FLOOD RISK ASSESSMENT OF LOWER REACHES OF KAMENG RIVER SYSTEM

Integrating GIS, Analytical Hierarchy Process (AHP) and Participatory Rural Appraisal (PRA)

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Background & Rationale

- Flooding is a recurring hydro-meteorological hazard in Assam, driven by intense monsoon rainfall and extensive river networks.
- The lower Kameng (Jia Bharali) system is susceptible because of low-lying floodplains, braided channels, gentle slopes and overbank flows.
- Deforestation, floodplain encroachment, unplanned urban expansion and embankment issues can further aggravate impacts.
- Flood risk depends not only on physical hazard, but also on exposure and socio-economic vulnerability.

STUDY FOCUS

Lower reaches of the Kameng River system

Sonitpur • Udalguri • Darrang

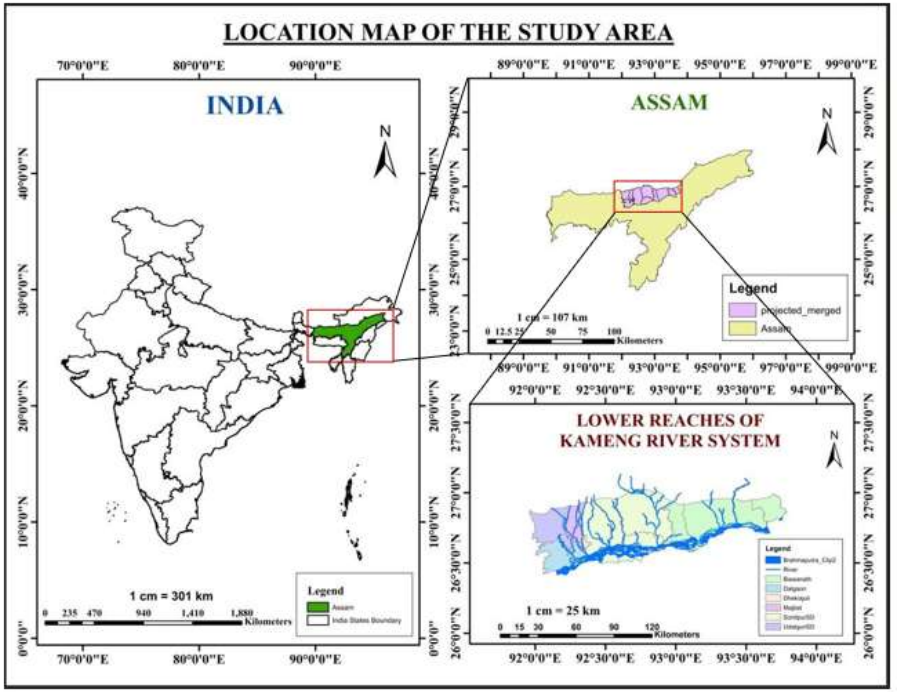
Flood hazard + vulnerability → integrated flood risk

47.13%

High + Very High hazard

Study Area & Data

- Location: 26.41°–27.03° N and 91.96°–93.78° E.
- Covers parts of Sonitpur, Udalguri and Darrang districts and 11 administrative circles.
- Major rivers/tributaries include Jia Bharali, Gabharu, Belsiri, Bargang, Mara Bharali, Mara Dhansiri, Jiya Dhansiri, Pagladiya, Panch, Sirajuli and Buroi.
- Annual rainfall: approximately 1,950–2,170 mm; most rainfall occurs during May-October.



KEY DATASETS

30 m SRTM DEM	**10 m** Sentinel-2 L2A	**1994–2023** IMD rainfall

Research Objectives

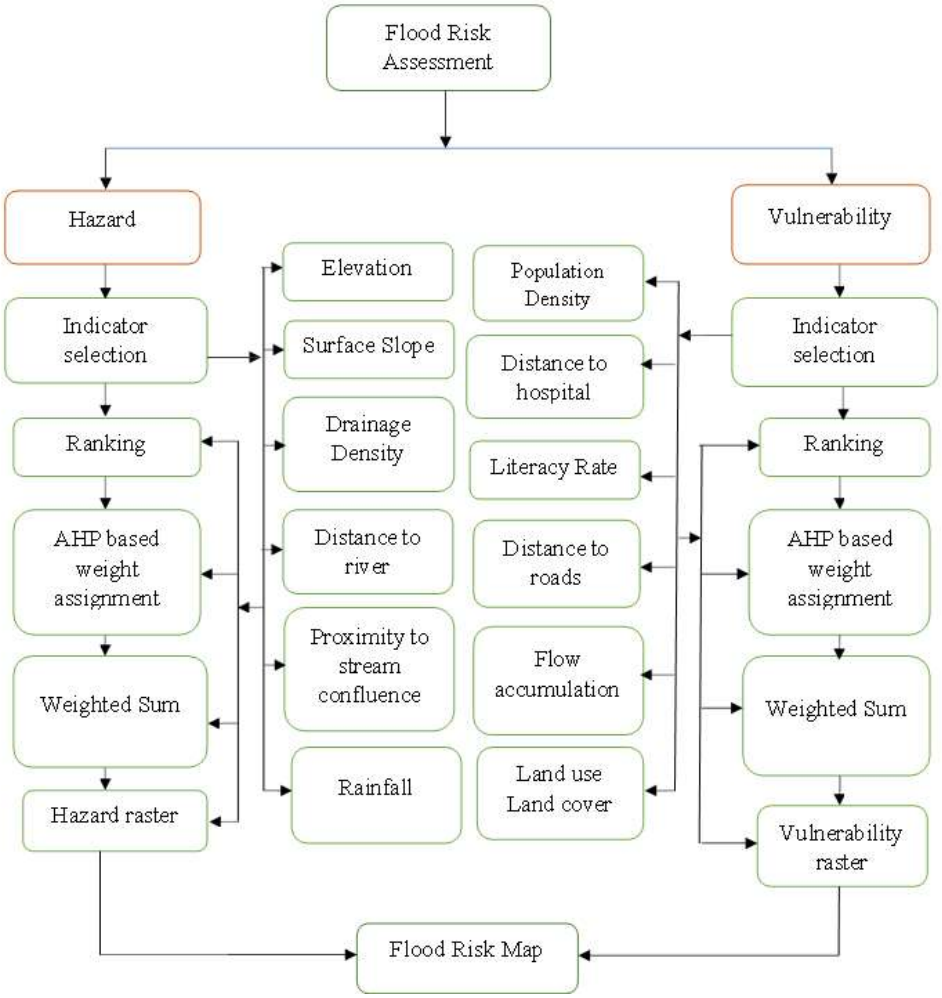
01 **Identify suitable indicators for flood hazard and flood vulnerability assessment.**

02 **Assign relative weights to indicators using the Analytical Hierarchy Process (AHP).**

03 **Develop integrated flood risk maps using GIS-based weighted overlay analysis.**

04 **Validate the spatial assessment with field visit.**

HIERARCHY OF FLOOD RISK ASSESSMENT

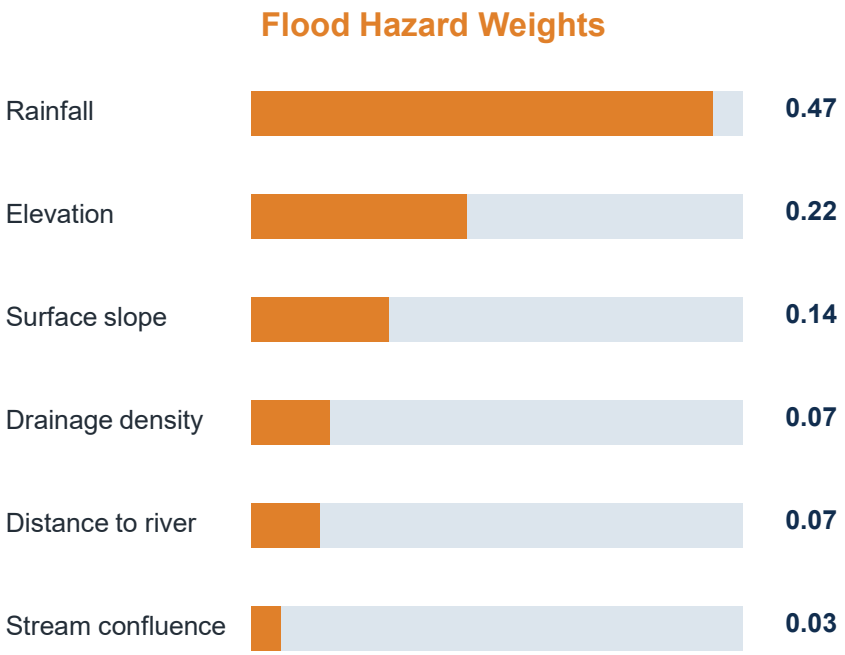


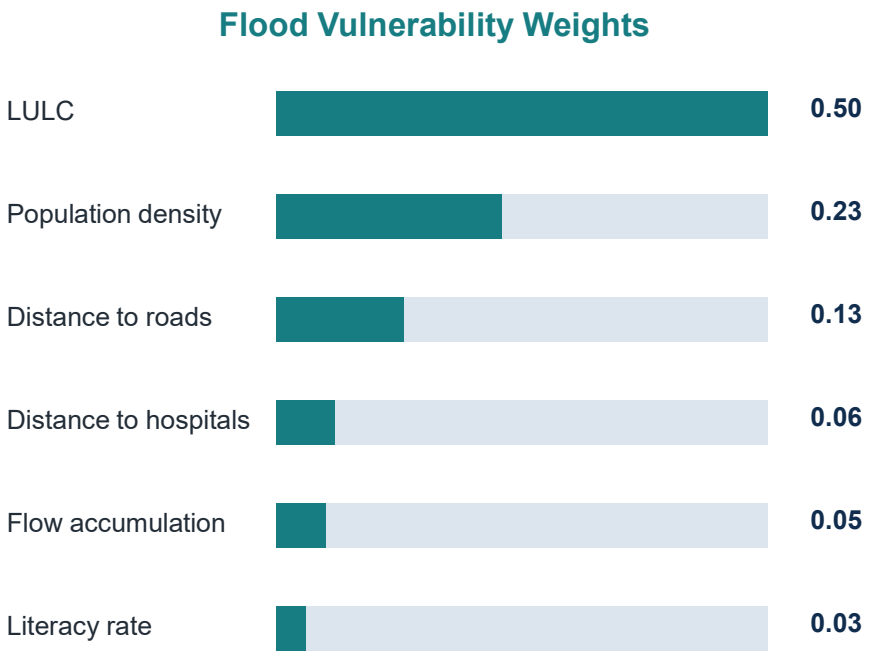
Flood Hazard & Vulnerability Indicators

FLOOD HAZARD	FLOOD VULNERABILITY
Elevation	Population density
Surface slope	Distance to hospitals
Drainage density	Literacy rate
Distance to river	Distance to roads
Proximity to stream confluence	Flow accumulation
Rainfall distribution	Land Use/Land Cover

All thematic layers were standardized to 30 m and reclassified into five functional classes.

AHP Results: Relative Importance of Indicators





0.08
Hazard CR

0.05
Vulnerability CR

Both consistency ratios are below the acceptable threshold of 0.10.

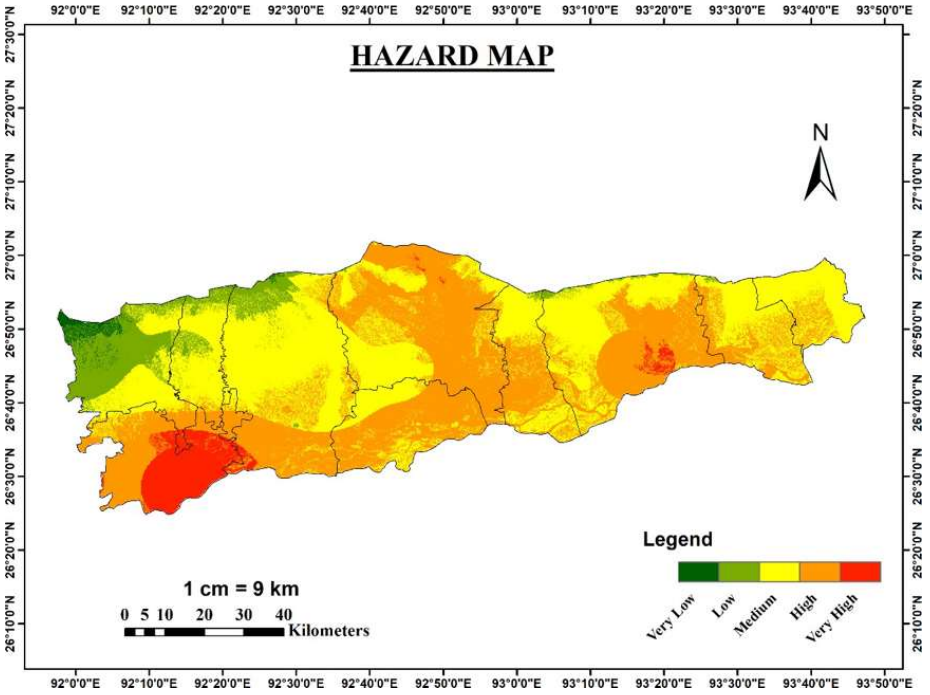
Flood Hazard Zonation

44.66%
Moderate hazard

41.99%
High hazard

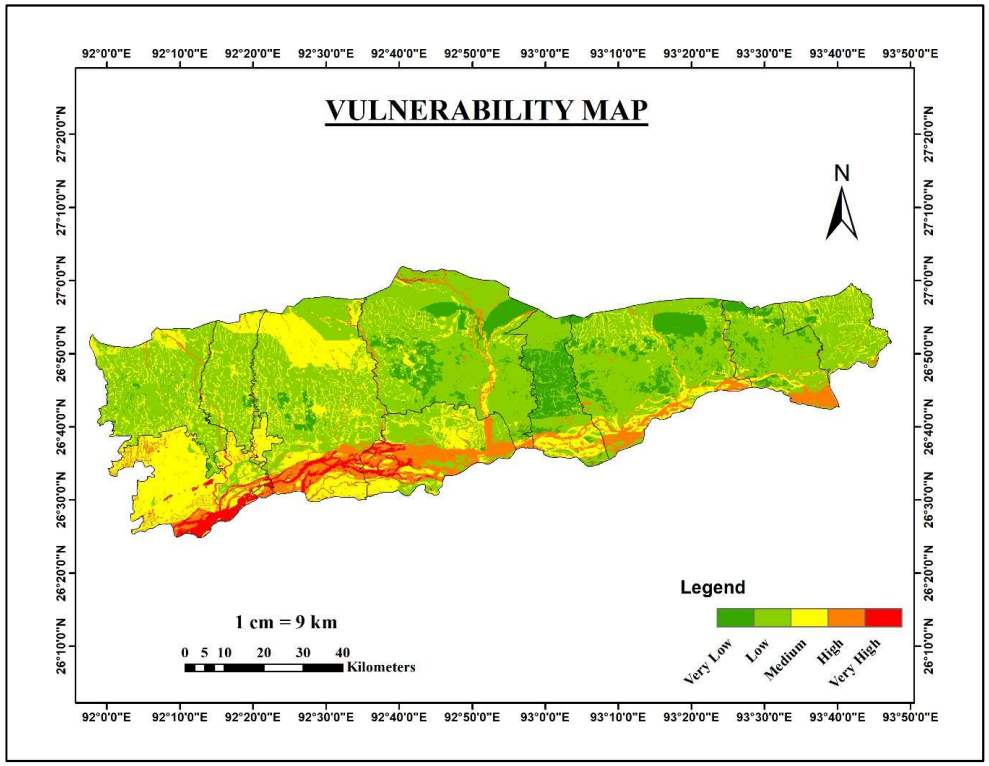
5.14%
Very high hazard

47.13%
High + Very High



- Highest hazard is concentrated in Dalgaon, Dhekiajuli, Chariduar and the Jia Bharali floodplain.
- Low elevation, gentle slopes, high rainfall and proximity to major channels combine to increase flood potential.

Flood Vulnerability Zonation



54.83%
Low vulnerability

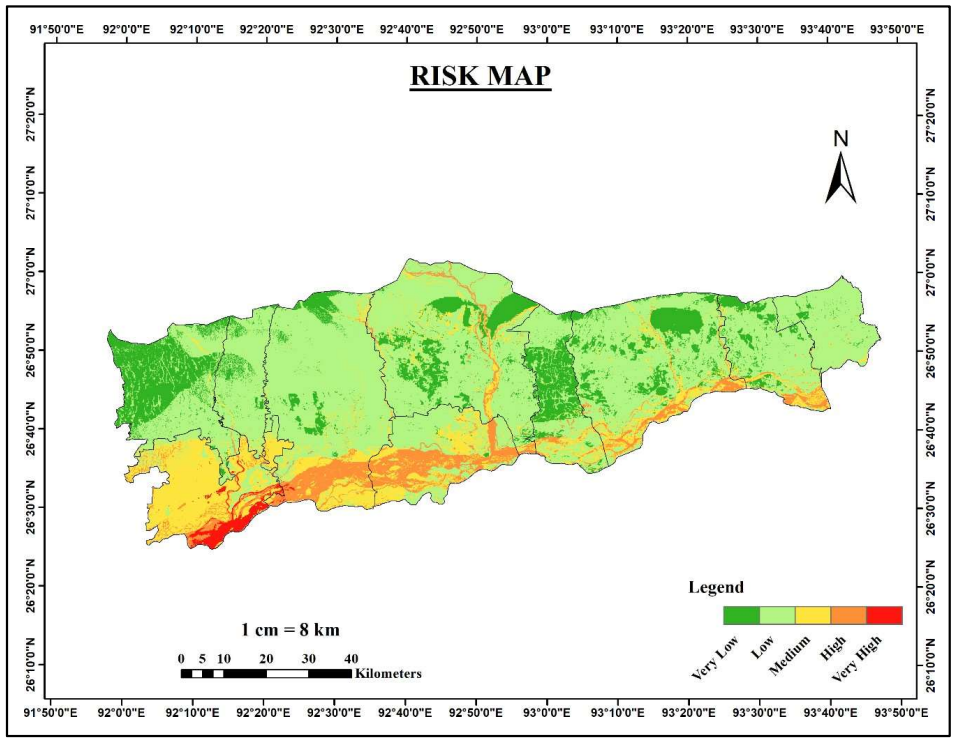
23.88%
Moderate

8.88%
High

2.43%
Very high

- High and very high vulnerability covers 11.31% of the study area.
- Vulnerable zones coincide with densely populated settlements, inadequate accessibility and extensive built-up land.
- LULC is the dominant vulnerability indicator (AHP weight = 0.50).

Flood Risk Zonation



60.98%
Low vulnerability

14.85%
Moderate

7.59%
High

1.05%
Very high

- This map demonstrates that, areas covered with water and built-up areas and abundant rainfall, significantly contribute to the risk of flooding in the basin.

Field Based Validation & Community Insights

2015, 2017, 2020, 2022, 2023
Major flood years reported by communities

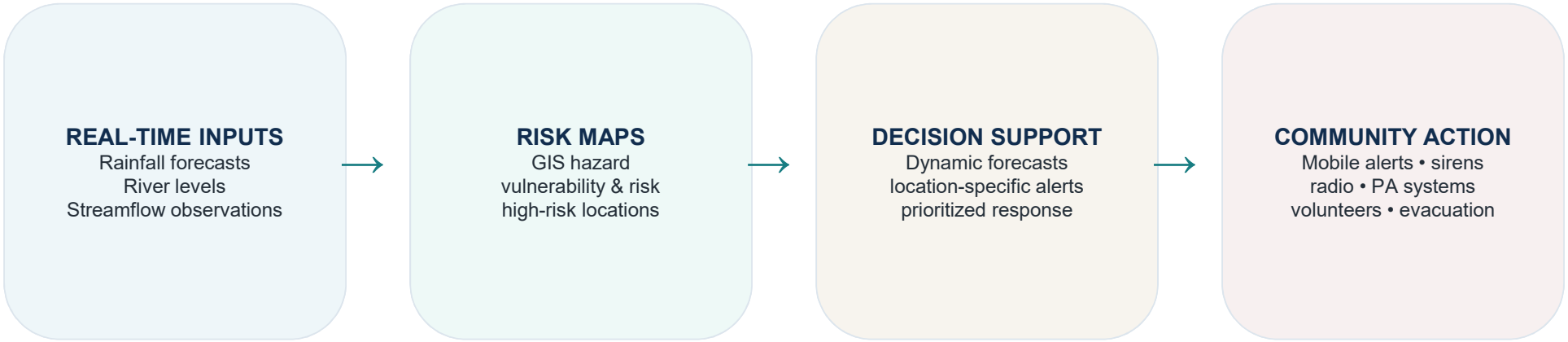
Dhekerigaon Balipara
Frequently inundated locations

Strong
Agreement between field based observations and GIS risk zones

Last-mile
Communication remains critical

- PRA included social/resource mapping, transect walks, seasonal calendars, group discussions and historical timelines.
- Communities reported inadequate drainage, recurrent crop losses, poor accessibility during floods and limited water-storage structures.
- The reported flood history closely corresponded with GIS-derived high and very high risk areas.
- Community knowledge strengthens the local relevance and practical usability of spatial flood-risk assessment.

From Risk Maps to Early Warning & Last-Mile Connectivity

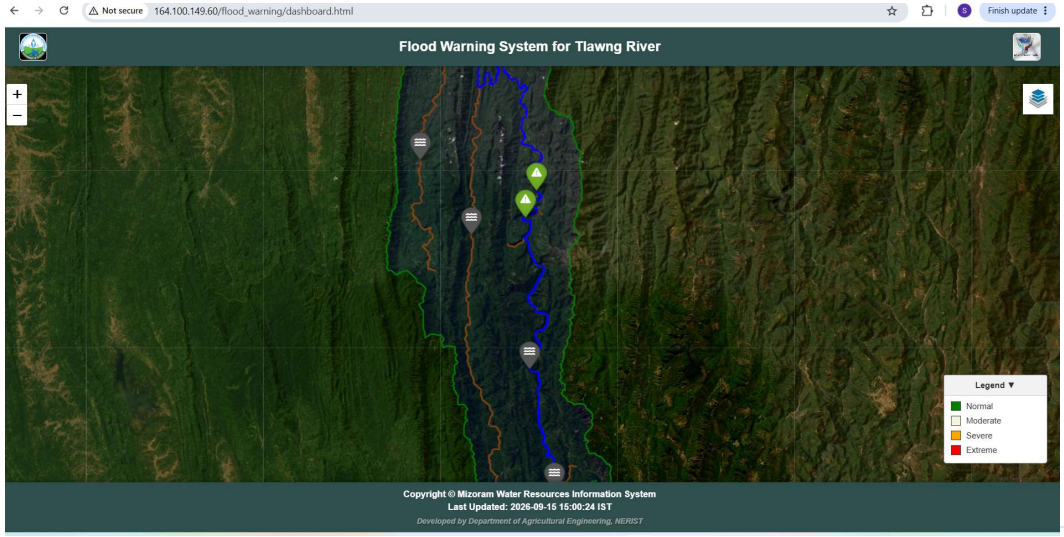


- Install automatic rain gauges, river-level sensors and telemetry stations preferentially in high-risk zones.
- Use risk maps for location-specific warnings, evacuation planning and resource allocation.
- Strengthen village disaster-management committees, self-help groups and local governance bodies for last-mile dissemination.
- The proposed approach supports proactive, data-driven flood preparedness and response.

Key Conclusions & Recommendations

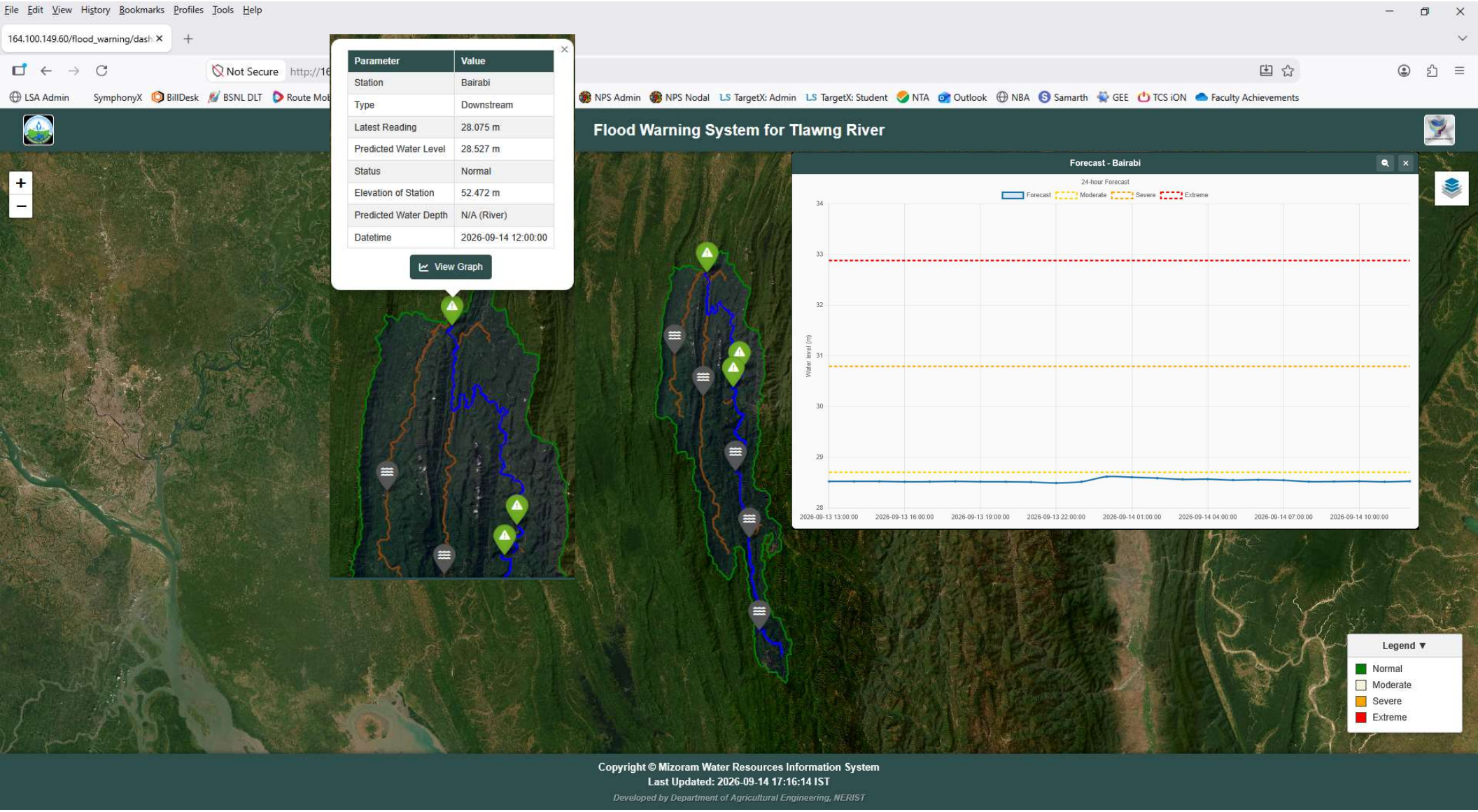
KEY FINDINGS

- 47.13% of the area falls under high + very high flood hazard.
- 11.31% falls under high + very high vulnerability.
- 60.98% of the study area is classified as low flood risk.
- 8.64% is high + very high risk (7.59% + 1.05%).
- Field based study broadly validates the GIS-derived risk pattern.



PRIORITY ACTIONS

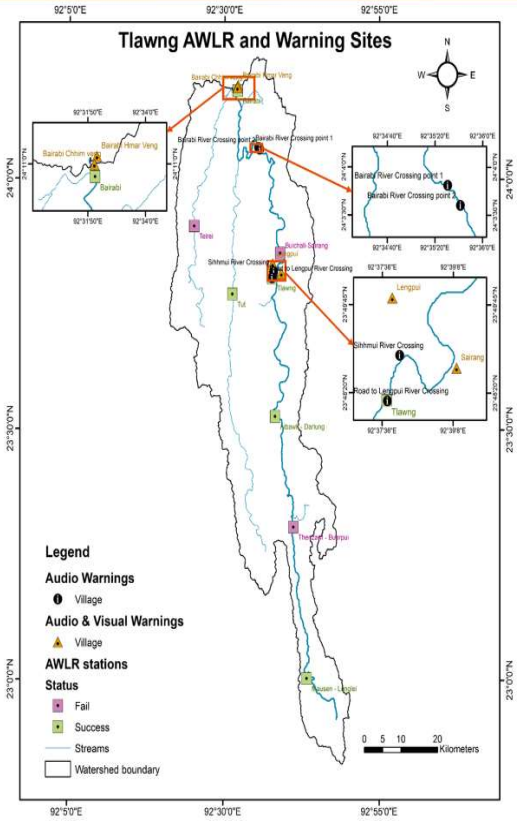
- Integrate risk maps with real-time hydrometeorological observations.
- Develop a real-time GIS-based Decision Support System for dynamic flood alerts.
- Expand multi-channel warning dissemination and last-mile connectivity.
- Prioritize monitoring, evacuation support and resilient infrastructure in high-risk areas.
- Institutionalize community participation in preparedness and response planning.


File Edit View History Bookmarks Profiles Tools Help
164.100.149.60/flood_warning/dash
Not Secure
LSA Admin
SymphonyX
BillDesk
BSNL DLT
NPS Admin
NPS Nodal
TargetX: Admin
TargetX: Student
NTA
Outlook
NBA
Samarth
GEE
TCS iON
Faculty Achievements
Flood Warning System for Tlawng River
Parameter
Value
Station
Bairabi
Type
Downstream
Latest Reading
28.075 m
Predicted Water Level
28.527 m
Status
Normal
Elevation of Station
52.472 m
Predicted Water Depth
N/A (River)
Datetime
2026-09-14 12:00:00
View Graph
Forecast - Bairabi
24-hour Forecast
Forecast
Moderate
Severe
Extreme
Water level (m)
34
33
32
31
30
29
28
2026-09-13 13:00:00
2026-09-13 16:00:00
2026-09-13 19:00:00
2026-09-13 22:00:00
2026-09-14 01:00:00
2026-09-14 04:00:00
2026-09-14 07:00:00
2026-09-14 10:00:00
Legend ▼
Normal
Moderate
Severe
Extreme
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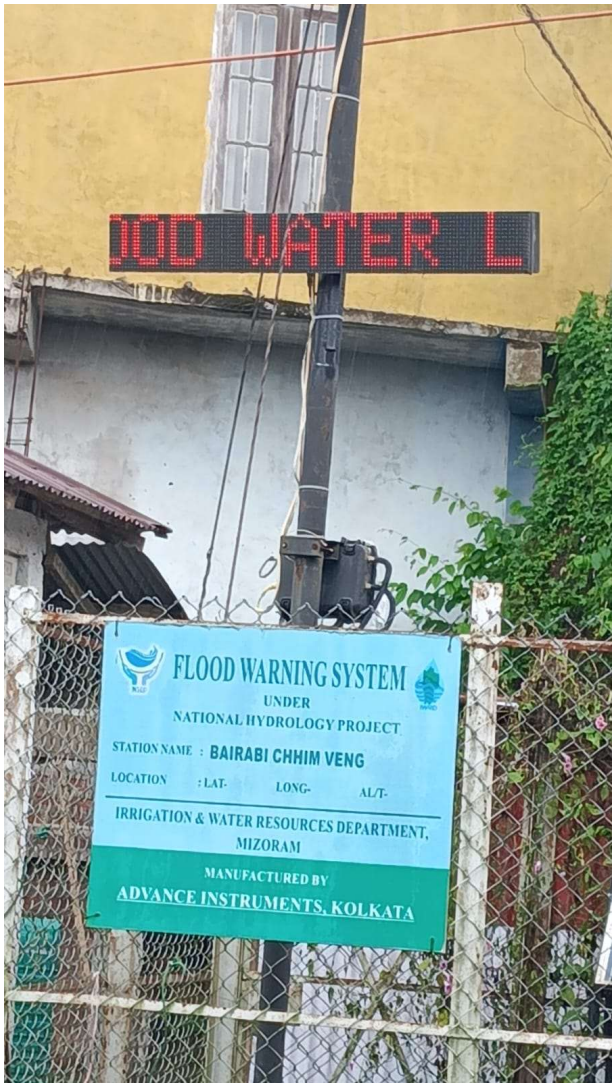
Downstream Forecast Based on Upstream AWLR Sites and Warnings

Forecast	Upstream Gauge	Downstream Gauge	Warning Sites	Type (Audio/AV)
1	Mausen - Lunglei	Tlawng	Lengpui	AV
	Thenzawl - Buarpui		Sihhmui River Crossing	Audio
	Aibawk - Darlung		Sairang	AV
			Road to Lengpui River Crossing	Audio
2	Mausen - Lunglei	Buichali-Sairang		
	Thenzawl - Buarpui		Bairabi River Crossing point 2	Audio
	Aibawk - Darlung		Bairabi River Crossing point 1	Audio
	Tlawng			
3	Teirei	Bairabi		
	Tlawng			
	Tut		Bairabi Chhim veng	AV
	Mausen - Lunglei		Bairabi Hmar Veng	AV
	Thenzawl - Buarpui			
	Aibawk - Darlung			
	Buichali-Sairang			

***Red color indicates missing gauge



One AV warning site. The LED display scroll horizontally with different colors based on level of severity



THANK YOU

Flood risk assessment is most effective when spatial science, real-time information and community knowledge work together.

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