Flood Foresight: Extending GloFAS for forecast-based financing and parametric insurance applications

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What is...?

Flood Foresight

Flood Foresight is JBA's strategic flood forecasting system, providing **flood inundation** and depth estimates at **30m resolution** up to **10-days ahead** of **fluvial** flood events. Recent applications of Flood Foresight include parametric insurance and disaster risk financing in 13 countries, across Europe, Africa and South and Southeast Asia. **Underpinned by GloFAS** modelling, the system can be deployed **globally** to monitor DRF schemes,

The Flood Foresight process
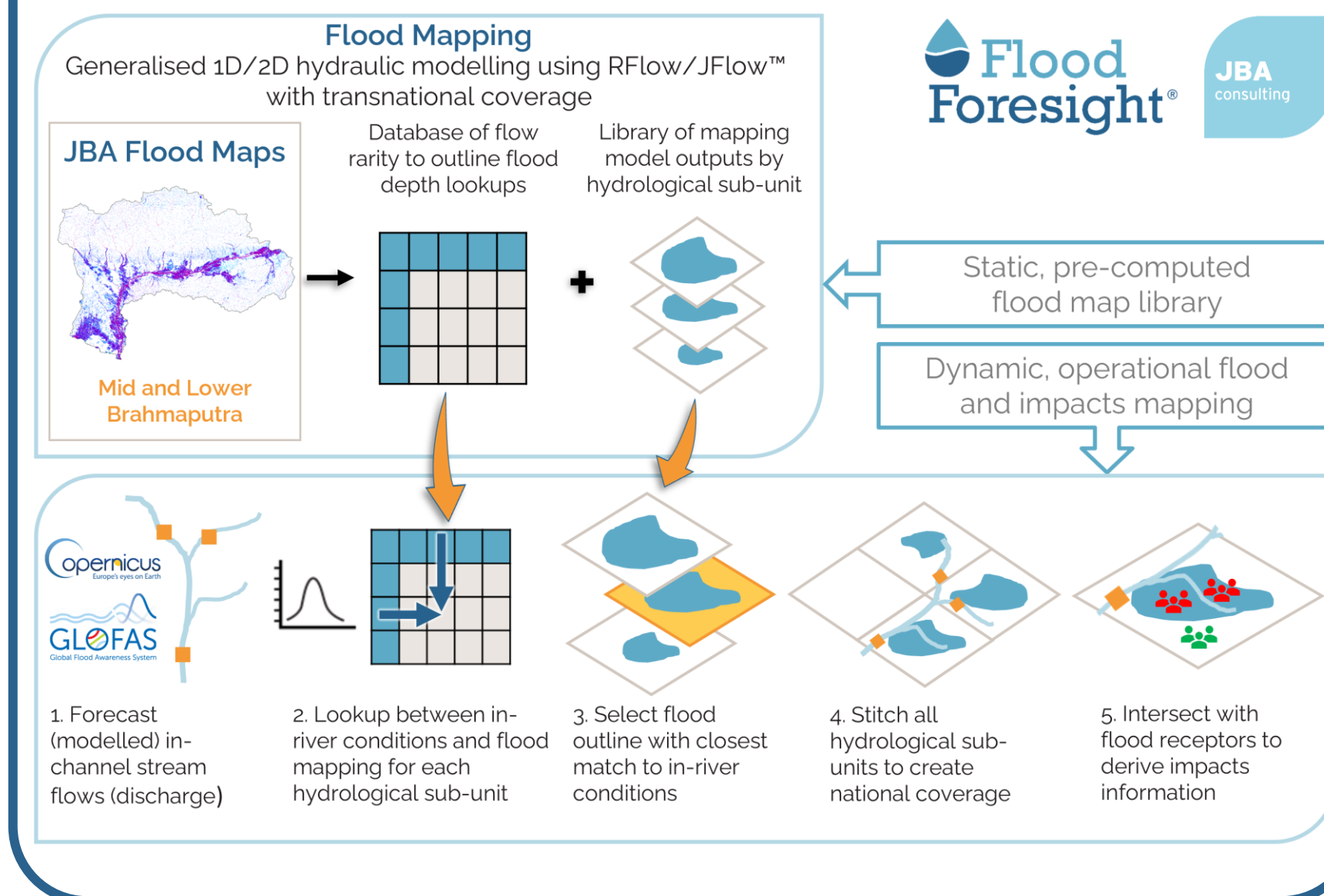
For **forecasting population impacts**, Flood Foresight couples the **Copernicus Global Flood Awareness System (GloFAS)** with a library of pre-computed flood hazard data to generate **daily probabilistic forecasts** of **flood inundation** extents and depths.

From the maps generated, the system then provides estimates of **population at risk** by intersecting the **probabilistic flood depth maps** with **gridded population datasets** such as WorldPop.

This **fully automated** early warning system provides **daily forecasts** of flood conditions at lead times of **0 – 10 days ahead**, with accompanying predictions of the **number of people** estimated to be **inundated** by fluvial flooding.

Who are...?

African Risk Capacity (ARC)

A **specialised** agency of the **African Union** promoting a **proactive** approach to disaster risk management. Their mission is to use **modern finance mechanisms**, such as risk pooling and risk transfer, to enable African countries to meet the **needs** of people **vulnerable** to natural disasters.
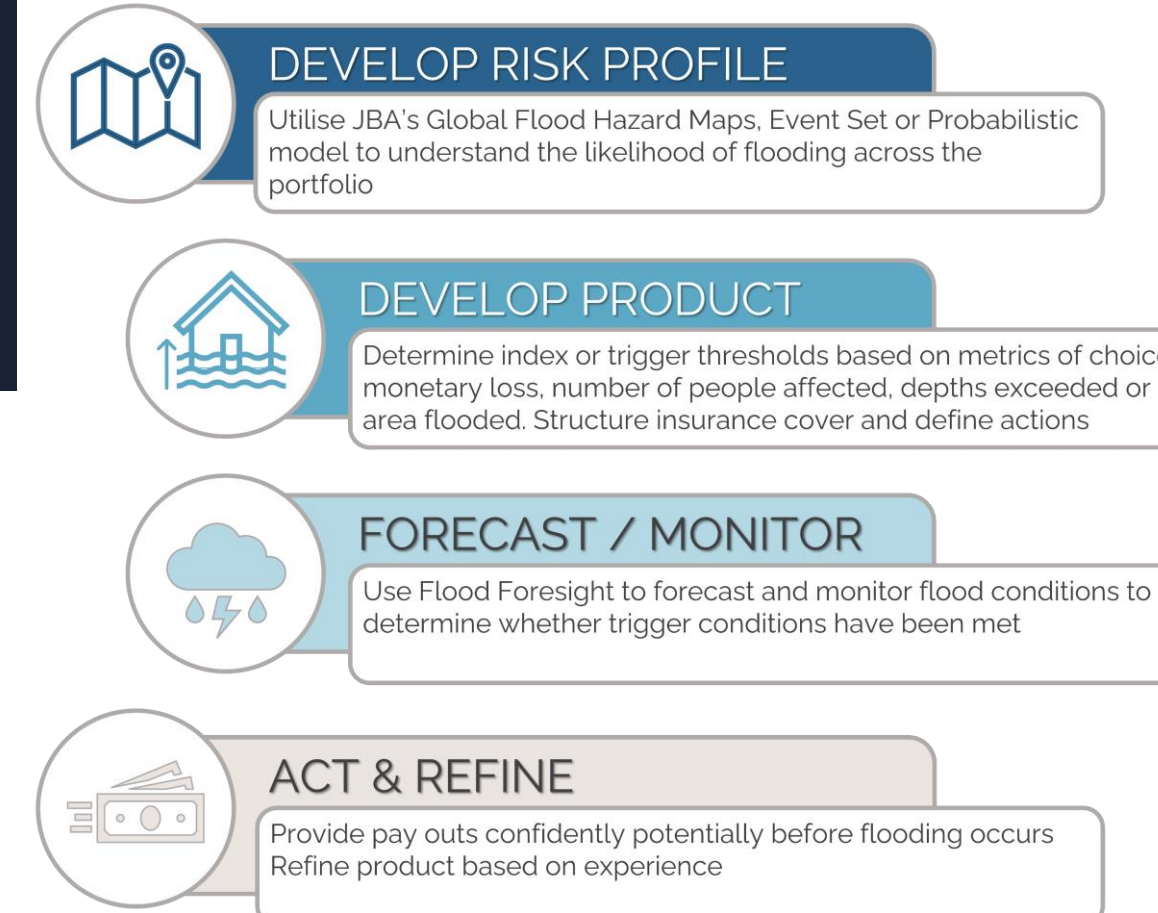
Start Network

A **network** of more than 80 **non-governmental organisations** and aid agencies across five continents, working together to **revolutionise** the global **humanitarian** system. Their mission is to create a **new era** of humanitarian action through **locally led** action, innovation and early and **rapid financing.**

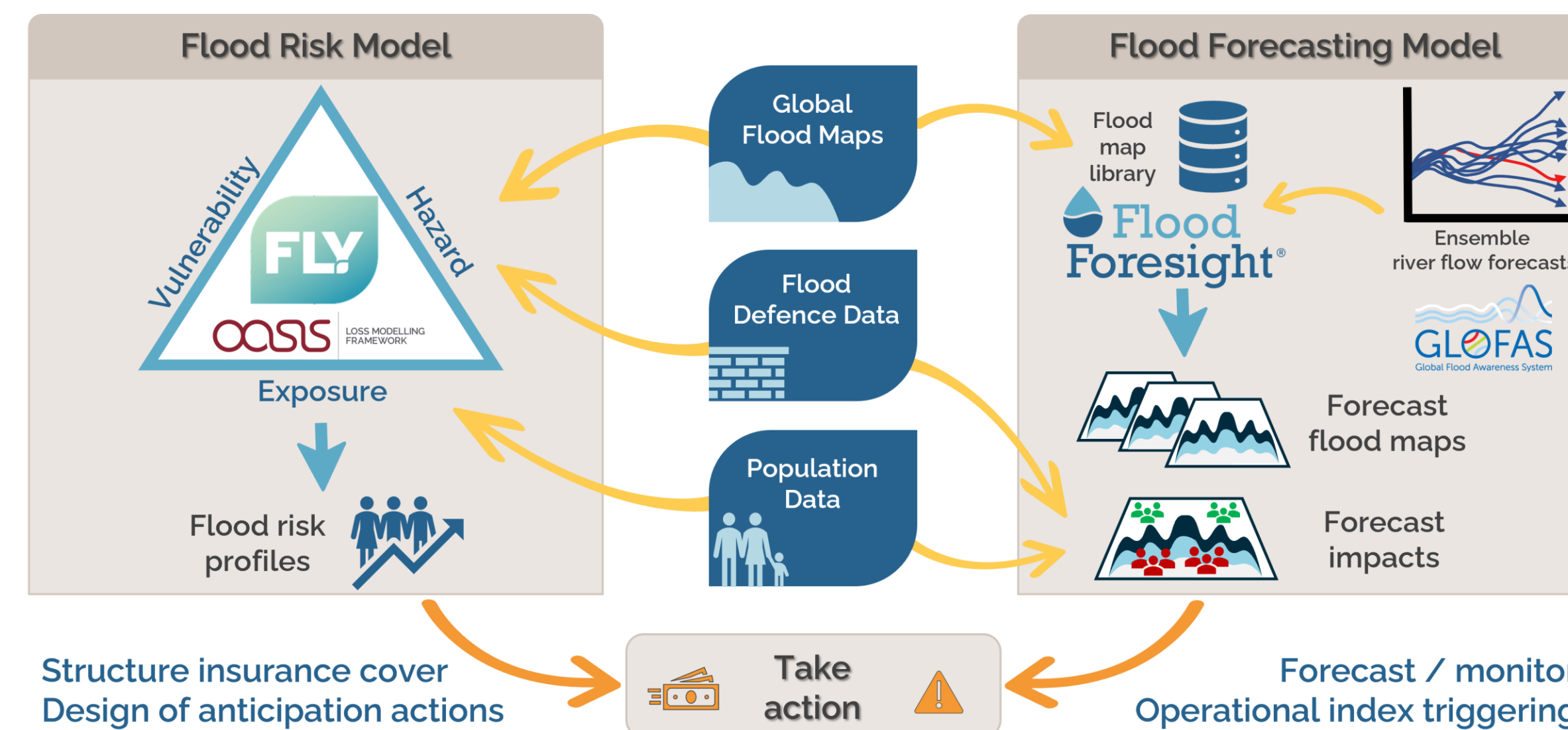## Disaster risk financing systems

JBA support the **Start Network** and **African Risk Capacity** to set up **disaster risk financing systems** in several countries.

Above is a summary of the **building blocks** required in a risk financing scheme - ranging from **initial strategy** through to **contingency planning** and managing **payouts**

JBA is developing systems to support the **risk analytics** element.

The **steps** required for the **risk analytics** component are summarised below:

DEVELOP RISK PROFILE
Utilise JBA's Global Flood Hazard Maps, Event Set or Probabilistic model to understand the likelihood of flooding across the portfolio

DEVELOP PRODUCT
Determine index or trigger thresholds based on metrics of choice, monetary loss, number of people affected, depths exceeded or area flooded. Structure insurance cover and define actions

FORECAST / MONITOR
Use Flood Foresight to forecast and monitor flood conditions to determine whether trigger conditions have been met

ACT & REFINE
Provide pay outs confidently potentially before flooding occurs
Refine product based on experience

Risk analytics for DRF schemes

Flood event investigations

In 2022, widespread flooding of 75,000 km² of land affected a third of the districts in Pakistan, impacting over 33 million people,

Flood Foresight, running in the Indus River basin, captured some of this event, but under-represented the overall flood extent due to limitations of the domain and in the driving model (GloFAS). In particular, flooding was missed along the main channel (1), and more extensive to the west (2). Despite having signals of the event in the model, the impact severity did not meet the trigger levels of the disaster risk financing scheme.

This event underlines the importance of local data and knowledge for calibration of GloFAS and Flood Foresight. The system is helping focus engagement with in-country stakeholders; with their collaboration, the impact of DRF schemes for at-risk communities can be increased.

What is...?

Parametric insurance

A **non-traditional** insurance product that provides **fast**, pre-specified payouts based on a **trigger** event.

Particularly well suited to **catastrophic** perils that are low-frequency but **high-impact**.

Forecast-based financing (FbF)

A programme that enables access to **humanitarian** funding for **early action** based on in-depth **forecast information** and **risk analysis**.

The **goal** of forecast-based financing is to **anticipate** disasters, **prevent** their impact, if possible, and **reduce** human suffering and losses.


Risk analytics required for DRF includes: a **flood risk model** and **flood forecasting model**.

Both of our models are based on **common** datasets, with the **benefit** of **quantifying the risk** and **designing the risk financing scheme** so they are **consistent** - the whole risk profile is quantified and included in the scheme.

The **Flood Risk Model** uses probabilistic catastrophe risk modelling approaches from our **Global Flood Model** to produce a **risk profile** at national, province and district level, for several depth thresholds (i.e. insurance-ready data). This informs **design of trigger levels** for the scheme.

The **Flood Forecasting Model** (Flood Foresight) couples an **ensemble hydrological model** with the same **flood hazard maps** to produce daily **footprints** of **likelihoods** of flooding – extent and depths which can be used to **calculate impact.**

Multi-resolution framework
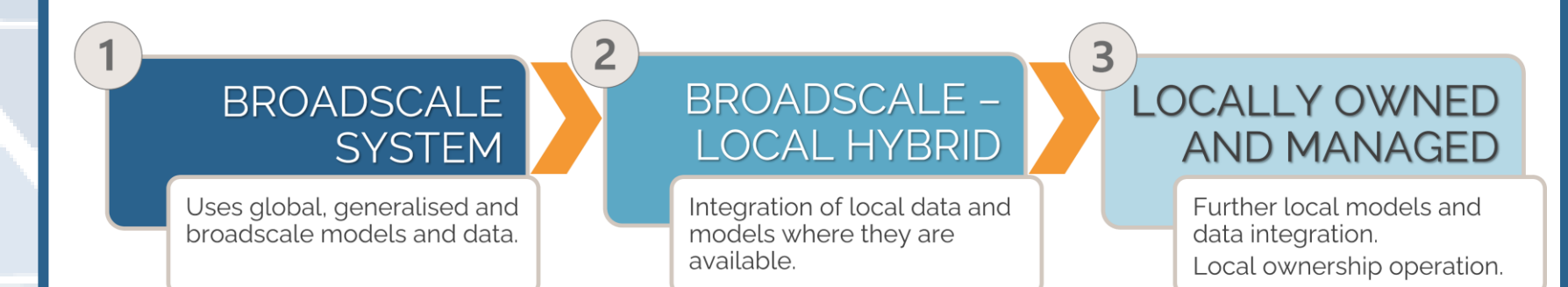
The **long-term success** of disaster risk financing schemes requires a **path** to local adoption – replacing some of the 'global' components with more localised models and data.
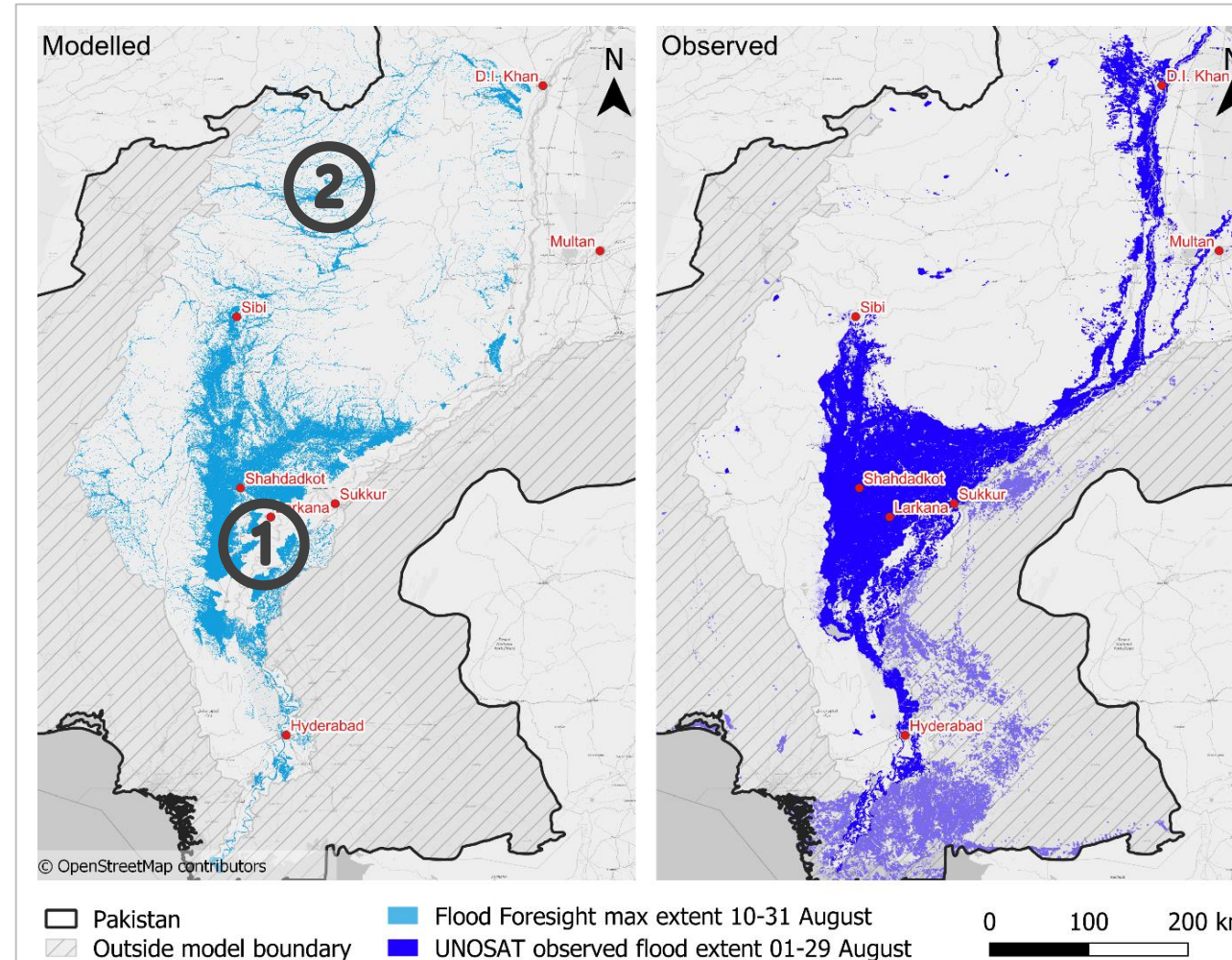
Initially set up with mostly **global** components – maps, models, etc. to **demonstrate** the structure and nature of the systems. **Performance** will be **improved** with more calibrated and **locally-specific** models such as those developed by national agencies. They are the **experts** in their countries and ultimately have the mandate for flood forecasting.

JBA have developed a **flexible framework** for risk analytics supporting **disaster risk financing** schemes that allows a **range of impacts** to be forecast.

GloFAS has allowed us to develop an **off-the-shelf** system that can be deployed **anywhere globally**, providing a **baseline** system which can be augmented with **targeted** improvements from **local** models and data.

Our **collaborations** with the **Start Network** and **ARC** provide avenues for in-country engagement to improve systems to integrate more local knowledge, models and data. Through this we also hope to raise **awareness** about GloFAS with in-country partners, highlighting how their data can be used to **improve** the local calibration of GloFAS.

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