National DRR Capacity Assessment Survey (2006)
Mapping NMHSs’ Capacities, Gaps and Needs

139 out of 187 Countries responded

http://www.wmo.int/pages/prog/drr/natRegCap_en.html
## National DRR Capacity Assessment Survey (2006)
### Country Responses

<table>
<thead>
<tr>
<th>Scope</th>
<th>Number of surveys received</th>
<th>Total number of countries</th>
<th>% Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global (WMO Members)</td>
<td>139</td>
<td>187</td>
<td>74%</td>
</tr>
<tr>
<td>Developing countries</td>
<td>85</td>
<td>137</td>
<td>62%</td>
</tr>
<tr>
<td>Least Developed countries</td>
<td>25</td>
<td>50</td>
<td>50%</td>
</tr>
<tr>
<td>Africa (RA I)</td>
<td>28</td>
<td>52</td>
<td>54%</td>
</tr>
<tr>
<td>Asia (RA II)</td>
<td>25</td>
<td>34</td>
<td>74%</td>
</tr>
<tr>
<td>South America (RA III)</td>
<td>10</td>
<td>12</td>
<td>83%</td>
</tr>
<tr>
<td>Central and North America (RA IV)</td>
<td>18</td>
<td>22</td>
<td>82%</td>
</tr>
<tr>
<td>South-West Pacific (RA V)</td>
<td>14</td>
<td>19</td>
<td>74%</td>
</tr>
<tr>
<td>Europe (RA VI)</td>
<td>44</td>
<td>48</td>
<td>92%</td>
</tr>
</tbody>
</table>
### National DRR Capacity Assessment Survey (2006)

<table>
<thead>
<tr>
<th>NMHS Category</th>
<th>Planning &amp; Legislation</th>
<th>Infrastructure Observation Forecasting Telecom.</th>
<th>Technical Capacities</th>
<th>Partnerships &amp; Concept of Operations</th>
<th>% countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Need for development in all areas</td>
<td></td>
<td></td>
<td></td>
<td>89</td>
</tr>
<tr>
<td>2</td>
<td>Need for improvements in all areas</td>
<td></td>
<td></td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>Self sufficient</td>
<td>Need for improvements in these areas</td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Self sufficient</td>
<td>Could benefit from sharing of good practices practices and guidelines</td>
<td></td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

Around 60% of the NMHS are challenged in meeting needs in DRM!
Gaps

**Governance:**
- Reflection of the role of NMHS’s in DRR plans, legislation and coordination mechanisms

**Technical:**
- Need for Modernization: Observing networks, data management systems, data rescue, and forecasting services, telecommunications,
- Need for Hazard Analysis: data quality assurance, standardized databases, metadata and hazard analysis and mapping
- Need for 24/7 Operational forecasting and warning services

**Organizational issues and partnerships:**
- Need for identification of stakeholder and understanding of their needs and requirements
- Need for strengthening partnerships, definition of roles and responsibilities of every stakeholders
- Need for Concept of Operations

**Education and Training:**
- Technical Guidelines and technical training targeted at NMHS staff, management
- Guidelines and joint multi-disciplinary training of staff, management of NMHs & partner agencies
- Public outreach programmes
How is WMO assisting its Members?
Strategic partnerships with ISDR System Partners have been actively sought to leverage complementary capacities, expertise and funding for implementation of disaster risk reduction projects at national and regional levels.
Identified criteria for good practices in early warning systems...

ORGANIZATIONAL

→ Clarity of roles and responsibilities (national to local level)
→ Coordination and partnerships (interoperability, sustainability; reliability)
→ Integrated planning

GOVERNANCE

→ Strong political commitment
→ Disaster management plans
→ Legislation and policies (national to local levels)
→ Legal and financial frameworks

OPERATIONAL

→ Integration of information in decision processes
→ Preparedness and drills
→ Education & training
→ Effective dissemination and response mechanisms (matching resources and cultures)
→ Feedback mechanisms to improve the system

http://www.wmo.int/pages/prog/drr/events/ews_symposium_2006
Coordination and Cooperation of NMHSs with Other Agencies in Early Warning Systems

Increasing level of direct coordination of NMHS with civil protection and risk management agencies for issuance of warnings

**Type I**

Hazard fully under the mandate of NMHS

- e.g. strong winds, strong rainfall, snow/ice, hail, tropical cyclone

**Type II**

Hazard under joint mandate with another technical agency

- e.g. floods, landslides, heat/health etc.

**Type III**

Hazard under mandate of other agencies but NMHS contribute

- e.g. locust, epidemic, man-made hazards

Increasing level of coordination of NMHS with technical agencies for early detection, monitoring and development of warnings
Identification of Good Practices

Implementation of EWS projects and sharing of good practices

Development of Guidelines for EWS implementation

Documentation of Good Practices

WMO Approach to Assist its Members in Strengthening Their Early Warning Systems
# Challenges identified along four technical components of EWS

## 1) Early Detection, Monitoring and Warning Services
- **Strengthen observation systems**
  - Coverage
  - Sustainability
  - Inter-operability
  - Multi-use of networks (where practical)
  - Built on "system of systems" concept
  - Data policies
- **Prediction and forecasting**
  - Methodologies, accuracy and lead time
  - Multi-disciplinary

## 2) Risk Knowledge and Integration in Warning Messages
- **Data gaps, quality, accessibility, sharing**
  - Hazard
  - Vulnerability (e.g. socio-economic, topographic…)
- **Standardized methodologies and expertise**
  (e.g. hazard analysis, risk modelling)
- **Understanding of the changing patterns of risk**
  (e.g. hazard, vulnerabilities)
- **Local capacities**

## 3) Dissemination and Communication
- **Effective warning messages**
  - Incorporation of information about risks in warning messages
  - Understandable warning messages
  - Authoritative warnings (Authentication of sources)
- **Dissemination networks**
  - Interoperability (use of international standards)
  - Redundancy and resilience of networks
  - Same distribution channels for warnings of different hazards (cost efficiency, reliability and effectiveness)
- **Standard warning terminologies**
  (nationwide, and across borders, traffic light concept)

## 4) Integration in Preparedness and Response Processes
- **Education and awareness**
  (emergency responders, authorities, risk managers, emergency responders, media, public…):
  - Understanding of warnings and uncertainties
  - Awareness of less frequent events
- **Cross-Training of Operational Agencies**
- **Operational planning**
  - Drills
  - Community preparedness

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*Need for Strong Governance, Organizational Coordination and Operational Processes*
Projects in support of Risk Assessment and Early Warning Systems
# Projects in support of Risk Assessment and EWS in Africa

<table>
<thead>
<tr>
<th>Project type</th>
<th>Outcomes</th>
<th>Regions</th>
<th>Partners</th>
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<tbody>
<tr>
<td><strong>Technical capacity Development of NMHSs</strong></td>
<td>SWFDP and Nowcasting</td>
<td>Southern Africa</td>
<td>NMHS, DMA</td>
</tr>
<tr>
<td></td>
<td>Flash Flood Guidance System</td>
<td>Southern Africa</td>
<td>DMA, NOAA, HRC, OFDA</td>
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<tr>
<td></td>
<td>Drought Assessment and Monitoring</td>
<td>Central and North Africa</td>
<td>WMO</td>
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<tr>
<td></td>
<td>Sand and Dust Storms</td>
<td>North Africa</td>
<td>Spain, NMHSs</td>
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<tr>
<td></td>
<td>Storm Surge Watch</td>
<td>South East Cost of Africa and West Africa</td>
<td>UNESCO-IOC, WMO RSMC (South Africa and La Reunion)</td>
</tr>
<tr>
<td><strong>Pilot Projects on National EWS Partnerships and ConOPs</strong></td>
<td>Use of EWS by the Health and Disaster Management Sectors</td>
<td>Southern Africa</td>
<td>NMHSs, DMA, Health Authorities, EC, (UNDP, IFRC, ISDR, OCHA)</td>
</tr>
<tr>
<td><strong>Technical Guidelines</strong></td>
<td>Meteorological hazards, Forecasting</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Good practices in EWS</td>
<td>Lessons learnt from countries with NMHSs meeting needs of users in DRM</td>
<td>Blangladesh, Cuba, France, Shanghai-China</td>
</tr>
<tr>
<td></td>
<td>Role of NMHSs in EWS</td>
<td>Raising awareness among NMHSs on developments in DRM</td>
<td></td>
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</table>
Strengthening of EWS through National Projects

Technical Capacities Development of NMHS (e.g., SWFDP, FFG, PWS, etc)
Operational EWS and Partnerships
Documentation of good practices and development of guidelines
Projects in support of Weather Risk Management and Catastrophe Insurance Markets
Examples of Catastrophe (CAT) Insurance / Bond and Weather Risk Management Markets (WFP/IFAD)

Drought Risk Management in Ethiopia
Southeastern Europe Disaster Risk management Project & Southeastern and Central European Risk Insurance Facility
UK Flood CAT Bond
Caribbean Catastrophe Risk Insurance Facility
Indian Agricultural Risk
Drought Risk Management in Ethiopia
Malawi Drought Risk Management
Pacific Risk Insurance Facility
Opportunities and Challenges

1. Opportunities through:
   (i) Implementation of national projects demonstrating regional;
   (ii) cooperation framework to develop NMHSs technical capacities;
   (iii) Implementation of national projects demonstrating frameworks of operational engagement of NMHSs with DRM users, nationally;
   (iv) Guidelines to support technical capacities of the NMHSs; and
   (v) Documentation of good practices

2. Challenges for scaling up benefits to more Members:
   (i) Need to realize partnerships and opportunities for funding and development that are primarily available at national and regional levels
   (ii) Need to expand DRR demonstrated frameworks and lessons learnt more systematically at national and regional levels