

The role of GeoAl and Foundational

Models in shaping

an Al-driven future for all

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GeoAl and the UN Geospatial Network

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UNITED NATIONS COMMITTEE OF EXPERTS O GLOBAL GEOSPATIAL INFORMATION MANAGEMEN



UN-GGIM Objectives

- Reports directly to ECOSOC as a formal inter-governmental body
- Coordinates global geospatial information management among Member States
- Sets joint directions for geospatial use in national and global policy
- Addresses global issues through shared geospatial knowledge
- Strengthens geospatial capacity, especially in developing countries
- Promotes timely, reliable, and accessible geospatial data for development.

GeoAl applications in UNICEF

Geosphere – Generative GeoAl to directly query global hazard and children vulnerability data

UNICEF has developed a prototype of a generative GeoAI tool that can be used to query curated, authoritative dataset on hazards, exposure and vulnerability of children. The tool can be expanded to query any geospatial data. One could ask 'how many children are exposed to coastal floods in Colombia' and the tool automatically does a zonal statistics and zooms to the location of the results.



High-resolution mapping of unvaccinated children in Western and Central Africa

UNICEF Combines Satellitebased Machine-Learning population estimates with geostatistical products of vaccination status coverage to provide highly granular datasets of unvaccinated children ("zero-dose") to accelerate identification and reach of missed children with combined vaccination and birth registration services. (Chad, Coite D'Ivoire, Mali, Cameroon, Guinea)



unicef



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UN Geospatial network

SKAI – Satellite Imagery Damage Assessments: Project partners and status



- Data Insights for Social and Humanitarian Action (DISHA) is the flagship AI work of the UN Global Pulse, the Secretary-General's Innovation Lab
- DISHA works to make it easier for humanitarian organizations to access operationally relevant insights for disaster management

Google Research

- SKAI Project: machine learning-based damage assessment for disaster relief, open source
- Base model developed in collaboration with the United Nations World Food Programme (WFP) Innovation Accelerator



- Provide advice and guidance on operational use
- Develop and deploy SKAI with Google and UN Global Pulse
- Test results and provide feedback

Current Status

- Accuracy ranging from 66%-89% when applied to large scale 'catastrophic' events. Much larger areas addressed than with human analysts only.
- UNOSAT analysts training to use the SKAI system operationally.
- Model and system improvements scheduled throughout 2025 (on github).

Leveraging GeoAl for Displacement Monitoring

Shelter detection using Deep Learning Mod



IOM is monitoring displacement sites using GeoAl and deep learning models. Through its Displacement Tracking Matrix (DTM) programme, IOM detects and monitors shelters in camps and in urban areas, providing accurate shelter counts and assessing population influx, including timestamps to track population movements in sudden-onset situations. This approach supports tracking the expansion of camps and population movements over time.





DISPLACEMENT TRACKING MATRIX

UNOPS Innovation in GIS - Leveraging GeoAl technologies

1. Predictive Risk Mapping for Explosive Ordnance (Afghanistan)

UNOPS uses machine learning on Mine Action Explosive Ordnance data, satellite imagery, and terrain factors to map high-risk contamination zones, guiding land release and clearance planning.



2. Damage Detection from Satellite Imagery (Gaza, Sudan, Ukraine)

GeoAl tools analyze satellite imagery to automatically detect damaged infrastructure, speeding up damage assessments and recovery planning.



3. Climate-Health Risk Mapping (Caribbean – Hurricane Beryl Response)

GeoAI models process hydroclimatic and health data to identify areas at risk from climate-driven health impacts, supporting early action and resilience planning.



4. Planning and Prioritization for Mine Action (Myanmar)

GeoAl analyzes satellite imagery to detect informal settlements and estimate population density, improving targeting for aid and risk education.









UNHCR is conducting tests on **object detection** and **feature extraction** using high-resolution satellite and drone imagery to identify shelters in refugee settlements.



UNHCR





Leveraging GeoAl for agricultural monitoring

1. Integration of field data for land cover and land use

Adoption of Land Cover and Land Use meta-languages for land classification (ISO-19144-1, 2, 3 and 4). Upgrading deep-learning classification with AI-markup languages. Improving critical agriinfrastructure (e.g. greenhouse, solar panel) mapping through GeoAI.

2. Testing the identification of acute malnutrition hotspots

Support malnutrition monitoring programs using GeoAI models to identify persistent and newly acute malnutrition hotspots considering drivers such as vegetation, population, terrain, rainfall, etc using SHAP (SHapley Additive exPlanations) analysis.

Sub Drivers Drivers Sub Drive

3. Delineation of field boundaries for local land characterization

GeoAI-powered field boundary delineation integrates highresolution remote sensing and time-series vegetation indices to accurately identify individual fields, supporting fine-scale land use analysis, enabling evidence-based monitoring. The approach strengthens food security strategies and digital agriculture through platforms like SEPAL and GEE with standardised geospatial outputs.



FAO

SEPAL

PAG 1

Geographic information - Classification systems

Classification system structure

Harnessing Geospatial AI for Transport Infrastructure and Energy— Water and Food Nexus in Africa

1. Innovative Technology and Management of Regional Transport Corridors: Application of Satellite Imagery and Al

Use of satellite imagery and AI to:

- 1. Reconstruct the routes of the African development corridors: the infrastructure network (roads, railways, pipelines, etc.)
- Assess of the state of the infrastructure. Particularly the road infrastructure: information on the main characteristics of the various sections of road corridors.
- 3. Manage infrastructure assets of corridor organizations.



2. Use of Geospatial AI and spatial analytics for the energy-water-food nexus in Madagascar

Spatial Analysis – the process



Use of Large Language

into scale/categories to

make the data easier to interpret or analyze. Scale: 1 - 10

Model to simplify or group

Weighting Assigning different levels of importance to factors that influence suitability.

Weighted -Overaly Multiple factors (often in the form of raster layers) are combined to create a final suitability map.

Zonal Statistics/Query Calculate statistical values (like mean, sum, or count) for a specific area, called a zone, based on the values of a raster dataset – Suitability map.

UNECA

Satellite imagery, geospatial AI, and spatial analytics are used to evaluate the country's renewable energy resources and identify optimal locations.

The analysis has also provided essential insights into the spatial distribution of renewable energy, agricultural, and water resources across Madagascar.





ARAB DEVELOPMENT GEO-INSIGHTS PORTAL

Open Maps, Deeper Insights, Informed Governance

Through its Geo-Insights Laboratory under the Decision-Support and Data-Science Division, ESCWA is positioning itself as a regional pivot for Geo-AI data fusion and analysis, providing location-assisted policy insights via multilayered earth observations and enabling pattern recognition to support user-centric policy generation across the Arab region. For location-assisted policy insights, please visit the <u>Arab Development Geo-Insights Portal</u>.



BLOWING IN THE RIGHT DIRECTION

This StoryMap identifies optimal sites for harnessing onshore wind resources across the region by using highresolution geospatial data and applying multi-criteria analysis. It pinpoints the most suitable locations for onshore wind farms by integrating social, economic, and environmental criteria. These include factors such as noise impacts on nearby populations, potential effects on bird habitats and heritage sites, and other relevant land-use and infrastructure considerations.



GEO-DATA CATALOGUE

An ever-expanding collection of geospatial datasets from across the Arab region, this curated repository empowers covariate analysis and location-driven policy insights. With 73 thematic maps and counting, it captures spatial dimensions of society, economy, and environment. Continuously enriched and updated, the collection evolves to reflect the region's shifting realities and emerging needs.



MANY SCHOOLS, LESS SCHOOLING

This StoryMap presents evidence on physical accessibility to public schools in Lebanon using national datasets and geospatial modeling techniques. Through a series of maps, we analyze school locations, walkable access, and their alignment with socioeconomic disparities.



SMART MAPS, SMARTER RESPONSE

Since October 2023, Lebanon has faced a new wave of conflict resulting in destruction across residential, public, and infrastructural zones. To support recovery planning, this StoryMap leverages earth observation data to provide a geo-intelligent visualization of affected zones.



FROM SUNLIGHT TO POWER: MAPPING SOLAR FOOTPRINT, BAHRAIN

Despite having high solar irradiance, compact urban areas, and a growing energy demand, Bahrain's rooftops remain largely underutilized for renewable energy generation. Rooftop solar photovoltaic (PV) systems present a strategic and sustainable opportunity to support the country's energy transition, yet their potential has not been fully tapped



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ESCWA, United Nations



WHO GeoAl Work: Advancing Al for health through Geospatial Innovation Key initiatives from the GIS Centre for Health (GISC)

ABLE Project – Building Footprint Extraction

- Al model for detecting building footprints in conflict-affected areas (e.g., Afghanistan, Somalia)
- Fine-tuned using high-resolution imagery and local data
- Supports health infrastructure planning and emergency response

Shelter & IDP Identification

- Automated detection of tents and shelters in IDP camps (e.g., Baidoa, Kismayo)
- Integration of AI results with online platforms for easy access and analysis
- · Used for urban displacement mapping







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Experimental Detection of Urban Infrastructure Manholes & Blue Lines (rivers/streams)

- Detection using AI/ML Models
- Leverages DEM data and high-res imagery for hydrological and urban planning applications

Generative AI (GenAI) for Health Intelligence

- Internal documents generation (e.g., National Action Plans, Grant Reports)
- · Proof-of-concept models trained on WHO documents
- Demonstrated time savings and higher coherence in strategic planning outputs

AI for Trauma Referral Pathways

Model categorizes hospitals by trauma care capacity
Uses road network and GIS data to propose optimal referral chains

•Piloted in humanitarian contexts for faster decision-making and evacuation planning











Accessibility analysis Compute the traveling time surface, efforming the time needed to reach the energy health facility

ysis Geographic co terter, Take into account the reach the each tealth facility to target population that

Referral analysis Calculate travelling times and distances separating different types of health facilities





Zonal Statistics to percentage of the population covered in each sub national division icaling up analysis fighte optimum tocation ter atong new teath facilities