School of Earth and Environment

Sustainability Research Institute

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The role of social science and co-production: towards usable climate services

Suraje Dessai

Acknowledgements: Marta Bruno Soares, Andrea Taylor, Meaghan Daly and others.

Second WMO workshop on operational climate prediction

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Usable science

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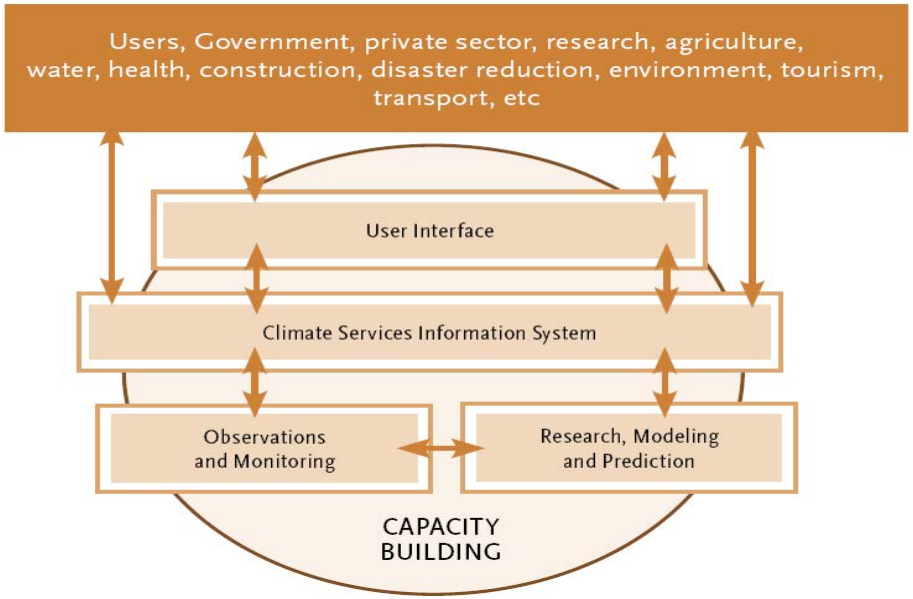
GFCS vison: "To enable better management of the risks of climate variability and change and adaptation to climate change, through the development and incorporation **of science-based climate information and prediction into planning**, policy and practice on the global, regional and national scale."



GFCS GLOBAL FRAMEWORK FOR CLIMATE SERVICES

Social science and operational climate prediction

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Stronger integration of the social sciences in the design and execution of future weather and climate research as well as the dissemination of atmospheric information

Many disciplines: anthropology, communication science, economics, geography, political science, psychology, and sociology

foundational knowledge (vulnerability; climate in culture)

Applied knowledge (what do users need? How to best communicate climate risk and uncertainty?)

AMS. (2014). "Strengthening Social Sciences in the Weather–Climate Enterprise." A Professional Guidance Statement of the American Meteorological Society, from https://www.ametsoc.org/ams/index.cfm/about-ams/ams-statements/statements-of-the-ams-in-force/strengthening-social-sciences-in-the-weather-climate-enterprise/.

Assessment of **users' needs** with regard to Seasonal to Decadal climate predictions across European sectors

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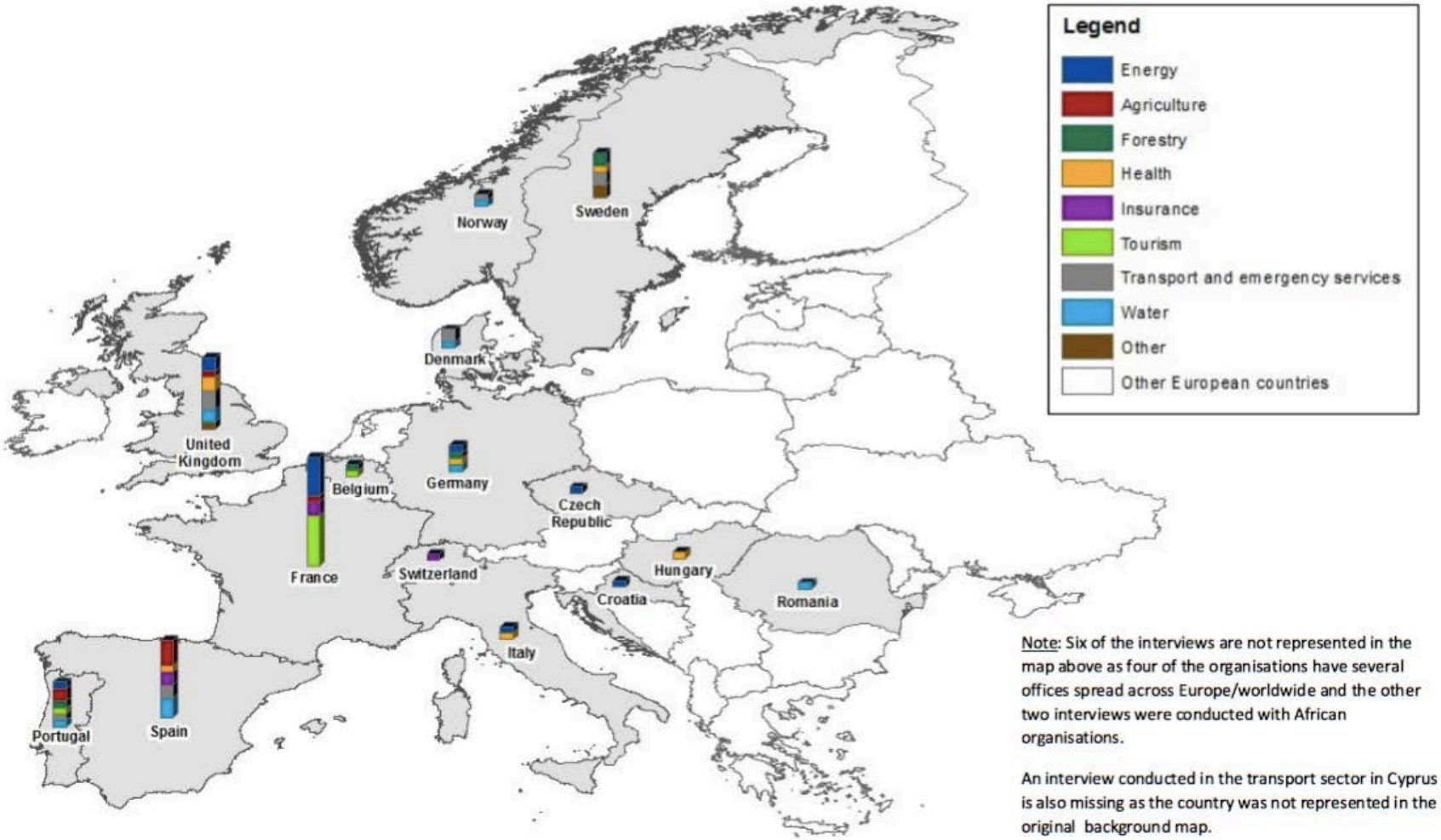
Interviews conducted (n=80)

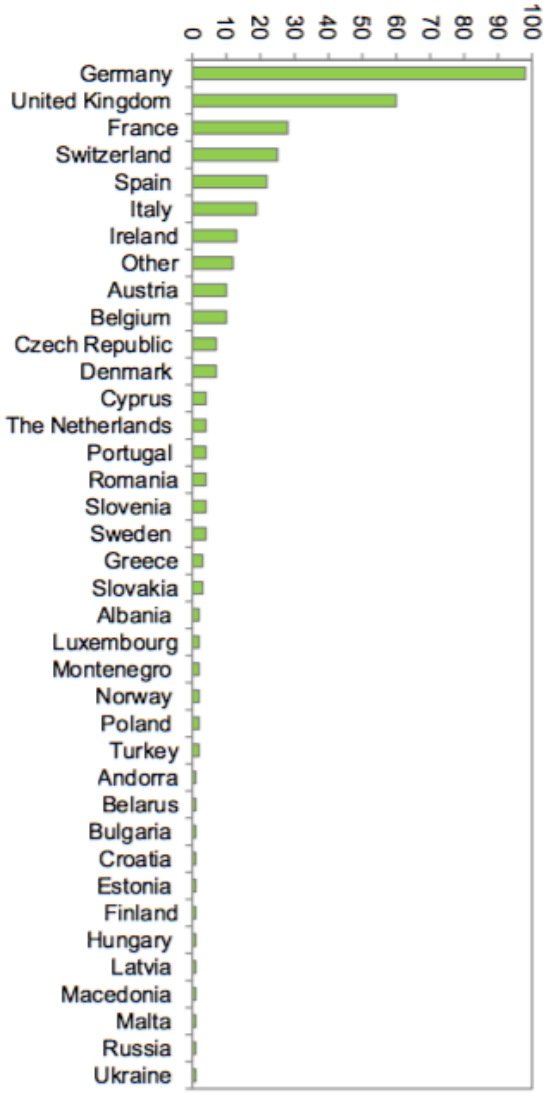


Note: Six of the interviews are not represented in the map above as four of the organisations have several offices spread across Europe/worldwide and the other two interviews were conducted with African organisations.

An interview conducted in the transport sector in Cyprus is also missing as the country was not represented in the original background map.

Survey responses (n=489)

Note: Some of the responses were not included in this map as those countries were not represented in the background map including, Cyprus, Luxemburg, Montenegro, Turkey, Andorra, Malta, and Russia.



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Who are the users?

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Heterogeneity and **complexity** of ‘users’ due to:

- Nature of the organisation (e.g. private *vs* government organisation); geographical/sectoral scope;
- Different regulatory/institutional contexts;
- Complex organisational structures & myriad decisions…
- Role of individual in the org.: ≠ perceptions of needs;
- In-house capacity, expertise and resources available;
- Relative importance of climate information

Different concerns, expectations, resources, knowledge, and demands from science!

What do they need?

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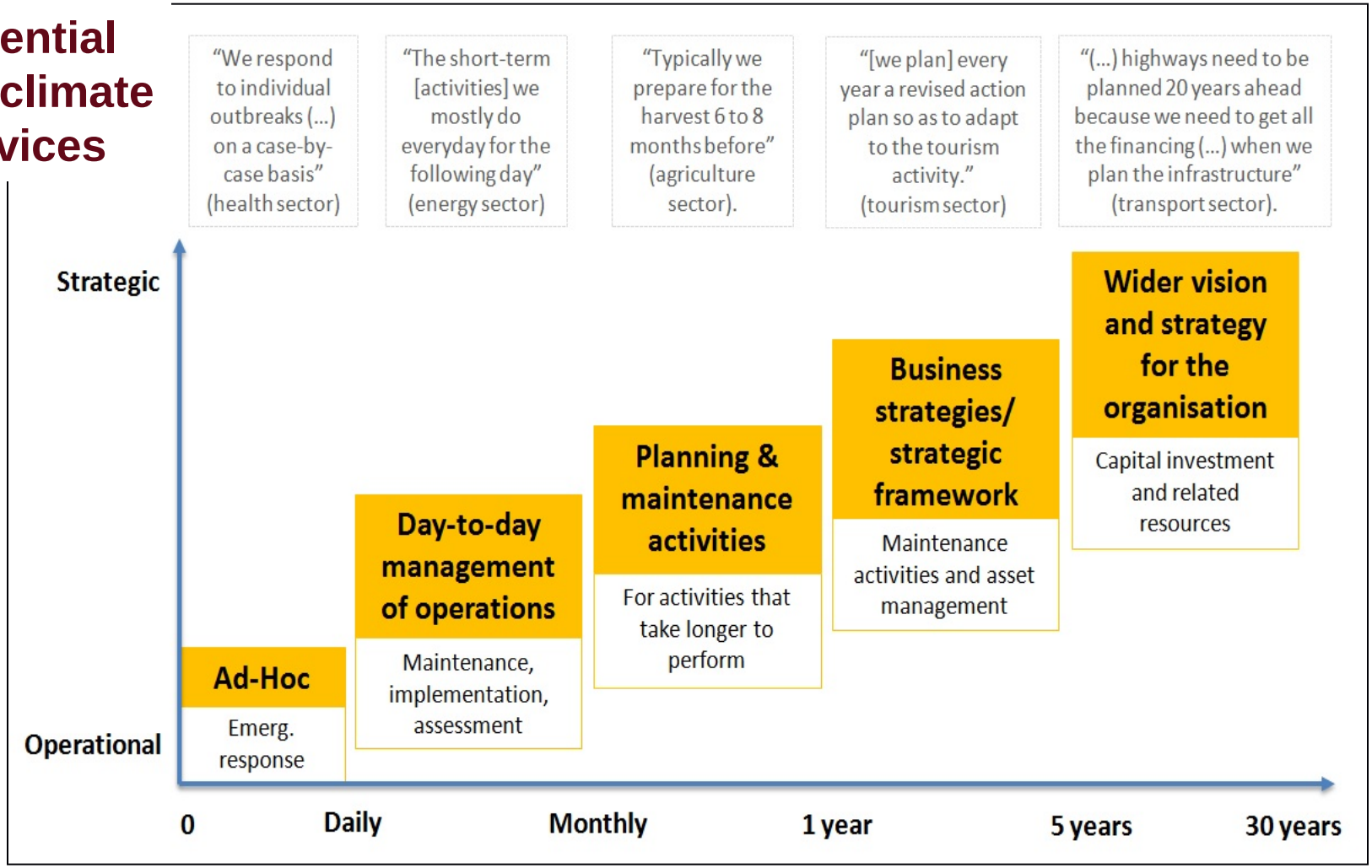
Potential for climate services



Dessai and Bruno Soares, 2015

What do they need?

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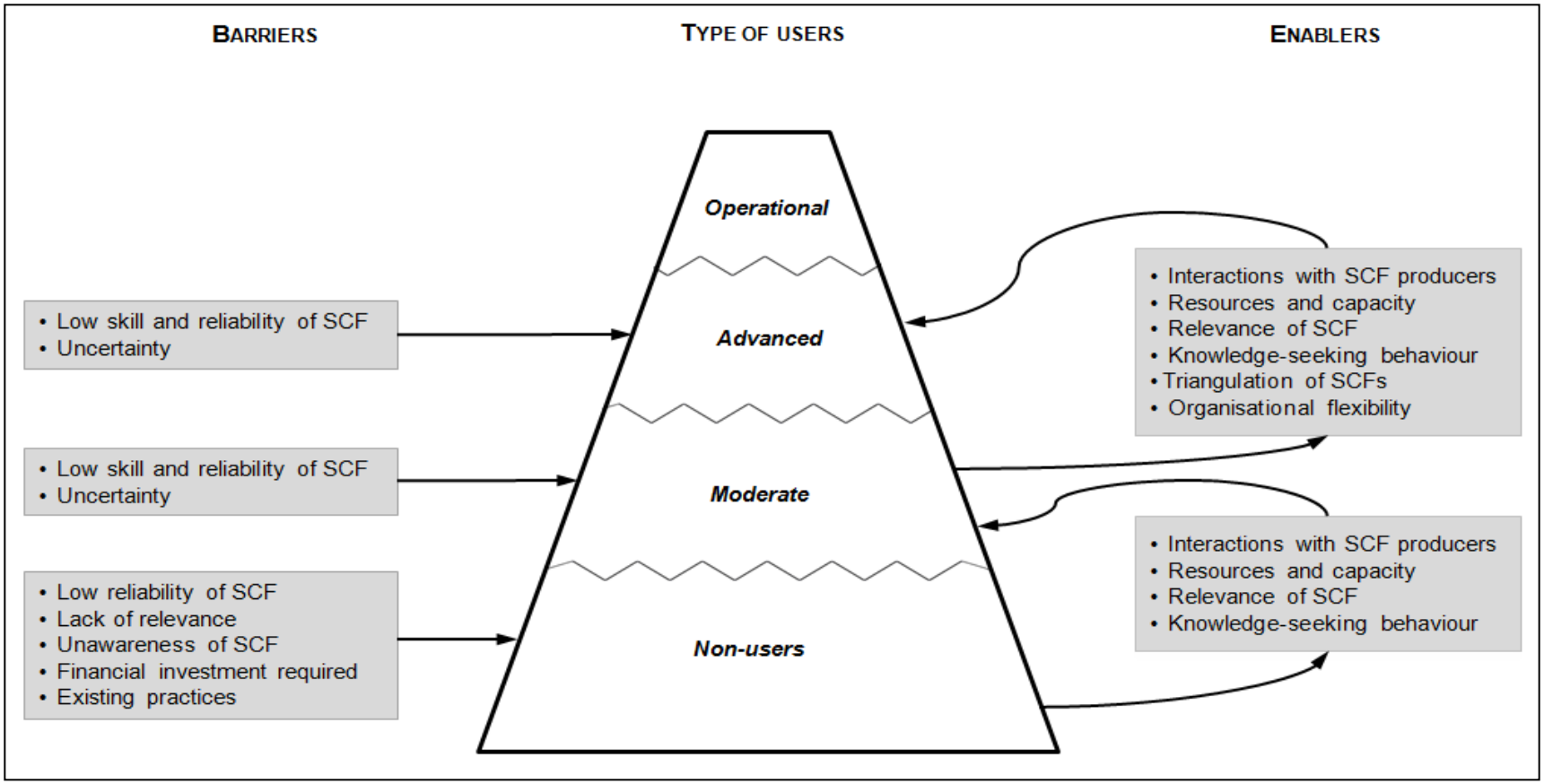
- **Continuum of information** – No need for virtual wall between weather and climate information (Bokoye et al., 2014); e.g. LMTool prototype
- Information that **fit their needs** (Lemos et al., 2012):
    - Spatial and temporal scales;
    - Usable information;
    - Timeliness of information;
    - Relevant and accessible;
    - Accurate and reliable;
    - Credible and salient…
- But needs differ in space and time within/across organisations!

High level findings - seasonal forecasts

- Few users of seasonal forecasts (25 out of 80; 125 out of 489) - **energy, water, transport, health, agriculture, and insurance sectors**;
- Seasonal forecasts used as **qualitative information** to help frame (to different extents) decision-making;
- Key role of **NMHS as providers** of seasonal forecasts (and other weather & climate information);
- Responsibility of NMHS to produce/provide S2D (resources & credibility); European Union as a potential centralising source of S2DCP;
- Provision of **S2DCP raw data** (model data) perceived as a **public good**; value added to information associated to private services.

High level findings - seasonal forecasts

Barriers and enablers to the use of seasonal climate forecasts in organisations interviewed



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Bruno Soares and Dessai (2016)

High level findings – seasonal forecasts

- Uncertainty information essential to understand the data;
- Few (n=8) consider **70-75% probability** required to consider information (e.g. health);
- *"As a rule of thumb, in order to take into account such a forecast I need to have at least 67% reliability, that's my threshold"* (interview in the agriculture sector).
- Few organisations (n=5) also consider **≤ 50% probability** not perceived as useful information;
- **Numerical estimates, graphics** (with accompanying **text**) and **maps** as preferred methods;
- Above all the method for communicating uncertainty needs to match the needs of who is using that information.

High level findings - decadal forecasts

- No use of decadal predictions yet;
- Very few organisations were aware of decadal predictions; some perceived decadal predictions as covering the period of 10 or 20 years from now - inter-annual may be a better description of these types of predictions;
- Potential interest in these type of forecast if they become available – transport, forestry and energy (e.g. wind) sectors;
- Main parameters of interest: temperature, precipitation (i.e. rainfall and snowfall), wind, humidity, and solar radiation.

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Seasonal Forecasts: The challenge of communicating uncertainty

- To use make informed decisions about how to use forecasts users should be aware of…
  - **The fact that forecasts are probabilistic**
  - **How well the forecast performs (i.e. skill, reliability)**

- Failing to communicate uncertainty can have negative consequences
  - **A false sense of certainty (Brezis, 2011)**
  - **Maladaptive decision making (Macintosh, 2013)**
  - **A loss of trust in forecast providers (LeClerc and Joslyn, 2015)**

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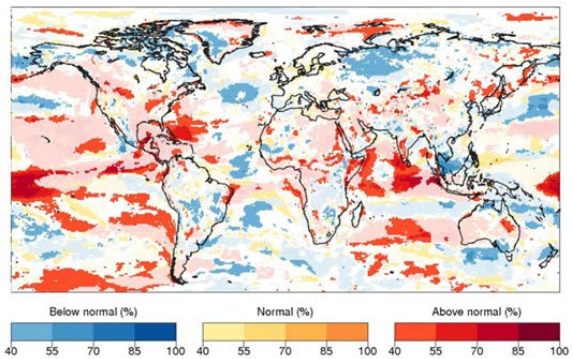
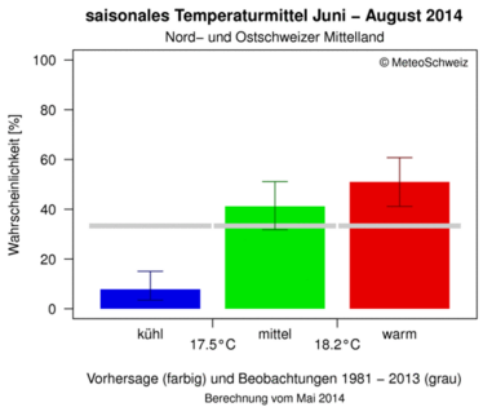
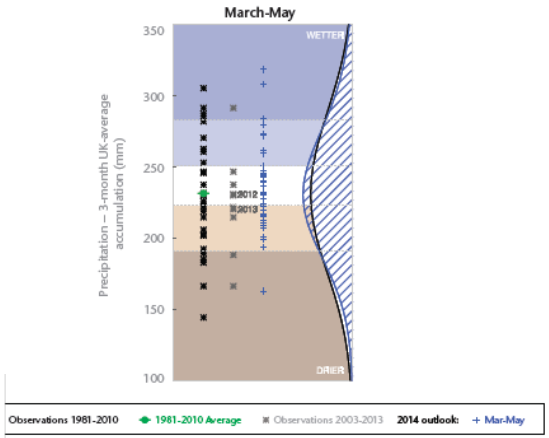
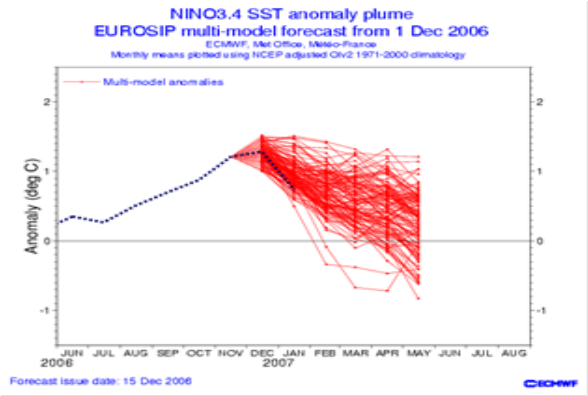
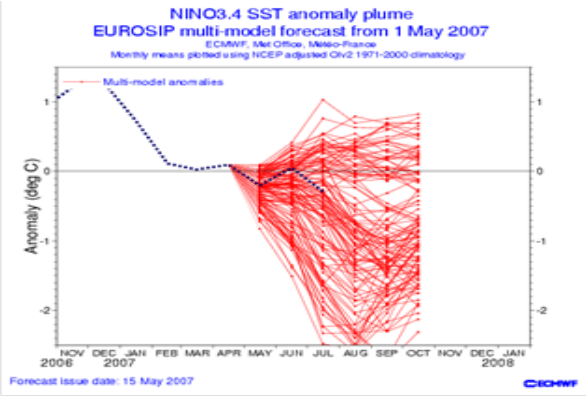
Different ways of representing seasonal forecasts….







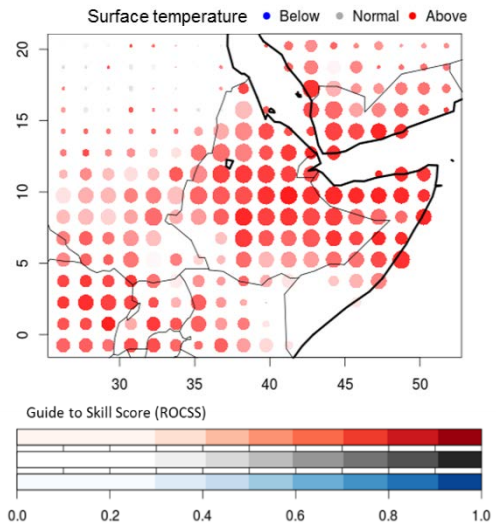


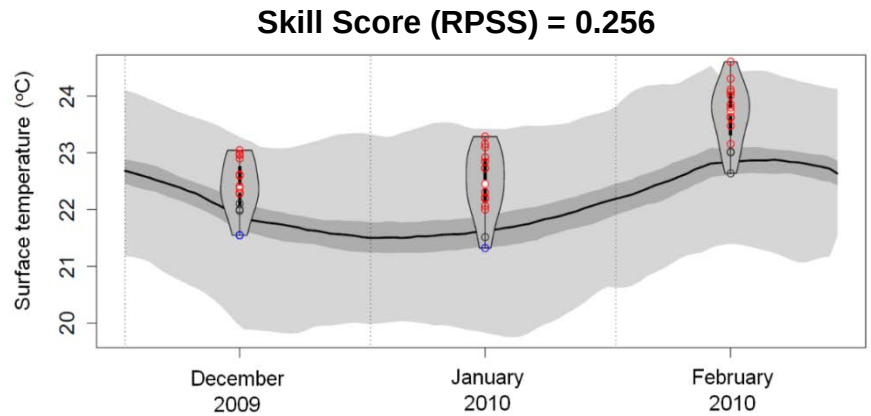


Top left example wind forecast (IC3). **Top middle** seasonal temperature forecast (MeteoSwiss), **Top right** precipitation forecast (Met Office). **Bottom left** Temperature anomaly forecast (ECMWF)

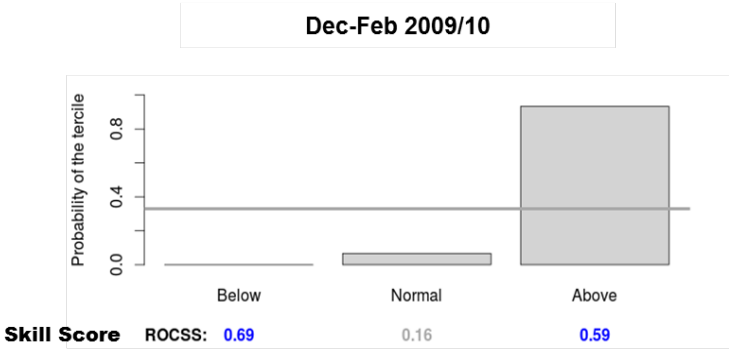
… but until recently relatively little testing with users

Formats: Higher stats experience





City	Cooler than average	Average	Warmer than average	Skill (RPSS)
Addis Ababa	0%	0%	100%	0.373
Adama	0%	0%	100%	0.480
Gondar	0%	0%	100%	0.232
Mekele	0%	7%	93%	0.308
Awassa	0%	0%	100%	0.512
Dire Dawa	0%	0%	100%	0.288



Sample surface temperature data retrieved from ECOMS -UDG (https://meteo.unican.es/trac/wiki/udg/ecoms). Predictions are retrieved from System 4 (15 ensemble members) and observations from WFDEI (Weedon et al., 2014).

See Appendix of Taylor et al. (2015) for accompanying R code: http://euporias.eu/system/files/D33.3.pdf

Formats: Lower stats experience

Confidence that winter temperatures will be warmer than average in Addis Ababa	3

Confidence Score Guide

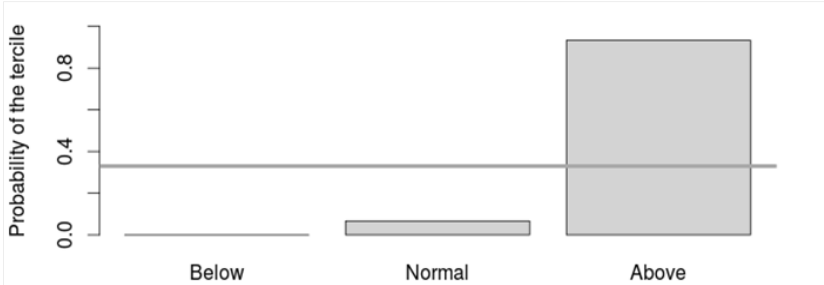
1	No clear indication yet
2	Small indication that temperatures will be warmer than average
3	Moderate indication that temperatures will be warmer than average
4	Strong indication that temperatures will be warmer than average

How the confidence Score is calculated

		Skill			
		None	Low	Medium	High
Likelihood	Very Low (under 30%)				
	Low (30-39%)				
	Medium (40-49%)				
	High (50% or more)			X	

Temperature	Likelihood	Skill
Colder than average	0%	Medium
Average	0%	
Warmer than average	100%	

Dec-Feb 2009/10



Skill Score ROCSS: 0.69 0.16 0.59

Sample surface temperature data retrieved from ECOMS -UDG (https://meteo.unican.es/trac/wiki/udg/ecoms). Predictions are retrieved from System 4 (15 ensemble members) and observations from WFDEI (Weedon et al., 2014).

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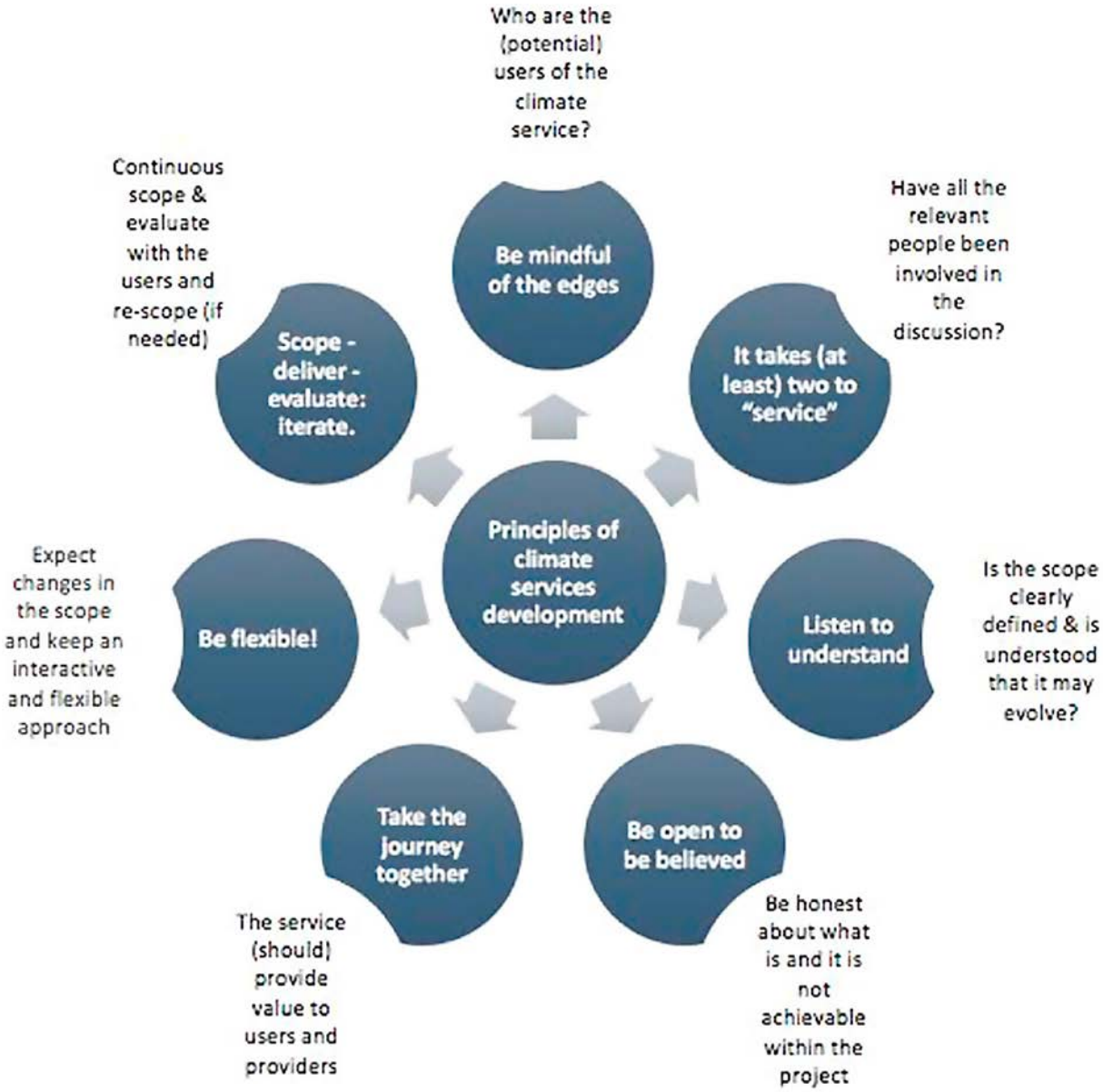
Recommendations

- People tend to like familiar formats, but this should not be assumed to to denote better understanding.
- Forecasts that have “no skill” should not be presented by default.
- Tailored communication strategies are optimal, but if these are not possible consider ‘layering’ information.
- **Validate communications by testing them with intended users.**


Who are the (potential) users of the climate service?
Have all the relevant people been involved in the discussion?
Is the scope clearly defined & is understood that it may evolve?
Be honest about what is and it is not achievable within the project
The service (should) provide value to users and providers
Expect changes in the scope and keep an interactive and flexible approach
Continuous scope & evaluate with the users and re-scope (if needed)
Principles of climate services development
Be mindful of the edges
It takes (at least) two to "service"
Listen to understand
Be open to be believed
Take the journey together
Be flexible!
Scope - deliver - evaluate: iterate.

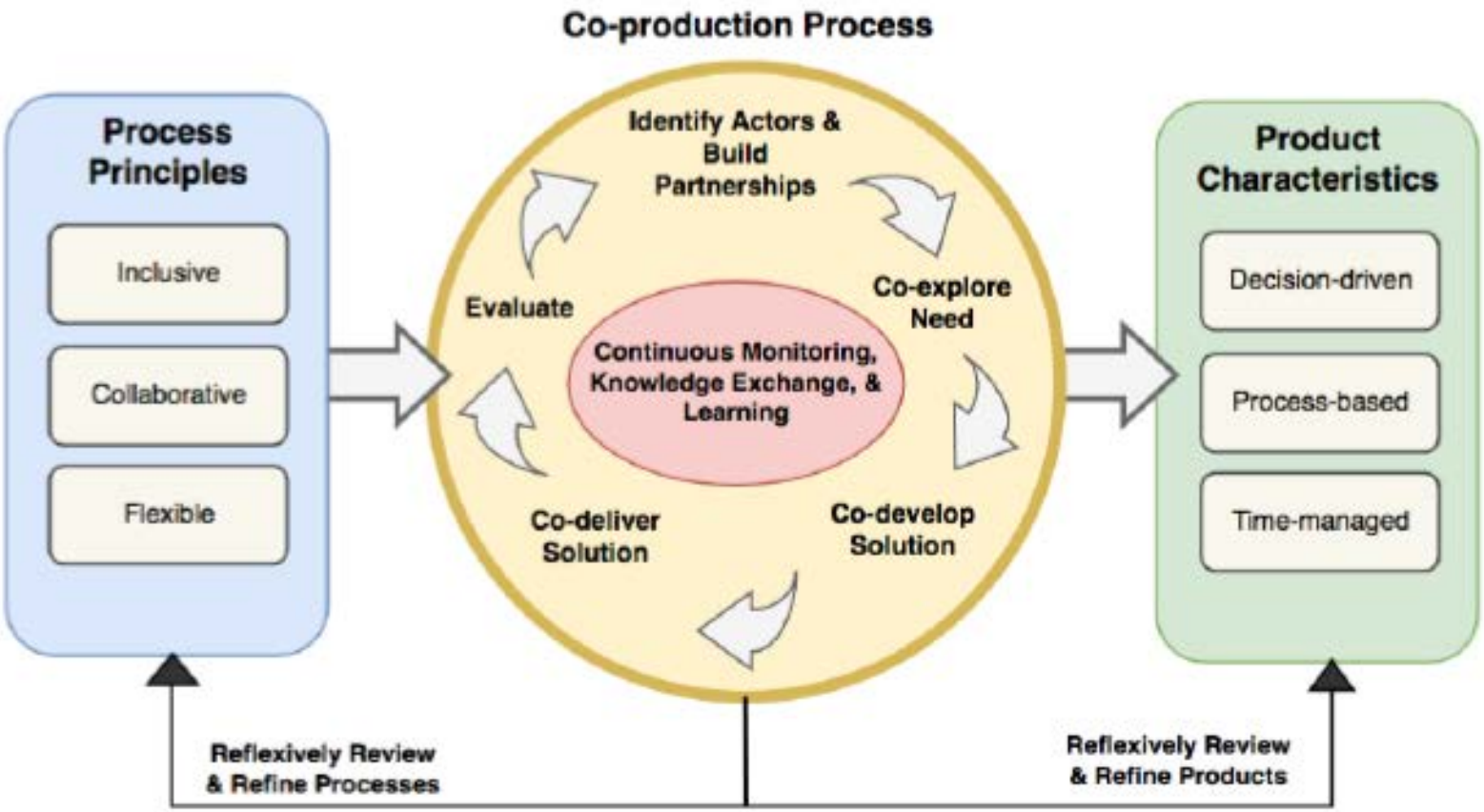


Figure 1: Overview of the components of the WISER co-production guidance

Examining the Role of User Engagement in the RCOFs: Implications for Co-production of Climate Services

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- Review and analysis of literature & technical documents
- Interviews with key informants involved in the establishment, coordination, or implementation of RCOFs at regional or global scale (n=25)
- Participation in the RCOF Global Review Meeting - 5 – 7 Sep 2017, Guayaquil Ecuador

Daly and Dessai (2018) working paper

https://www.cccep.ac.uk/wp-content/uploads/2018/03/Working-Paper-329-Daly-Dessai.pdf

Key Lessons Around User Engagement in RCOFs

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- How users are engaged varies widely from region to region and reflects the different institutional landscapes – e.g. scale of forecast may better coincide with scale of policy formulation, decision-making
- Difference in the landscapes of users across regions is not explicitly addressed within discussions of user engagement in RCOFs
- Need for greater consideration of where, when, how, why – and *whether* – user engagement is useful in all RCOFs
- Context-dependent – need to understand institutional arrangements and landscapes of users
- Better to focus efforts at national scales (NCOFs) in many locations?

Key Lessons Around User Engagement in RCOFs

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- RCOFs are part of a *chain* of climate services delivery – regional activities may provide many indirect or diffuse benefits that are much more difficult to measure, quantify, and attribute
- Important to consider the value of RCOFs in relation to all goals

Implications for Co-production of Climate Services

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- Co-production in the field of climate services is often conceptualized narrowly as iterative collaboration between 'producers' and 'users'
- RCOFs demonstrate the need for multiple sites of co-production throughout the delivery chain – e.g. production of consensus forecast
- RCOFs *cannot* and *should not* be expected to do everything – need to more clearly articulate the multiple goals and benefits of RCOFs as part of a multi-tiered climate services infrastructure
- Should be evaluated accordingly – e.g. capacity of NMHS, credibility & legitimacy of regional forecasts, social learning & communication

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Gracias. Thank you. Merci.

Questions?

s.dessai@leeds.ac.uk

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