WORKING WEEK 2025
AND Locate25 THE NATIONAL GEOSPATIAL CONFERENCE
Collaboration, Innovation and Resilience: Championing a Digital Generation
FIG Geospatial Council of Australia
Brisbane, Australia 6–10 April

From Crisis to Reconstruction: Integrating Geospatial Technologies for Climate-Resilient Infrastructure

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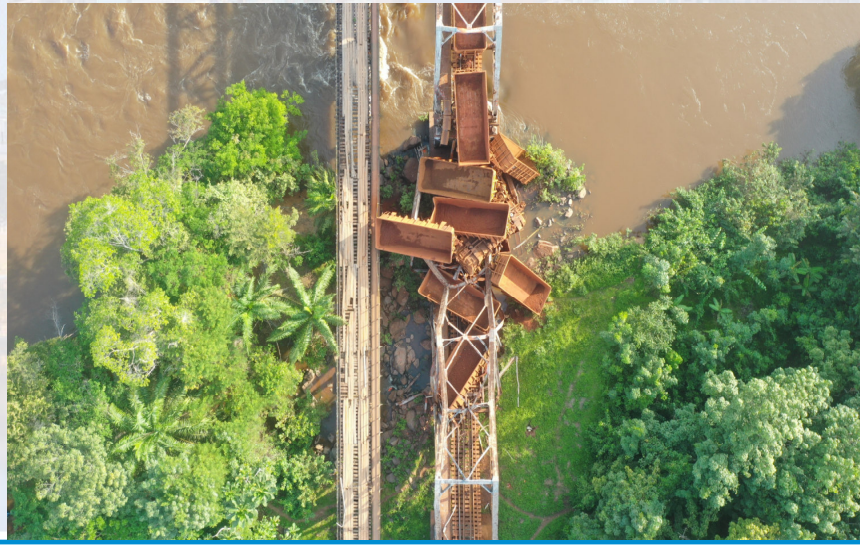

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The Bridge Collapse Incident

1 October 2023

A stacker mounted on a wagon crashed into the St. John's River rail bridge in Duo, Bong County, Liberia.

2 Immediate Impact

Severe damage to bridge structure, disrupting ArcelorMittal's critical rail network.

3 Assessment Need

Remote location and hazardous conditions required innovative geospatial solutions.

4 Project Launch

Multidisciplinary team deployed to assess damage and design remediation strategy.

Geospatial Technologies Deployed

UAV Photogrammetry

DJI Mavic 2 and Mavic 3E drones captured high-resolution imagery for 3D modeling.

Terrestrial LIDAR

Trimble x7 scanner provided millimeter-precision structural data.

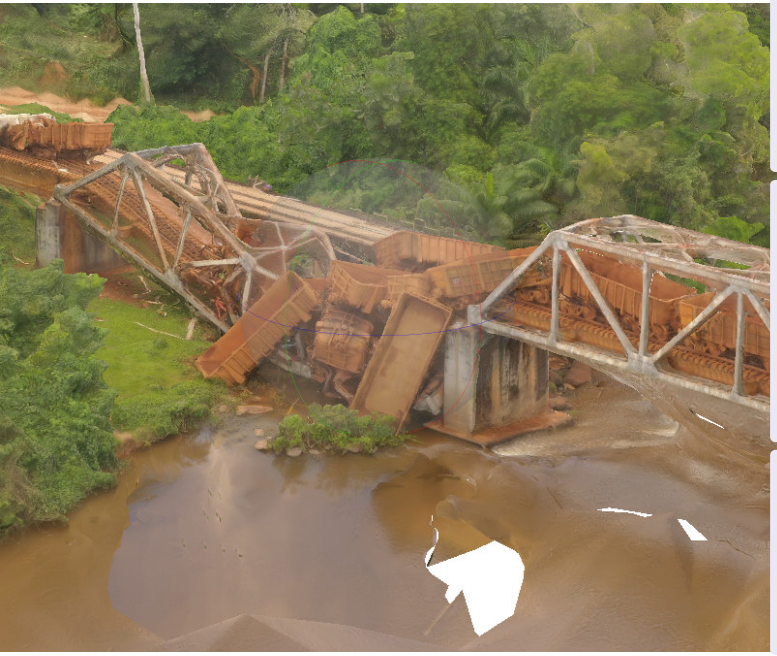
Bathymetric Surveys

Sonar-equipped boats mapped river depths and identified underwater hazards.

GNSS & Total Station

Trimble m3 established control points and monitored structural movement during reconstruction.

Survey Findings



Structural Damage

LIDAR revealed lateral displacement of bridge piers by up to 12 cm and truss shifts of 8-10 cm.

Riverbed Conditions

Average depth of 4.2m with 2.1m of sediment accumulation increasing flood vulnerability.

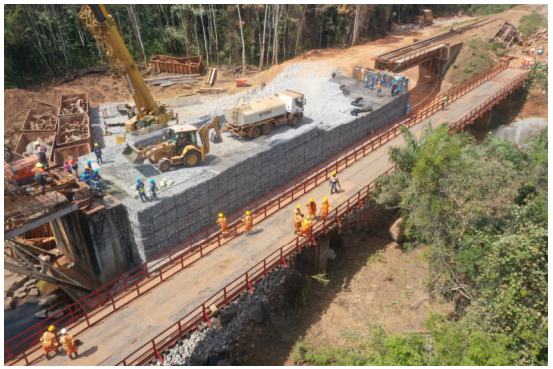
Hydrodynamic Risks

Models predicted 40% increase in flow velocity during rainy seasons, threatening stability.

Settlement Rate

Monitoring pins detected ongoing settlement of 2mm per month post-impact.

Engineering Solutions



Structural Realignment

Hydraulic jacks repositioned displaced trusses within ±5mm tolerance.

Retaining Wall Construction

6-meter high wall with gabion baskets protected against future flooding.

Rail Track Reinstatement

Precise elevation corrections of ±4cm restored operational functionality.

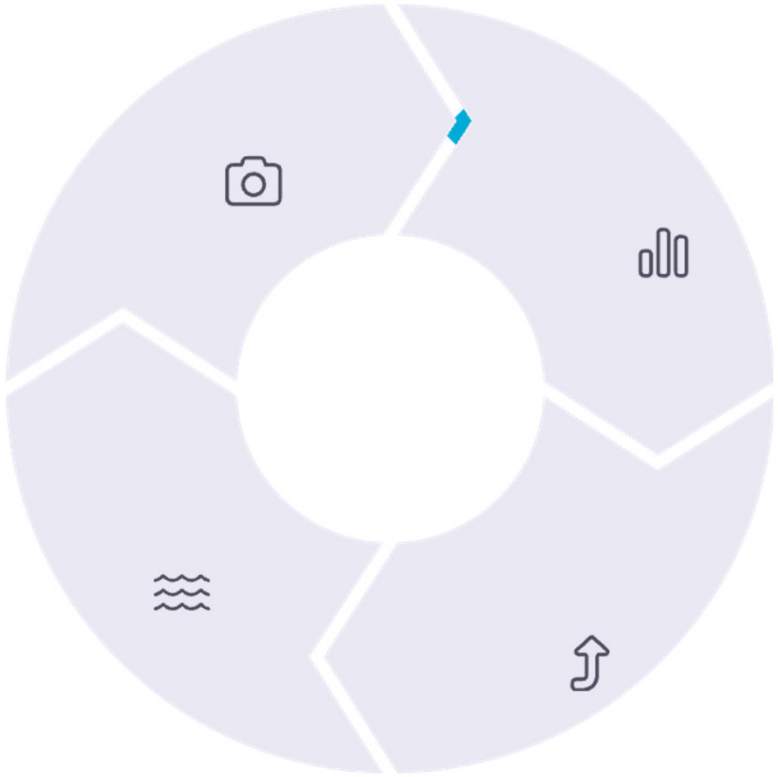
Environmental Protection

Vegetative buffer zones reduced erosion and managed sediment accumulation.

Monitoring & Quality Control

Weekly UAV Flights

Documented construction progress and created time-lapse imagery.



Deformation Analysis

Monitoring pins tracked structural movement throughout and after reconstruction.

Bathymetric Surveys

Verified riverbed stability and effectiveness of erosion controls.

Level Instrument Checks

Regular measurements ensured bridge stability within tolerances.

Key Challenges & Solutions

Remote Location

Site was 60km from main work area, requiring expanded access roads.

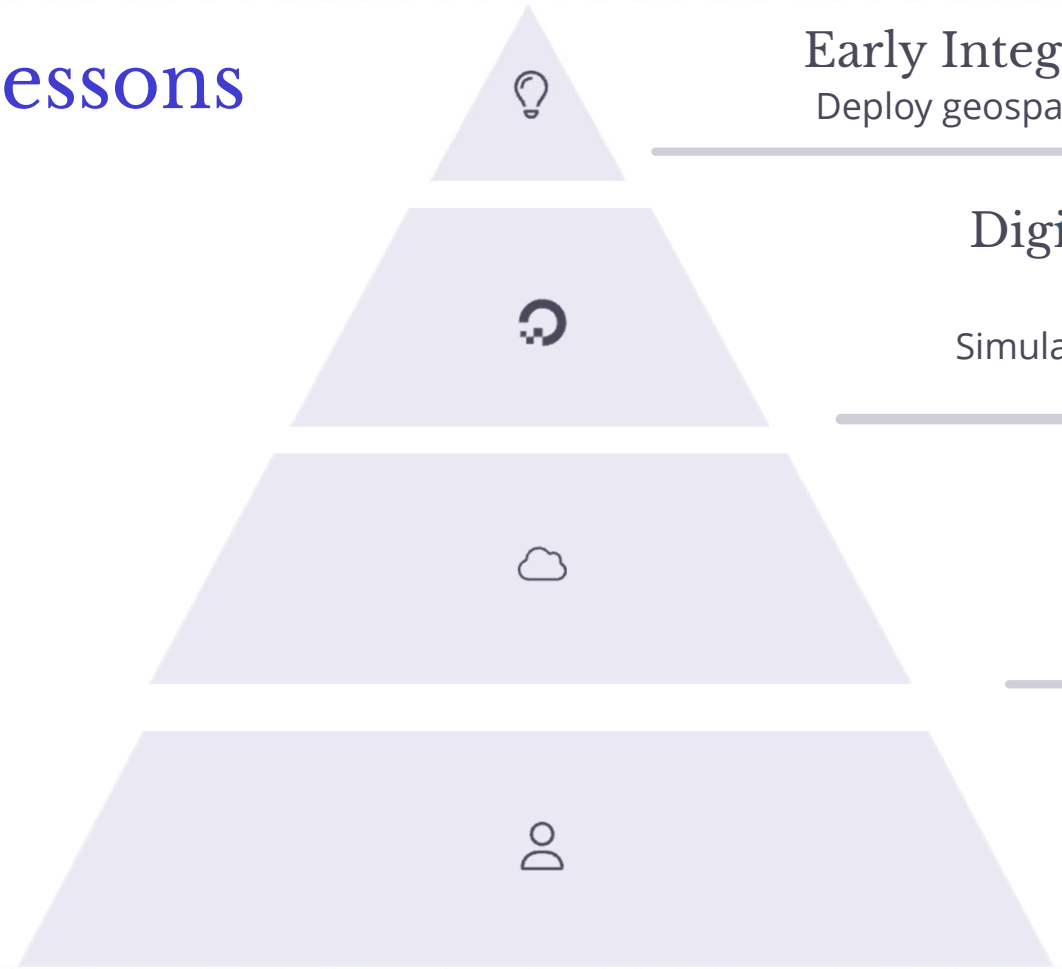
Environmental Constraints

High water levels and unpredictable rainfall disrupted survey work.

Data Processing Demands

Large datasets required cloud-based processing and compression techniques.

Lessons



Early Integration

Deploy geospatial technologies immediately after incidents.

Digital Twin Models

Simulate structural behaviors before physical implementation.

Climate Resilience Planning

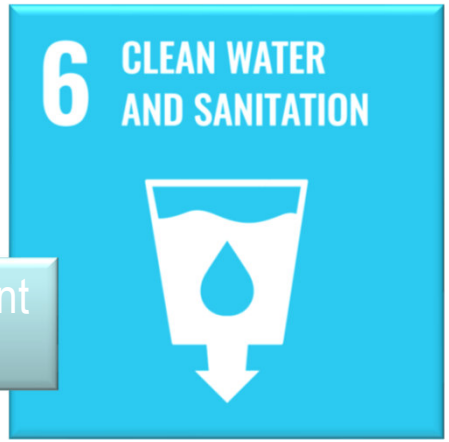
Embed climate modeling in all infrastructure projects.

Interdisciplinary Collaboration

Standardize workflows between surveyors, engineers, and scientists.

The most relevant SDGs related to the presentation and theme of this session

1st relevant SDG



2nd relevant SDG

3rd relevant SDG

SUSTAINABLE DEVELOPMENT GOALS

International Federation of Surveyors supports the Sustainable Development Goals