COLUMBIA CLIMATE SCHOOL
Climate, Earth, and Society

Climate Information:

User Needs and User Uses

Walter E. Baethgen

IRI, Columbia Climate School

Early approach: Supply Driven (1990s)

"We produce great climate information Use it in your Decisions, Plans, Policies"

IRI Lesson learned

Understand the System / Understand the Challenges (Participatory)

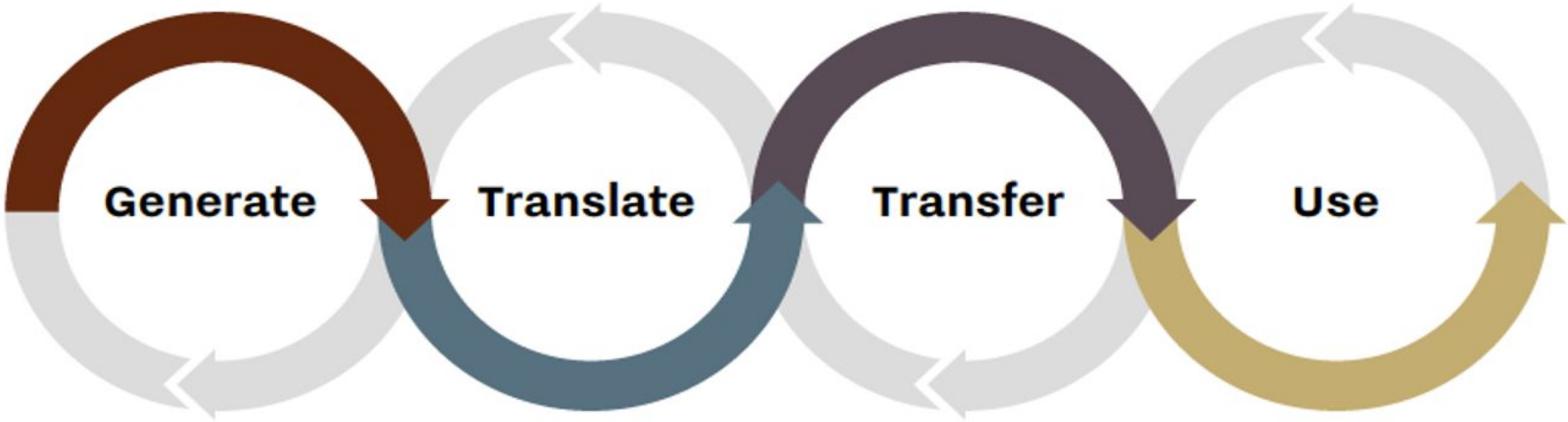
Identify the Role of Climate Information (Participatory)

Explore Tools, Products to Inform Solutions (Participatory)

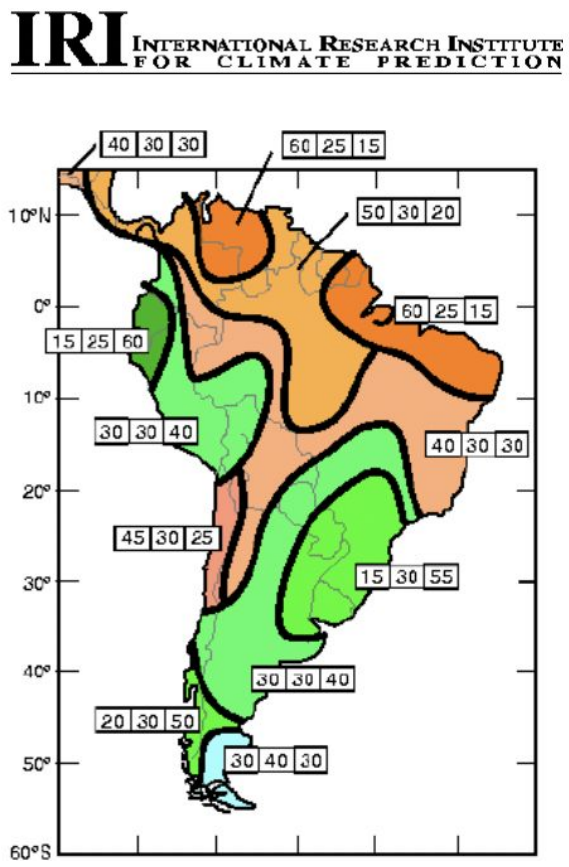
Translate "Climate" into "Agronomic" (or Water, Public Health, Energy, etc.)

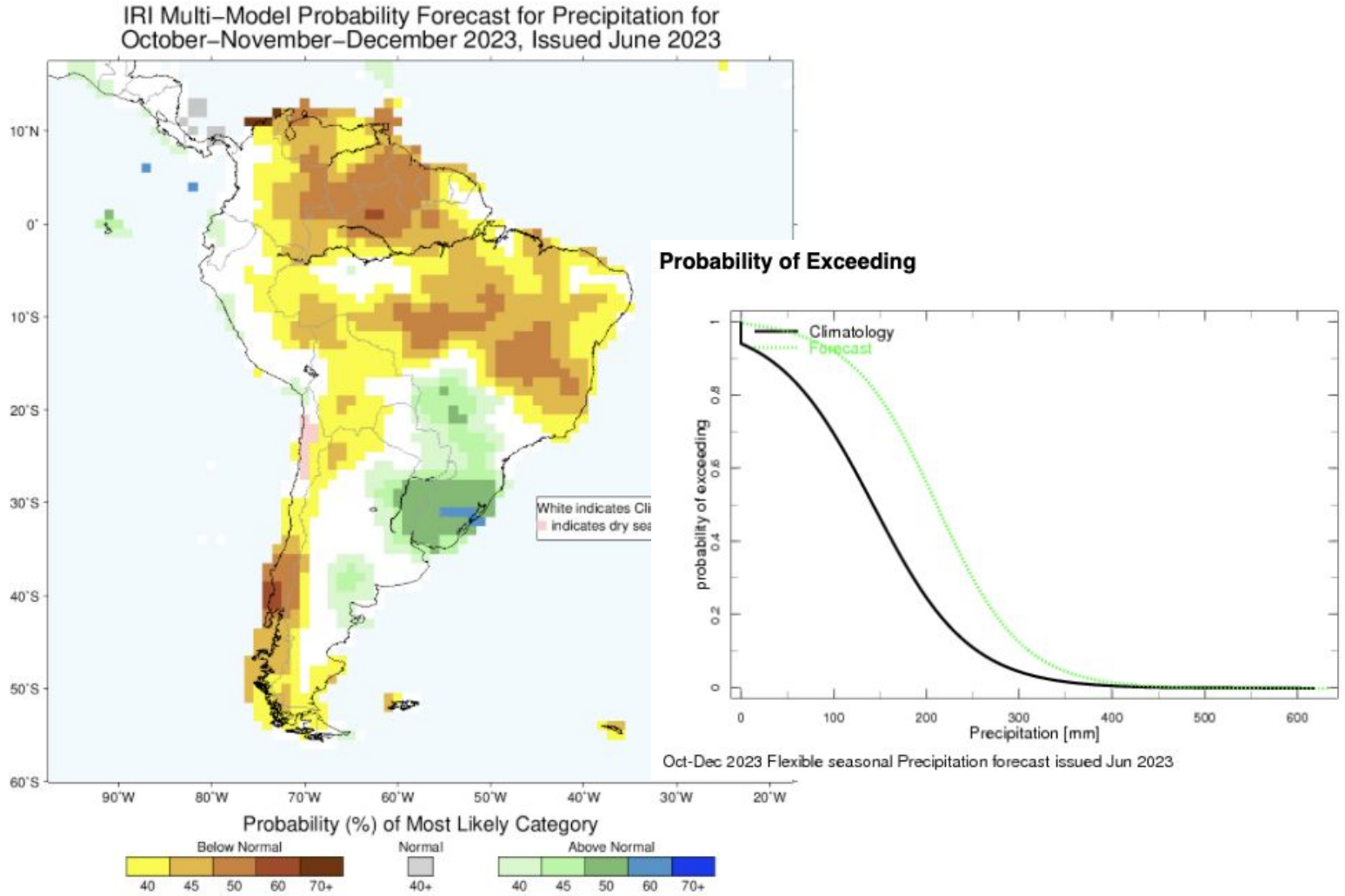
Identify "Intermediaries", "Next Users" (as opposed to "End Users")

Climate Services



GENERATION:





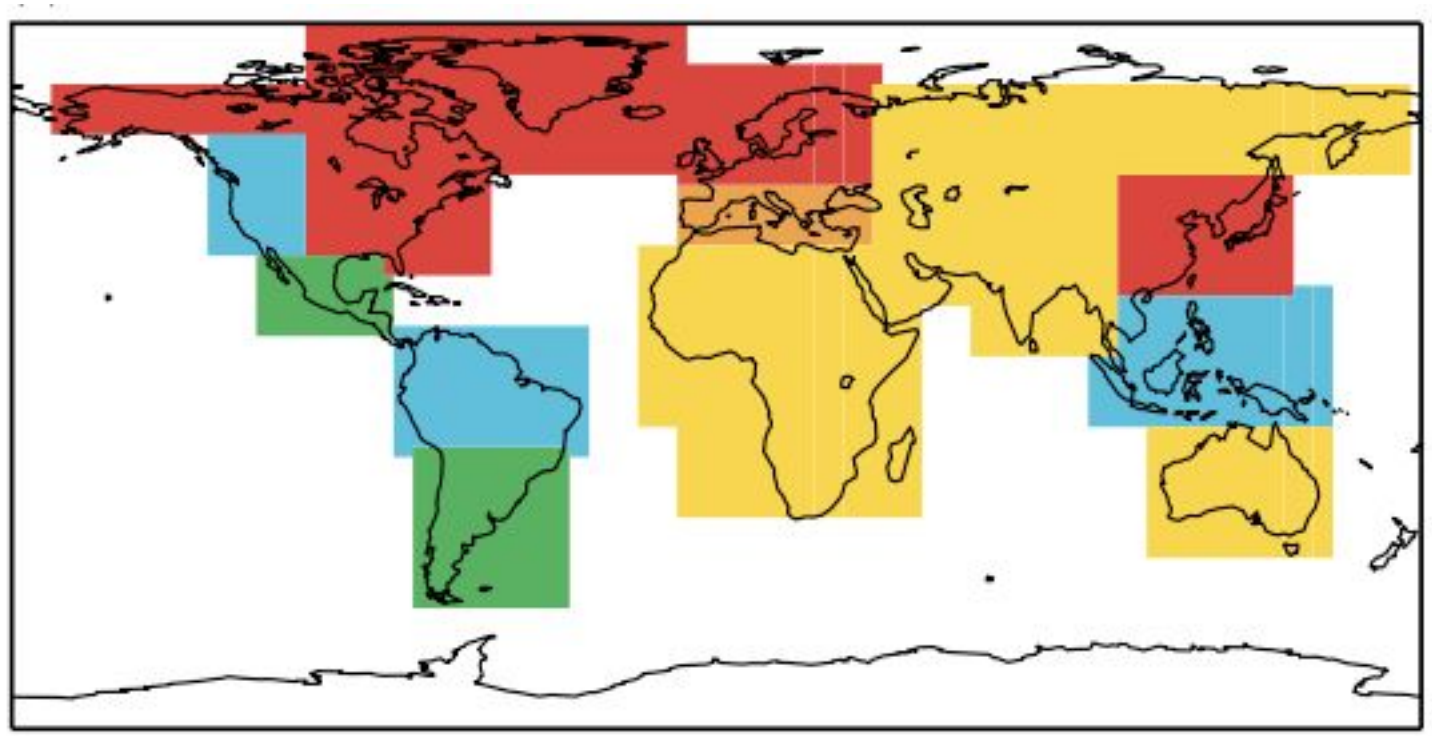
Subjective, Consensus,
expressed as Terciles
(Regional Climate Outlook Forums)

Objective, Verifiable, using full Probabilities
(NextGen being used in RCOFs)

Challenges for Using Forecasts

(1) Reliability of Seasonal Forecasts

Example: Dry DJF (ECMWF)



5 perfect 4 still useful 3 marginally useful 2 not useful 1 dangerous

(Forecast frequency vs Observed frequency)

A. Weisheimer and T. N. Palmer, 2014

Role of Subseasonal Forecasts in regions with no ENSO signal (and/or years with no ENSO)

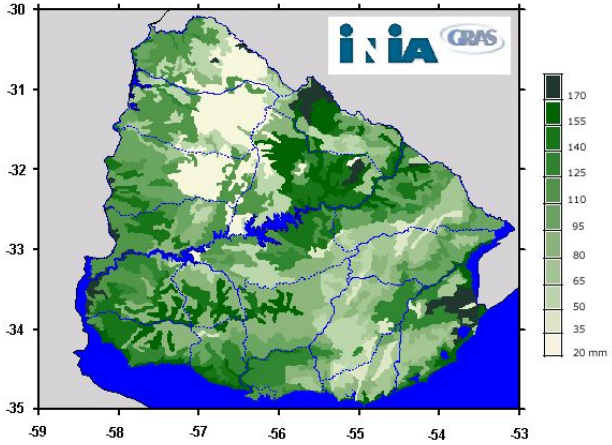
Often Monitoring is Enough

Uruguay Drought in 2015:

Provided information to
Ministry of Agriculture

Current Soil Water Content
(Translate "Climate into Agronomy")

Original Soil Water Balance
per Soil Type



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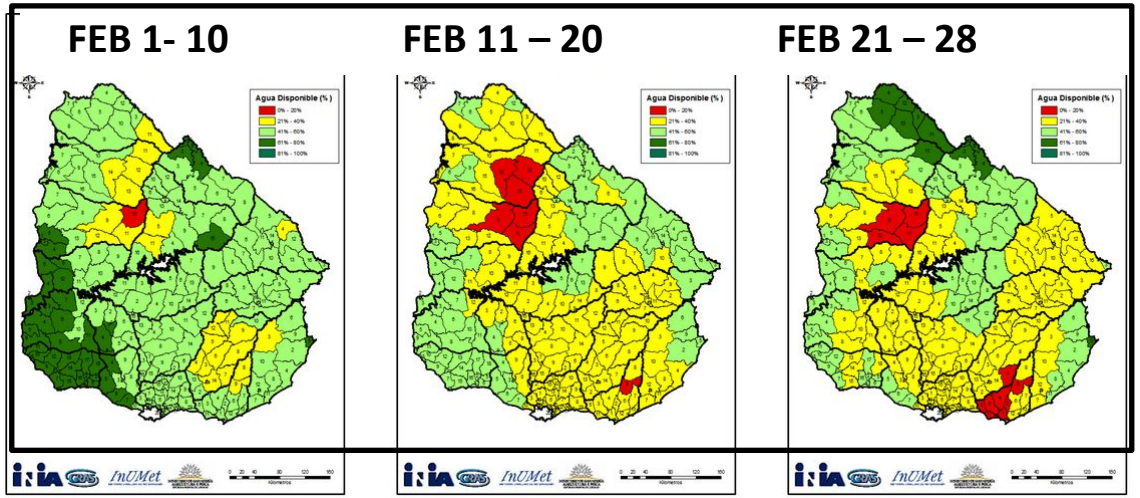

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Ministry declared Emergency in
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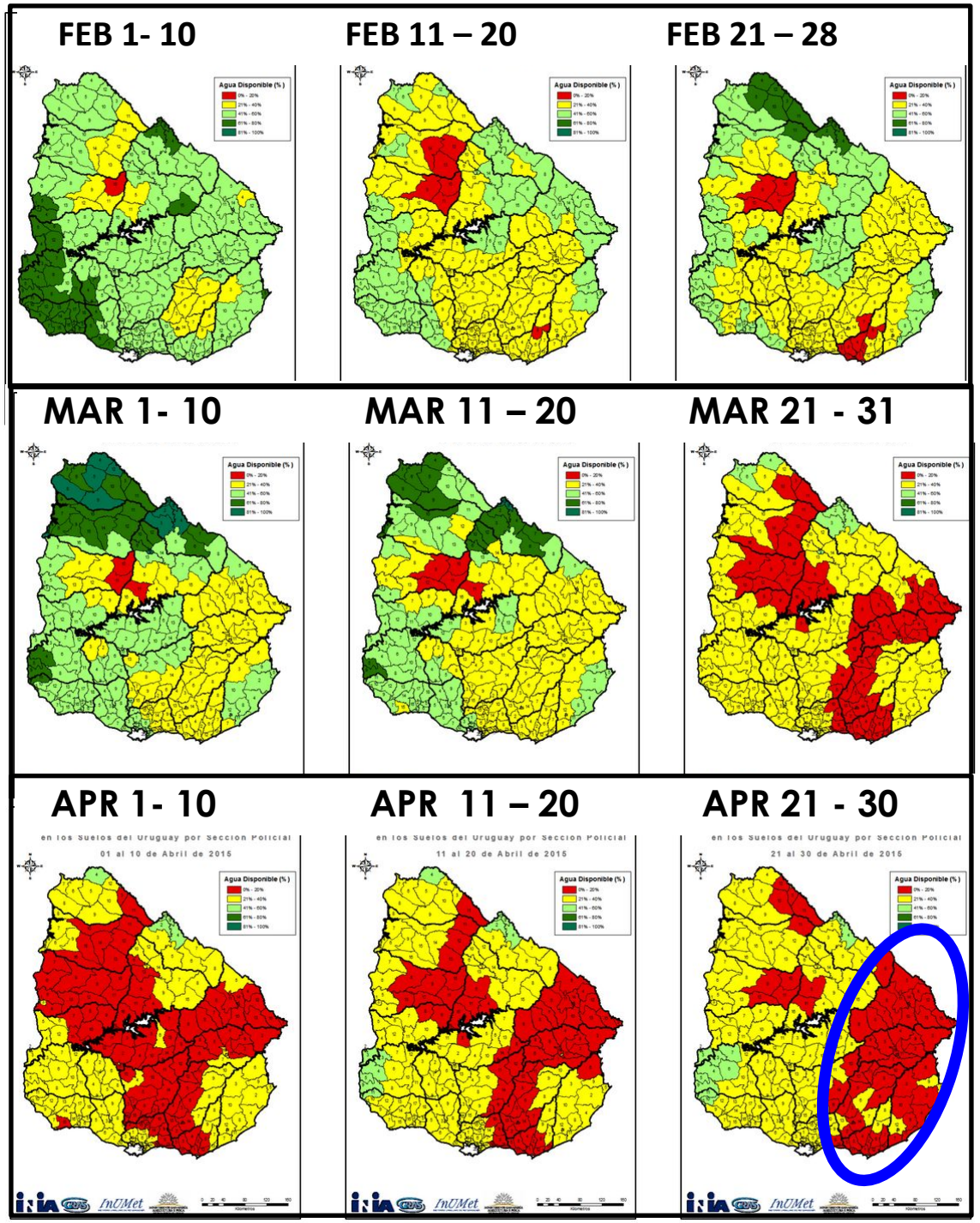
-Special Credit for feed
-Prioritize response



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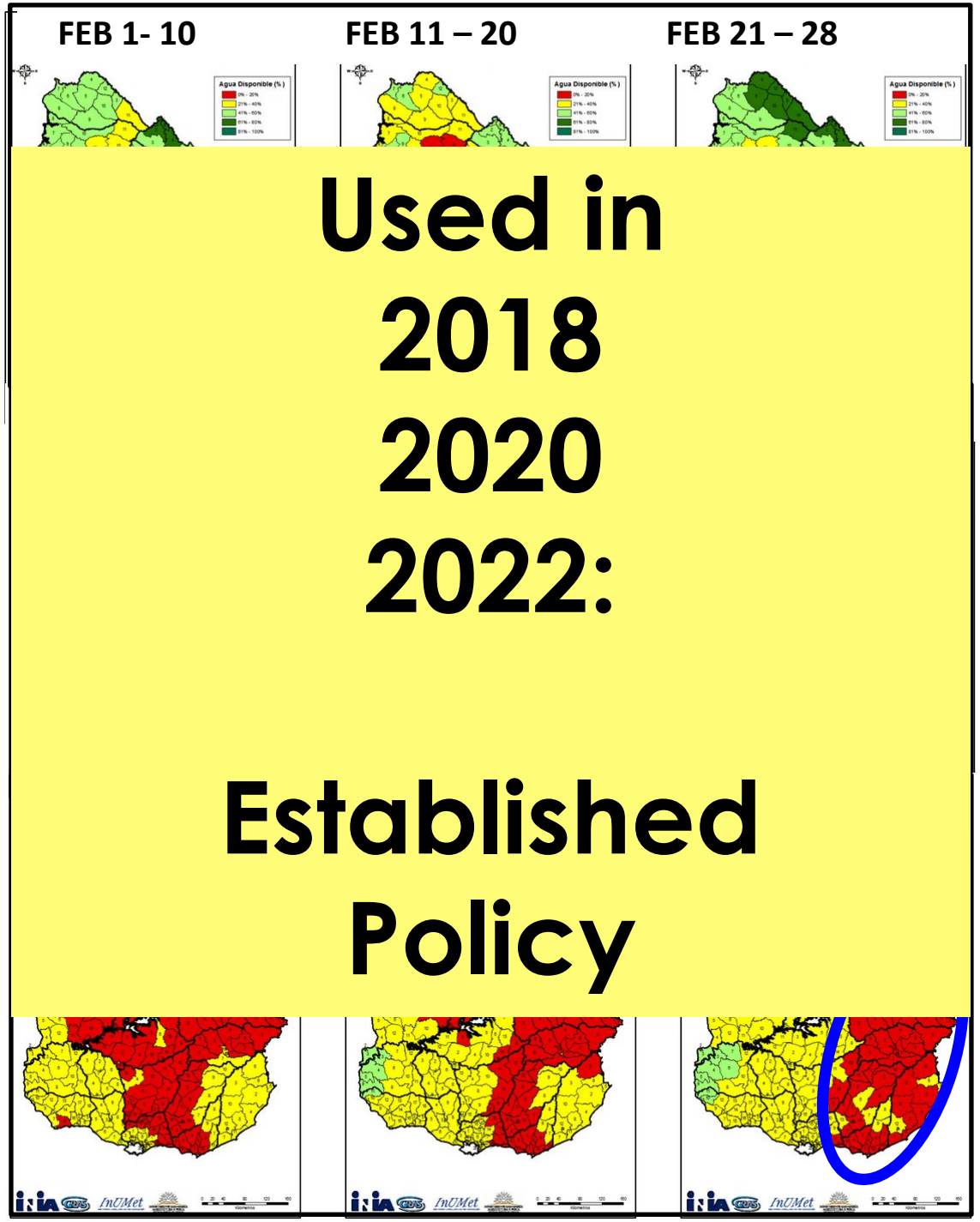

Used in
2018
2020
2022:

Established Policy

Challenges for Using Forecasts

(2) Decision System in Place

- Algorithms, Models / Simple Decision "mental model"?
- Individual? Group? Structure?
- Options for Decisions (e.g., Inputs? Credit?)
- When? Needed Lead time?

Who Makes Decisions?

- Ministry of Agriculture?
- Agri-business?
- Farmer / Adviser?

Decision System Sophistication and Impact

Include ENSO based Seasonal Forecast in the Electric Power System Simulator (SimSEE) to optimize the integrated power system in Uruguay (100% electricity is renewable).

2/3 of the years: significant net benefits

Maciel et al., Int. J. Climatol. (2015)

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Minister of Agriculture in the Parliament during a Drought

"Need more funds, Drought is not Over"

Based on a Screen capture of **IRI Seasonal Forecast**

Simple info □Big Impact

Produce and Make Available Climate Information

Very Useful but: Not Enough to Inform Decisions / Policies

No Decisions / Policies are based on "One Dimension"

- **Climate**
- **Prices and Costs**
- **Farm characteristics**
- **Policies in Place**
- **Personal / Cultural preferences**
- **Many possible others…**

Need to Integrate Information

Decision Support Systems (Extension / Advisers)

CLIMATE INFORMATION

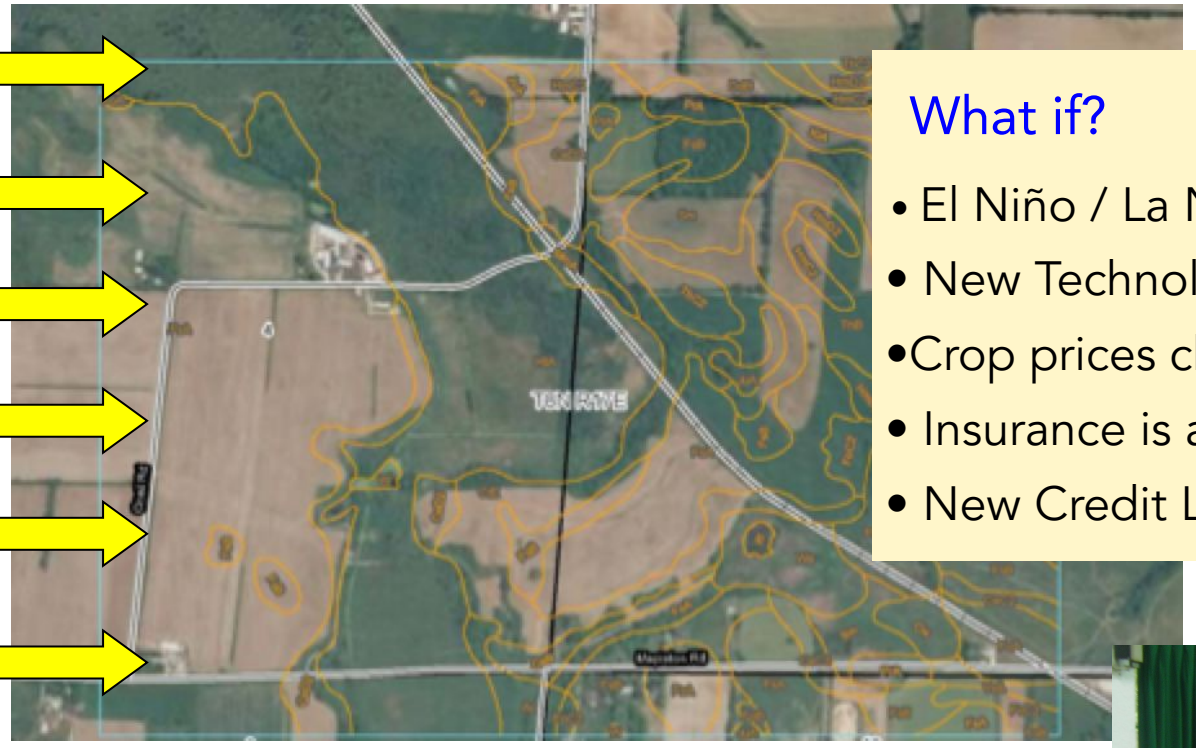
VARIETIES

PLANTING DATES

SOIL TYPES

PRICES, COSTS

CROP SIMULATION MODELS



What if?

- El Niño / La Niña Year
- New Technology
- Crop prices change
- Insurance is available
- New Credit Line

Provide Quantitative Information to Farmers and Policy Makers to Assess Risks, Inform Decisions

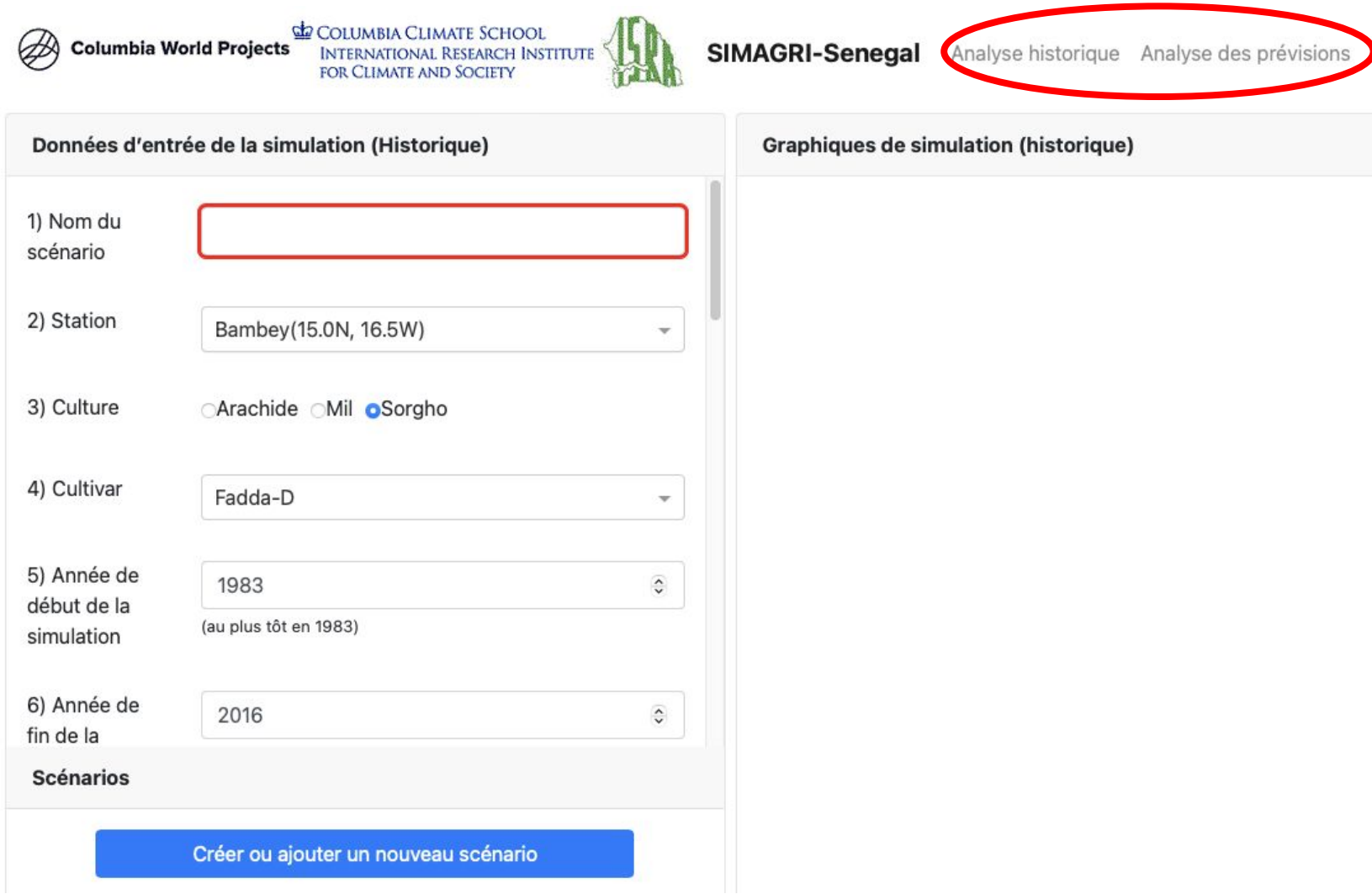
Use Crop Simulation Models

Problem:

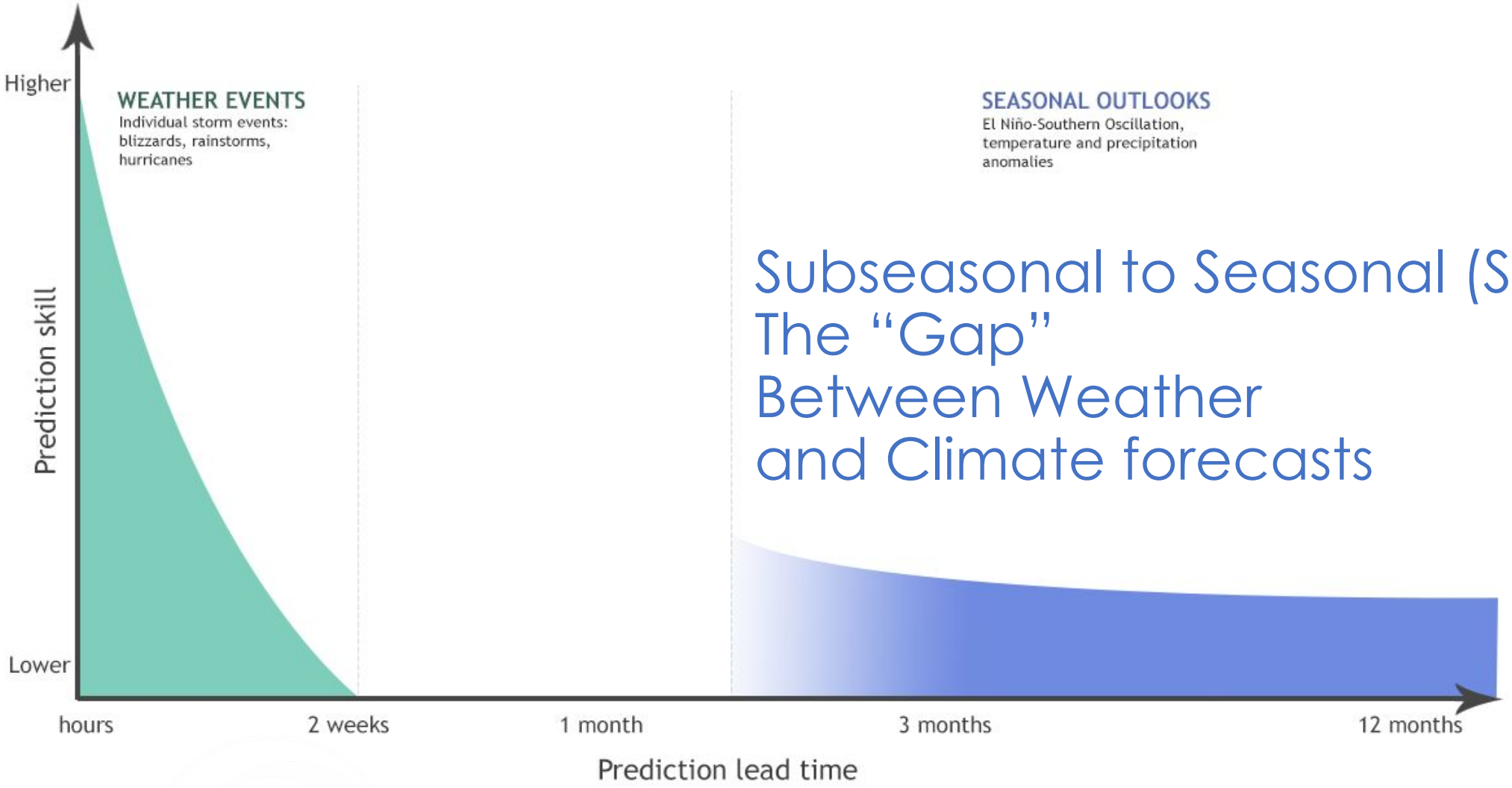
- Not user friendly
- "Dangerous"

IRI's Solution: "SIMAGRI"

- Easy to Use Interface
- Online



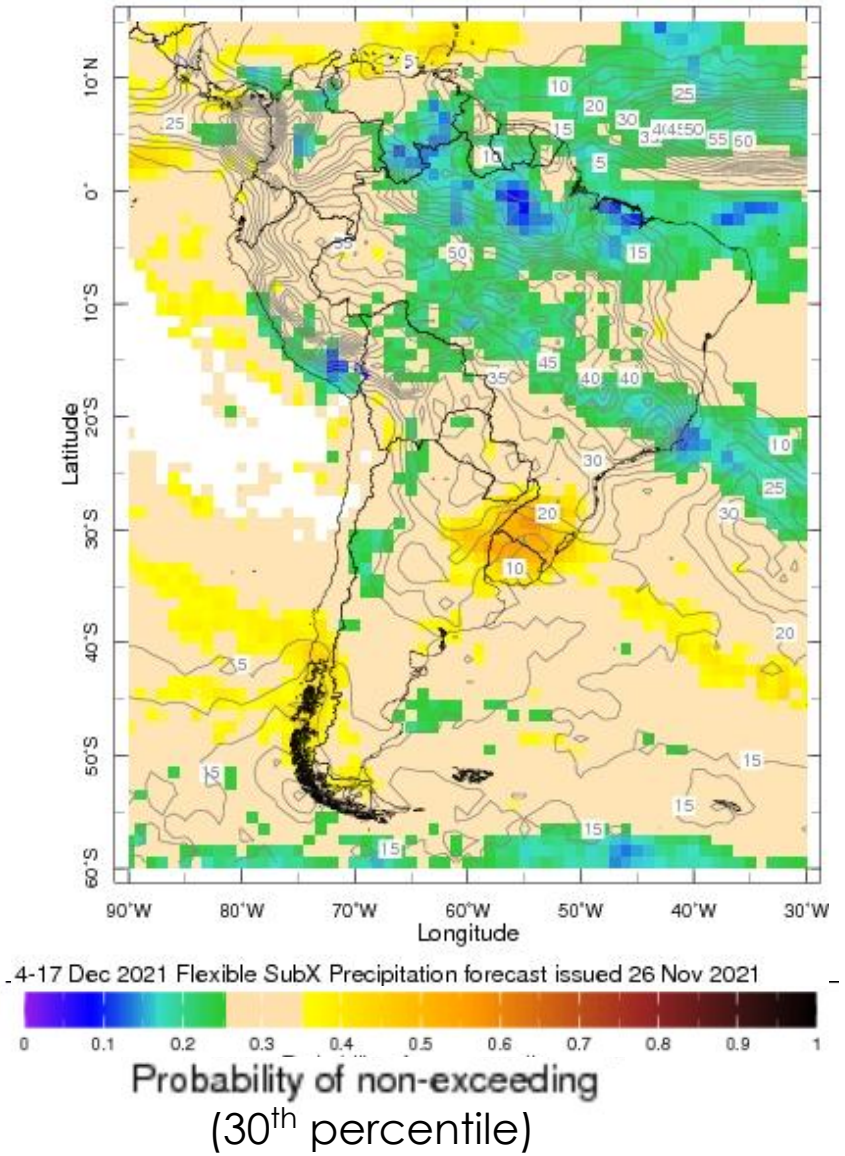
Informing Decisions with Weather & Climate Forecasts



Subseasonal to Seasonal (S2S): The "Gap" Between Weather and Climate forecasts

Adapted from: iri.columbia.edu/news/qa-subseasonal-prediction-project

Subseasonal Forecasts Complementing Seasonal



http://iridl.ldeo.columbia.edu/maproom/Global/ForecastsS2S/precip_flex_subx.html

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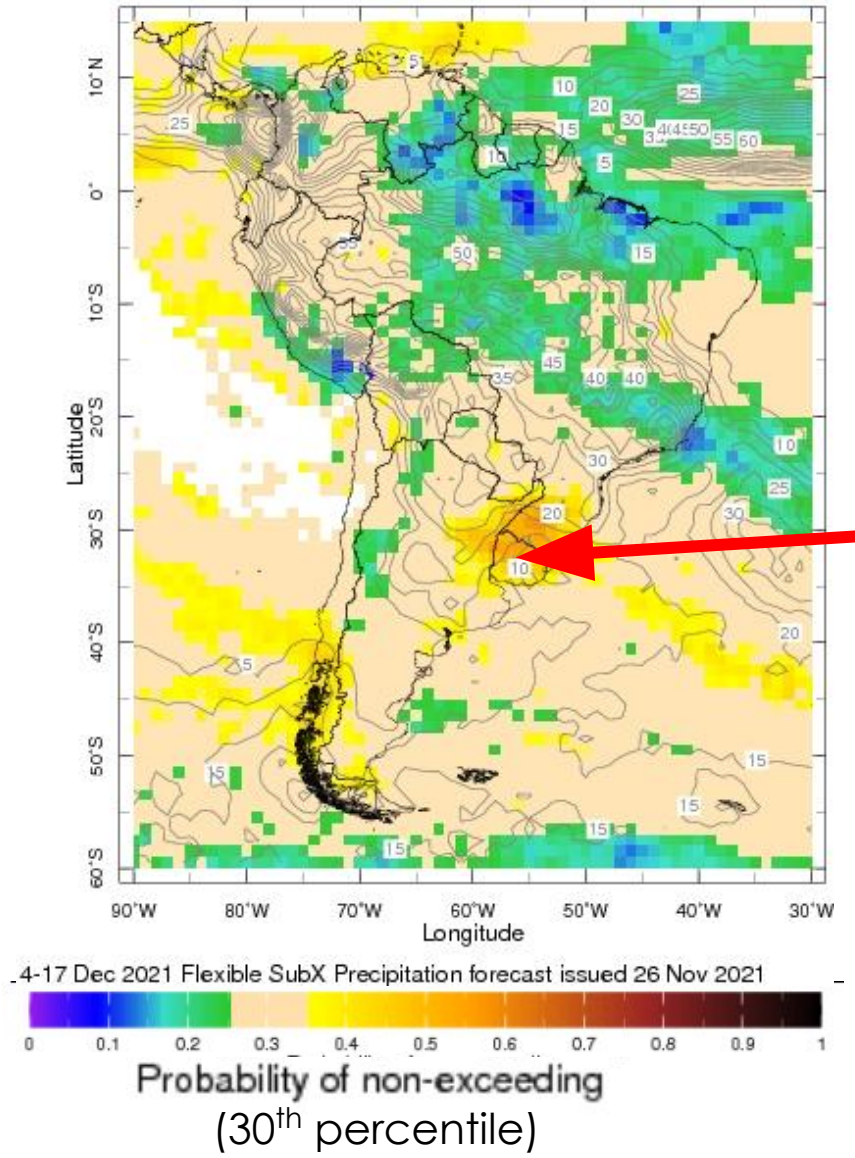


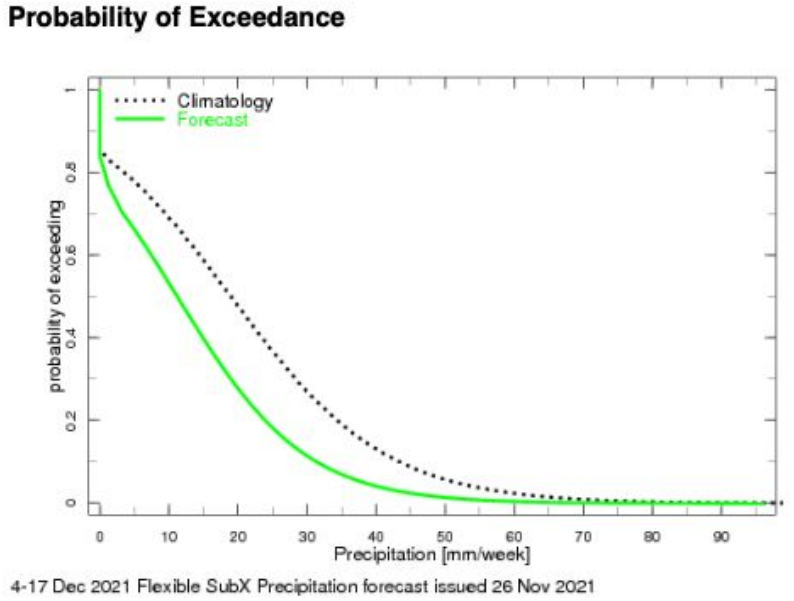
At Selected Point:

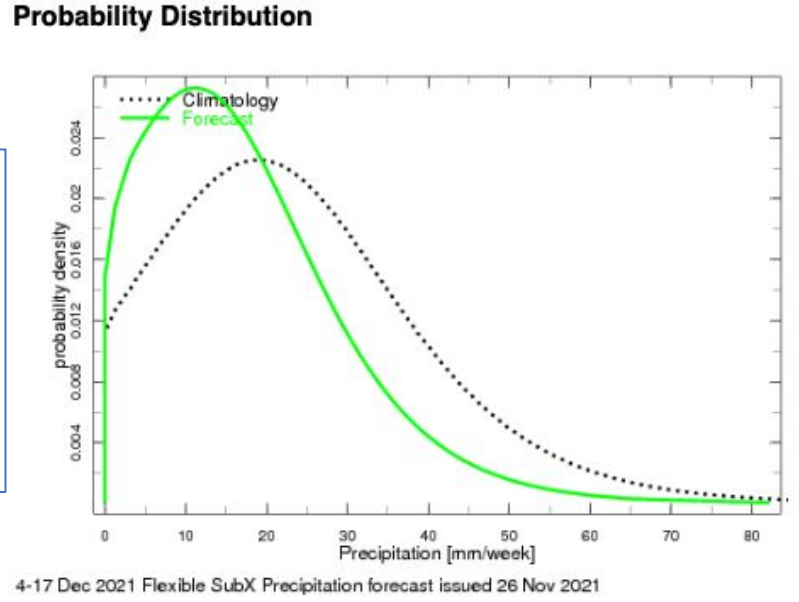
Rainfall Full Distribution
For Weeks 3 and 4

- **Forecast**
- **Climatology**

Expectation:

- **Plan with Seasonal**
- **Adjust with Subseasonal**





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Maproom Climate | Climate: Subseasonal Forecasts | Region: Global

Subseasonal Forecasts

Subseasonal forecasts of precipitation and temperature.

This section is dedicated to subseasonal forecasts, i.e. that bridge the gap between medium range weather forecasts (up to 10 days) and seasonal climate predictions (above a month). They are issued at different frequencies (from daily to once or twice a week) forecasting daily values with lead times from 1 to about 40 days, depending on the Global Producing Center (GPC). The availability of forecast products in the subseasonal-to-seasonal time range offers an unprecedented opportunity to develop intra-seasonal forecast information that other forecasts can't, in association with increased lead time compared to medium range weather forecasts, and with higher temporal resolution than seasonal forecasts that give an overview of an upcoming

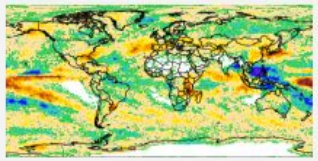
For instance, subseasonal forecasts may allow delivering relevant information about key climate characteristics such as the timing of the onset of a rainy season for agriculture, the risk of extreme rainfall events or heat waves in regards to public health.

SubX Forecasts | SubX Hindcast Skill | S2S Lagged Forecasts

SubX Forecasts

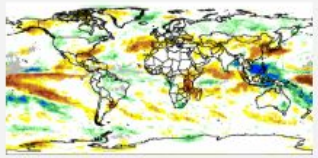
Precipitation Median Probability Forecast

Calibrated Subseasonal Two-category precipitation real-time forecasts

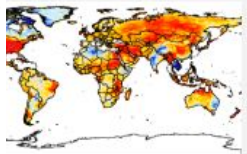


Precipitation Biweekly Probability Forecast

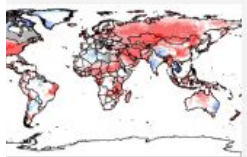
Calibrated Subseasonal tercile category biweekly-precipitation forecasts



Temperature Median Probability Forecast



Precipitation Weekly Probability Forecast



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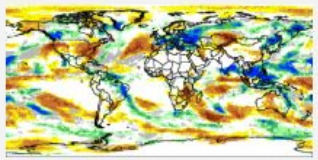

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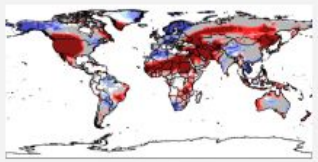
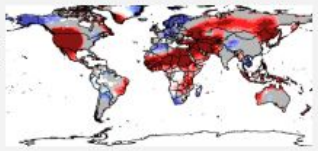


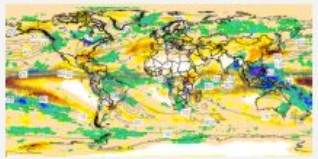
Temperature Weekly Probability Forecast (LELR)

Subseasonal tercile categories temperature forecasts with pattern-based calibration



Precipitation Flexible Biweekly Forecast

This subseasonal forecasting system consists of probabilistic precipitation forecasts based on the full estimate of the probability distribution.



Temperature Flexible Biweekly Forecast

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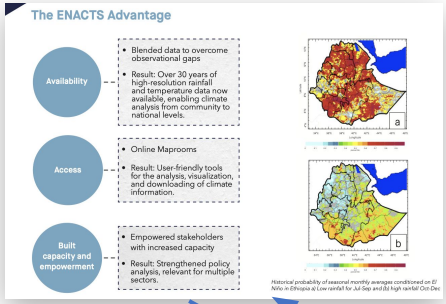
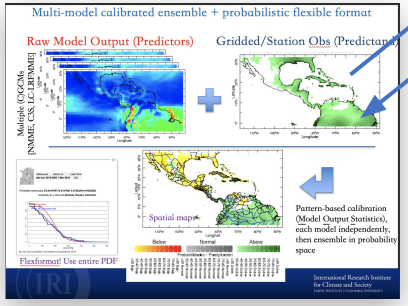
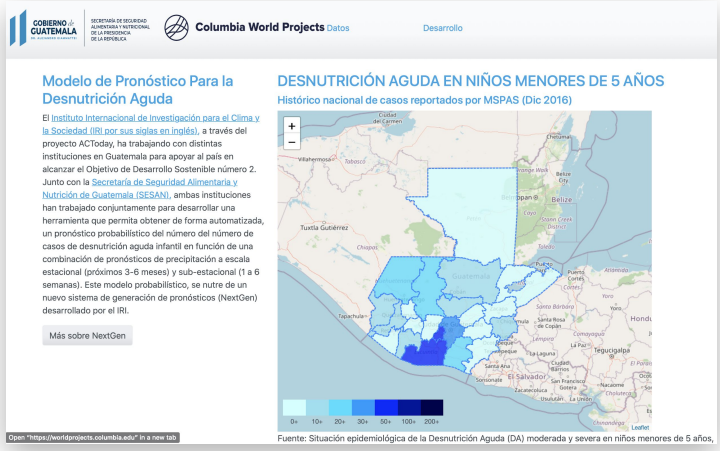
Early Warning / Early Action Informed with Climate

Learn from the Past



Forecast Future

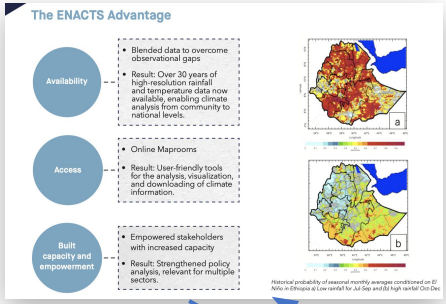




Early Warning on Child Undernutrition (Guatemala)

Early Warning / Early Action Informed with Climate

Learn from the Past



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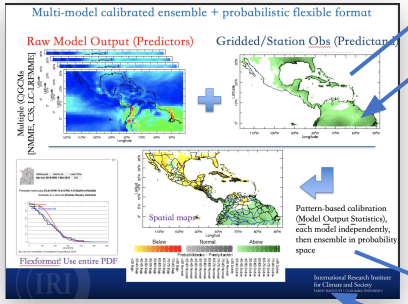

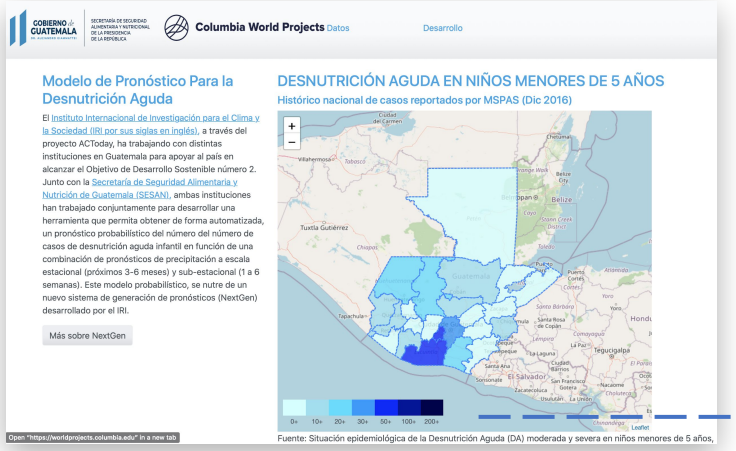

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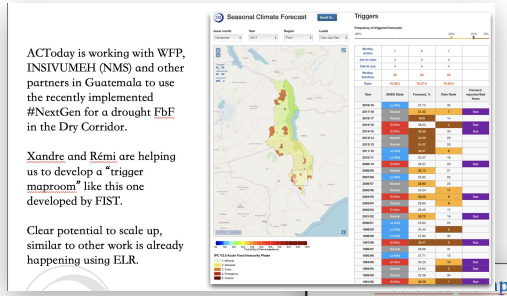
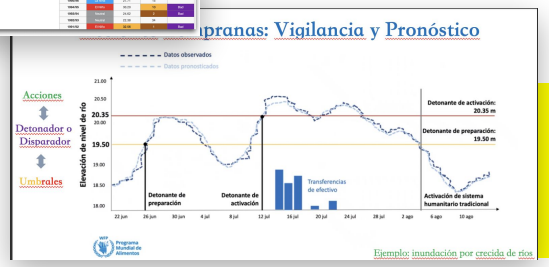


"Triggers" for Action: Financing based on Forecasts (FbF) (Niger)



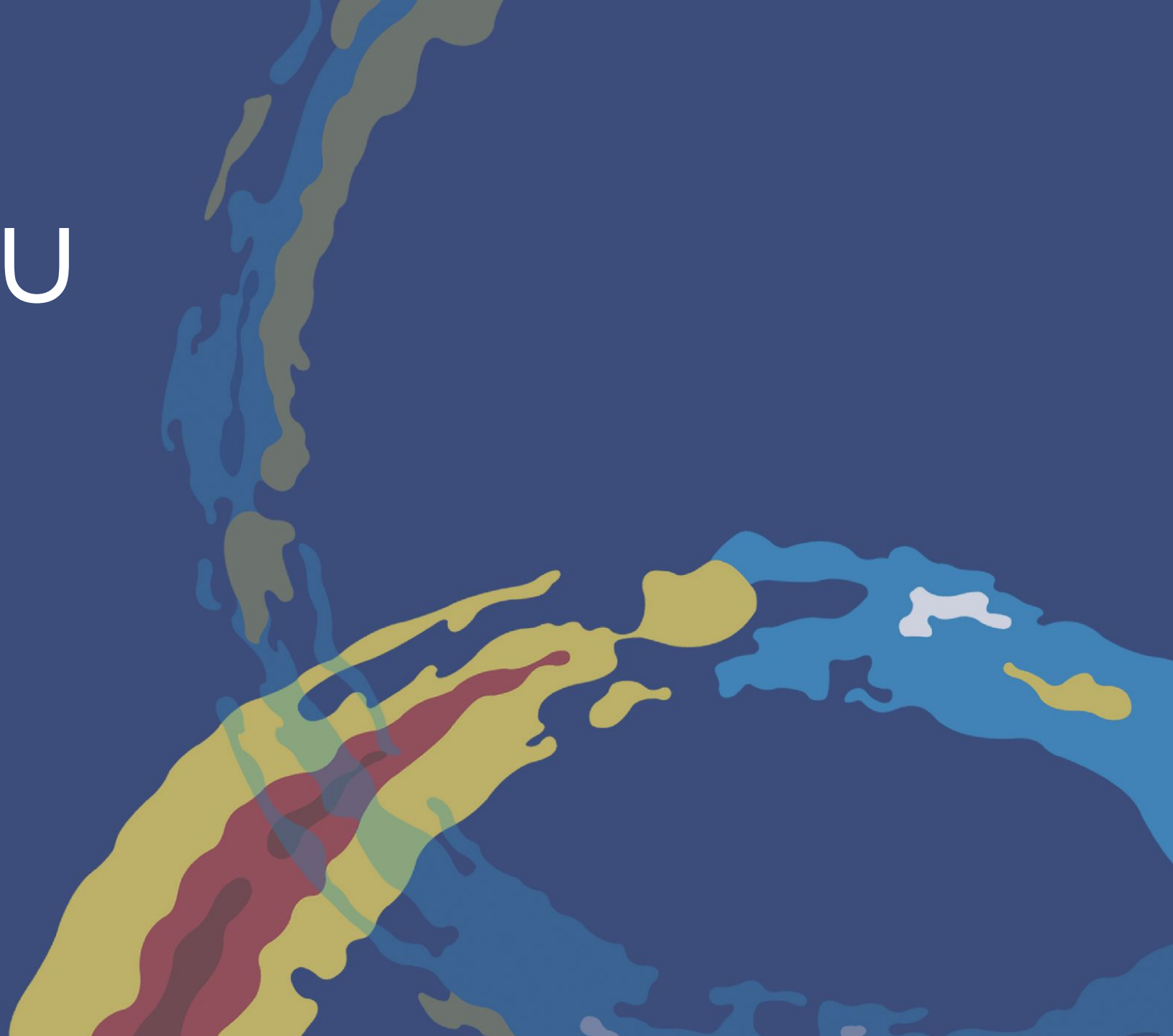
Actions based on Forecasts (FBA)

Potential to Adjust with Subseasonal Forecasts

Final Comments

- Demand Driven, Problem Driven, Understand the System
- Participatory, “Next Users”, Intermediaries
- Forecasts, but also Historical Analyses and Monitoring
- Translate and Integrate to make it Understandable and Actionable
- Expectations on Subseasonal

Thank You



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for Climate and Society
Earth Institute | Columbia University