Climate Services and Drought - The role of National Met and Hydro Services (NMHS)

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Assessing Drought Early Warning Information Systems around the world – WMO, NIDIS, UNISDR (to support the High Level Meeting on National Drought Policy 2013)
• Challenges in assessing and responding to drought impacts—Unique nature of drought(s)

• Indicators (PDSI, SPI, SWSI, WRSI, Vegetation Drought Response Index)

• Food and Water Security Outlooks (FEWSNet etc.)
Constraints on implementation:

• The lack of specificity of reliable information provided by forecasts, e.g. non-ENSO years
  – Diverse temporal and spatial scales
  – Aggregation (over areas with negative and positive impacts)

• Lack of national and regional drought policy frameworks

• Lack of coordination between institutions that provide different types of drought early warning and relief, and

• Lack of social indicators to form part of a comprehensive early warning system
Drought Early Warning Information Systems - Architecture:
Role of NMHS-Tasks

1. Define the core set of data, data characteristics, and information technologies needed to maintain the minimum acceptable level of stewardship in the management of drought risk to communities, resources and infrastructure

2. Convergence on definitions and concepts

**Product** – A general term for tangible results, technology, or information that have potential value in one or more *uses*. Examples of the former would be a data set or output from a climate model simulation; examples of the latter would be a forecast or a summary of the state of knowledge on a subject.

**Service** – The acquisition, archiving, indexing, quality assessment, synthesis, interpretation, communication and evaluation of data, knowledge, and information that contributes to the welfare of communities and the nation.
3. Develop a collaborative framework between research, impacts assessment and management

- Strengthen the scientific and monitoring foundations to support risk profiles and early warning for drought onset and frequency, emphasizing severity, persistence
- Place multiple indicators within a statistically consistent triggering framework-cross-correlation among units for rapid transitions (e.g. climate and vegetation mapping) before critical thresholds are met from onset to severity-probabilistic risk assessment
4. Prototyping and Learning

• Overcome impediments to information flow and to working as a information system
  • Gaming -Innovations and new information introduced and tested as thresholds and baselines change, and
  • Clarify benefits of participation in design, implementation and maintenance

• Post-audits and evaluation
  • How does new information relate to what is already known-how often adaptation decisions should be reconsidered
5. Collaborative Impacts Outlook

Wall Street Journal, 3 Jan, 2012
NOAA; USACE; Planalytics, Dan Tonsmeire, Apalachicola River Keeper; Keith T. Ingram, Southeast Climate Consortium; Bob Rose, Lower Colorado River Authority; Willard Ferguson, Habersham County, Georgia; Susan E. Ford, Haskin Shellfish Research Lab; SnowSports Industries America; New Mexico Cattle Growers’ Association; Highlands County Citrus Growers Association

Snow, Rain, Heat and Gloom of Night
This year’s La Niña weather pattern is expected to be a weak one, peaking in the winter months. But it will exacerbate conditions in vulnerable areas devastated by the floods, tornadoes, wildfires and droughts of 2011. Last year broke the record for the number of climate-related disasters that caused billions of dollars in damages in the U.S., according to the National Oceanic and Atmospheric Administration.

How does it affect the U.S.?

Forecasts for the first three months of the year

What will it mean for 2012?
Government and businesses are watching for disruptive—or beneficial—weather. Some preparations and expectations:

Retail/Energy
- Increased energy consumption from cold northeastern winter in mid-to-late January, once warm pattern in region subsides.
- Relatively short, intense winter expected for the upper Great Lakes region and Northeast, which retail sales in spring and early summer.
- Less conifer-like behavior in Pacific Northwest because of warm spring. California does exceptional without snowpack.
- Lake Tahoe ski season starts off the slowest start, but good season for winter sports.

Agriculture
- Cattle ranchers in New Mexico cautiously optimistic for spring weather warmer than predicted December.
- Texas, New Mexico and Nebraska should have good crop production expectations.
- Spring breakers and others planning vacations in the Pacific Northwest should expect below-average conditions, with possible coastal and beach closures.

Sources:
- National Oceanic and Atmospheric Administration, Planalytics, U.S. Army Corps of Engineers, Dan Tonsmeire, Apalachicola River Keeper, Keith T. Ingram, Southeast Climate Consortium, Bob Rose, Lower Colorado River Authority, Willard Ferguson, Habersham County, Georgia, Susan E. Ford, Haskin Shellfish Research Lab, SnowSports Industries America, New Mexico Cattle Growers’ Association, Highlands County Citrus Growers Association
Global Framework for Climate Services

- **User Interface Platform** - to provide a means for users, user representatives, climate researchers and climate service providers to interact
- **Climate Services Information System** - to collect, process and distribute climate data and information according to the needs of users and according to the procedures agreed by governments and other data providers
- **Observations and Monitoring** - to ensure that the climate observations necessary to meet the needs of climate services are generated.
- **Research, Modelling and Prediction** - to assess and promote the needs of climate services within research agendas
- **Capacity Building** - to support systematic development of the necessary institutions, infrastructure and human resources to provide effective climate services.

Regional Climate Outlook Fora in the Climate Services Information System
Why is “communication” not enough?

Broad societal processes that create dynamic pressures and unsafe conditions are not easy to change, yet are fundamental to human vulnerability.

Social process(es) of risk communication are more than “one-way” AND even more than “two-way”

No matter how well designed, institutions are only as good as the people inhabiting them at key nodes i.e. focused on overcoming impediments to the flow of information and innovations.

Number of personnel needed/trained to conduct vulnerability and risk
The “Climate Services” Challenge for National Met. And Hydro Services

- Identify user requirements
- Conduct research
- Develop applications
- Integrate knowledge and products
- Deliver products
- Disseminate information
- Data quality control

RESEARCH & DEVELOPMENT & PROTOTYPING & SERVICES
Identifying and transferring indicators, decision support tools and innovative local strategies for risk assessment, communication and preparedness

Coordinate existing national, state, and local climate-related data and information support activities (e.g., within watersheds and administrative units)
Thanks you!
Two approaches

Climate Models-Scenarios -First

Vulnerability-Thresholds-First
Preparedness and adaptation—Through what mechanisms and pathways?

- Information
- Infrastructure
- Insurance
- Institutional capacity
- Integrated systems
Monitoring & Forecasting

Drought and Flood Impacts Assessments and Scenarios

Drought Information Systems

Communication and Outreach

Engaging Preparedness
Consensus Process in RCOFs: Mostly Subjective

Observations

- ENSO State
- Climate patterns

Assessment (conversation)

Background

- Average climate
- ENSO Climatology

Forecasts

- ENSO forecasts
- Global forecasts
- Statistical forecasts

Regional, seasonal Outlook (temp, rain, flows)

Products
5. Post-audits and evaluation

Number of personnel needed/trained to conduct vulnerability and risk assessments

Relevant threat and hazard information and outlooks generated and disseminated to stakeholders on a timely basis

Number and type of projects that conduct and update risk and vulnerability assessments

Number of targeted institutions with increased capacity to minimise exposure to climate variability risks

Number and type of projects that conduct and update risk and vulnerability assessments

Development sectors’ services (health and social services) responsive to evolving needs from changing and variable climate
Elements of effective information systems - overview

• Knowledge development and management

• Product and delivery systems

• Capacity and coordination
## Climate information products supporting services

<table>
<thead>
<tr>
<th>Historical Data</th>
<th>Climatologies Special Publications</th>
<th>Indices Analyses for CC Metadata</th>
<th>Status reports Reviews</th>
<th>Near real time analysis/data</th>
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<tbody>
<tr>
<td>Web accessible statistics, graphs, Maps</td>
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### Relative status of information

- **STATIC**
- **DYNAMIC**

### Structural
- Design
- Safety factors
- Energy

### Management
- Site planning
- Community health and well being
- Climate related standards

### Operations
- Siting designs
- Hazards/warnings
- Streamflow

### Public
- National drought planning
- Resource allocation
- Agriculture
- Hazards and health

### Strategic Planning
- Monthly/seasonal Planning
- International Markets
- Demand

### Services
- Climate information products supporting services
### Developing Climate Risk Profiles

<table>
<thead>
<tr>
<th>Vulnerable Sector/activity/group</th>
<th>Magnitude</th>
<th>Rates of Change</th>
<th>Persistence and reversibility</th>
<th>Likelihood and confidence</th>
<th>Distribution</th>
<th>Potential for Adaptation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic sectors (Water, Ag, Tourism etc.) Communities at risk</td>
<td>Situation of existing Levels of vulnerability for different magnitudes of change, especially thresholds, relative to temperature, precipitation or the other critical parameters that create the vulnerability</td>
<td>Critical rates/steeper response curves that affect vulnerability</td>
<td>Likelihood that the vulnerable sector will be affected by an irreversible impact and whether it is likely to persist.</td>
<td>Overall confidence and likelihood, but state confidence also with any specific figures or points.</td>
<td>Distribution of impacts – both physically and socially within countries (not in a simple developed/developing dichotomy).</td>
<td>Capacity for adaptation. Is adaptive capacity sufficient to delay or prevent adverse impacts and at what cost.</td>
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Vegetation Drought Response Index (VegDRI)

✓ Hybrid Drought Index that Integrates:
  - Satellite-based observations of vegetation conditions
  - Climate-based drought index data
  - Biophysical characteristics of the environment

http://drought.unl.edu/vegdri/VegDRI_Main.htm

(Source: Wardlow, 2008)
NIDIS Governance: Executive Council

NATIONAL

NIDIS Program Office

NIDIS Implementation Team:

NIDIS Technical Working Groups

REGIONAL

- Public Awareness And Education
- Engaging Preparedness Communities
- Integrated Monitoring and Forecasting
- Interdisciplinary Research and Applications
- U.S. Drought Portal

WATERSHED/URBAN/LOCAL

Regional Drought Early Warning Systems
Information clearinghouse, prototypes, and implementation
Institutional capacity for early warning: Characteristics of adaptive organizations

- **alertness** (monitoring the external world for early warning signs that key assumptions are likely to fail and monitoring of the organization's own performance);

- **agility** (the ability to react to early warning signs of problems or opportunities);

- **adaptability** (the ability to adjust strategies and tactics rapidly to meet changes in the environment); and

- **alignment** (the ability to align the whole organization to its mission)
Key questions-improving the linkages between information and decision-making (ICSU, NIDIS)

• What is the quality of information available to decision-makers at all levels?

• What factors influence whether or not such information will be used?

• What factors influence whether risk communications are trusted?

• What governance structures may facilitate better decision-making practice?

• How to adapt the decision-making systems to the different levels of decision makers?