Connecting science, operations and decision-making when communicating uncertainty in hydro-meteorological forecasting

Maria-Helena Ramos [1,*], Florian Pappenberger [2]

(1) INRAE, UR HYCAR Antony, France; ECMWF Fellow

(2) ECMWF, Shinfield Park, Reading, UK

EGU2020: Sharing Geoscience Online

About 10 years ago: mission impossible?

METEOROLOGICAL APPLICATIONS
Meteorol. Appl. **17**: 223–235 (2010)
Published online 17 May 2010 in Wiley InterScience
(www.interscience.wiley.com) DOI: 10.1002/met.202

RMetS
Royal Meteorological Society

Communicating uncertainty in hydro-meteorological forecasts: mission impossible?

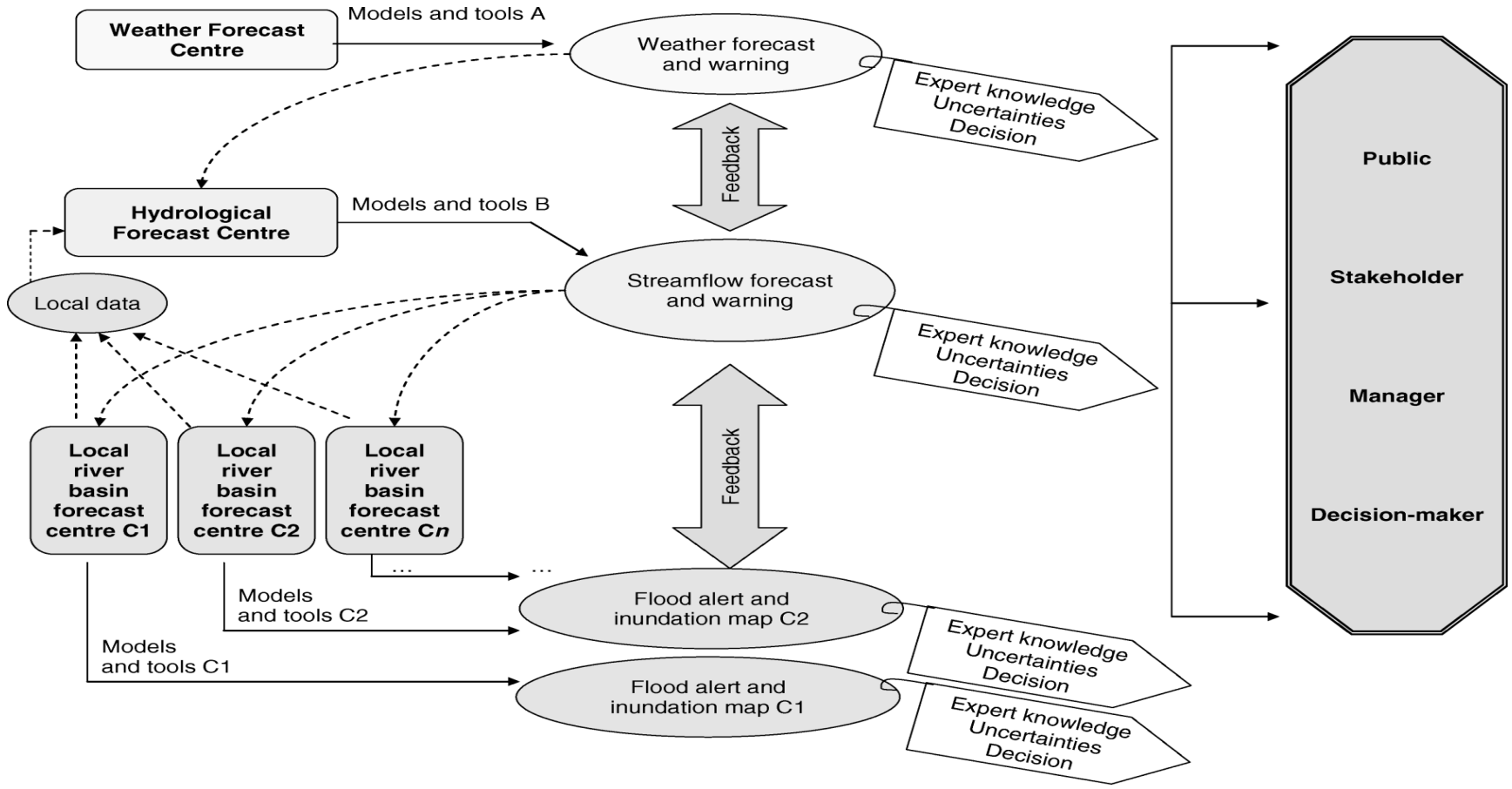
Maria-Helena Ramos,[a]* Thibault Mathevet,[b] Jutta Thielen[c] and Florian Pappenberger[d]
[a] *Cemagref, Hydrology Group, Research Unit HBAN, Parc de Tourvoie, BP 44, 92163, Antony, France*
[b] *EDF-DTG, Electricité de France, Direction Technique de Grenoble, Grenoble, France*
[c] *JRC, DG Joint Research Centre, European Commission, Institute for Environment and Sustainability, TP261, 21020 Ispra (VA), Italy*
[d] *ECMWF, European Centre for Medium-Range Weather Forecasts, Shinfield Park, Reading, RG2 9AX, UK*

- Context: Hydrologic Ensemble Prediction Experiment (HEPEX) community (since 2004)
- Focus: EU-based flood forecasters (EFAS partners) and operational forecasters from the hydropower sector in France

About 10 years ago: mission impossible?

- Make (more) explicit the flow of uncertainties and decisions
- Understand the role (and the influence) of expert knowledge in the process

Identify interconnections



Ramos *et al.* (2010)

About 10 years ago: mission impossible?

Our answer to the question:

- "an optimistic temptation to bet on a negative answer: the mission is **not impossible**, at least not in its absolute terms, although the tasks to be executed might be difficult to accomplish"

What is there that might make it impossible?

- "[importance of] integrated platforms [that] can benefit greatly from an automatic and adaptive chaining of suitable components for **communication and decision support**"

Who communicates and who decides (what)?

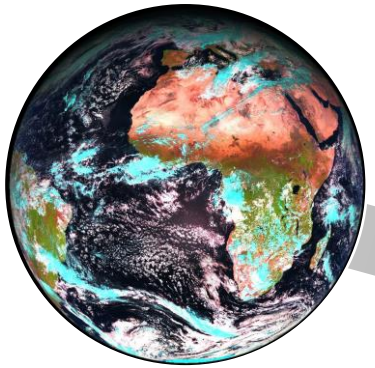
Ramos *et al.* (2010)

About 10 years ago: mission impossible?

Our answer to the question:

- "a lot of work is still necessary [to make sure users] understand the message conveyed and **act accordingly**"

Will good communication necessarily result in better decision-making?



Earth System Observations, Modelling & Forecasting

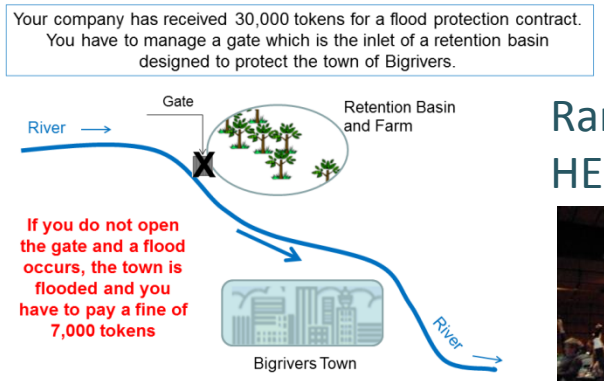
Users & Decision-makers

Ramos *et al.* (2010)

What have we accomplished…

… in terms of communicating uncertainty in hydrological forecasts in practice, and contributing to better inform decision-making?

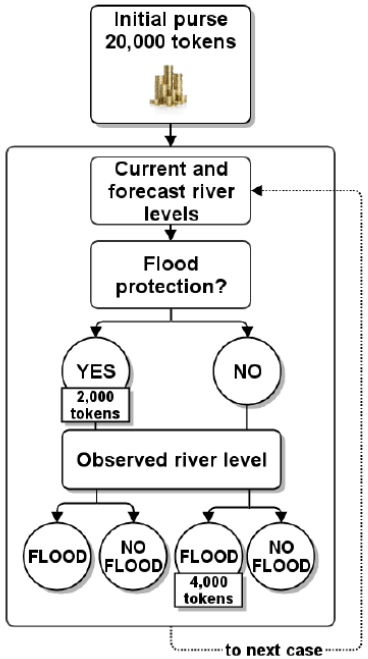
- ✓ **Role-play games and training:** reflecting on wrong or misleading perceptions and the way probabilistic forecasts are (can be) used
- ✓ **Understanding forecast quality and value:**
  - attributes that impact most the user's decision
  - understanding and modelling the decision process



Ramos et al., 2013, HESS, 17, 2219–2232

HEPEX games in: hepex.org

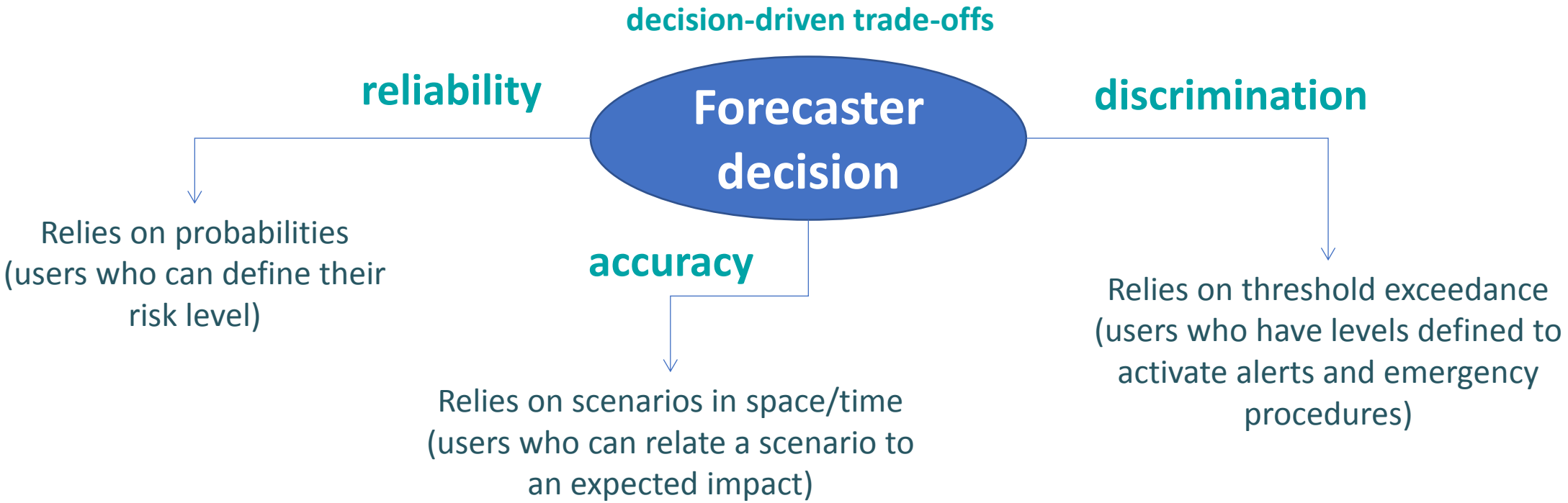
Arnal *et al.*, 2016, HESS, 20, 3109–3128



What have we accomplished?

In practice, which forecast quality attribute affects most a decision?

- ✓ “Probabilistic forecasts must be, first of all, reliable”
- ✓ “Better forecasts, higher economic value”



Connecting science, operations and decision-making when communicating uncertainty in hydro-meteorological forecasting

What do you think?

More successful areas	Less successful areas
▪ Changing paradigm from deterministic to probabilistic (ensemble-based) predictions ▪ Evaluating forecast quality (and handling expectations: "*Hindsight is a wonderful thing…*", William Blake) ▪ Visualisation & products	▪ Addressing users "uncomfortability" with automated processes and ownership of decisions (influencing communication) ▪ Linking forecast decision-making (value) to forecast quality/attributes ▪ Keep it simple while enhanced with state-of-the-art methods ("smart forecasting systems")

Contact: maria-helena.ramos@inrae.fr