Information Sources for Flood Forecast-based Action Efforts

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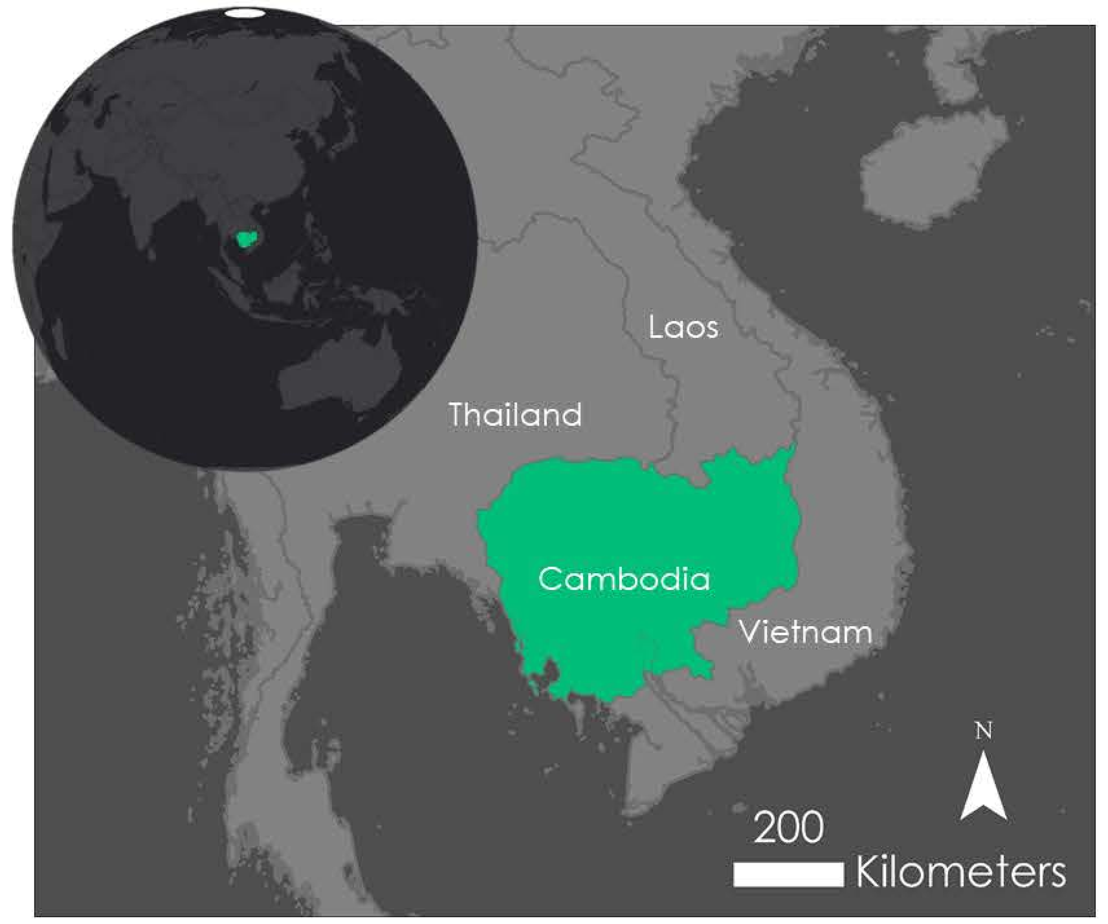
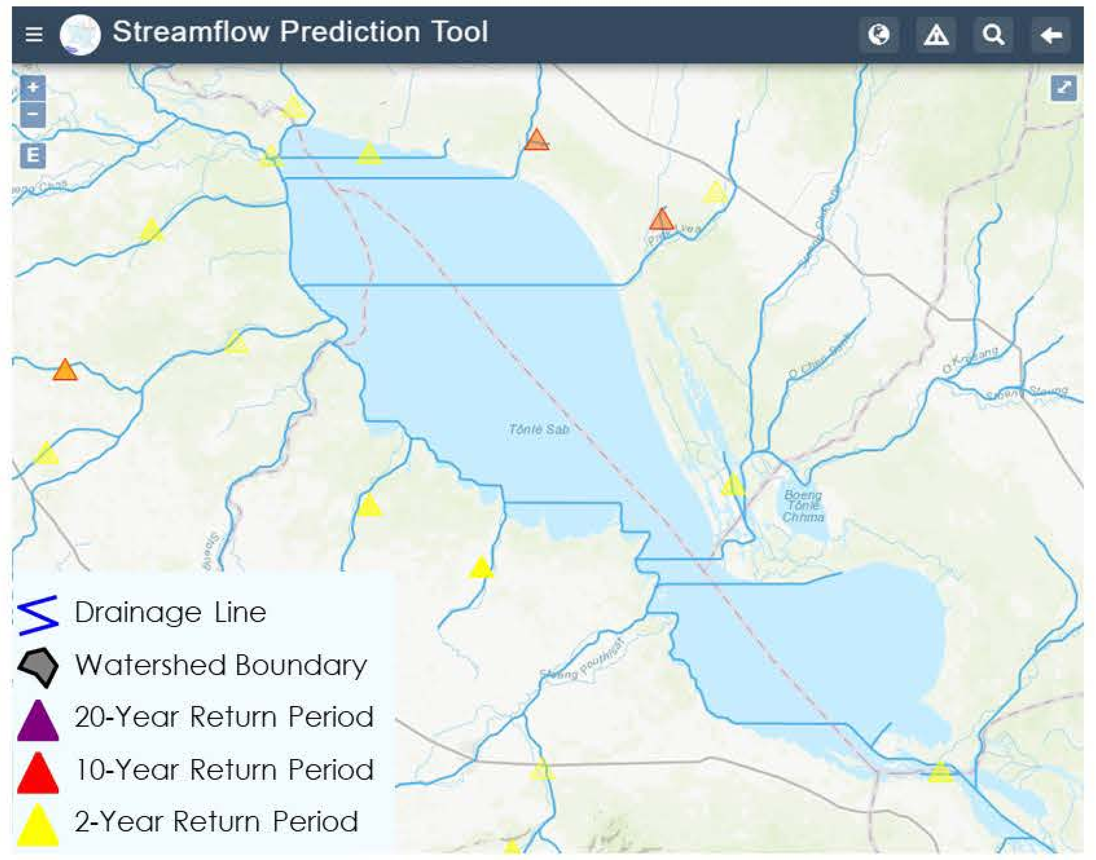
In forecast-based action (FbA), decision-makers can define plans to automatically trigger action before an extreme event occurs utilizing forecast information. Gathering data from past events is an important part of developing these plans. We showcase here several different types of information that can be used for selecting an FbA program location and developing FbA early action protocols, using the **2013 Cambodia flood event** as an example. Cambodia falls within the lower Mekong region, which frequently experiences flooding.

To understand where an event has occurred, flood extents derived from models or observed by **satellites** (A) can be consulted. **Disaster loss databases** can provide information about the impact of the event (B). **Flood models** and ***in situ* observations** can provide information about the timing of peak flows. In selecting a forecasting system and determining a forecast trigger threshold (e.g. 80% chance of exceeding the 1 in 10 year streamflow), performance of forecasting systems, like the **Streamflow Prediction Tool** co-developed by SERVIR and Brigham Young University, can be evaluated through comparison with *in situ* observations like those of the Mekong River Commission (C, D, E, F). **News articles** can also provide information about the event's impact and timing (G).

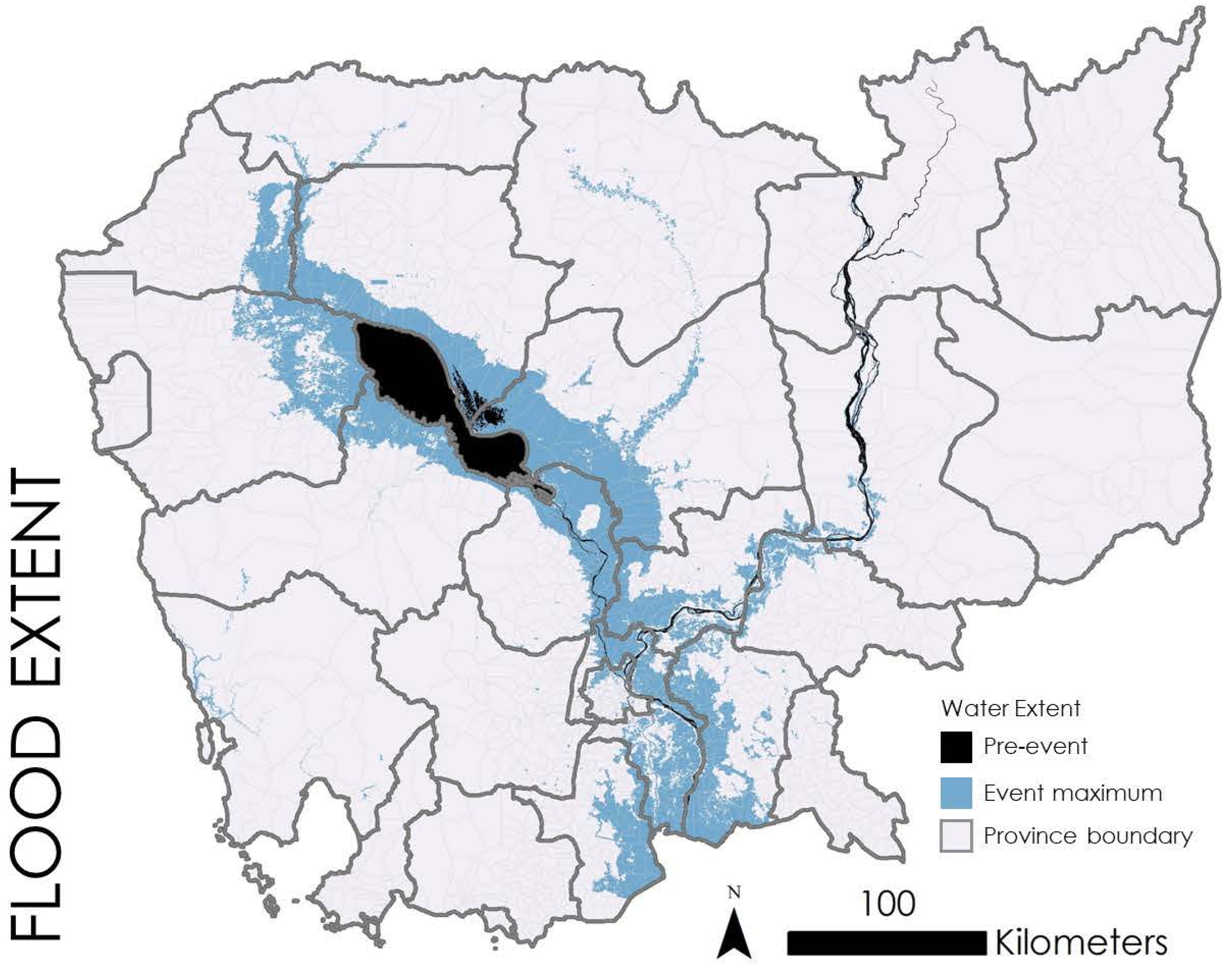
Forecast uncertainty is one of the greatest challenges for taking action based on a forecast. **Probabilistic forecasts** account for uncertainty by running a model several times with slight changes in initial conditions and parameters. Each model run is called an ensemble and the spread of the ensembles gives an indication of the probability (e.g. 80% of ensembles exceeded the 10-yr return period threshold) (E). **By examining historical data, decision-makers can determine the optimal trigger thresholds, enabling action despite uncertainty.**





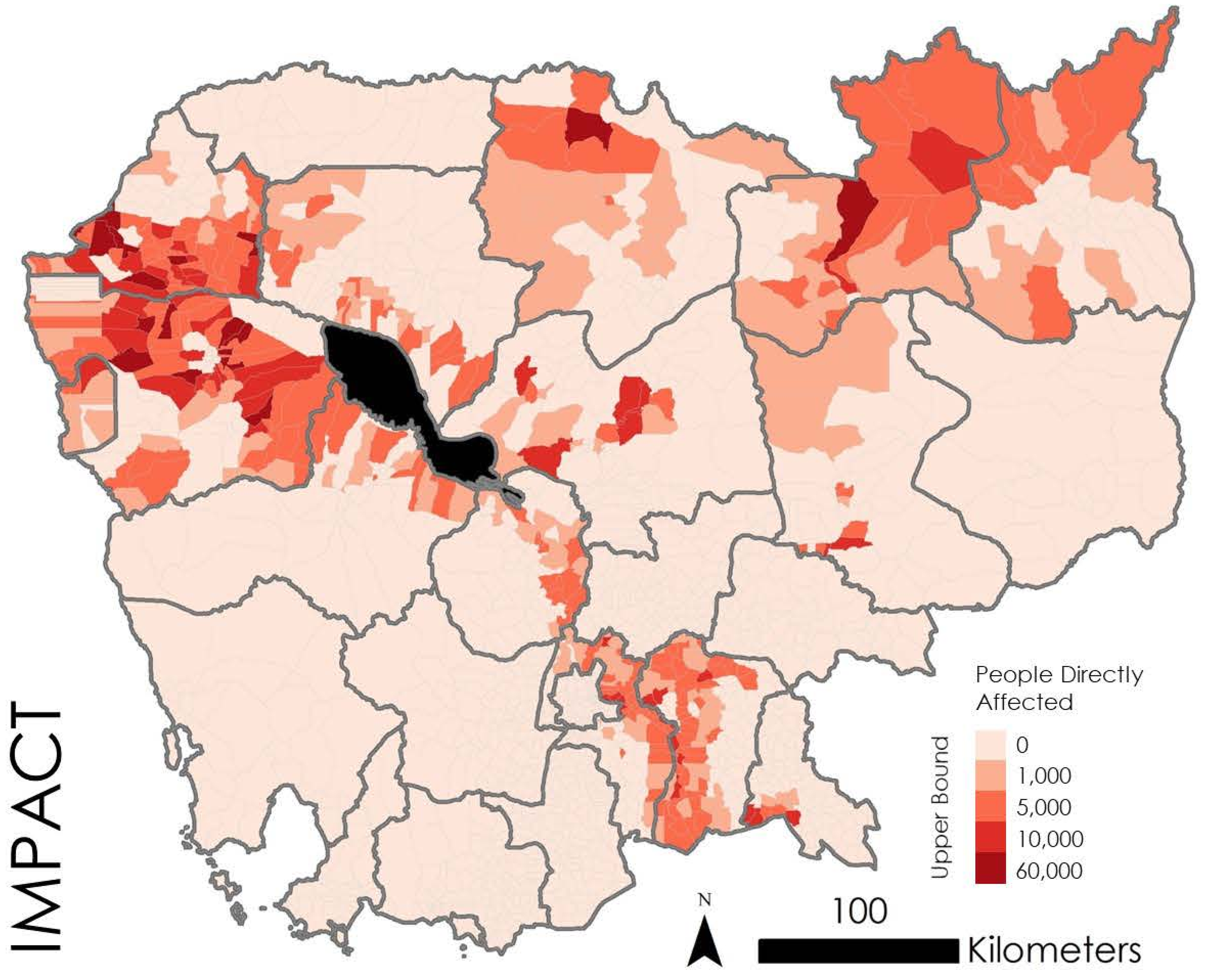
(C) Screenshot of Streamflow Prediction Tool (SPT) stream segments.

FLOOD EXTENT



(A) Maximum flood extent observed by several satellite overpasses in Oct, 2013. (UNOSAT)

IMPACT



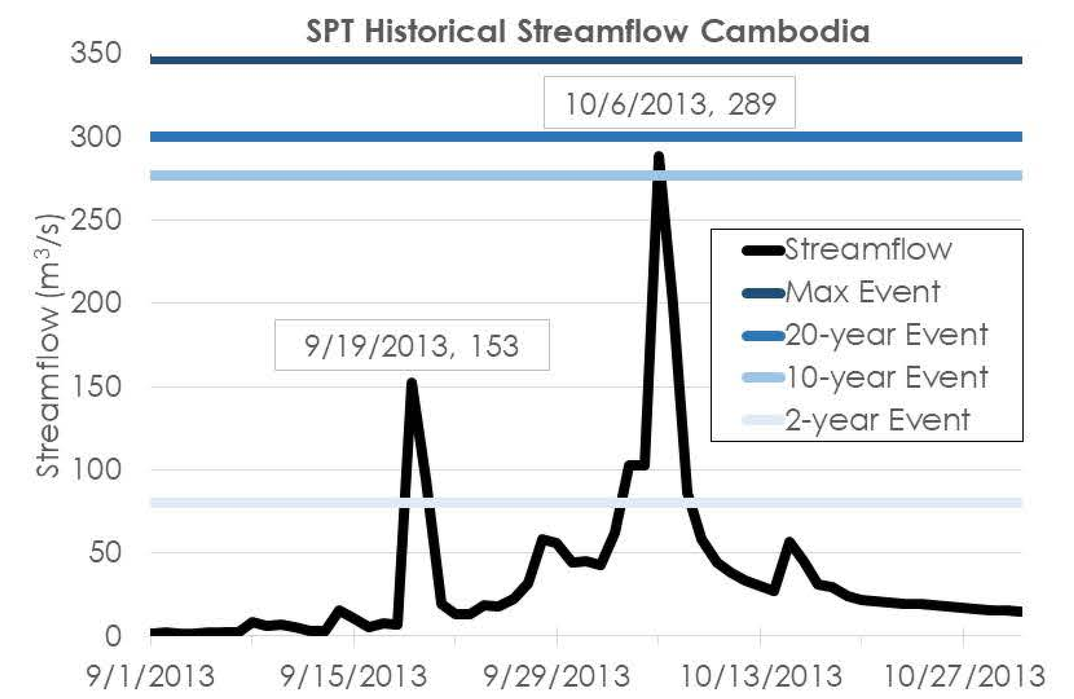
(B) People directly affected by flooding caused by monsoon rains Aug-Oct, 2013. (DesInventar)

$$\text{Hit Rate} = \frac{a}{a+c}$$

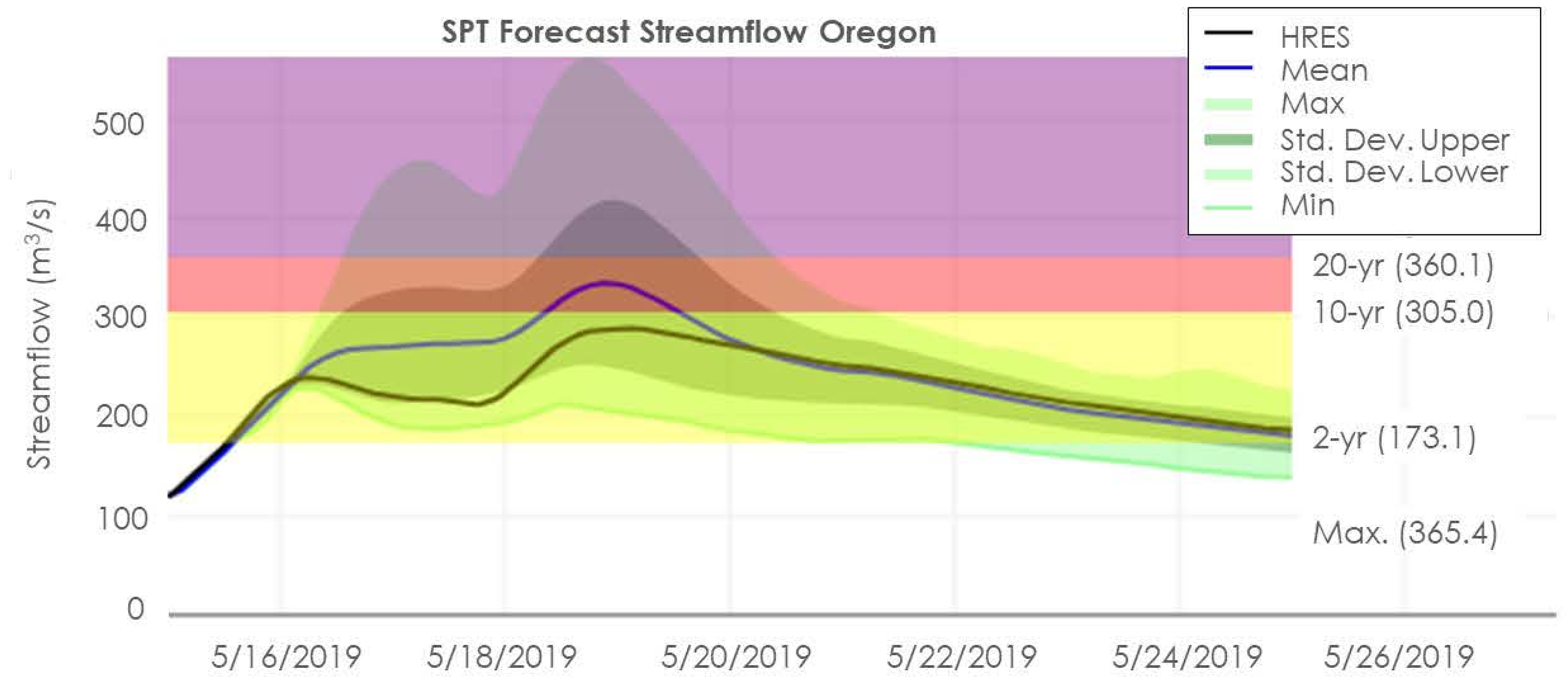
$$\text{False Alarm Ratio} = \frac{b}{a+b}$$

Forecast	Observed: Extreme Event	Observed: No Extreme Event
Extreme Event	a	b
No Extreme Event	c	d

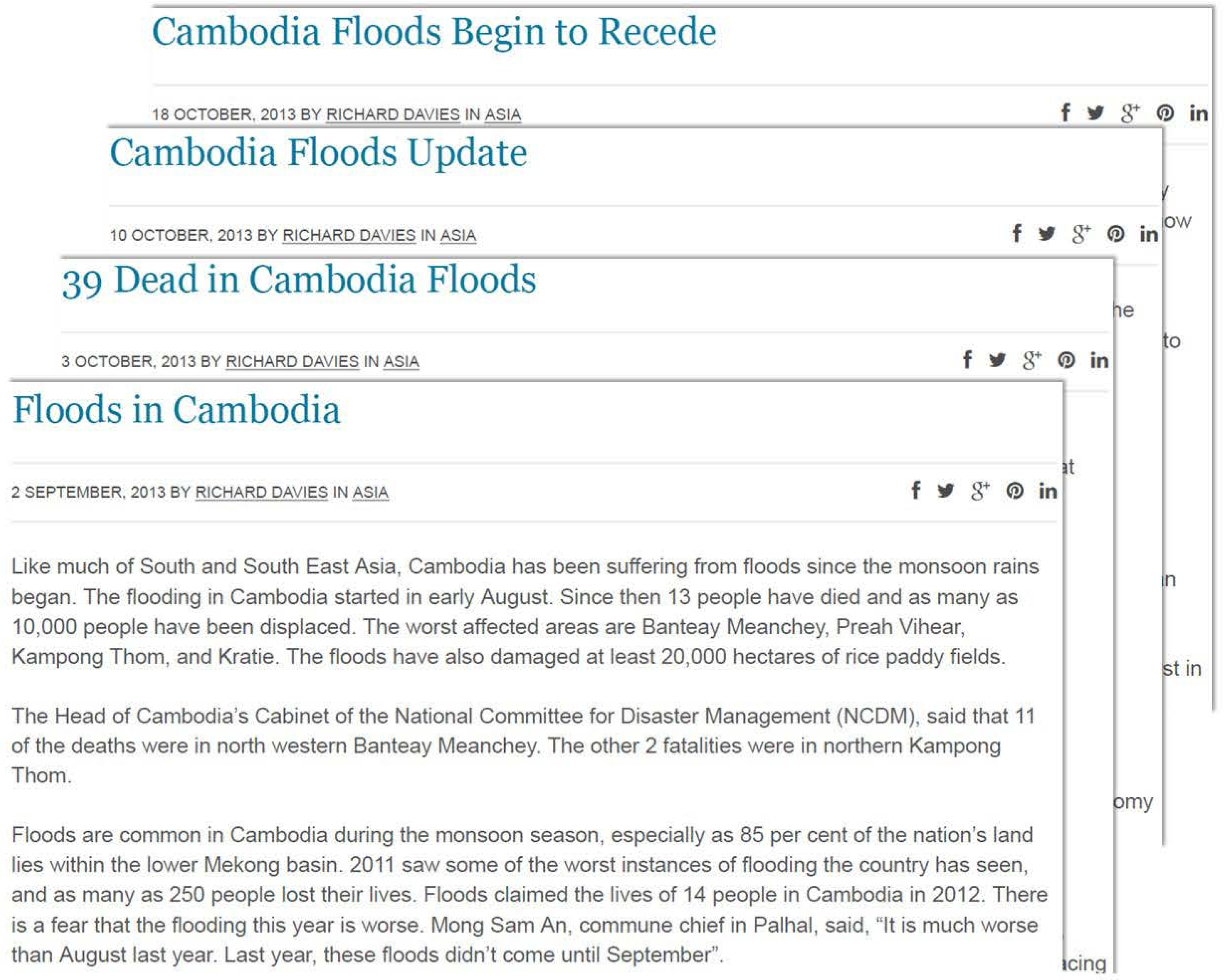
(F) Contingency table and equations for evaluating forecast performance against *in situ* observations.



(D) SPT **historical** streamflow at peak flows Sept-Oct, 2013 for a stream segment near Tonle Sap Lake.



(E) Example of the SPT probabilistic **forecast** from May 15, 2019 for a stream segment in Oregon. Some ensemble runs cross the 2-yr, 10-yr, and even 20-yr return period thresholds.



Cambodia Floods Begin to Recede

18 OCTOBER, 2013 BY RICHARD DAVIES IN ASIA

Cambodia Floods Update

10 OCTOBER, 2013 BY RICHARD DAVIES IN ASIA

39 Dead in Cambodia Floods

3 OCTOBER, 2013 BY RICHARD DAVIES IN ASIA

Floods in Cambodia

2 SEPTEMBER, 2013 BY RICHARD DAVIES IN ASIA

Like much of South and South East Asia, Cambodia has been suffering from floods since the monsoon rains began. The flooding in Cambodia started in early August. Since then 13 people have died and as many as 10,000 people have been displaced. The worst affected areas are Banteay Meanchey, Preah Vihear, Kampong Thom, and Kratie. The floods have also damaged at least 20,000 hectares of rice paddy fields.

The Head of Cambodia's Cabinet of the National Committee for Disaster Management (NCDM), said that 11 of the deaths were in north western Banteay Meanchey. The other 2 fatalities were in northern Kampong Thom.

Floods are common in Cambodia during the monsoon season, especially as 85 per cent of the nation's land lies within the lower Mekong basin. 2011 saw some of the worst instances of flooding the country has seen, and as many as 250 people lost their lives. Floods claimed the lives of 14 people in Cambodia in 2012. There is a fear that the flooding this year is worse. Mong Sam An, commune chief in Palhal, said, "It is much worse than August last year. Last year, these floods didn't come until September".

(G) Flood impact, location, and onset date information from news sources reporting on the 2013 Cambodia flooding.

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