

A stylized world map with various regions highlighted in different colors: dark blue, light blue, yellow, green, and red. The map is centered on the Atlantic Ocean.

WCRP's role in Climate Services

WCRP 40th Anniversary Symposium
Dec 7, 2019 -- San Francisco, CA

Lisa Goddard

International Research Institute
for Climate and Society
EARTH INSTITUTE | COLUMBIA UNIVERSITY

CLIMATE VARIABILITY AND CHANGE

This century has already seen a million deaths and \$1.7 trillion in losses due to the interaction of society and geophysical phenomena, primarily extreme weather

GLOBAL ASSESSMENT REPORT
UNISDR, 2013



TYPHOON HAIYAN



EAST AFRICA DROUGHT



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CLIMATE VARIABILITY AND
CHANGE

No society is
immune



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Structure of the Talk

Climate Services....,

- Where did they come from?
- What are they?
- And, where are they going?

1986: First Dynamical Forecast of El Niño Published

NATURE VOL. 321 26 JUNE 1986

ARTICLES

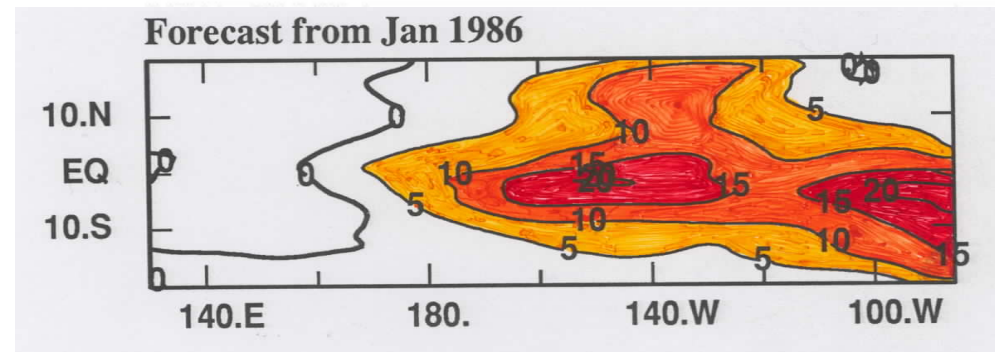
827

Experimental forecasts of El Niño

Mark A. Cane, Stephen E. Zebiak & Sean C. Dolan

Lamont-Doherty Geological Observatory of Columbia University, Palisades, New York 10964, USA

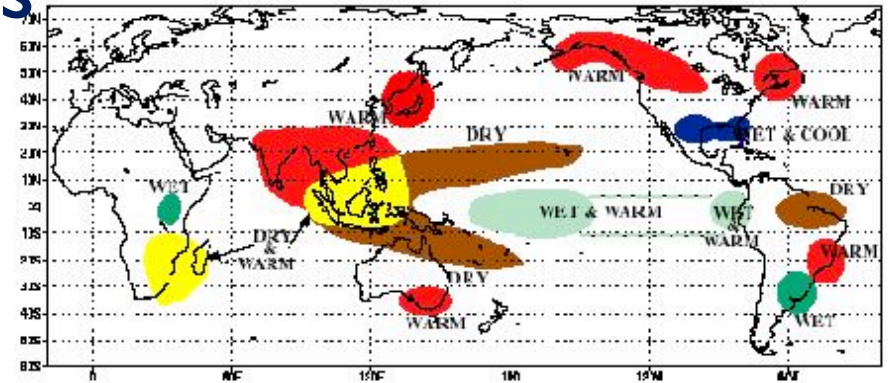
Experimental forecasts of El Niño events occurring since 1970, made with a deterministic model of the coupled ocean-atmosphere system, indicate that El Niño is generally predictable one or two years ahead. A forecast for 1986 is also presented.



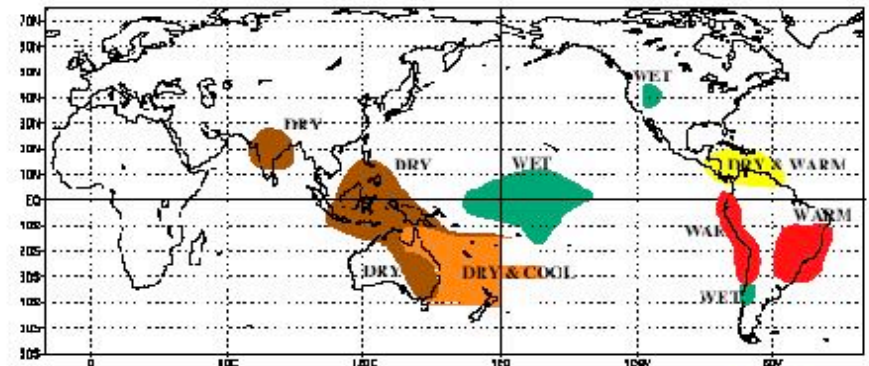
1987: Global Teleconnections of El Niño Published

Ropelewski & Halpert, *Journal of Climate*

WARM EPISODE RELATIONSHIPS DECEMBER - FEBRUARY



WARM EPISODE RELATIONSHIPS JUNE - AUGUST

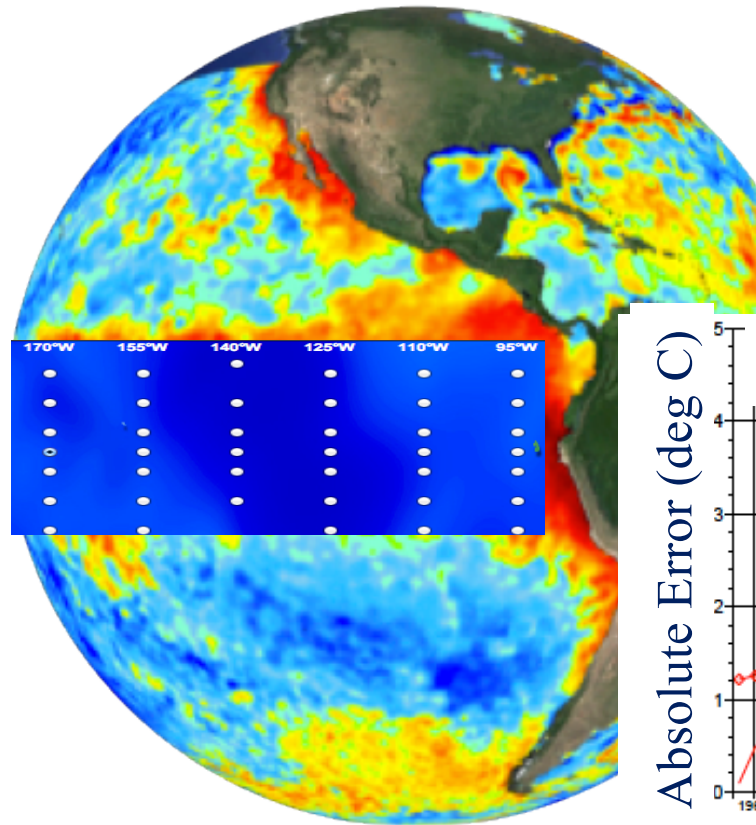


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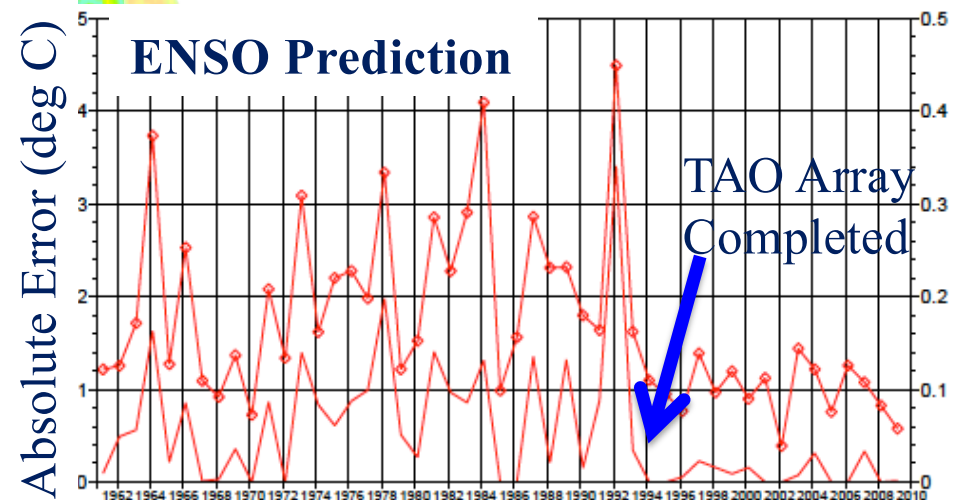


Climate Prediction Center
NCEP

1980s-early90s: TOGA-TAO Buoy Array Erected

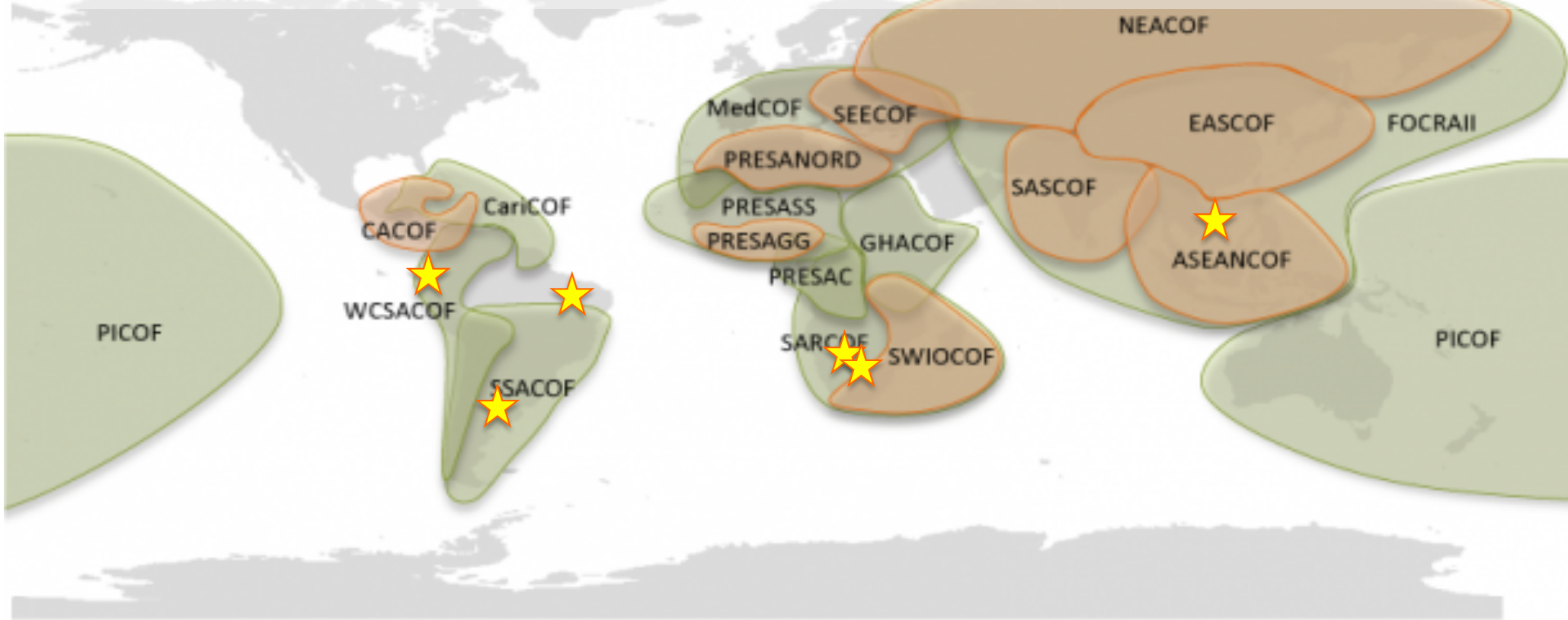


Forecast error drops to near-zero in European model with completion of TAO buoy array in the



(Stockdale et al. 2010)

1997/98: Big El Niño Event – Sparks RCOF Creation



1996: The IRI is created by NOAA

The mission of the IRI is to enhance society's capability to understand, anticipate and manage the impacts of climate in order to improve human welfare and the environment, especially in developing countries.

2006: WMO establishes Global Producing Centers for Long-range Forecasts

13 Officially designated centers



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2009: World Climate Conference-3 yields GFCS

Supported by WMO, in collaboration UNESCO, UNEP, FAO, ICSU and other intergovernmental and non-governmental partners.

Theme: Climate Prediction and Information for Decision Making

Vision: for “An international framework for climate services that links science-based climate predictions and information with the management of climate-related risks and opportunities *in support of adaptation to climate variability and change* in both developed and developing countries”



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2011: Climate Services Partnership established



Secretariat originally @ IRI, USA
Currently @ CSC, Germany

International Conference on Climate Services:

ICCS-1: New York, USA, 2011

ICCS-2: Brussels, Belgium, 2012

ICCS-3: Montego Bay, Jamaica, 2013

ICCS-4: Montevideo, Uruguay, 2014

ICCS-5: Cape Town, South Africa, 2017

ICCS-6: Pune, India, Feb 11-13, 2020

For more information...

<http://www.climate-services.org>



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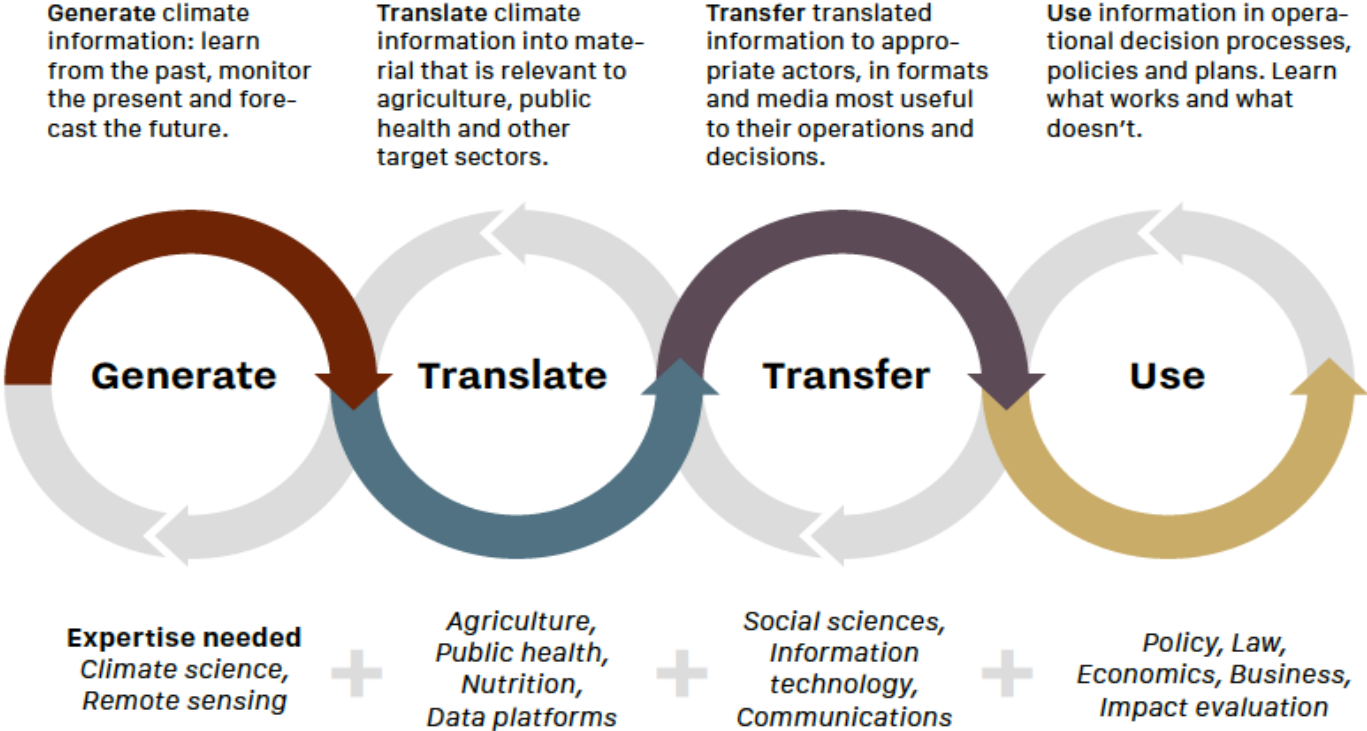


Figure: The schematic indicates the 4 Pillars of climate services. The colored arrows indicate that information flows from left to right, and is enhanced and made more relevant, and finally put to use. The grey arrows indicates feedback and iteration. The text above explains each of the Pillars. The 'Expertise' listed below each Pillar, builds as you proceed from left to right, with considerable multi-disciplinarity required to effectively transfer and use the information.

CLIMATE SERVICES

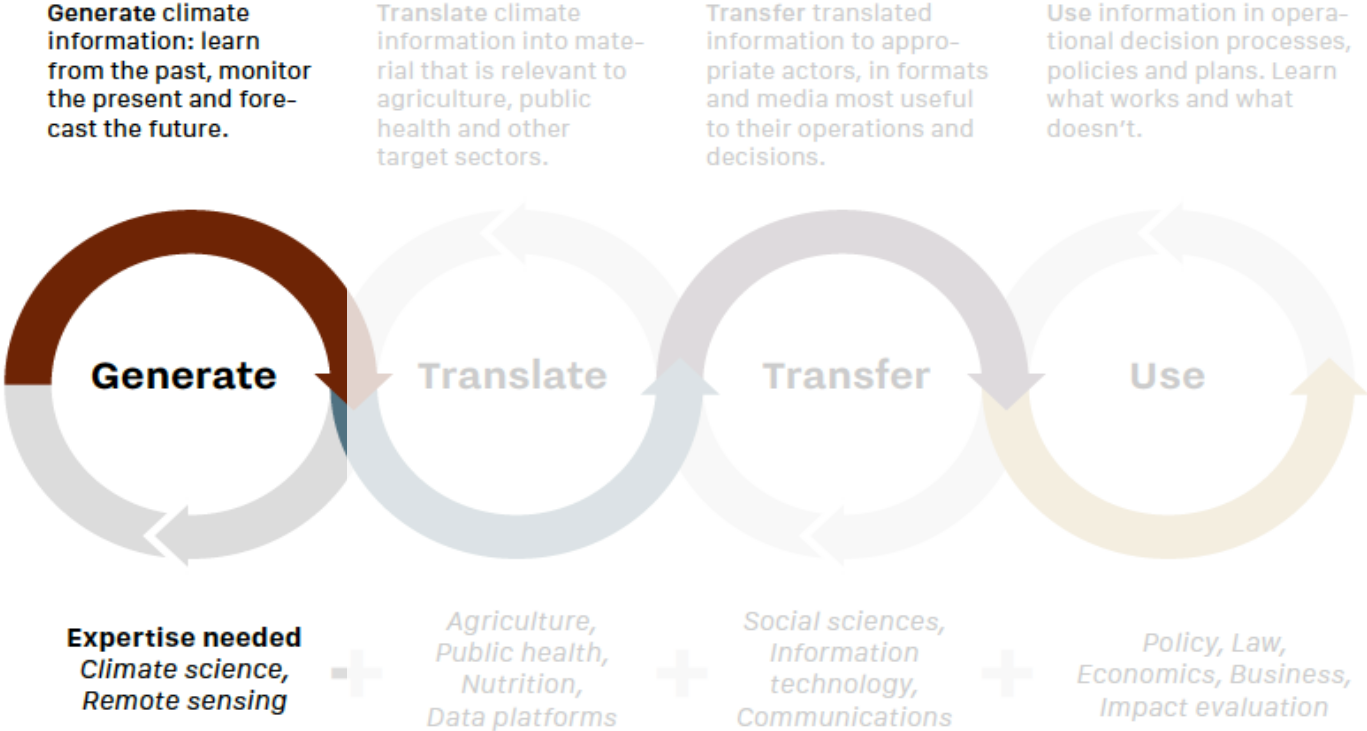


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Data Poverty limits Climate Services for the most vulnerable

Rain Gauges

Africa: 2,967 Germany: 4,133

Land Area (million sq. miles)



Africa



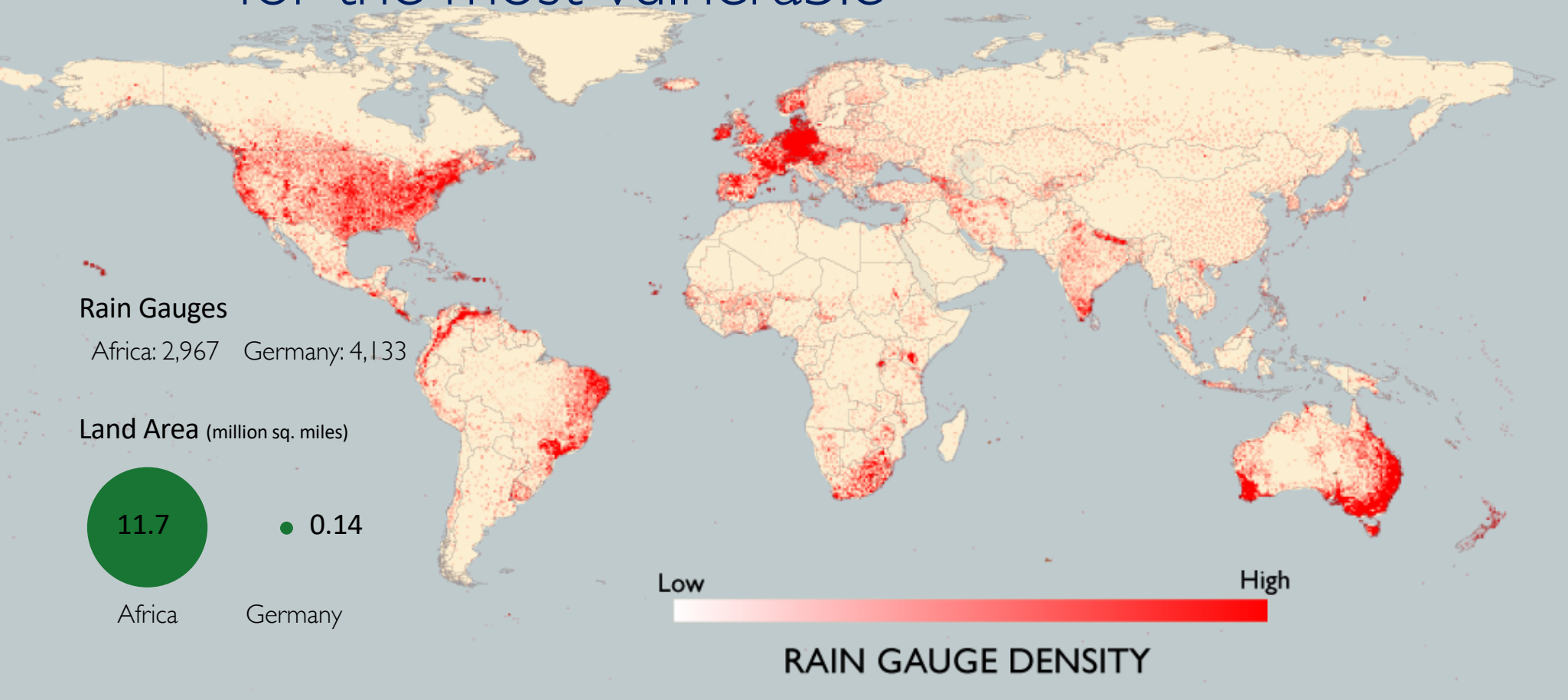
Germany

Low

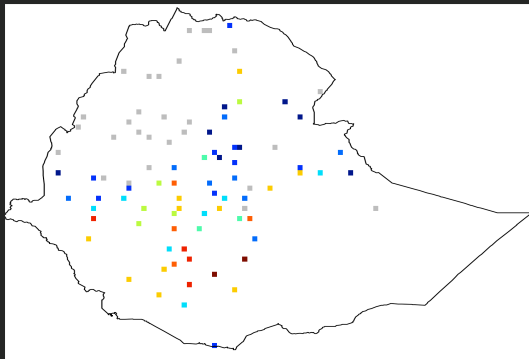
High



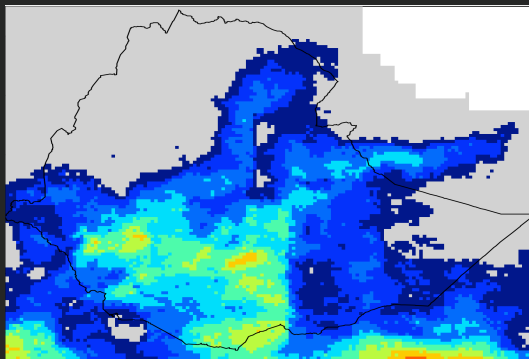
RAIN GAUGE DENSITY



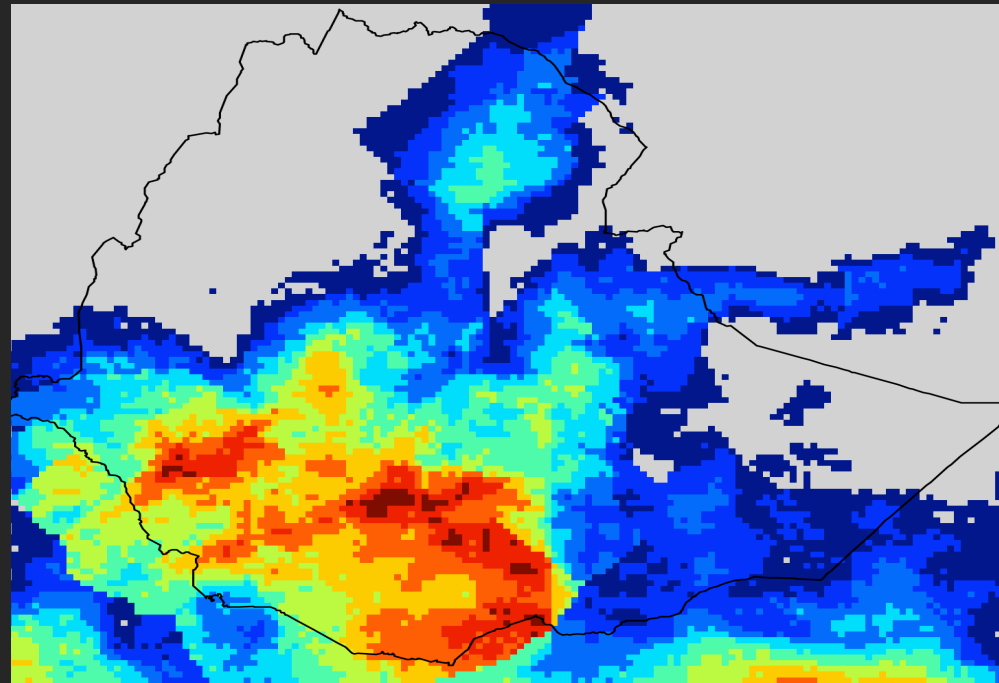
Rain Gauges - Ethiopia



Satellite Estimates



Hybrid Data Sets



<http://iri.Columbia.edu/ENACTS>

IRI

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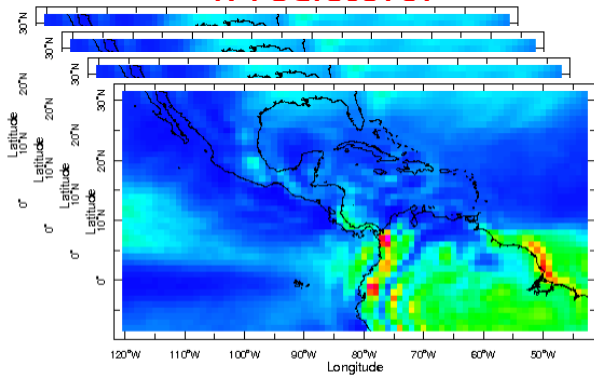
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The Making of a Forecast: Multiple models, each with multiple predictions, calibrated against observations

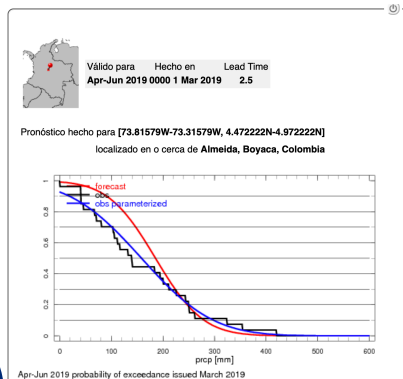
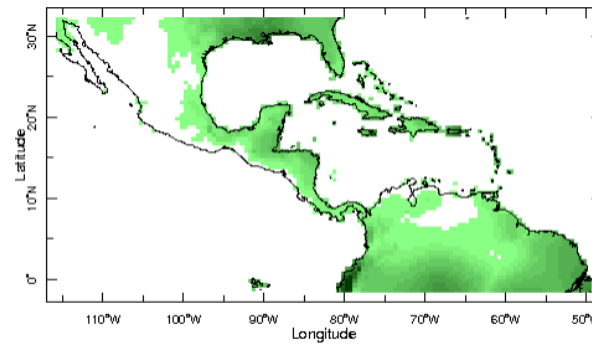
Raw Model Output of Past (Predictors)

Gridded/Station Obs of Past (Predictand)

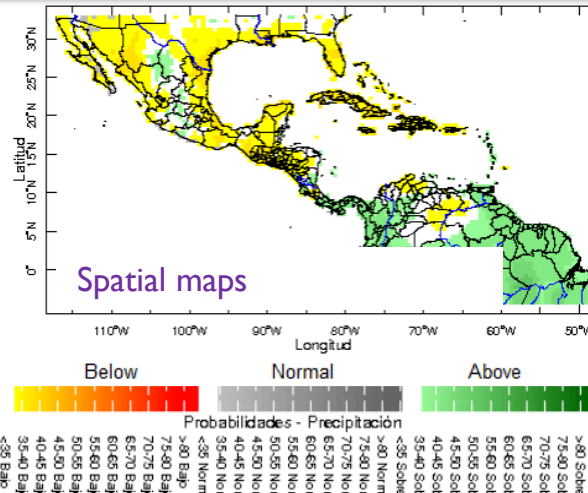
Multiple Climate Models



Forecast Assimilation



Flexformat! Use entire PDF



Apply Relevant Correction to Current Prediction

Pattern-based calibration (Model Output Statistics), each model independently, then ensemble in probability space



CLIMATE SERVICES

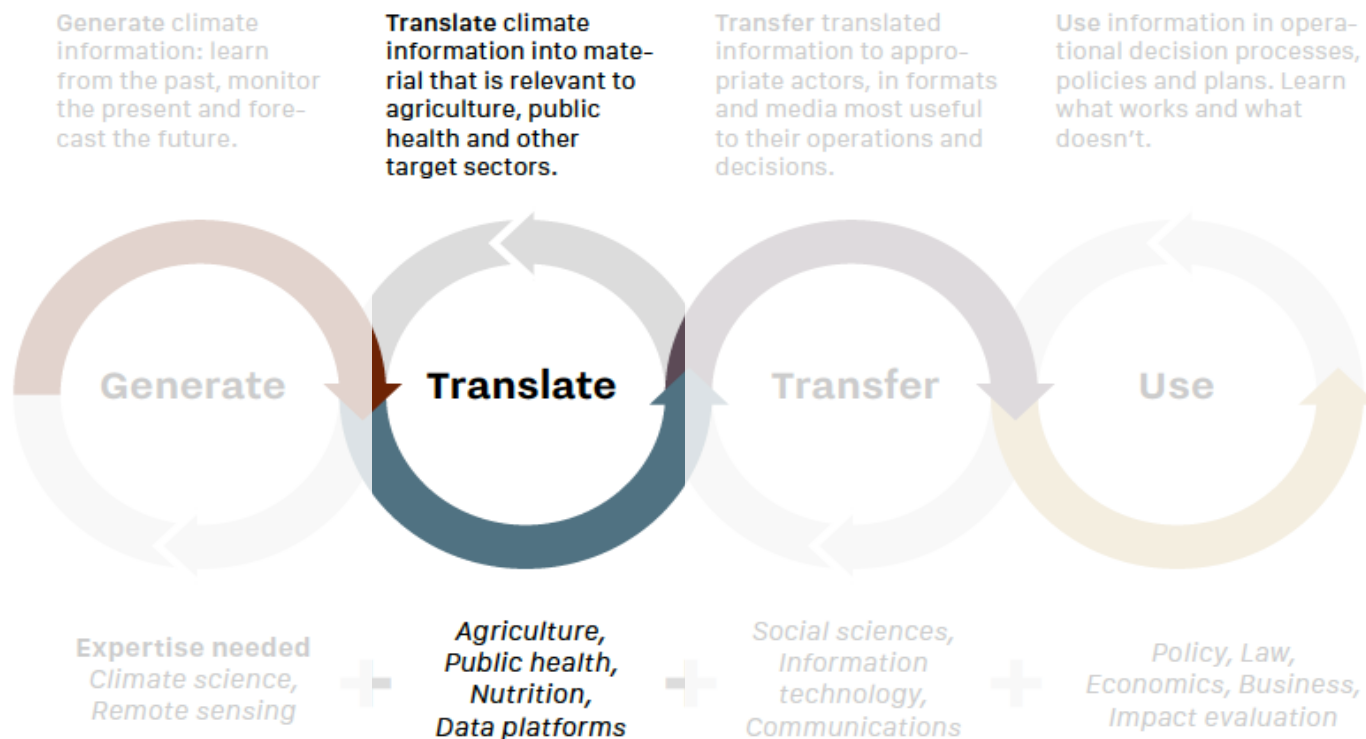
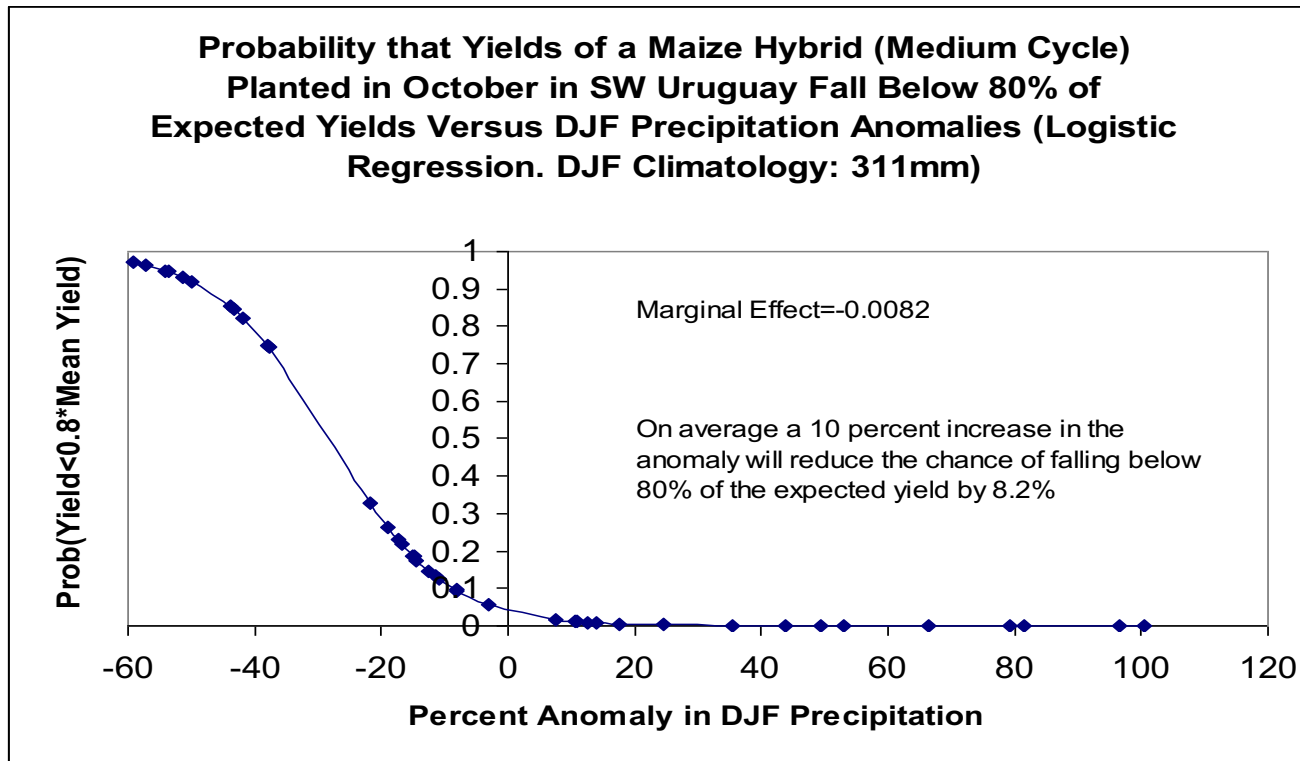


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Translation of rainfall information into relevant sector-related terms



CLIMATE SERVICES

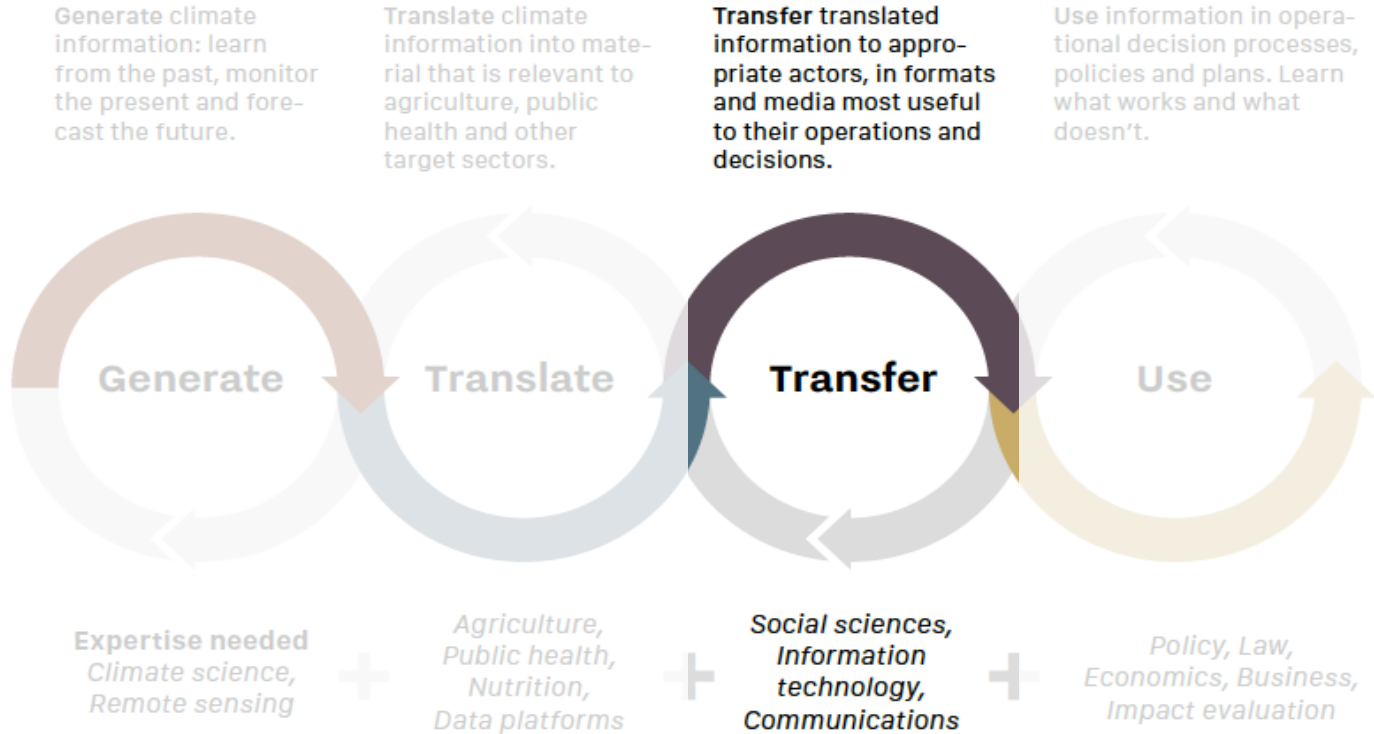


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Ethiopia Climate Service: Information Delivery

The screenshot displays the NMA website interface with the following components:

- Header:** Logo of the National Meteorology Agency (NMA) and the text "የኢትዮጵያ ሚትዎሮሎጂ ኤጀንሲ" (National Meteorology Agency).
- Navigation Menu:** Home, Daily Weather, Forecasts, Maproom, Satellite, Bulletins, Contact.
- Search and Navigation:** A search bar and a list of menu items including About NMA, Data Service, Climate, Short Range Forecast, Medium Range Forecast, Long Range Forecast, Agromet Bulletins, Health Bulletins, Hydromet Bulletins, Satellite Images, Climate Analyses & Application (Maproom), Research and Training, News Media, Frequently Asked Questions, Vacancies, Feedback, Useful Links, and Aviation Meteorology.
- Main Content Area:**
 - Climate Analysis:** A map of Ethiopia showing rainfall and temperature time series (1983-2010) reconstructed from station observations and remote sensing proxies.
 - Climate Monitoring:** A map showing a rainfall-monitoring product based on dekadal rainfall, allowing users to view recent rainfall with a seasonal and recent historical perspective.
 - Climate and Agriculture:** A map exploring historical daily precipitation by calculating simple seasonal statistics, allowing users to produce yearly time series of a chosen seasonal diagnostic.
 - Climate and Water:** A map titled "Flood Prone Area In Ethiopia" which is currently "Under Construction".
 - Climate and Health:** A map showing empirically-derived thresholds of precipitation, temperature, and relative humidity used to assess the climatic suitability of malaria transmission.
 - Seasonal Climate Monitoring:** A section with a text input field: "I can put a text to describe my maproom."
- Footer:** "You Are Here: Home" and "National Meteorology Agency" with a photo of the head office building.

Dissemination Platforms:

- Web-based
- Printed advisories
- Radio/TV
- Newspaper
- Community centers



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Mesas Técnicas Agroclimáticas (MTA)

La MTA es un proceso de diálogo entre una diversidad de actores locales, que busca comprender el posible **comportamiento del clima** en una localidad y generar recomendaciones para disminuir los riesgos asociados a **la variabilidad climática esperada**.

Como resultado de dicho diálogo, se genera un **boletín agroclimático** que contiene la **predicción climática**, su posible **impacto** en los cultivos, asociado a **recomendaciones** como toma de decisión.

• Producción - Traducción - Transferencia - Uso



= Toma de decisiones informadas sobre el clima



Dissemination Platforms:

- Discussion forums



RESEARCH PROGRAM ON
**Climate Change,
Agriculture and
Food Security**



Giraldo-Mendez et al.(2018) Manual de implementación de las Mesas Técnicas Agroclimáticas (MTA). CCAFS - CIAT

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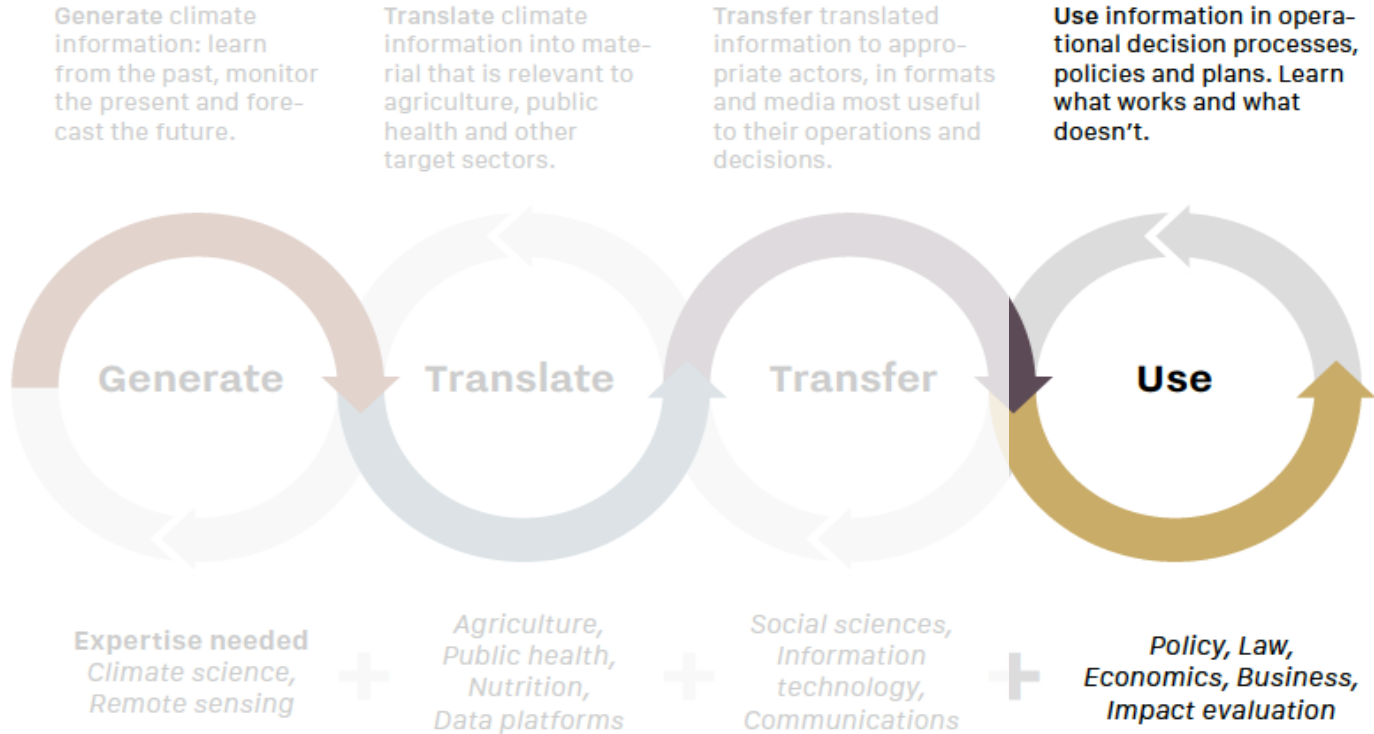



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Emergency appeal

 International Federation
of Red Cross and Red Crescent Societies

West and Central Africa: Flood preparedness

Emergency appeal n° MDR61003
11 July 2008

This preliminary Emergency Appeal seeks CHF 750,000 (USD 731,134 or EUR 462,475) in cash, kind, or services to support the National Societies of West and Central Africa to assist 47,500 beneficiaries.

CHF 483,047 has been allocated from the Federation's Disaster Relief Emergency Fund (DREF) to start the planned activities. Discussions are currently taking place to reallocate approximately CHF 550,000 remaining from the 2007 West Africa floods appeal to support this appeal. While these discussions are underway, partners are encouraged to provide timely support to this appeal.



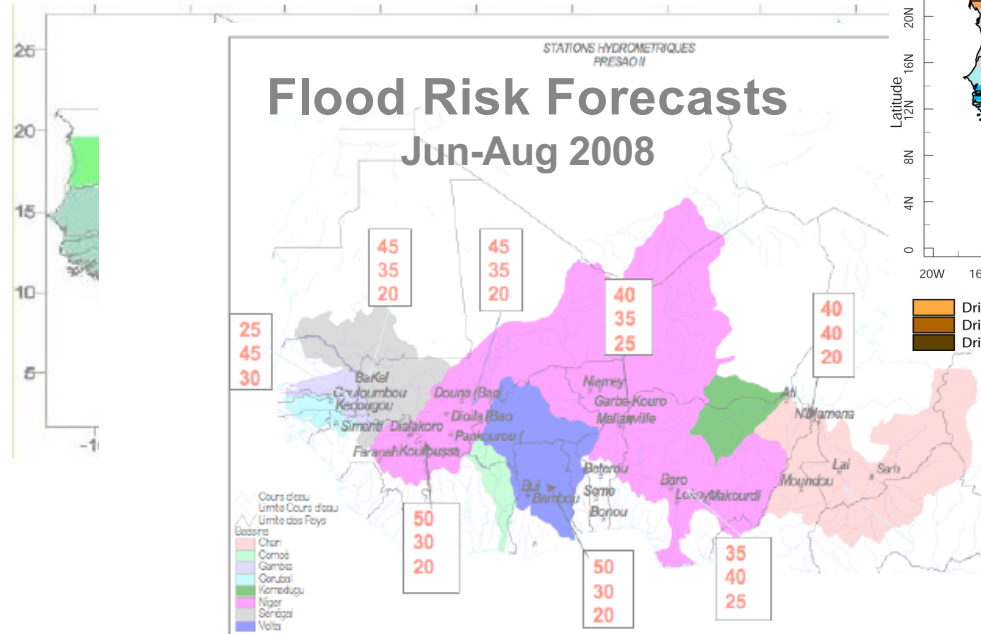
Red Cross Volunteer, Lomé, Togo, June, 2008



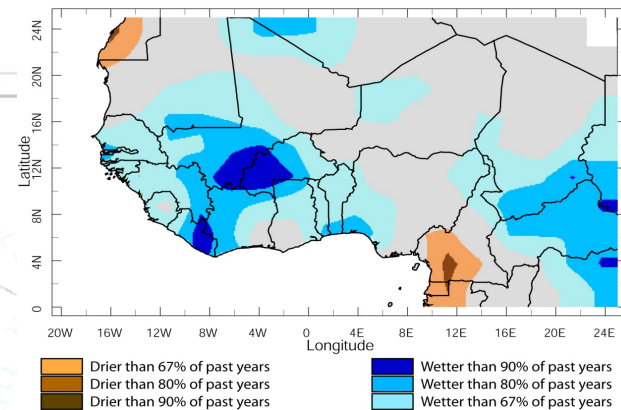
International Federation
of Red Cross and Red Crescent Societies

West Africa preparedness appeal

Precipitation Forecasts Jun-Aug 2008



Observed Rainfall



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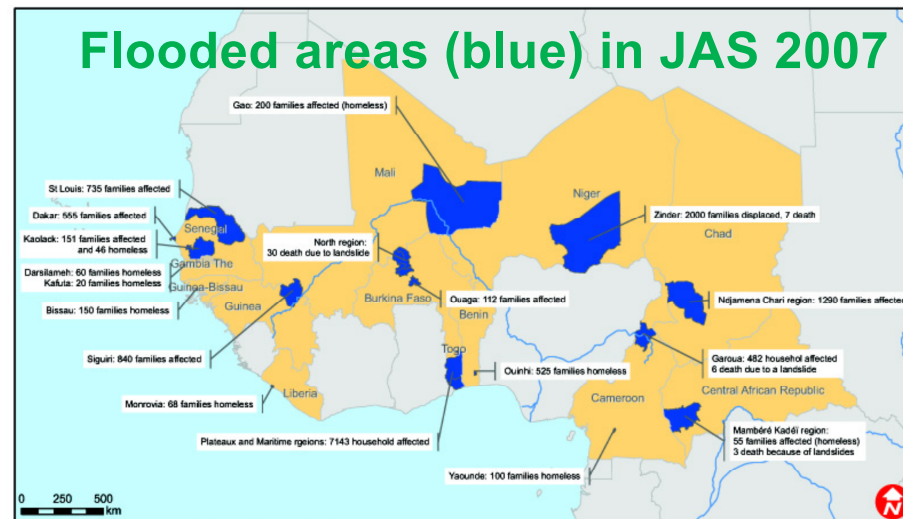


International Federation
of Red Cross and Red Crescent Societies

Early Action works:

- Faster response: **1-2 days** rather than 40 in 2007
- Fewer victims (**30** instead of hundreds)
- Lower cost per beneficiary (**30%**)

Example: Red Cross volunteers in Ghana saving lives by alerting Volta fishermen that the Bage dam would be spilled.



FAO: Early Warning – Early Action

SOMALIA EXAMPLE: RESULTS

Situation Analysis

- El Niño 2015: Risk of floods affecting more than 90 000 people and 9100 ha of farmland along the Shebelle and Juba Rivers.

Example FAO Actions:

- strengthen riverbanks
- build flood barriers

Return on Investment

- Investment: 1.7m USD
- approx. 6.7m USD in maize production saved

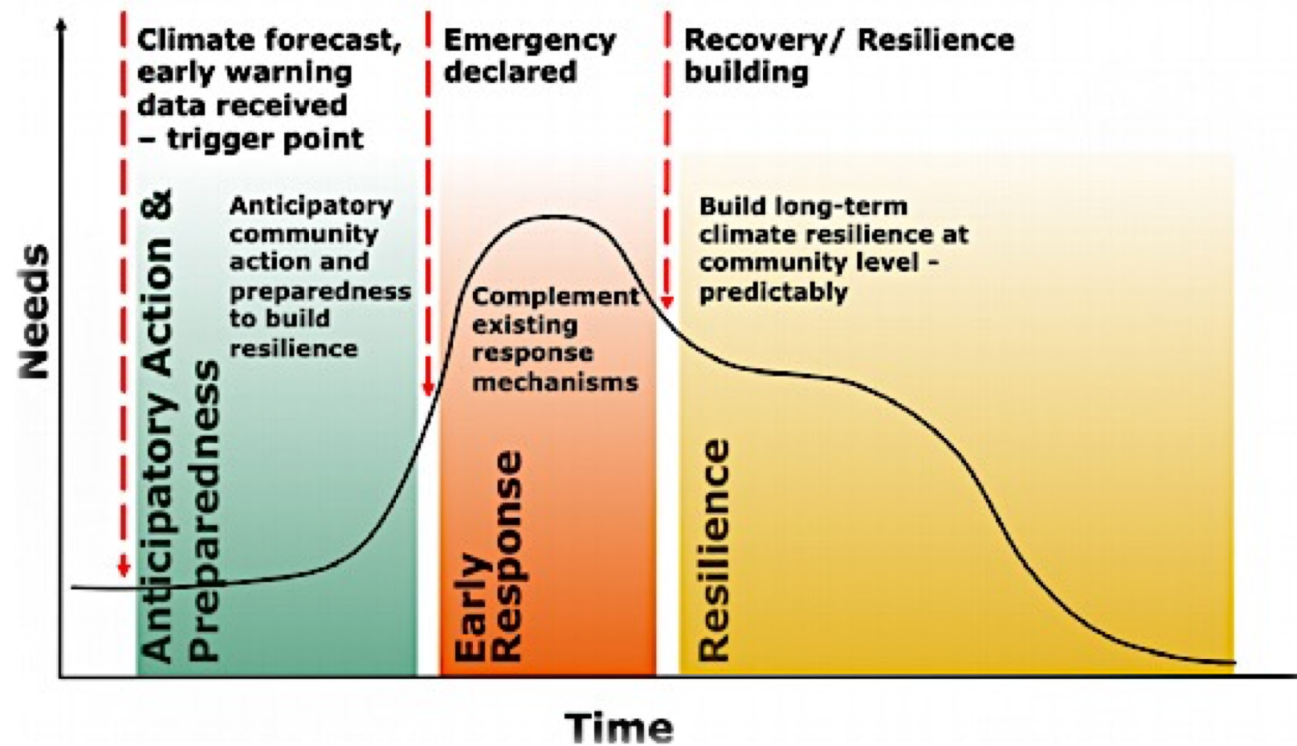


- And, where are Climate Services going?
- Sea change in how humanitarian sector works

WFP+IRI Pioneering Example of Forecast-based Financing (FbF)

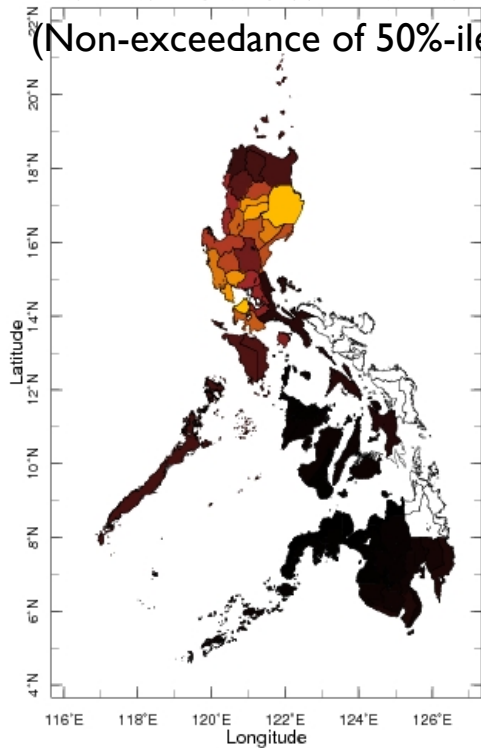
-- Specific example of Early Warning for Early Action

CONCEPT:

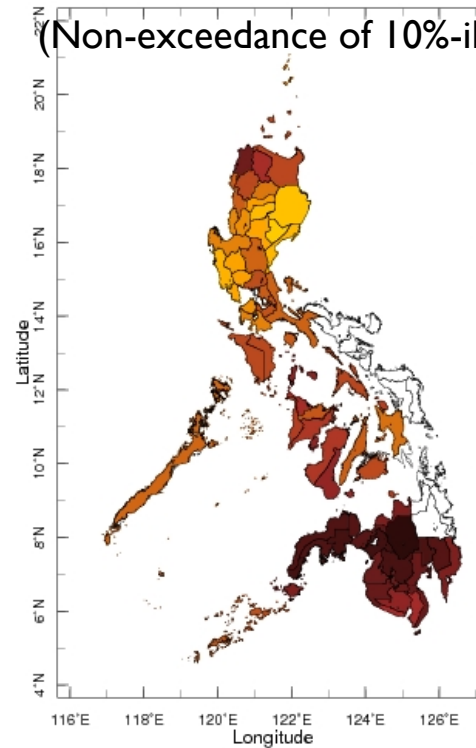


WFP + IRI FbF – Drought Triggers

Rainfall below median
(Non-exceedance of 50%-ile)



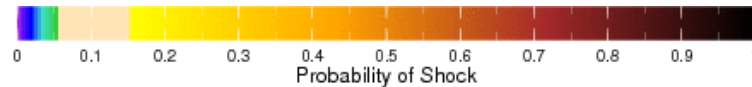
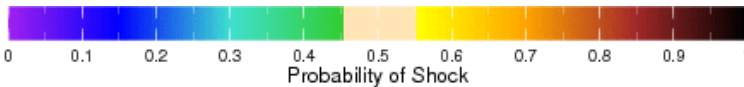
Rainfall below driest 10% of past obs
(Non-exceedance of 10%-ile)



Made
Sept.
2015

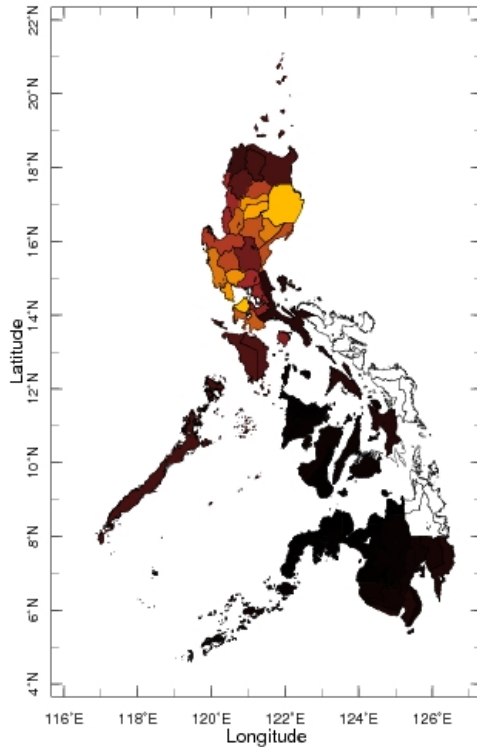
Jan-Apr 2016 Forecast issued September 2015

Jan-Apr 2016 Forecast issued September 2015



WFP + IRI FbF – Drought Triggers

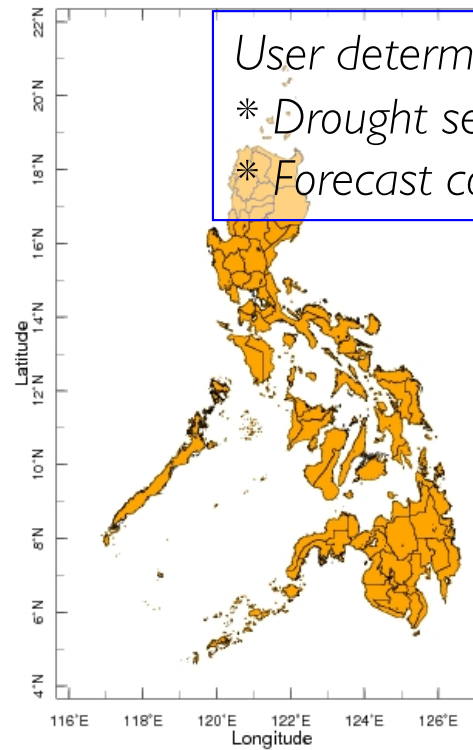
Rainfall below median



Made
Sept.
2015



“ACTIVE TRIGGERS”



User determines:
* Drought severity
* Forecast confidence

Jan-Apr 2016 Forecast issued September 2015



➤ And, where are Climate Services going?

- Sea change in how humanitarian sector works
- Private sector will become increasingly involved
- More and more universities and research labs engaged in societally-relevant research
- Society becomes accustomed to managing/adapting across timescales

Several Challenges that GFCS, WCRP, and the Broader Scientific Community should consider

- 1) How do many organizations occupy this space cooperatively while still ensuring credit/accountability where due?
- 2) How should best practices be determined and monitored?
- 3) Some information providers make false claims of high skill and accuracy that most people would not be able to refute. Should some sort of certification exist?

SUMMARY

- **Climate Services is about a lot more than just providing climate information**
- **Not all climate information is created equal.**
- **Several challenges lie ahead, but the frontier is vast!**

Thank You



A central box containing social media contact information for the International Research Institute for Climate and Society. It features three rows of icons and text: the IRI logo with the URL <http://iri.columbia.edu>, the Twitter logo with the handle @climatesociety, and the Facebook logo with the page name /climatesociety.

goddard@iri.columbia.edu

info@iri.columbia.edu



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