Forecast-based Financing for Drought

An optimal stopping problem?

SAMBa ITT9: Challenges in environmental risk

28th January 2019

Willis Towers Watson

Forecast-based Financing

Early action to save lives and loss

A window between a forecast and a disaster – most climate related hazards can be forecast

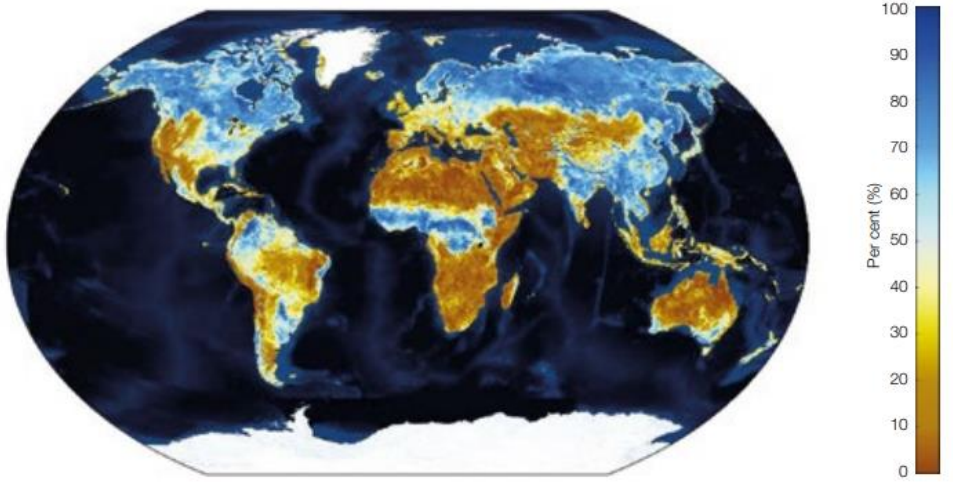
- Populations, corporates and governments can engage in protective actions if they have prior warning
- Contingency plans are linked to the severity of the forecast: as simple as ‘high risk’ and ‘low risk’
- Pioneered by the Red Cross Red Crescent Climate Centre to improve the humanitarian response be being proactive

Increasingly possible through earth observation data

- Remote sensing data are crucial in places such as east Africa, where historic and real time variables are generally lacking
- Evidence-based, trigger activated response

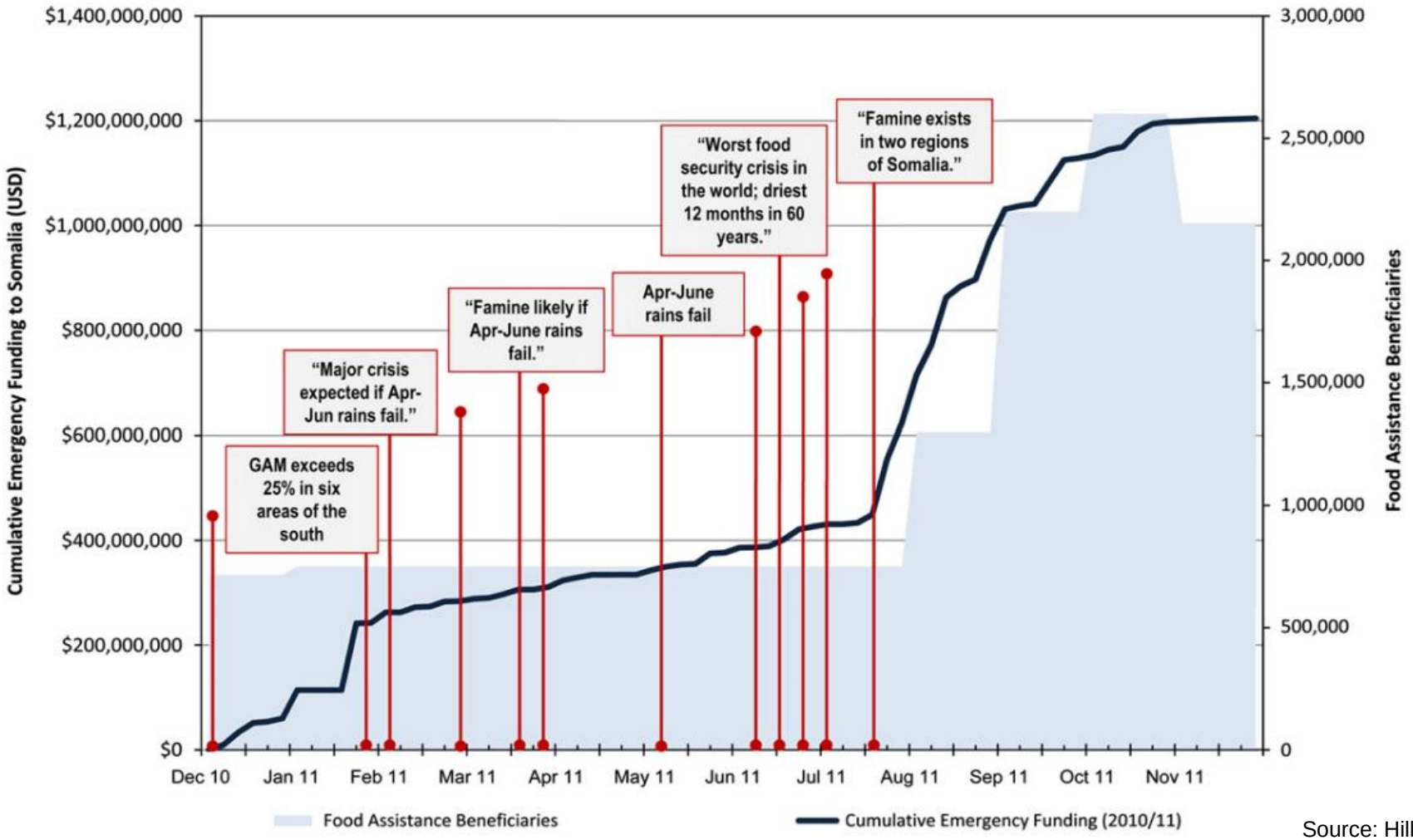
Interest in slow onset events

- Drought – when does a drought start?



Source: IFAD, 2017

FbF: Drought in Somalia, 2011



Source: Hillbruner and Moloney, 2012

Index Choice

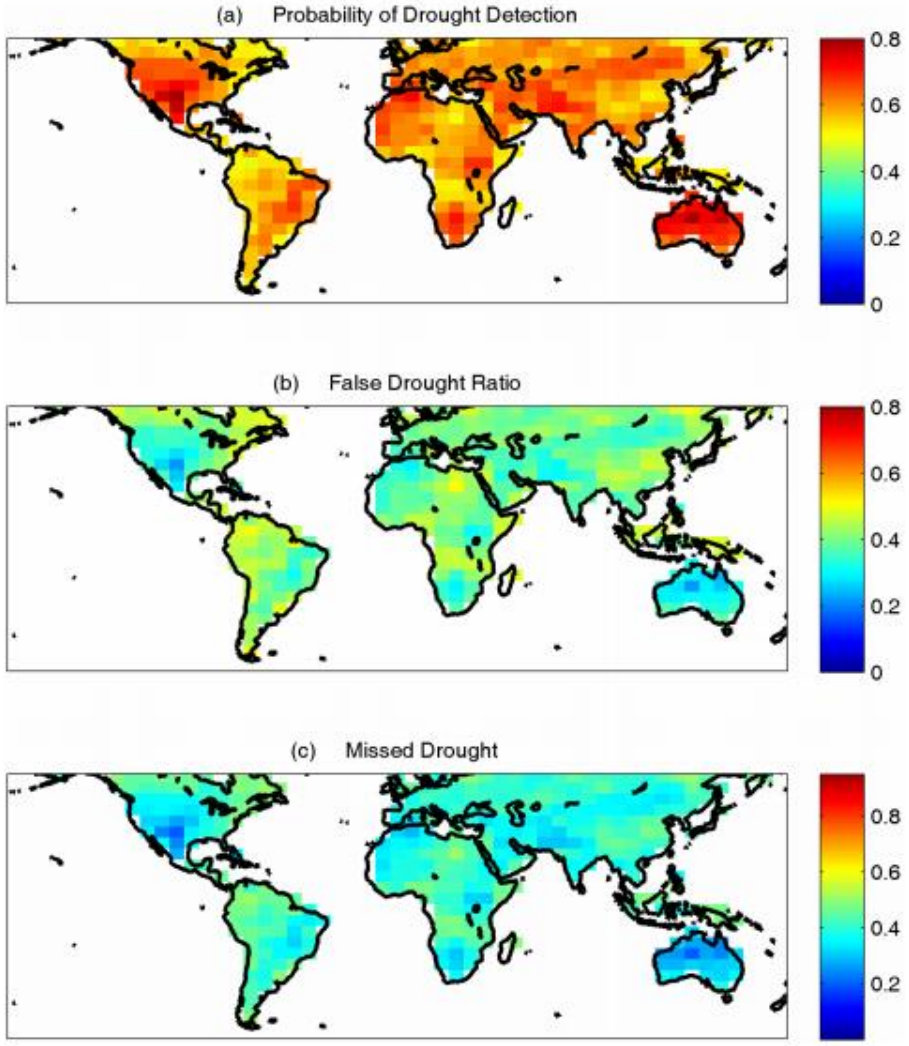
Indices demonstrate substantial variation in skill

- Droughts can be monitored by precipitation, runoff and soil moisture
- Precipitation measures typically detect drought earlier because rainfall is a primary source

A wide variety in hybrid indices

- Innovation to improve forecasting skill
- Innovation to meet
- An exceptionally dynamic field with overwhelming institutional support (UN, WFP, Red Cross Red Crescent etc.)

Drought early warning is concerned with monitoring and early detection, rather than forecasting



Source: Farahmand et al. 2015

Methodological problems

The usefulness of an early warning system is determined by the ratio of hits to false alarms

	Yes extreme event	No extreme event
Yes forecast-based action	Correct prediction - worthy action	False alarm – act in vain
No forecast-based action	Miss – response cost	Correct rejection – no cost

Contingency table of possible outcomes

Source: Coughlan de Perez et al. 2015

Forecast-based warnings are probabilistic, rather than deterministic

- A range of risk perception challenges
- False alarms bring reputational and trust issues – not to mention cost

Challenge: What is the optimal balance/frontier between an accurate warning and an early warning?

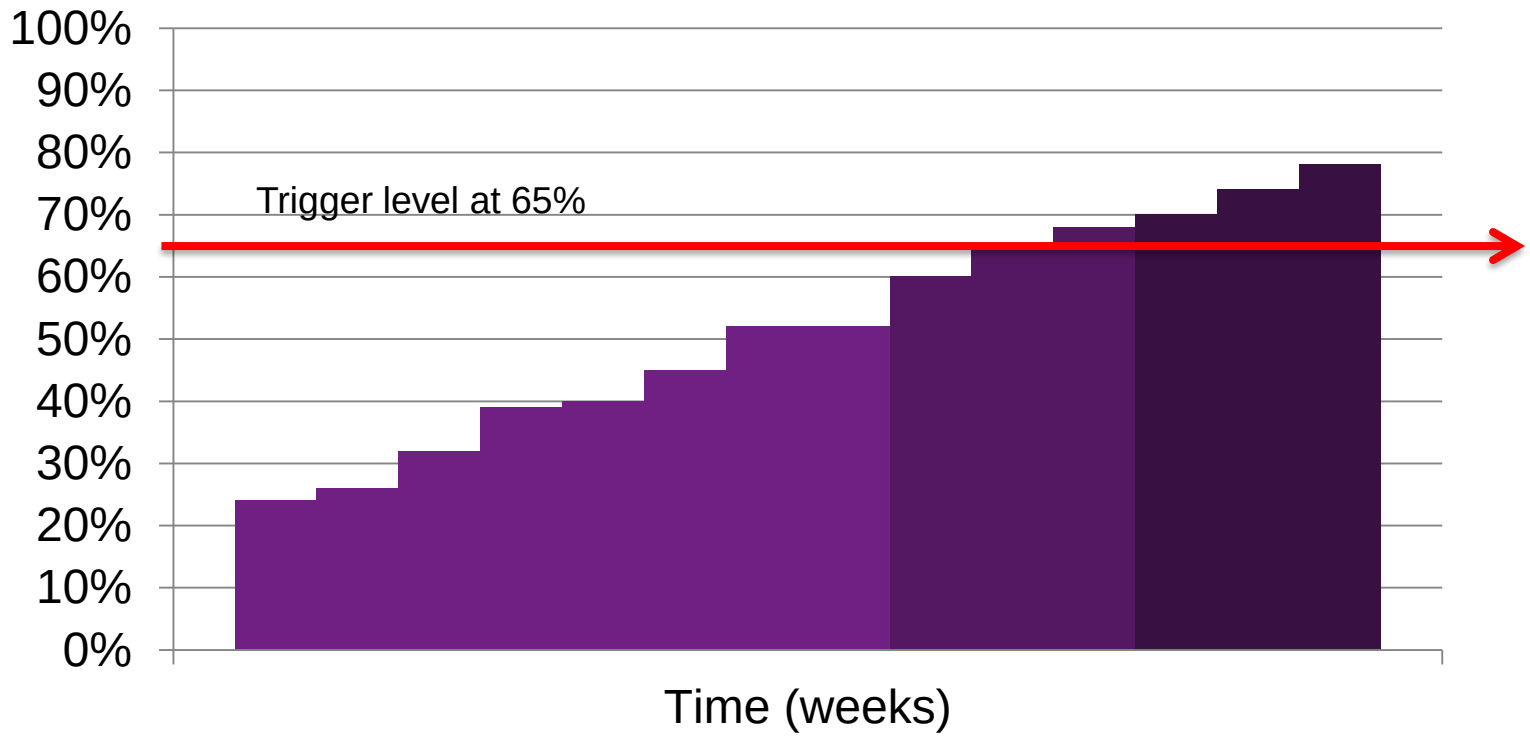
Conceptual solution

Rolling index of probabilities

- A distillation of seasonal forecasts, such as El Nino and seasonal rainfall, with sub-seasonal (monthly)
- Percentage of exceeding the 1 in 10 year return period, 3 months in advance

Setting the trigger level

- The trigger is an indicator of the confidence in monitoring
- Where should the trigger be set?



Data sources & references

Standardised Precipitation Index

NDVI / WRSI / CHIRPS

FEWS NET

http://stream.princeton.edu/redirect.html

Cancelliere et al. 2007 ‘Drought forecasting using the Standardized Precipitation Index’, *Water Resources Management*

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Stephens et al. 2015 ‘Forecast-based Action: SHEAR Final Report’, University of Reading

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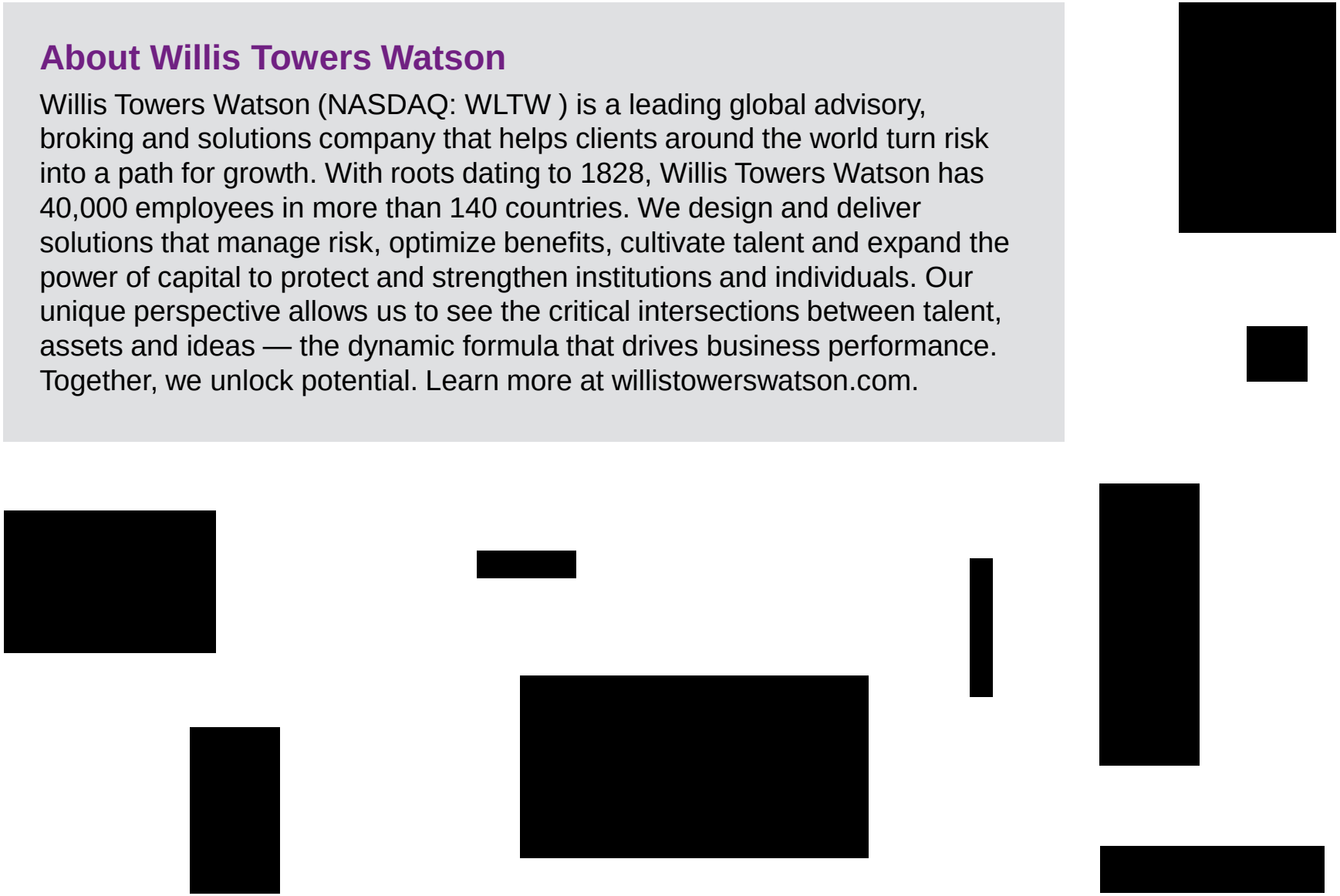

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