Integration and Practical Application of Geospatial Intelligence via BigGIS in Disaster Response Centers

Wei-Cheng Zheng[1]* Ming-Hsun Ko[2] Kuo-Wei Chen[1] Chen-Yu Chen[1]

ABSTRACT With the increasing frequency and severity of natural disasters, the integration and rapid analysis of multi-source geospatial intelligence have become critical for effective disaster management. This study explores the "BigGIS" (Big Geospatial Information System) platform, developed by the Agency of Rural Development and Soil and Water Conservation (ARDSWC), Ministry of Agriculture. BigGIS aims to integrate and revitalize century-long spatial datasets spanning from 1897 to the present, providing robust support for real-time decision-making in disaster response centers.

The BigGIS platform consolidates extensive remote sensing resources, including over 19,000 multi-source satellite images, 88,000 aerial orthophotos, and more than 3,000 UAV survey results. By implementing "API Tile Image Sharing" technology and intuitive "Online Analysis Tools," the system has successfully lowered the technical barriers to remote sensing applications. This enables various disaster management units to efficiently utilize professional geospatial information, achieving cross-platform resource sharing and collaborative response.

This presentation focuses on the practical application of BigGIS during the 2025 Mataian River large-scale landslide and dammed lake event. The platform facilitates a "Detection-to-Action" workflow: geomorphic variations were first actively detected via Sentinel-1 SAR imagery, followed by the use of high-frequency PlanetScope satellite imagery to confirm a landslide area of approximately 500 hectares and a dammed lake of 18 hectares, allowing for the immediate issuance of emergency alerts. Furthermore, advanced built-in modules—such as cross-section profiling, cut-and-fill volume calculations, and SDF (Debris Flow) simulation—provide essential quantitative data for

risk assessment and recovery planning.

Ultimately, BigGIS represents a transition toward "Data-Driven Governance," successfully transforming massive spatial datasets into actionable intelligence. By enhancing situational awareness and operational efficiency, the system has become a critical digital infrastructure for strengthening regional resilience and safeguarding public lives and property.

Key Words: Big Geospatial Information System(BigGIS), Disaster Response, Remote Sensing, Geospatial Intelligence, Decision Support

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〔1〕農業部農村發展及水土保持署
Agency of Rural Development and Soil and Water Conservation, MOA.
〔2〕鉅網資訊股份有限公司
GeoNet Co., Ltd
* Corresponding Author. E-mail: bigbear44@mail.ardswc.gov.tw

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1 Agency of Rural Development and Soil and Water Conservation, MOA.
2 GeoNet Co., Ltd

Introduction

- This study leverages BigGIS to optimize decision-making precision in Disaster Response Centers.
- By integrating satellite, UAV, and sensor data into a unified spatial portal, the platform overcomes data fragmentation and inconsistent formats, streamlining intelligence for more effective large-scale natural disaster management.

Conclusion

- BigGIS enables rapid integration of multi-source geospatial data for disaster response.
- The platform significantly improves situational awareness and cross-agency coordination.
- Near real-time satellite, UAV, and seismic data enhance early detection of large-scale landslides.

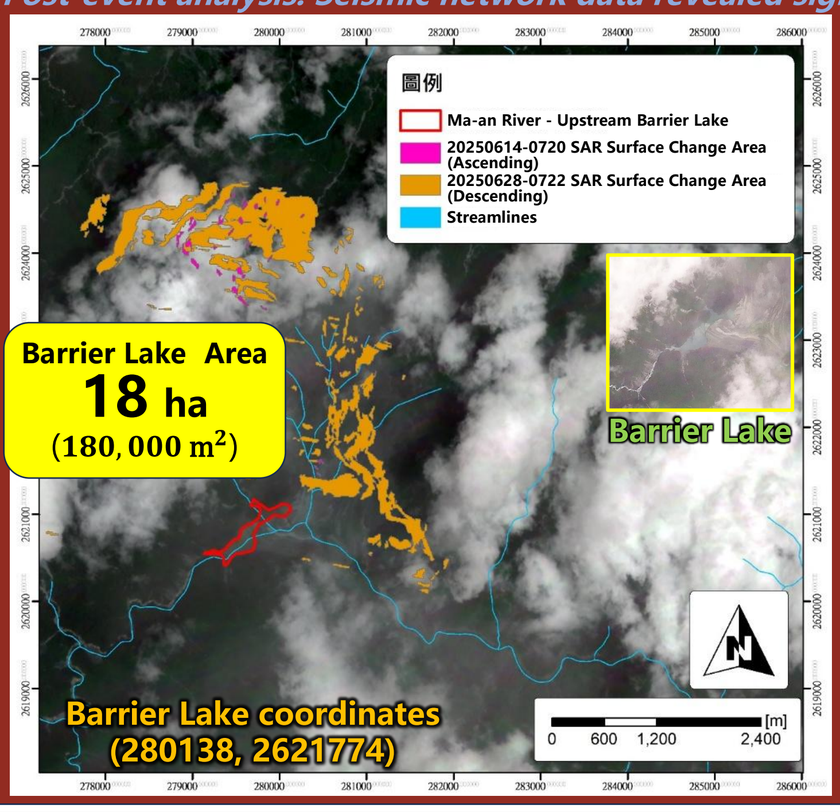
Typhoon Danas & 0728 Heavy Rain

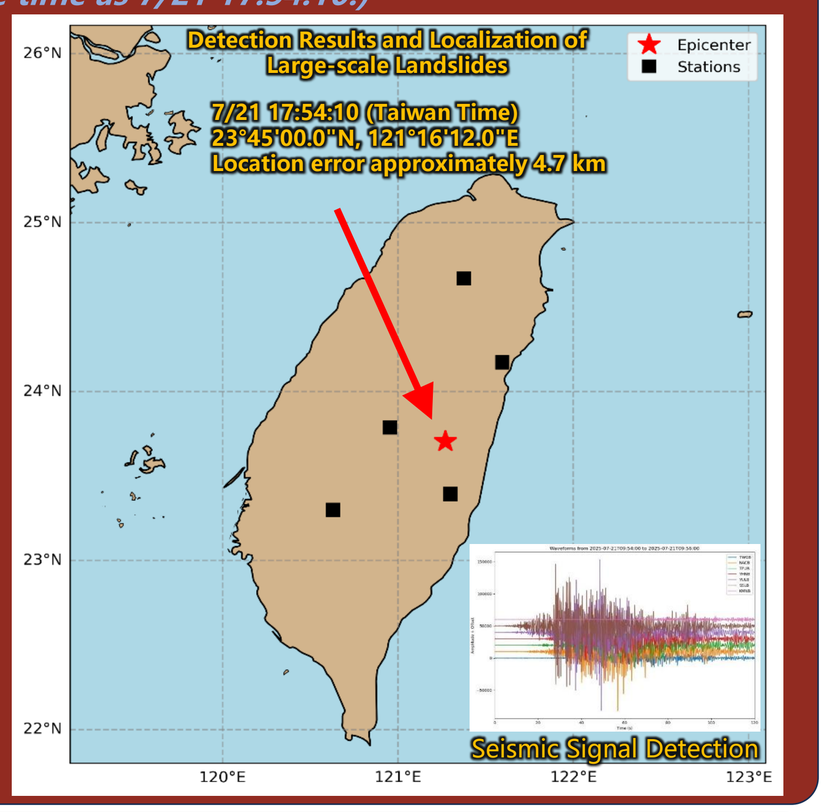
- In late July 2025, Typhoon Danas and the 0728 Heavy Rain caused severe river flooding and extensive housing damage across southern Taiwan.
- BigGIS responded by rapidly establishing a dedicated disaster portal that integrated multi-source remote sensing imagery, UAV survey results, and cadastral data.

Large-scale Landslide and Barrier Lake of Mataian Creek

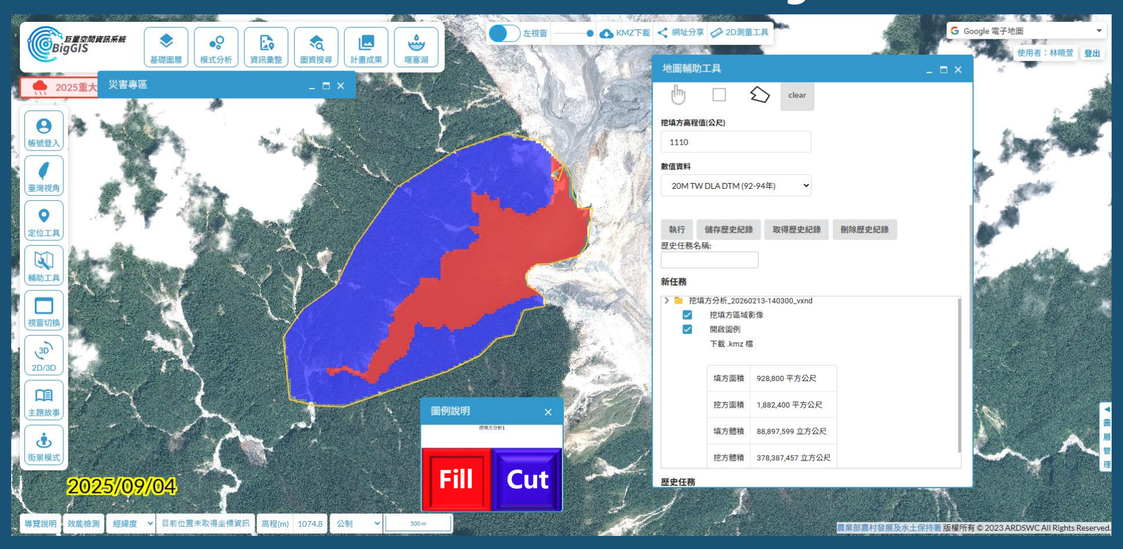
- **7/22:** Sentinel-1 radar satellite detected large-scale topographical variations.
- **7/24:** Planet optical satellite captured images of a barrier lake; **7/25:** Planet optical satellite captured the full view of the landslide area, exceeding 500 hectares.
- **7/26 01:26:** The Agency of Rural Development and Soil and Water Conservation urgently notified relevant disaster prevention units; **7/27:** The Aerial Survey Office conducted the first aerial photography mission.

(Post-event analysis: Seismic network data revealed signals of a large-scale landslide, confirming the occurrence time as 7/21 17:54:10.)





- **Cut and Fill Analysis: Subtracts multi-temporal elevation models to calculate terrain volume changes.**



- **Debris Flow Model: Simplifies complex fluid mechanisms to rapidly simulate debris flow paths and depths.**