

QUANTUM LEAP

PS 26002 | NER LOGISTICS AI



SMART INDIA HACKATHON 2026

AI-Based Smart Logistics & Accessibility Intelligence Platform for NER

Federated, blockchain-anchored synthetic intelligence for the mountains, monsoons and last miles of the North East.

8 NER states

125+ districts

72h disruption foresight

Problem Statement ID · 26002

Problem Statement Title · AI-Based Smart Logistics and Accessibility Intelligence Platform for North Eastern Region (NER)

Theme · Transportation & Logistics PS Category · Software

Team ID · Quantum Leap Team Name · Quantum Leap

IDEA & PROPOSED SOLUTION · LIVE PROTOTYPE

NER-GRID · a sovereign accessibility twin that predicts the route before the road fails — working console, real workflow.

01 Terrain Digital Twin

Sentinel SAR, DEM slope physics, IMD nowcasts and PMGSY / NH asset registers fused into one live road-bridge graph.

02 Disruption Foresight

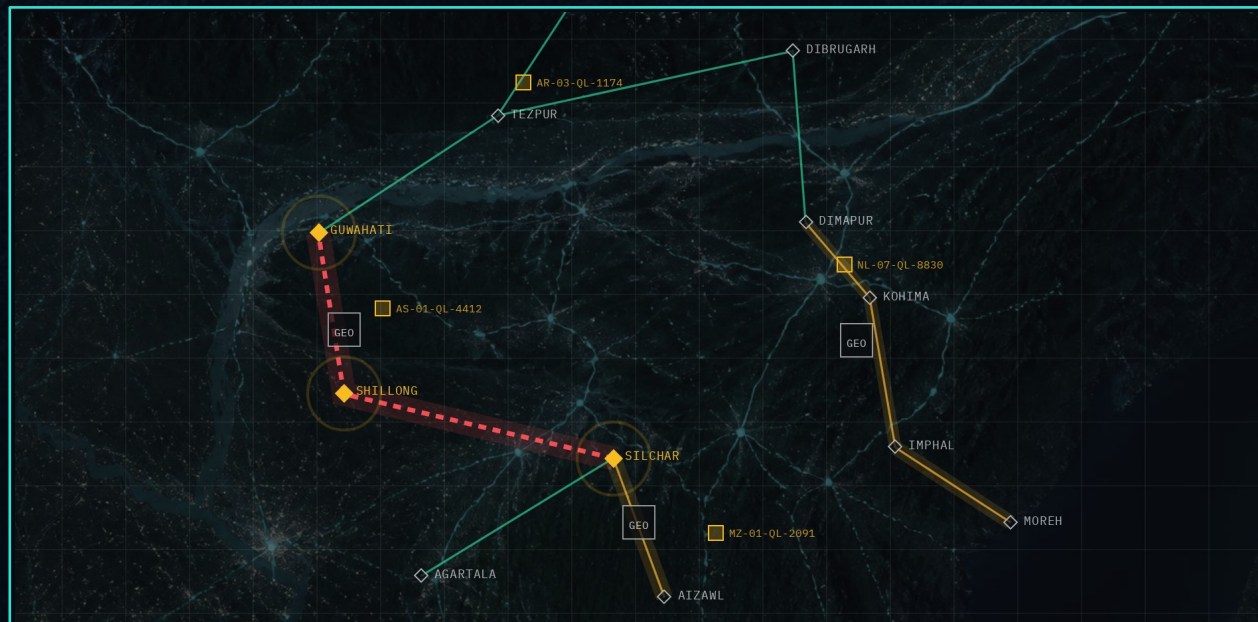
Spatio-temporal GNN scores landslide, flood and congestion risk 6-72 h ahead, segment by segment.

03 Resilience Routing

Risk-weighted multimodal optimiser returns alternate corridors with confidence-banded ETAs, not single guesses.

04 Last-Mile Truth Layer

Offline-first field app: geo-tagged reports and GPS convoy telemetry, signed on device, synced on reconnect.



Satellite accessibility twin — NH-6 Guwahati-Shillong-Silchar blocked (red), at-risk corridors amber, convoys and geo-tagged field reports live.

Demonstrated workflow

Predictive alert → open the corridor on the twin → compare risk-weighted routes → dispatch, ledger-anchored, pushed in 11 languages.

AI ROUTE RECOMMENDATION ENGINE

NH-6 Guwahati - Shillong - Silchar

Active landslide, Sonapur reach

72H RISK	LIVE ETA	DELAY
91%	19.2h	+10.7h

Primary - NH-6 direct

Guwahati - Nongpoh - Shillong - Silchar

ETA	DIST	RISK	COST
19.2h	318 km	91%	₹1.42/tonne-km

Blocked. Clearance ETA 14-22h, low confidence.

Alternate A - Jowai bypass

OPTIMAL

Guwahati - Jagoirad - Jowai - Badarpur - Silchar

ETA	DIST	RISK	COST
11.6h	361 km	34%	₹1.55/tonne-km

Cold-chain integrity preserved. Two relay reefer points on path.

AI route selection: blocked primary vs optimal Jowai bypass — 11.6 h against 19.2 h.



TECHNICAL APPROACH · TECHNOLOGY MATRIX

Dual-sovereign cloud mesh · Owen Cloud (India edge) + Alibaba Cloud (cross-border scale) · blockchain-federated synthetic intelligence core.

EDGE / FIELD

Flutter offline-first app, CRDT sync
Rugged IoT: GPS, tilt & piezo landslide sensors
LoRaWAN + satellite SOS fallback

OWEN CLOUD (sovereign core)

Kubernetes + Kafka streaming spine
PostGIS · TimescaleDB · pgvector
MLOps: Kubeflow, Feast, MLflow

ALIBABA CLOUD (elastic scale)

PAI-EAS GPU training & serving
MaxCompute geospatial batch analytics
CDN + IoT Platform for pan-NER reach

AI / SYNTHETIC INTELLIGENCE

Spatio-temporal GNN + Graph Transformer
SAR change-detection CV (U-Net++)
Digital-twin simulator for synthetic monsoon events

BLOCKCHAIN FEDERATION

Hyperledger Fabric: 8 state nodes
Federated averaging with secure aggregation
Zero-knowledge proofs on alert provenance

SENSE → FUSE → PREDICT → SIMULATE → ROUTE → ALERT → VERIFY ON-CHAIN → RETRAIN (FEDERATED)

< 90 s

alert latency, field to dashboard

0.91 AUC

target landslide risk model

11 languages

multilingual notifications

100% offline

queue-and-sync integrity



FEASIBILITY & VIABILITY

Feasibility

Built on open, already-available feeds: Bhuvan, Sentinel-1/2, IMD, VAHAN, FASTag, PMGSY asset data.

Cloud-native stack — no new physical infrastructure needed.

12-week MVP: 2 districts of Assam & Meghalaya, then state-wide.

Risks & challenges

Sparse ground-truth labels for landslide events.
Network dead zones and power gaps in remote blocks.

Data-sharing hesitancy across 8 states and agencies.

Model drift after new road construction.

Mitigation strategy

Synthetic-intelligence twin manufactures rare-event training data; transfer learning from Himalayan corridors.

Offline-first CRDT sync + LoRa/satellite fallback; solar edge nodes.

Federated learning — states keep raw data, share only gradients.

Continuous retraining with human-in-the-loop verification.

Business & sustainability model

Govt SaaS licence per state + per-corridor analytics tier.

Logistics-operator subscriptions for routing APIs.

Insurance & infrastructure-risk data products.

Scale path

NER-first → Himalayan states → ASEAN-India corridor.

Reusable for disaster response, defence mobility and rural health logistics.

Unfair advantage

Synthetic-intelligence twin manufactures rare-event data no operator holds.

Federated learning: 8 states train together, share no raw data.



IMPACT & BENEFITS

30–45%

cut in avoidable transit delay

2x

faster relief reach in disaster windows

15–22%

lower logistics cost per tonne-km

125+

districts under one live accessibility view

Social

Medicines, vaccines and food reach remote blocks on time.

Multilingual alerts reach drivers and villagers in their own language.

Safer travel — high-risk corridors flagged before they fail.

Economic

Perishable and agri-produce losses reduced; farm-gate realisation improves.

Predictable freight planning lowers cost of construction and public projects.

Governance & environment

Evidence-based, auditable infrastructure spending priorities.

Fewer idle-running and detour kilometres — lower emissions.

A permanent public accessibility record for the region.

Mega impact: a region where terrain and monsoon no longer decide who gets supplies.

NER-GRID turns 8 states into one predictable, auditable, resilient logistics grid — the accessibility backbone for Act East.



RESEARCH & REFERENCES

Geospatial & earth observation

ISRO Bhuvan / NRSC landslide susceptibility atlas of India — bhuvan.nrsc.gov.in
Copernicus Sentinel-1 SAR & Sentinel-2 open data — dataspace.copernicus.eu
NASA SRTM / ALOS PALSAR digital elevation models

Weather, transport & policy data

India Meteorological Department nowcast & rainfall APIs — mausam.imd.gov.in
PMGSY rural road asset data — omms.nic.in ; NHIDCL & MoRTH NER project reports
MoDoNER / NEC Vision documents and NER district connectivity statistics

Methods & literature

Spatio-temporal graph neural networks for traffic and disruption forecasting (STGCN, Graph WaveNet).
Rainfall-threshold and infiltration models for landslide early warning (Guzzetti et al.).
Federated learning with secure aggregation (Bonawitz et al.); Hyperledger Fabric architecture.

Platform references

Alibaba Cloud PAI & MaxCompute geospatial documentation.
Owen Cloud sovereign deployment and edge-region architecture guides.
OSRM / Valhalla open routing engines; OpenStreetMap NER road network.