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CASE STUDY · MARLUC SYNOPSIS

Google Flood Hub AI river forecasts used to trigger anticipatory flood action in Nigeria

IMPLEMENTED 2024–2026 · GOVERNMENT AND PUBLIC SERVICES · NIGERIA · BAND C · PARTLY PROVED

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Google's AI river forecasting model, published in Nature in 2024, predicts floods in river basins that have no stream gauges and feeds the free Flood Hub service. In Nigeria, a UN-coordinated anticipatory action framework approved in 2025 uses the Google forecast as one of two triggers, alongside the European GloFAS system, for pre-arranged flood funding in Adamawa State. The framework was triggered in September 2025 and the flood occurred as predicted, per an OCHA workshop report; an independent 2026 reassessment argues the model's accuracy is substantially lower than Google reported.

ABOUT THIS SYNOPSIS

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AT A GLANCE

Frontier case: AI used for a scientific, medical or engineering breakthrough. The transformation is potential and unproven; MarLuc grades what has changed in practice so far.

AI used: Machine-learning hydrological model: long short-term memory (LSTM) networks that forecast daily river flow up to seven days ahead from weather and catchment data, including in river basins without stream gauges, published on Google's Flood Hub.

Implemented: 2024–2026. Grade: band C, Process change, Partly proved.

Headline result, as reported: A Google AI river forecast is one of two triggers for a UN-pooled flood fund in Adamawa State, Nigeria; the framework was triggered in September 2025 and released US$7 million, while an independent 2026 reassessment says the model's accuracy is likely much lower than reported

1 · The case

The facts, as reported by the 5 sources listed at the end. Where a source is silent, the field says "Not reported".

Organisation

Google Research (flood forecasting), with UN OCHA and Nigerian government agencies. Google Research's flood forecasting team, part of Alphabet, runs the free Flood Hub service. The Nigerian use is a UN-coordinated anticipatory action framework for the Benue River in Adamawa State, built with Nigerian government agencies and UN and NGO partners. Canvas block: 4. Operations and process. Also 6. Data and technology.

Business challenge

The challenge. Per the Nature paper, floods hit developing countries hardest, those countries often lack dense stream gauge networks, and hydrological models usually need long data records in each watershed for calibration. In Nigeria, per NEMA's flood dashboard as cited by the Anticipation Hub, floods affected over 1.3 million people in 2024 and displaced over 700,000.

How it was addressed. Google trained LSTM networks on open weather and catchment data to forecast daily river flow up to seven days ahead, tested out of sample across 5,680 gauges, and publishes forecasts on Flood Hub. In Nigeria, a government-chaired trigger task team (NiHSA, NiMet, NEMA, NASRDA and OCHA) agreed two triggers for the Benue River: GloFAS predicting at least 3,132 cubic metres per second at Wuroboki within five days, or the Google forecast predicting at least 1,195 cubic metres per second at Kangli at any point. [1] [2] [3] [4] [5]

Who implemented it

Google Research (Model or cloud provider): Developed the AI river forecasting model and publishes its forecasts on Flood Hub..
In-house (In-house): Coordinated the Core Anticipatory Action Group that developed the framework; the OCHA Centre for Humanitarian Data sat on the triggers group..
In-house (In-house): Chaired trigger development and supplied historical data used to validate the triggers..
GloFAS, the Copernicus Emergency Management Service global flood system, is the framework's second trigger source. Google's role in designing the Nigerian triggers is not reported in the sources opened.

Technology (SEAM pillar E)

SEAM types: T8 Predictive / ML models. Deployment: Vendor SaaS. Vendors and products: Google, Flood Hub, Google AI flood forecasting model (encoder-decoder LSTM).

Where it was built in: The framework's riverine trigger reads the Google forecast at the Kangli forecast point (hybas_1120842550) on the Benue River, at any lead time, alongside the GloFAS forecast at Wuroboki station. Either source crossing its threshold releases CERF and Nigeria Humanitarian Fund money for seven local government areas.

What changed

Before: no joint anticipatory action framework for floods in Nigeria is reported before 2025; anticipatory action was introduced into the 2025 Humanitarian Needs and Response Plan. After: pooled UN money for Adamawa State is released when either GloFAS or Google's AI forecast crosses an agreed threshold, with Nigerian agencies co-designing the triggers and leading the review. [1] [2] [3] [4] [5]

What it cost

Not reported for the AI model. The framework pre-arranged US$7 million (US$5 million from CERF and US$2 million from the Nigeria Humanitarian Fund); this is the humanitarian funding released, not the cost of the AI.

What it saved

Not reported. No cost-benefit or avoided-loss figure for the activation, or for the AI forecast's part in it, appears in the sources opened. [1] [2] [3] [4] [5]

Governance and control

Triggers were set by a government-chaired task team, validated on national historical data and backed by two forecast sources; UN leadership approved and endorsed the framework; the government convened an after-activation review. The model was evaluated by its developers in a peer-reviewed paper and reassessed critically by independent hydrologists.

S2 · Accountable owner · Evidenced
The framework was approved by the UN Resident and Humanitarian Coordinator on 4 August 2025 and endorsed by the Emergency Relief Coordinator on 11 August; the after-activation review was convened by the Office of the Vice-President. [2] [3]

A1 · Safe use · Evidenced
Triggers were validated with historical data from NiHSA and NEMA, and two forecast sources were combined for accuracy and for redundancy if either is disrupted. [2]

A2 · Human in the loop · Evidenced
People set the decision rule: a government-chaired task team reviewed trigger sources and agreed thresholds in advance. Case-by-case human confirmation of each forecast is not described in the framework. [2]

A3 · Monitoring and assurance · Evidenced
A government-led after-activation review assessed the September 2025 activation, and independent hydrologists reassessed the model's published evaluation. [3] [4] [5]

A4 · Vendor AI · Evidenced
The framework names the Google forecast, the forecast point identifier and the threshold; Google's paper describes the model and a research version in the open-source NeuralHydrology repository. [1] [2]

A5 · Agent controls · Not reported
No agents described.

A6 · Standards and regulation · Not reported
No standard, certification or regulatory approval for the AI forecast is reported in the sources opened.

What worked, what did not, what is unproven

WORKED

– The framework was triggered in early September 2025 after forecasts exceeded pre-agreed thresholds, and the flood occurred as predicted, per the OCHA workshop report.

– Within 72 hours WFP delivered anticipatory cash to over 83,500 people; multisector assistance

– In Google's out-of-sample tests, AI forecasts up to five days ahead were as reliable as, or more reliable than, GloFAS nowcasts for 1-year to 5-year return period events.

– Combining the two sources gave historical lead times of 14 to 25 days and redundancy against the disruption of either source, per the framework.

DID NOT

– Li and colleagues (Journal of Hydrology X, 2026) conclude the system's actual predictive accuracy is likely to be substantially lower than reported, particularly for extreme events, with false positive and false negative rates above 90% in their assessment.

– In the Nature paper itself, the AI model showed no statistically significant advantage over GloFAS in Africa for 1-year return period events, or in Asia for 5-year and 10-year events.

– The after-activation review identified breakdown moments and prioritised an early review of the framework and multi-layered triggers; the summaries opened do not link these to forecast performance.

UNPROVEN

– Which forecast crossed its threshold in September 2025, and whether the Google forecast alone would have triggered the release: Not reported.

– Whether acting before the flood reduced losses compared with aid after it: no impact evaluation is reported in the sources opened.

– Whether the model is reliable at the Kangli forecast point and other ungauged sites, given the independent reassessment.

– Whether Nigerian agencies take over the approach; the review called for stronger national ownership of coordination and financing.

Timeline

Mar 2024 Nature publishes Google's paper on AI forecasts of extreme floods in ungauged watersheds; operational forecasts run in over 80 countries [1]

Jul 2025 Anticipatory Action Framework: Nigeria - Floods dated 29 July 2025, with GloFAS and Google forecast triggers; approved on 4 August and endorsed on 11 August 2025 [2]

Sept 2025 Framework triggered on 8 September, releasing US$7 million for anticipatory action in Adamawa State [3]

Nov 2025 Government-led National After-Activation Review in Yola, 25 to 27 November; participants prioritise an early review of the framework and multi-layered triggers [4]

Mar 2026 Journal of Hydrology X publishes an independent reassessment of Google's flood forecasting system [5]

2 · Grade and SEAM assessment

MarLuc's opinion, made on the evidence above. How cases are graded: marluc.co.uk/case-studies/how-we-rate

Level of change and impact

Claimed: A. Grade: C, Process change. Proof: Partly proved. Level of change: Process change.

Process change (Level 2, band C): a humanitarian funding process now uses an AI forecast as a defined trigger, set and reviewed with national agencies. Claimed A: Google presents AI forecasting in ungauged basins as a major advance for global flood warning; MarLuc treats that transformation as potential and unproven.

Graded C. What changed in practice is how anticipatory flood funding is released in Adamawa State: a UN-coordinated framework, with triggers set by a government-chaired team, names the Google AI forecast as one of two trigger sources, and it released US$7 million in September 2025 ahead of a flood that occurred as predicted. The sources opened do not say which forecast crossed its threshold, and no evaluation isolates the AI forecast's effect. Google's paper presents reliable forecasting in ungauged basins as a major advance; MarLuc treats a wider transformation of flood warning as potential and unproven, given the 2026 independent reassessment.

The SEAM view and lessons learnt

The change came from combining an open AI forecast with pre-agreed money, national historical data and a jointly designed trigger. The AI's own contribution cannot be separated, because GloFAS was the other trigger and no source says which crossed first, and the model's accuracy is contested in peer-reviewed work. Before tying money or evacuation decisions to an outside forecast, a leadership team should ask who validated it independently at the exact points used, and what happens after a false alarm or a missed event.

1. Validate an outside forecast against your own historical records before tying money to it.
2. Use more than one forecast source so a single model failure cannot block or force action.
3. Review every activation openly and adjust triggers with the agencies that own the data.

Evidence

Score 2 of 4. Mixed: developer's peer-reviewed paper (Nature 2024, Google authors); UN framework and after-activation records showing operational use; independent peer-reviewed reassessment (Journal of Hydrology X 2026) disputing accuracy. No impact evaluation of the AI forecast's contribution.

Evaluation method. Retrospective out-of-sample evaluation by the developer against GloFAS (1984 to 2021), UN framework documents and a government-led after-activation review of the September 2025 activation, and an independent reassessment of the published evaluation. No controlled comparison of outcomes.

Sources disagree. Google's Nature paper reports reliability similar to or better than GloFAS nowcasts at up to five days' lead time; the 2026 reassessment says the supporting evidence relies on subjective choices whose implications were not assessed, and that actual accuracy is likely substantially lower, especially for extreme events. A response from Google is not reported in the

3 · Original sources

Read these in full. To challenge a fact or a grade, use the contact form at marluc.co.uk or the link on https://marluc.co.uk/case-studies/google-flood-hub-nigeria-anticipatory-action

[1] Nature (2024): Global prediction of extreme floods in ungauged watersheds
https://www.nature.com/articles/s41586-024-07145-1

[2] UN OCHA: Anticipatory Action Framework: Nigeria - Floods (29 July 2025, endorsed 11 August 2025)
https://www.unocha.org/attachments/5eb6a13c-ee8c-4bd2-8f36-4d420fe8b00e/Nigeria%20AA%20flood%20framework%20-%20CERF%20and%20NHF_Endorsed_11%20August%202025.pdf

[3] Anticipation Hub: Nigeria's National After-Activation Review: advancing anticipatory action for floods in Adamawa State
https://www.anticipation-hub.org/news/nigerias-national-after-activation-review-advancing-anticipatory-action-for-floods-in-adamawa-state

[4] ReliefWeb (OCHA): Nigeria: After Activation Review - Workshop Report (Yola, Adamawa State, 25 - 27 November 2025)
https://reliefweb.int/report/nigeria/nigeria-after-activation-review-workshop-report-yola-adamawa-state-25-27-november-2025

[5] Journal of Hydrology X (2026) via ANU Research Portal: When are AI models ready for deployment? Reassessing Google's global AI flood forecasting system through the lens of responsible modelling
https://researchportalplus.anu.edu.au/en/publications/when-are-ai-models-ready-for-deployment-reassessing-googles-globa/

Google Research (flood forecasting), with UN OCHA and Nigerian government agencies website:
https://sites.research.google/floods/

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