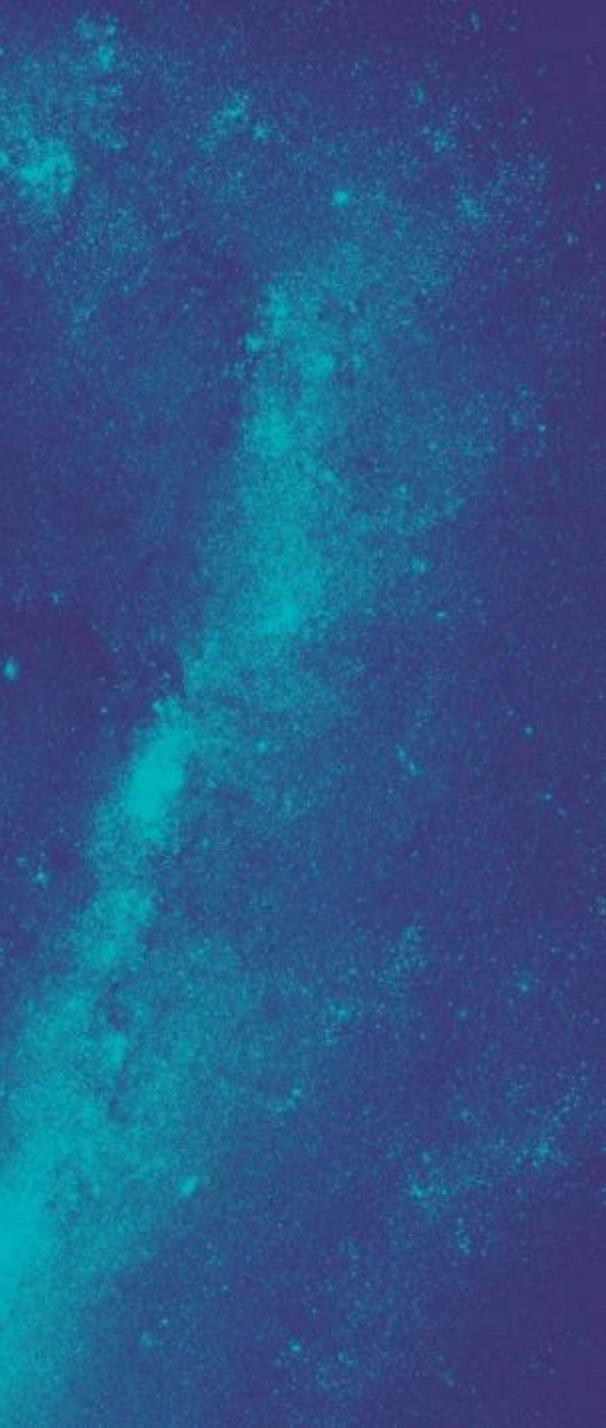UNITED NATIONS
Office for Outer Space Affairs

UNOOSA, estd. 1957

Achieved and Planned Activities supported by Japanese Government/Industries regarding GeoAI and Digital Twin

▶ **About UNOOSA and UN-SPIDER**

Achieved and Planned Activities supported by Japanese Government/Industries regarding GeoAI and Digital Twin

UNITED NATIONS
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SPACE4SDGS

Main Activities

➤ Maintain the UN Space Registry and share space information with Member States.

➤ Enhance global development by improving space science and technology use.

➤ Provide technical advice and training on various space-related topics.

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SPACE4SDGS

UN-SPIDER stands for <u>United Nations Platform for Space-based Information for Disaster Management and Emergency Response</u>. It was established through a General Assembly Resolution in December 2006.

Mission: Provide universal access to all countries and all relevant international and regional organizations to all types of space-based information and services relevant to disaster management to support the full disaster management cycle.

Technical Advisory Support	Capacity-building	Fostering cooperation	Knowledge management

About UNOOSA and UN-SPIDER

▶ **Achieved and Planned Activities supported by Japanese Government/Industries regarding GeoAI and Digital Twin**

Supported Myanmar's response to the 7.7 magnitude earthquake on March 28, 2025, by coordinating satellite imagery analysis to assess damage. Partnering with satellite providers and academic institutions, it helped identify severely affected areas and supported emergency planning through space-based data.

Monitoring Map of Damaged Buildings Ditribution of the Earthquake

Satellite	Provider	Sensor
AIRSAT-01	CASC	SAR
HT2-03C	PIESAT	SAR
AS-01	Sixiang Tech.	SAR
HY1D	CNSA	Optical
ZY1E,1F	CRESDA	Optical
HY1C	CNSA	Optical
GF3C	CNSA	SAR
GF1,4,6	CNSA	Optical
BJ-3	CHINASIWEI	Optical
JL-1	CGSTL	Optical
StriX-1,2,3	Synspective Inc.	SAR
GRUS-1	Axelspace	Optical
WorldView-1,2	Maxar Technologies	Optical
WorldViewLegion-2,3,4	Maxar Technologies	Optical
HAMMER	Open Cosmos	Hyperspectral
MANTIS	Open Cosmos	Optical

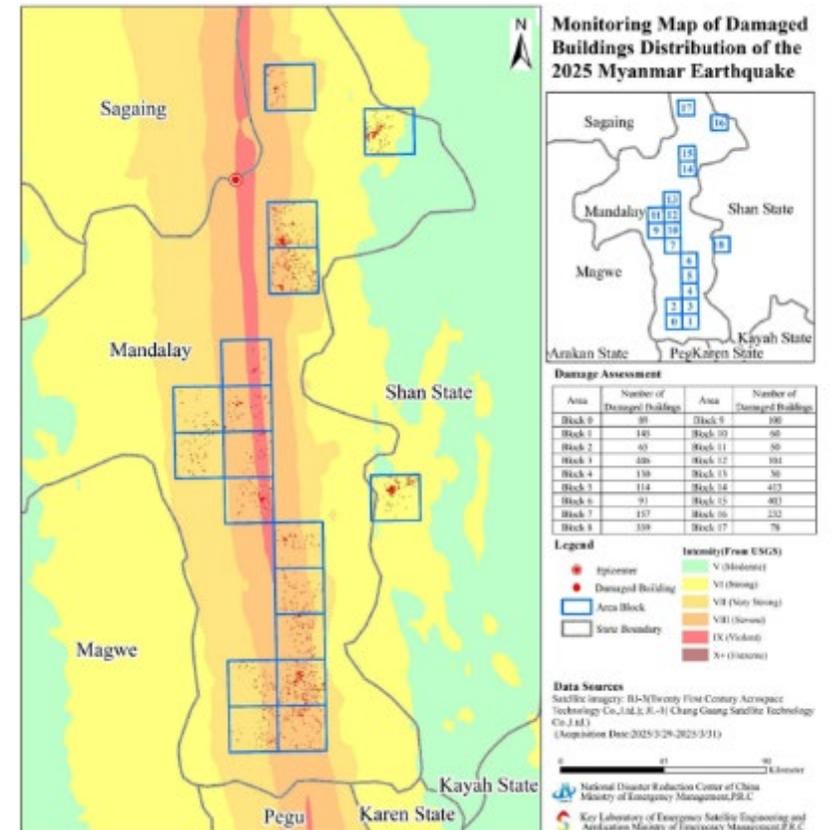*Ava Bridge Collapse (Left) and Daily SAR imagery for Se Daw Gyi Dam*

Very High-Resolution imagery before and after Collapse of Sky Villa Condomium building

Example of a block-wise assessment of Damaged Buildings Ditribution of the 2025 Myanmar Earthquake before (Left) and after (Right)

➢ This Compendium presents the first global stock-take of **GeoAI practice** across the UN-SPIDER community.

➢ After peer review and validation, **18 best-practice cases** were selected that together span rapid-onset hazards such as floods, wildfires and earthquakes, as well as slow-onset stresses including drought, coastal erosion and urban heat.
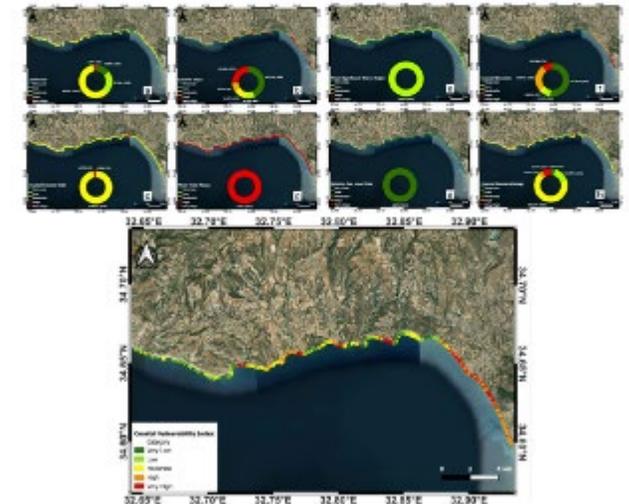

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Mapping Disaster Resilience: GeoAI Best Practices from the UN-SPIDER Network

UNITED NATIONS

V. GEOAI BEST PRACTICES AND INNOVATIVE APPLICATIONS

ECOE I ENHANCED COASTAL MONITORING AND RISK ASSESSMENT FOR SUSTAINABLE MANAGEMENT IN CYPRUS

Figure: Coastal Vulnerability Index (CVI) map for the western Limassol coast.

- Digital twin technology leverages satellite imagery and AI to create highly detailed, real-time 3D models of the physical world.

- Compared to the development from UAV, Drone, or Stereo, using satellite data and AI is **cost-effective**.

34,405 buildings

Adding information such as walls, materials, colors, and rooftop structures
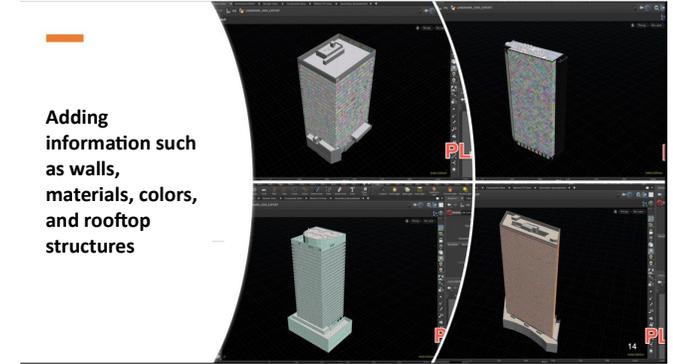
1 Procure 30cm Satellite Image

2 Detect Building with Deep Learning Model

3 Build 3D with NeRF and Gaussian Splatting

4 Create Realistic objects using Pre-trained model

Digital Twin in the Pacific Islands

Cook Islands, Tonga and Palau

- ✓ PLATEAU concept by the MLIT (Japan)
- ✓ Develop digital twin using satellite data
- ✓ Flood simulations
- ✓ Optimizing evacuation plans for flooding depth scenarios

Digital Twin in West Africa

Ghana and Nigeria

- ✓ PLATEAU concept by the MLIT (Japan)
- ✓ Develop digital twin using satellite data
- ✓ Flood simulations

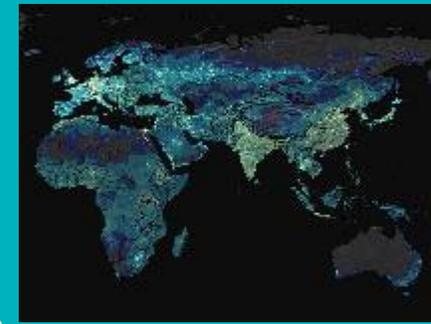## Crop Classification in Afghanistan

*with **UNODC***

- ✓ Try AI/DL with the Foundation Model based on open-source, high-resolution time-series satellite image data and crop classification data

Population Map in Myanmar

*with **UNODC***

- ✓ Help to analyze the impact of illegal crop cultivation on rural communities and providing satellite-based population maps

Solar Panel Installation Sites in The Gambia

*with **UNIDO***

- ✓ Select suitable locations for solar panel installation using open-source satellite imagery

PLATEAU, initiated by Japan's MLIT, promotes open 3D city model development and utilization to accelerate digital transformation in urban planning and management.

https://www.mlit.go.jp/en/toshi/daisei/plateau_en_2.html

Project PLATEAU
INTRODUCTION

Map the New World

1 **3D City Model as Infrastructure for a Digital Society**

Publishing Standard Data Product Specification for 3D city model which is compliant with CityGML 2.0 and ISO/TC211 Standards. Promoting to maintain nationwide homogeneous data of 3D city model by conforming the standard.

Major Works

❶ Development of data specification for 3D city model
- Extension of features and attributes
- Covers most of features which consist of city

❷ Data Coverage
- FY2022 127 Cities
- FY2023 196 Cities
- FY2027(projected) 500+ Cities

2 **Use Case Development and Social Implementation**

Develop use cases utilizing advanced technologies in diverse fields such as disaster management, environment, urban planning, mobility and etc. Promote social implementation of use cases in various fields of public and private sectors by creating and horizontally deploying best practices.

Major Works

❶ Various Demonstration Projects
- More than 100 projects
- Wide range of fields including urban planning, mobility, robotics, etc.

❷ Establishment of the Consortium
- PLATEAU consortium consists of more than 350 institutions from private/ public sector

3 **Open Data and Solution for Open Innovation**

Openly available 3D city model data. Releasing a wide range of knowledge including guidebooks, technical material and source code from web site.

Major Works

❶ Open Data
- More than 200 datasets are available in various format

❷ Open Source Software on GitHub
- PLATEAU VIEW 3.0 source code
- PLATEAU SDK for Unity/Unreal Engine
- PLATEAU SDK Toolkits for Unity

PLATEAU SDK for Unity

Planned: Optimized Disaster Risk Management including IoT device and 3D Digital Platform

Install water level sensor and rain gauge at the river system	Create Digital Twin from Satellite Data and Simulate Disaster Events	3D Digital Platform for Disaster Risk Management with Evacuation Route

Install IoT weather stations

Create Digital Twin from Satellite Data

1 Satellite Data
Automatic extraction of geographic information with satellite data & machine learning

2 AI Tech
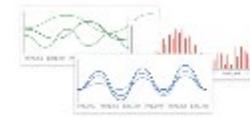AI automatically generates 3D models of the ground

3 3D CG Tech
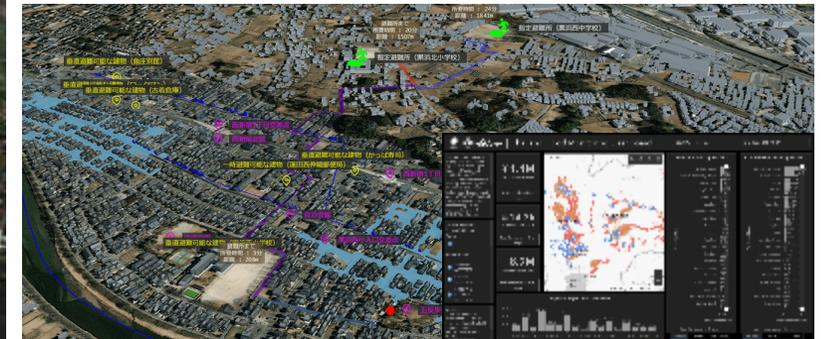Real-time reproduction of expressions (material and light)

Early Warning Alert with sensors and 3D data

Simulate Disaster Events such as Sea Level Rise

4 M

Digital Platform or Dashboard for Disaster Risk Management with Optimized Evacuation Routes

➢ UNOOSA leverages digital twin technology combined with IoT sensors to support disaster preparedness and response. By collecting real-time data on flooding depth, building footprints, road networks, and evacuation facilities, the digital twin helps optimize evacuation routes.

➢ The platform also facilitates data-driven discussions with stakeholders on updating critical infrastructure and evacuation planning to enhance resilience.

Real-time Precipitation Info. from IoT Rain Gauge

Digital Twin

Simulation Disaster

Early Warning Alert via Email

Optimized Evacuation Route

Before Flooding

After Flooding

Changed Evacuation Route

https://www.mlit.go.jp/plateau/use-case/uc22-041/

Thank you