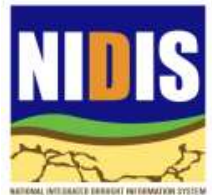


Climate Services and Drought-The role of National Met and Hydro Services (NMHS)

Roger S. Pulwarty PhD
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GFDRR
Global Framework for Drought Resilience and Recovery



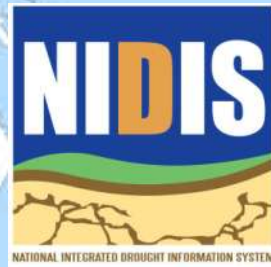
Cooperative Governance
Traditional Affairs



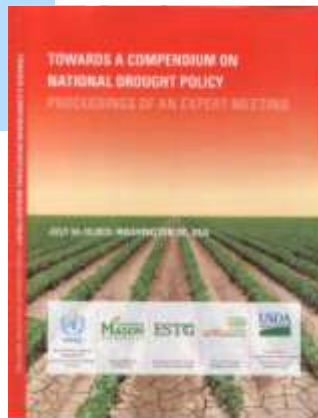
ISDR



Drought information systems-Lesson for climate services



Assessing Drought Early Warning Information Systems around the world –WMO, NIDIS, UNISDR (to support the High Level Meeting on National Drought Policy 2013)

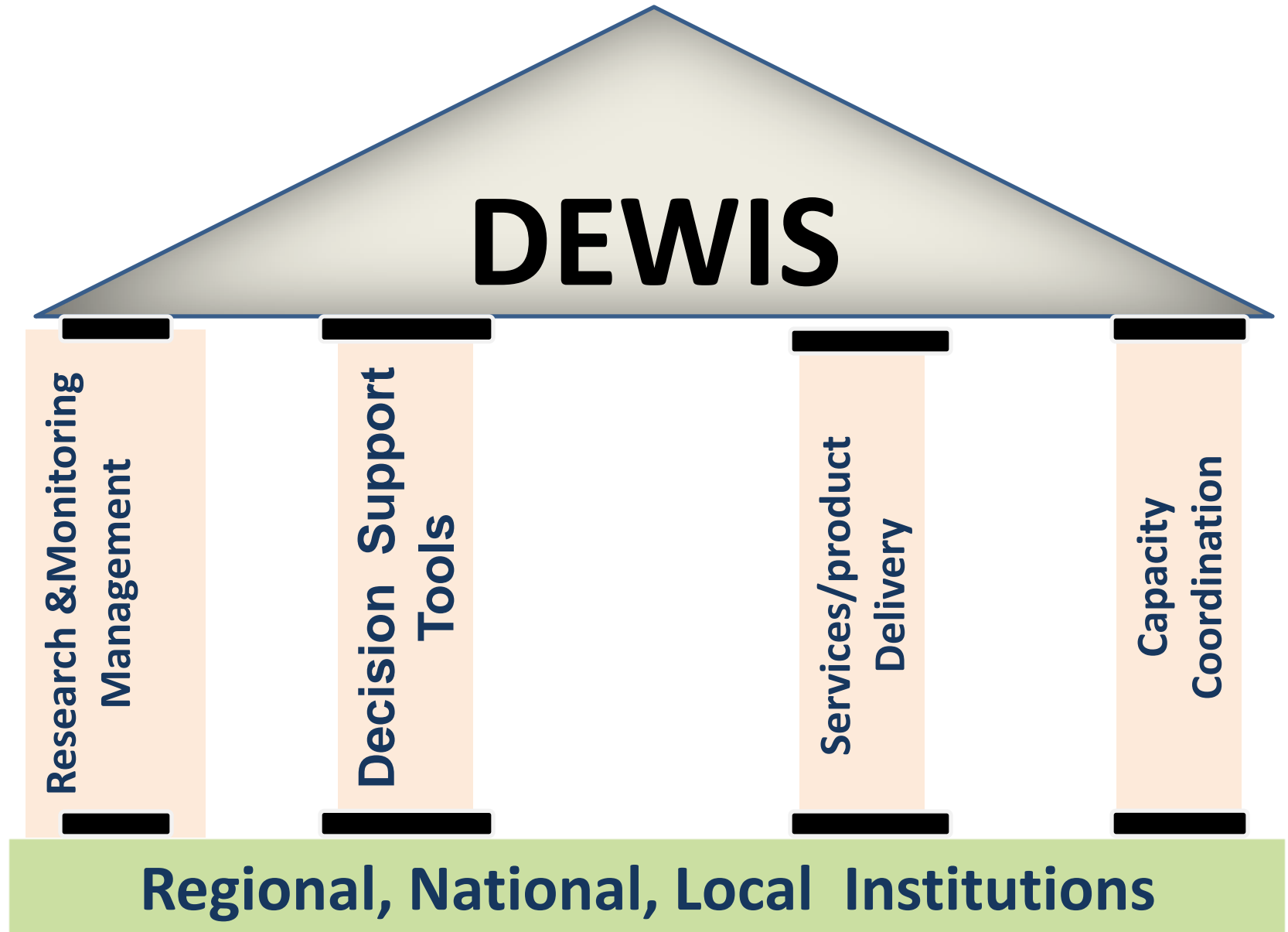


- Challenges in assessing and responding to drought impacts-Unique nature of drought(s)
- Indicators (PDSI, SPI, SWSI, WRSI, Vegetation Drought Response Index)
- Food and Water Security Outlooks (FEWSNet etc.)

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:

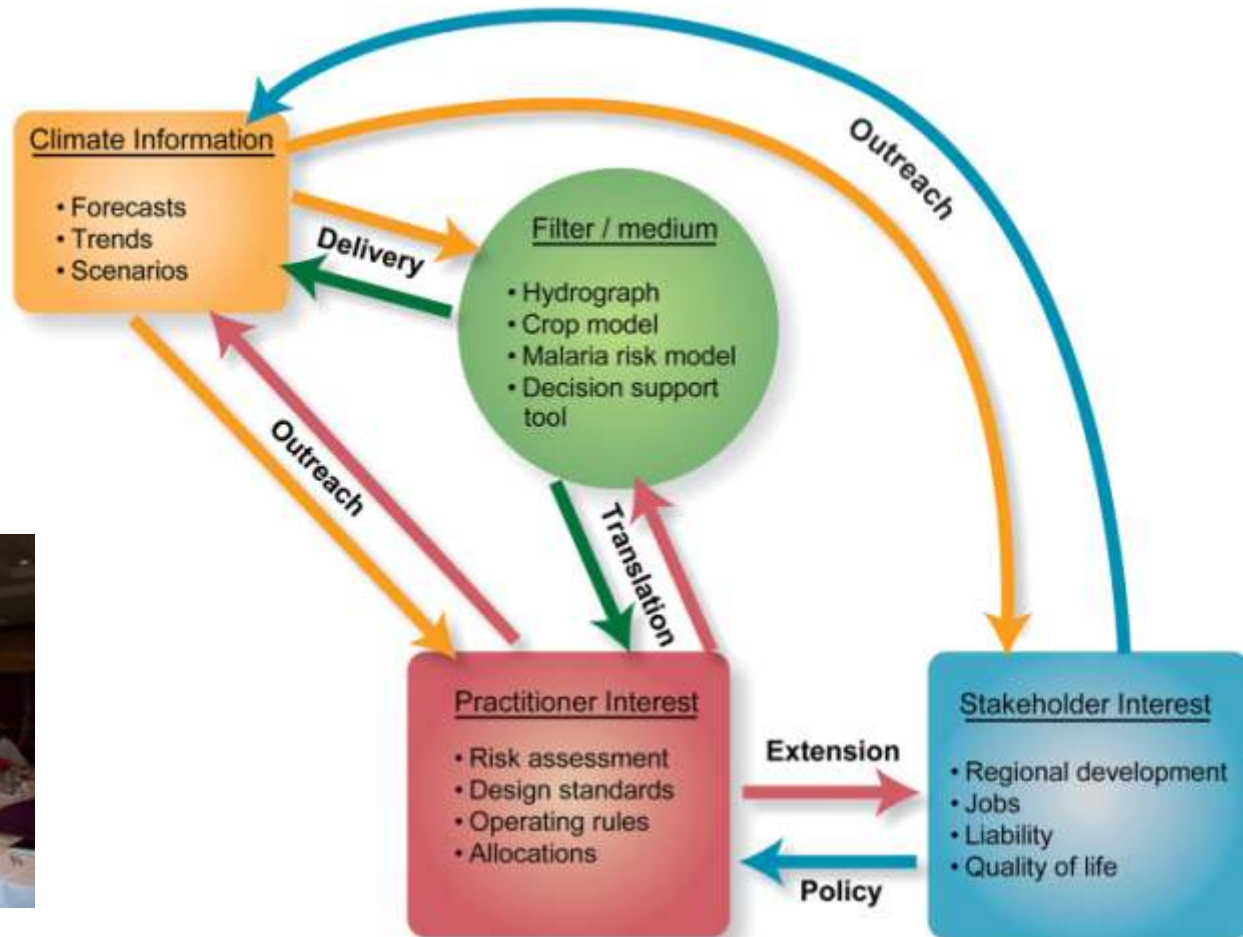


Role of NMHS-Tasks

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.

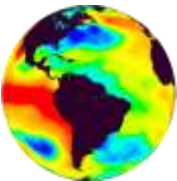


3. Develop a collaborative framework between research, impacts assessment and management

- 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

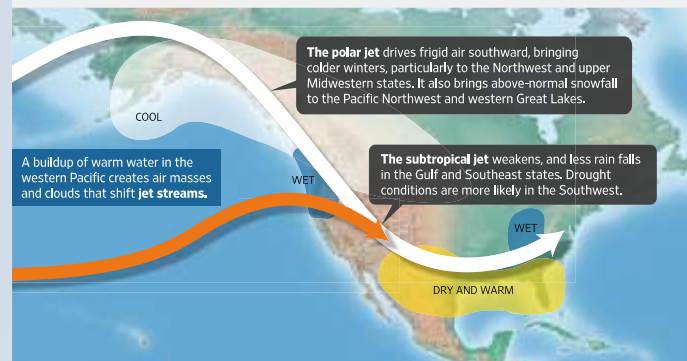


Snow, Rain, Heat and Gloom of Night

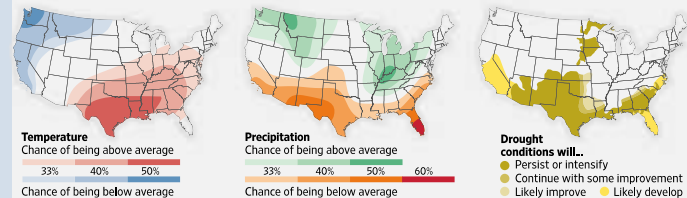
This year's La Niña weather pattern is expected to be a weak one, peaking in the winter months. But it will exacerbate conditions in vulnerable areas devastated by the floods, tornadoes, wildfires and droughts of 2011. Last year broke the record for the number of climate-related disasters that caused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

—Elaine He, Joe Barrett and Jack Nicas

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 beneficent—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 spurs retail sales in spring and early summer.
- Less cocoon-like behavior in Pacific Northwest boosts commerce in spring and summer if precipitation is lower than last year.
- Lake Tahoe ski season off to dry start, but good season for winter sports still possible if warm weather goes coastal, keeping rain away from mountains.

Agriculture

- Cattle ranchers in New Mexico cautiously optimistic for spring; wetter-than-predicted December good for thirsty beasts. In Texas, possible extension of drought may further squeeze hay and feed resources.
- Spring breaks early in South, permitting longer planting season for cotton, wheat, corn and soy.
- Florida citrus growers concerned about a recent dry stretch extending and threatening size of orange crop.
- Grim news for oyster growers on Atlantic and Gulf coasts if winter is warm and dry—better conditions for a parasite that can kill oysters.

Government

- Spring drought conditions in South and Southeast better than last year. But in worst-case scenario, dry, hot spring and summer worsen drought and trigger tighter water-use restrictions.
- Drought distresses local ecosystems, reducing shrimp, crab and fish harvests for fishing industry still recovering from 2007 drought and 2010 Gulf oil spill.
- After last year's record floods, Army Corps of Engineers is racing to make repairs to levees near confluence of Ohio and Mississippi rivers. Corps is spending some \$50 million to repair about 70 miles of critical levees along Missouri River. Expects to have 3% more space for floodwaters in reservoirs in Montana and Dakotas.

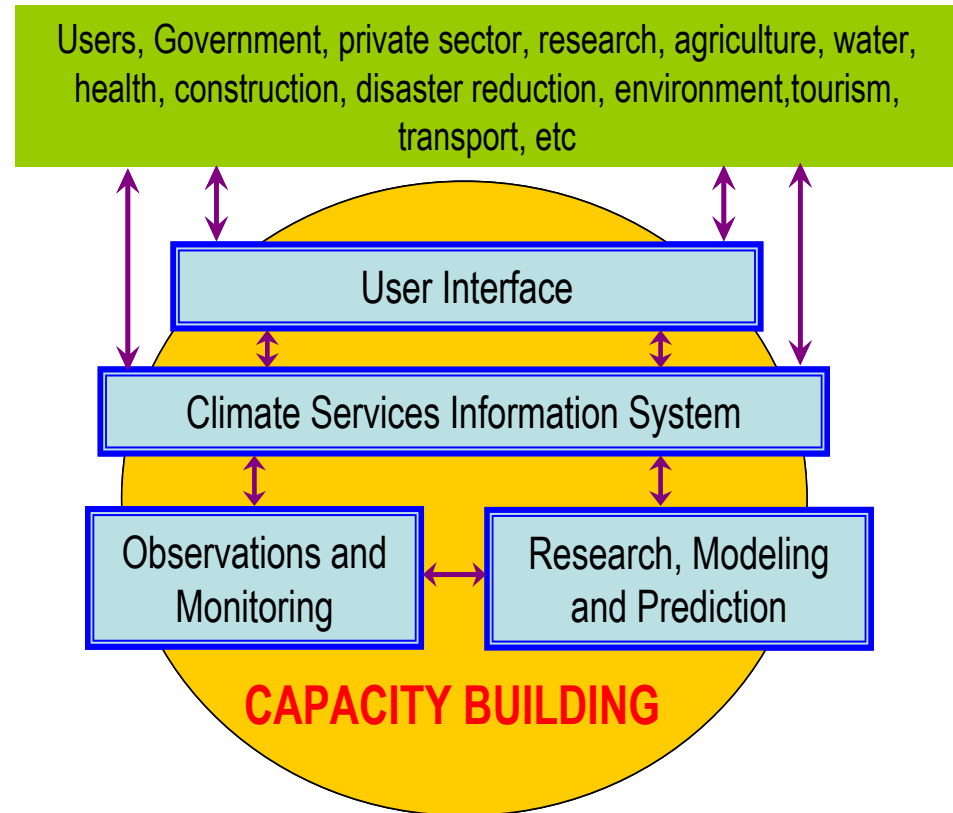
Maps by Katie Rigdon/The Wall Street Journal

Sources: National Oceanic and Atmospheric Administration; Planalytics; 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 Laboratory; SnowSports Industries America; New Mexico Cattle Growers' Association; Texas and Southwestern Cattle Raisers Association; Highlands County Citrus Growers Association

Sources:

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?

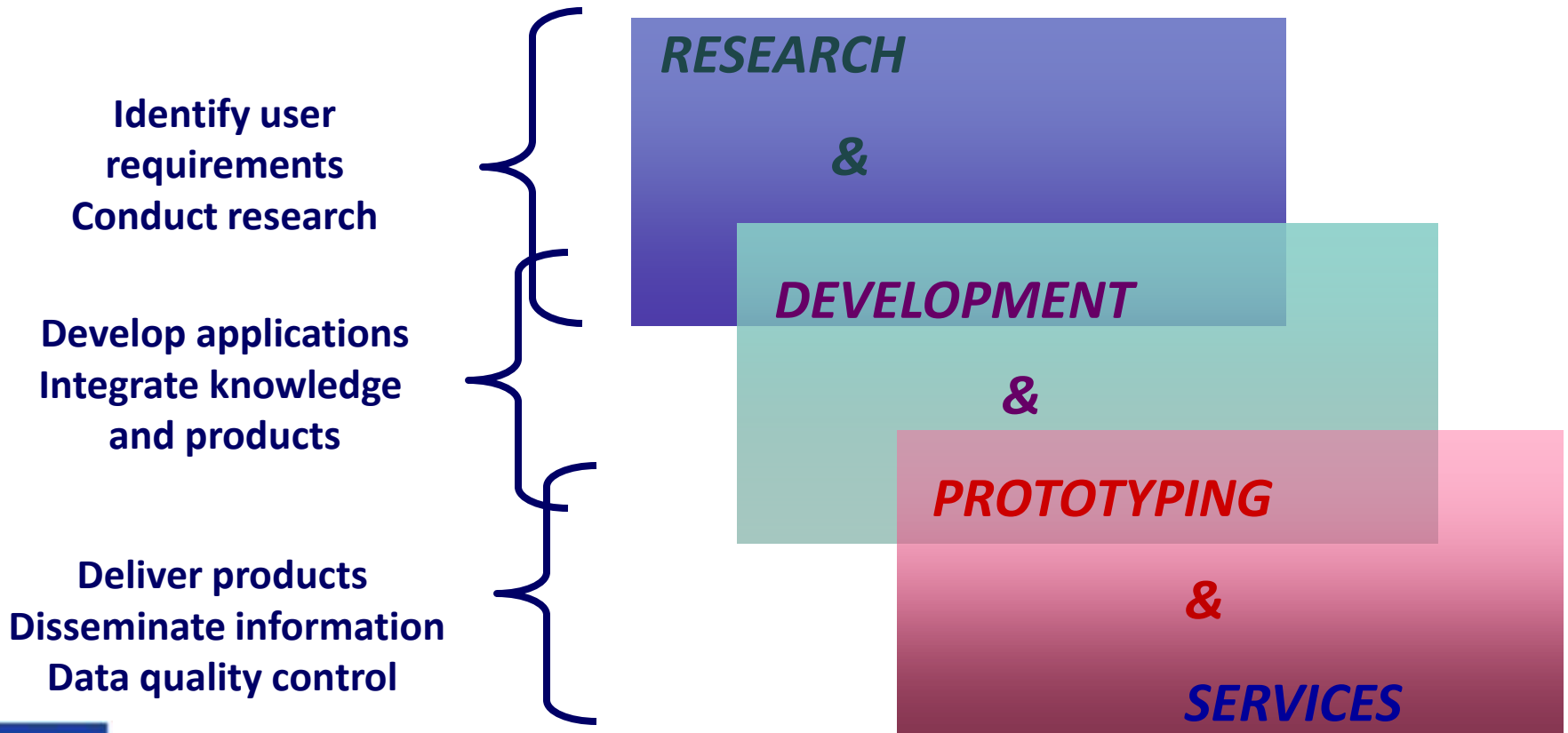
Broad societal processes that create dynamic pressures and unsafe conditions are not easy to change, yet are fundamental to human vulnerability

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-

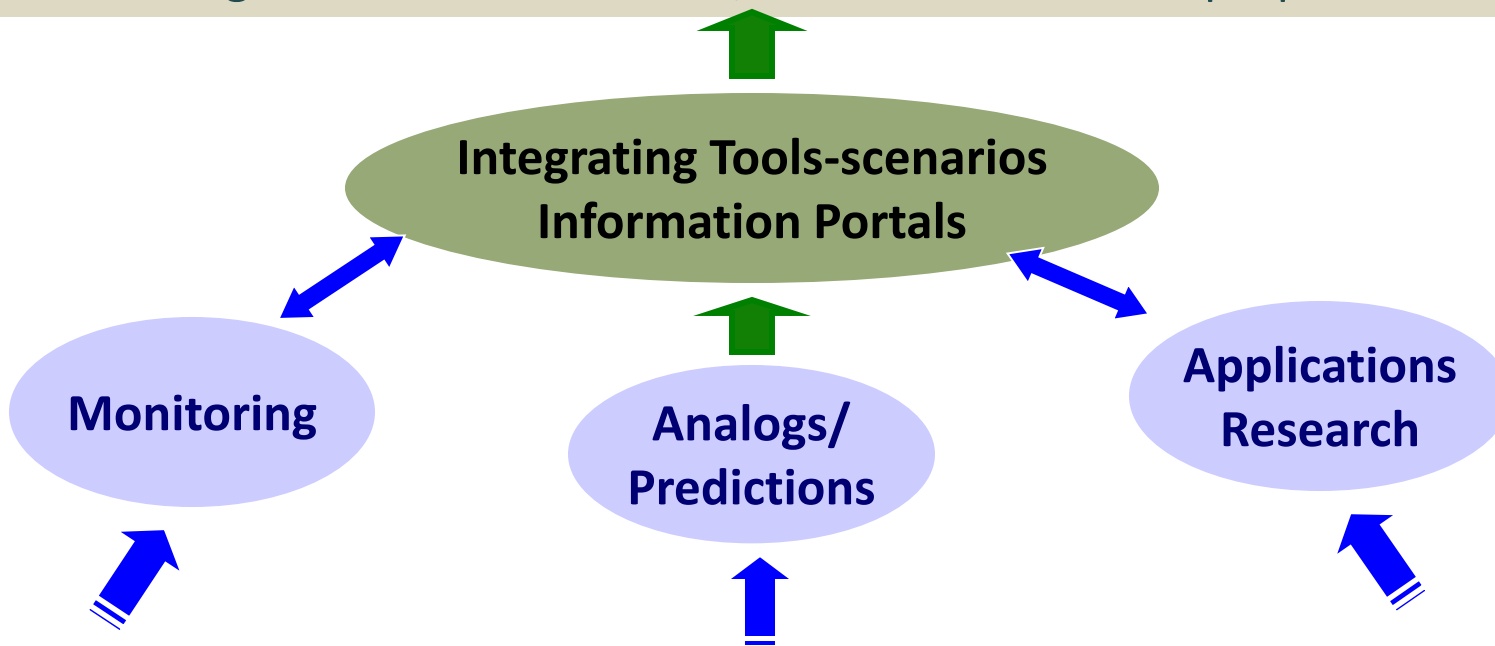
Number of personnel needed/trained to conduct vulnerability and risk

The “Climate Services” Challenge for National Met. And Hydro Services



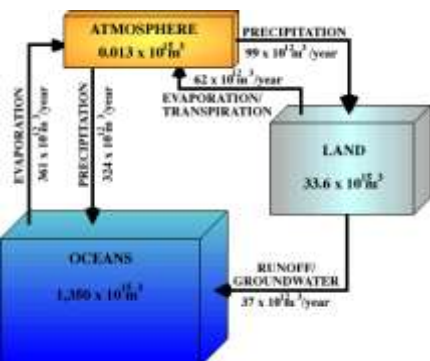
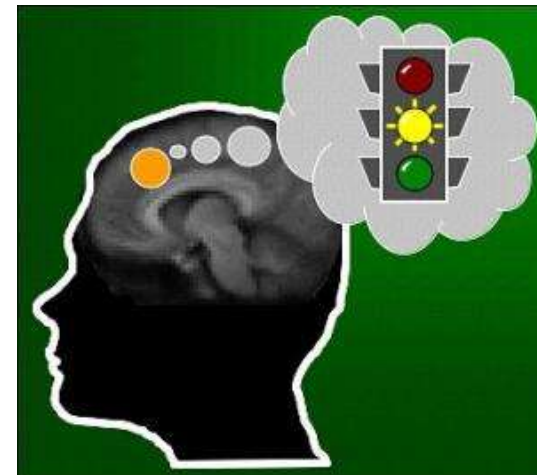
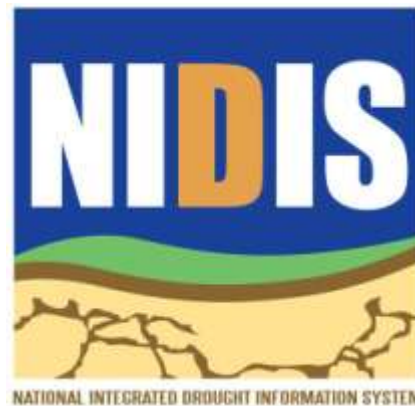
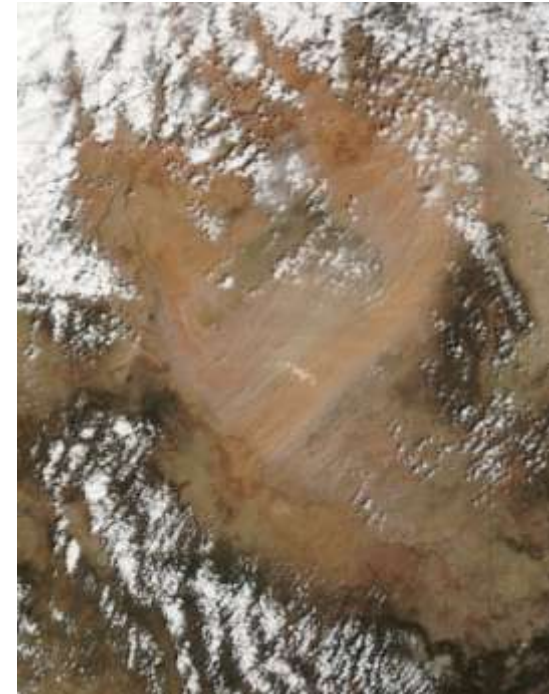
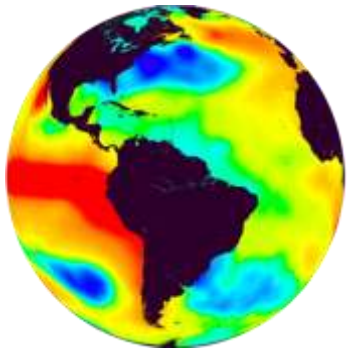


Identifying and transferring indicators, decision support tools and innovative **local** strategies for risk assessment, communication and preparedness

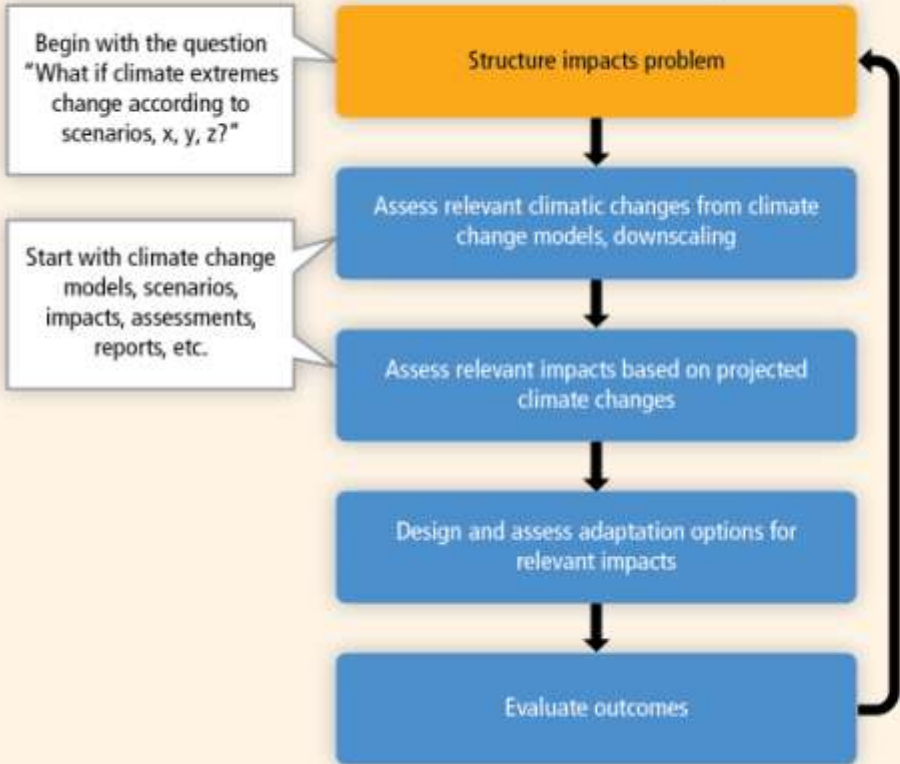


Coordinate existing national, state, and local climate-related data and information support activities (e.g., within watersheds and administrative units)

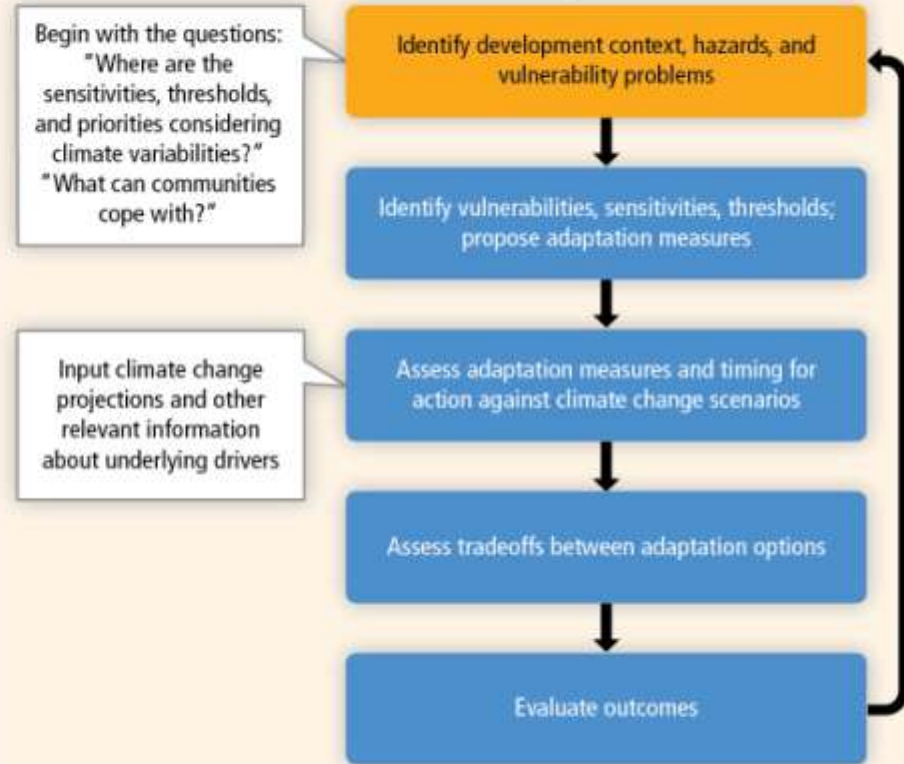
Thanks you!



"Climate Models, Scenarios, Impacts-First"



"Vulnerability, Thresholds-First"



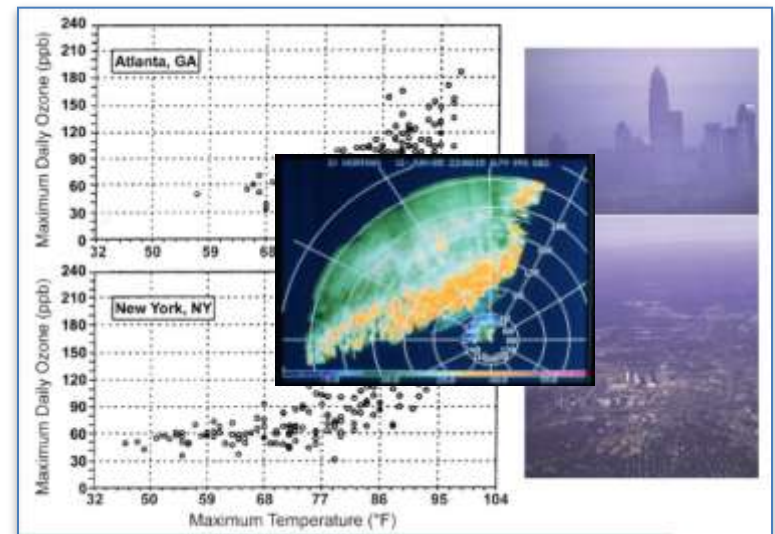
Two approaches

Climate Models-Scenarios-First

Vulnerability-Thresholds-First

Preparedness and adaptation-Through what mechanisms and pathways?

- Information
- Infrastructure
- Insurance
- Institutional capacity
- Integrated systems



Monitoring & Forecasting

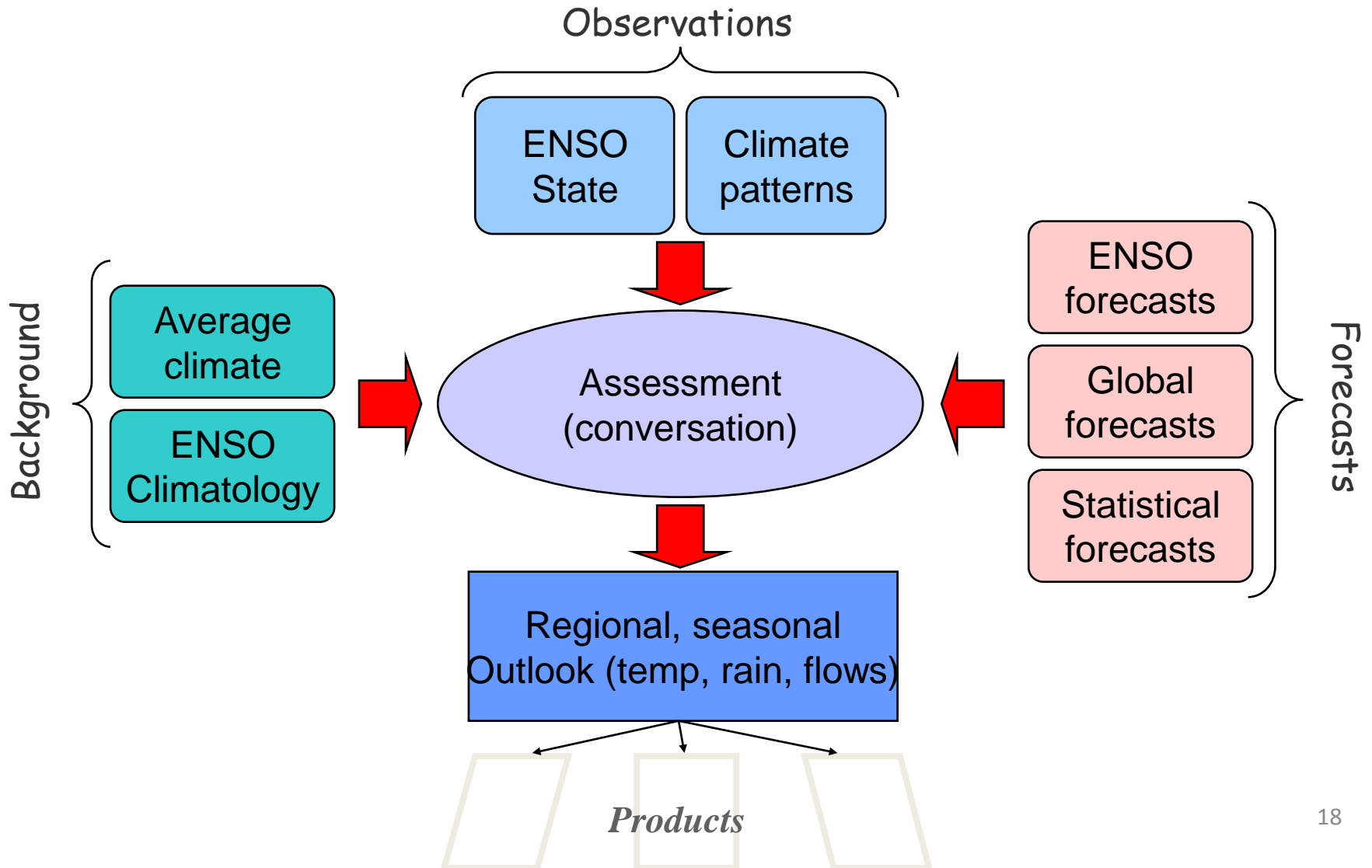
Drought and Flood Impacts Assessments and Scenarios

Drought Information Systems

Communication and Outreach

Engaging Preparedness

Consensus Process in RCOFs: Mostly Subjective



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

Elements of effective information systems- overview

- **Knowledge development and management**
- **Product and delivery systems**
- **Capacity and coordination**



Climate information products supporting services

Historical Data	Climatologies Special Publications	Indices Analyses for CC Metadata	Status reports Reviews	Near real time analysis/data	Web accessible statistics, graphs, Maps
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Structural	Management	Operations	Public	Strategic Planning
Design		Siting designs		Monthly/seasonal
Safety factors		Hazards/warnings		Planning
Energy	Site planning	Streamflow	National drought planning	International
	Community health and well being		Resource allocation	Markets
	Climate related standards		Agriculture	Demand
			Hazards and health	

Developing Climate Risk Profiles

Vulnerable Sector/ activity/ group	Magnitude	Rates of Change	Persistence and reversibility	Likelihood and confidence	Distribution	Potential for Adaptation
<p>Economic sectors (Water, Ag, Tourism etc.) Communities at risk Bounded ecosystems such as coastal, mountain are already stressed</p>	<p>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</p>	<p>Critical rates/steeper response curves that affect vulnerability</p>	<p>Likelihood that the vulnerable sector will be affected by an irreversible impact and whether it is likely to persist.</p>	<p>Overall confidence and likelihood, but state confidence also with any specific figures or points.</p>	<p>Distribution of impacts – both physically and socially within countries (not in a simple developed/developing dichotomy).</p>	<p>Capacity for adaptation. Is adaptive capacity sufficient to delay or prevent adverse impacts and at what cost.</p>

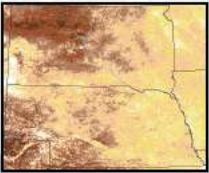
Vegetation Drought Response Index (VegDRI)

✓ Hybrid Drought Index that Integrates:

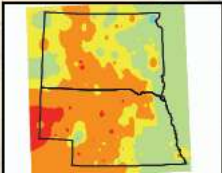
- Satellite-based observations of vegetation conditions
- Climate-based drought index data
- Biophysical characteristics of the environment

1. **Historical Database Development**


Satellite Data



Climate Data



Biophysical Data



Data Input Variables

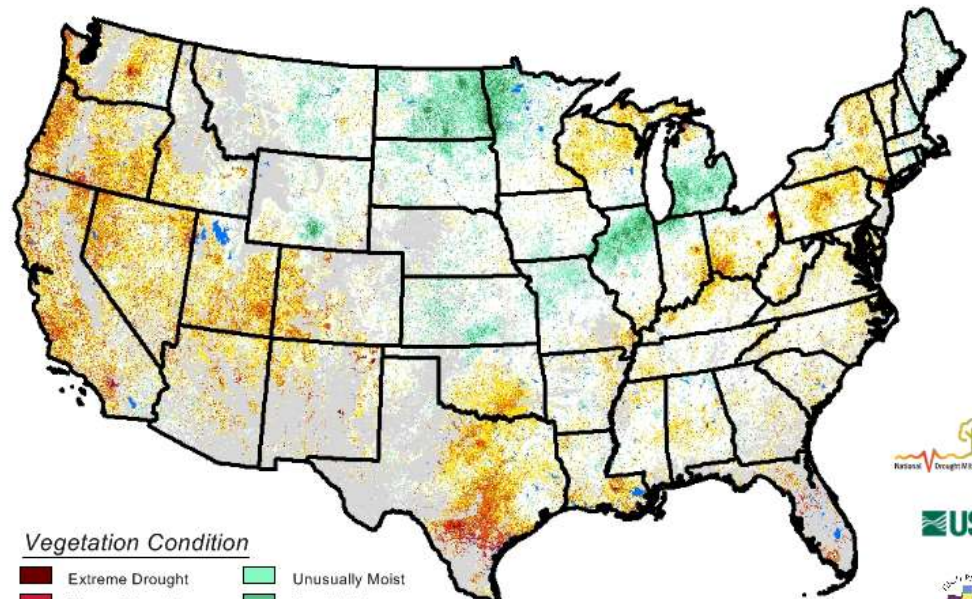
- 1) Percent Annual Seasonal Greenness (PASG)
- 2) Start of Season Anomaly (SOSA)
- 1) Palmer Drought Severity Index (PDSI)
- 2) Standardized Precip. Index (SPI)
- 1) land use/ cover type
- 2) soil available water capacity (STATSGO)
- 3) ecoregion type
- 4) irrigation status
- 5) elevation

(Source: Wardlow, 2008)

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

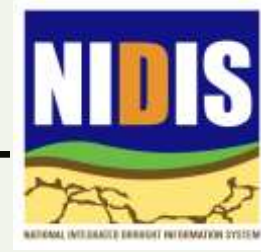
Vegetation Drought Response Index
Complete

May 4, 2009



Vegetation Condition





NIDIS Governance: Executive Council
NATIONAL

NIDIS Program Office

NIDIS Implementation Team:

NIDIS Technical Working Groups
REGIONAL

Public Awareness
And Education

Engaging
Preparedness
Communities

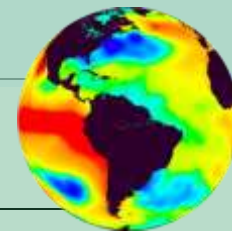
Integrated
Monitoring and
Forecasting

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?