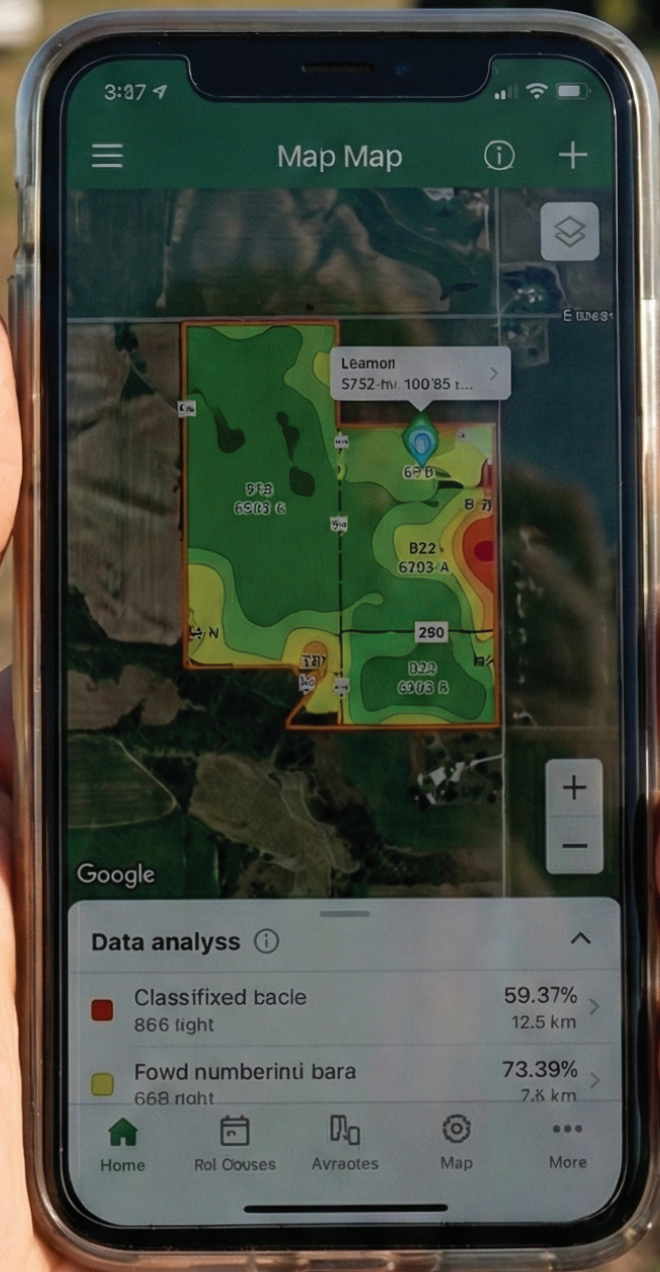


GIS PRODUCTS AND SERVICES

CATALOGUE



What is 3iS?

3iS is an international non-profit organization that provides information management services to humanitarian and development organizations, enabling partners to make informed decisions that ultimately deliver high-quality, targeted assistance to the world's most vulnerable populations.

3iS transforms data into information and generates knowledge for decision-makers operating in conflict, disaster, post-disaster and recovery environments, as well as in other complex emergency situations and development contexts.

Information Innovation Impact

Our services



Information Management



Capacity Building



Monitoring and Evaluation



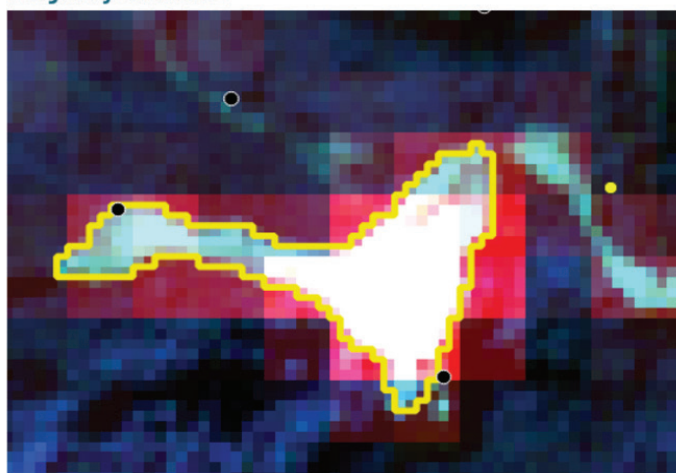
Strategy and Systems



Artificial Intelligence

Artificial Intelligence for Mass Movements Detection in Colombia

Polígono y Sentinel 2



Polígono y Google Earth



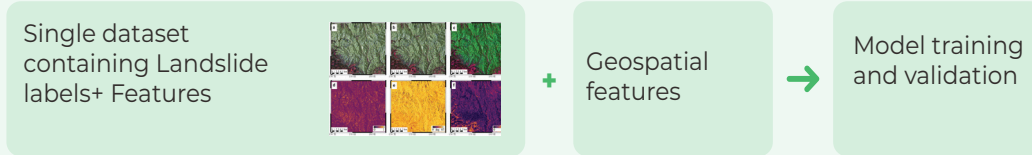
Landslide in Toledo (August 2016), Norte de Santander. Polygon generated using the Machine Learning methodology (SAM - Segment Anything Model) and Sentinel-2 satellite images

Mass movements are one of the leading causes of human and economic losses in Colombia, due to its geographical location and natural conditions. This study presents an artificial intelligence model that uses Gradient Boosting techniques to predict the likelihood of these events occurring in the country. By combining geospatial and environmental data with a Social Exposure and Sensitivity Index, the model not only identifies areas of high susceptibility but also incorporates social and economic factors that influence community vulnerability. This comprehensive approach provides accurate susceptibility maps that are essential for disaster risk planning and mitigation in Colombia

Susceptibility to mass movements

Susceptibility to mass movements refers to the predisposition of an area to experience these events. Using the Gradient Boosting model to evaluate multiple geospatial factors, such as elevation, lithology, and precipitation, the areas with the highest likelihood of landslides were identified.

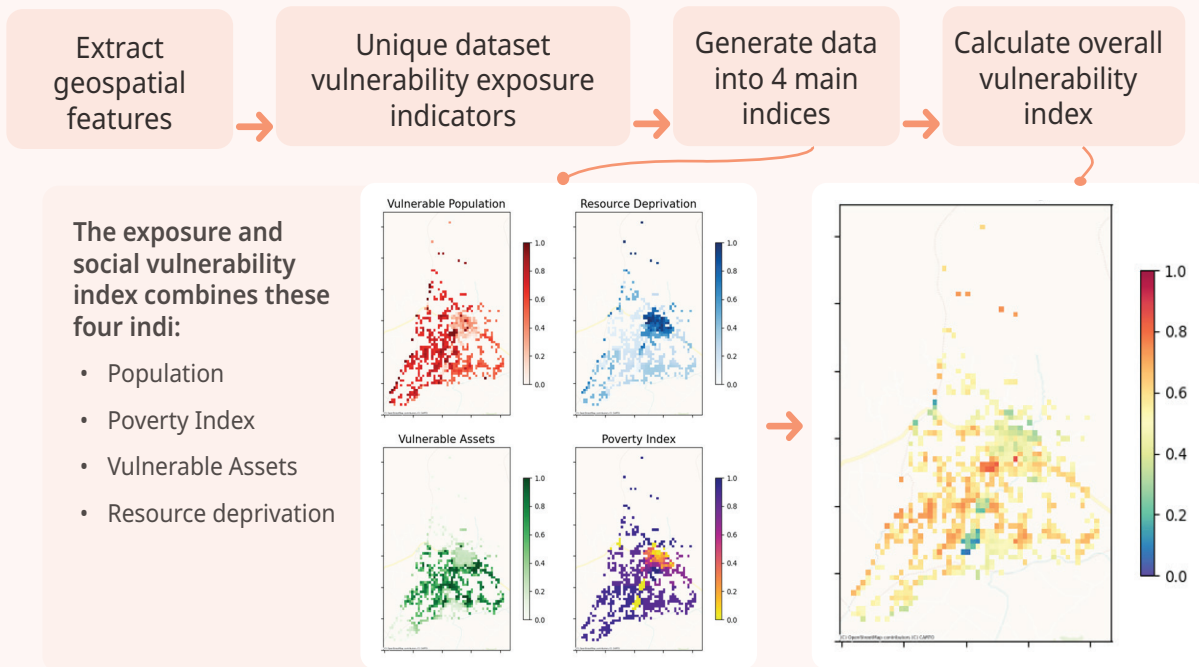
Susceptibility model development process



Exposure and Social Vulnerability Index:

The exposure and social vulnerability index combines four key indicators that reflect the vulnerability of communities to landslides. Through Principal Component Analysis (PCA), the data is simplified into a general index that identifies areas with the highest risk to the population.

Index development process

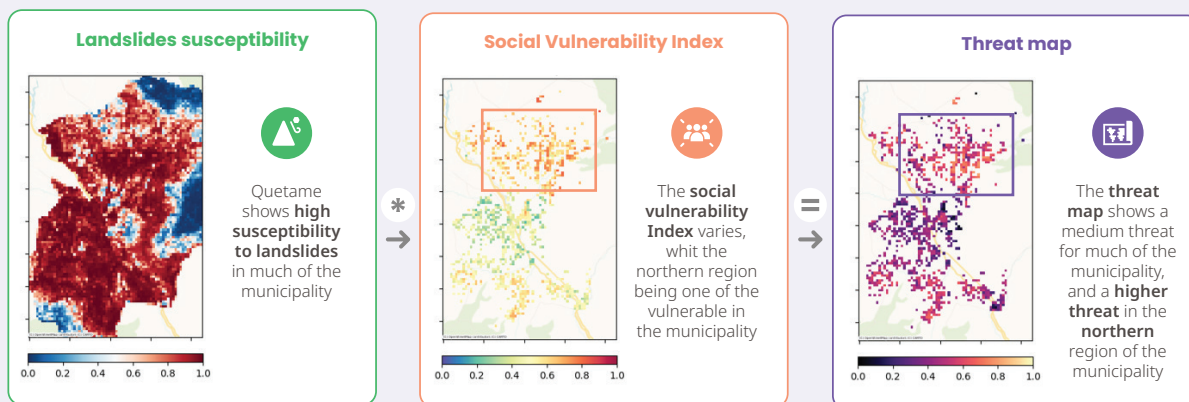


The exposure and social vulnerability index combines these four indi:

- Population
- Poverty Index
- Vulnerable Assets
- Resource deprivation

Threat Map

The threat map integrates the results of the susceptibility analysis with the exposure index by multiplying both values to generate a threat index. This index ranges from 0 to 1, where higher values indicate areas of greater risk for landslides and flows for each type of mass movement.



Detection and Profiling of New Settlements Through Satellite Imagery and Mobile Apps

3iS and Thinking Machines, through the use of innovation and new technologies in information management, has adopted an artificial intelligence model to detect and profile these settlements. The overall objective of this model is to make high-quality information available for humanitarian responders. Through which, humanitarian efforts can be channeled to respond to the Venezuelan migrant and refugee populations with the greatest needs.

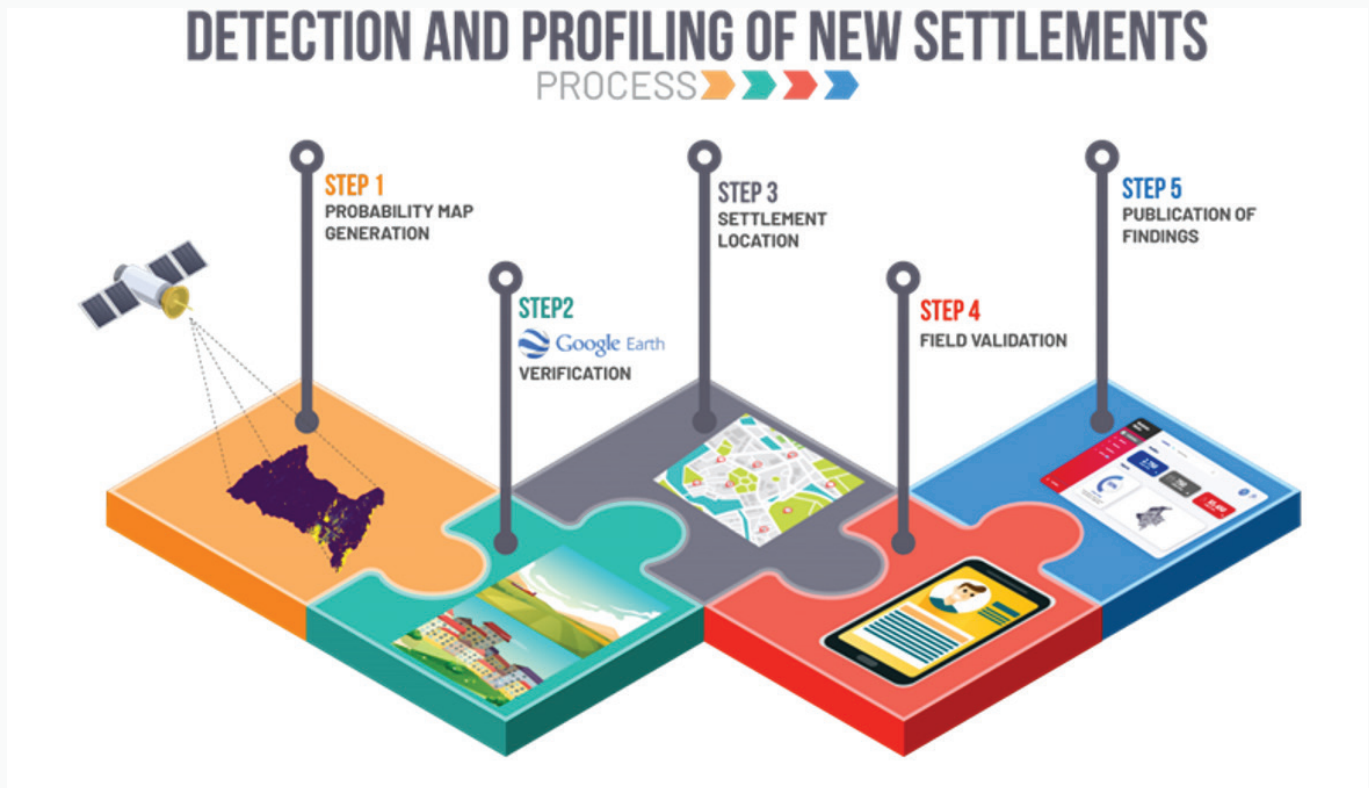
Bogotá D.C.



Increase the visibility of newly established settlements hosting refugee and migrant populations from Venezuela, enabling NGOs, state entities, and local and governmental authorities to provide faster, more efficient, and effective assistance

The detection process begins with the generation of a machine learning model which uses Sentinel-2 low-resolution satellite imagery to generate a probability map of new settlement locations. With this map, a verification is carried out on Google Earth Pro to ascertain the emergence of settlements over the 2015-2020 time period, during which Colombia received the greatest number of people arriving from Venezuela.

To complement the remote verification, a ground-based validation is carried out to identify the presence of settlements and whether they are currently inhabited. This verification is conducted as the model may detect a settlement that no longer exists or pick up satellite images on Google Earth that are not up-to-date in some municipalities. The ground-based validations are used to provide confirmation of the existence of a settlement as well as profiling the current condition of these sites through the Premise application, a mobile crowdsourcing platform.



Tools:

- **Google Earth Engine:** a platform for downloading and processing satellite images
- **QGIS:** an open-source GIS desktop application
- **Google Earth Pro:** a desktop application for exploring historical satellite images
- **Premise:** a crowdsourcing data and analytics platform, available on Android and iOS

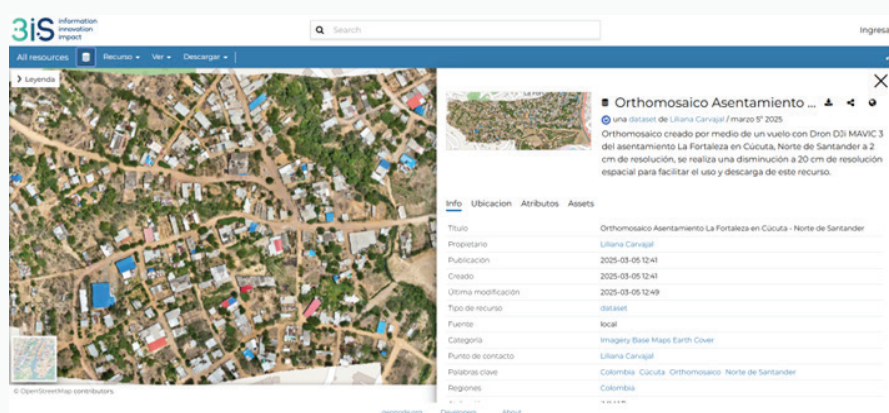
Orthomosaics and digital terrain models generated through unmanned aerial vehicles (UAVs)

Unmanned Aerial Vehicles (UAVs)

play a crucial role in humanitarian and development contexts by providing access to remote and hard-to-reach areas, assessing damage following natural disasters, supporting search and rescue operations, generating detailed orthomosaics and digital terrain models to inform intervention planning, monitoring development projects, and providing aerial observation in conflict-affected areas to help prevent violence and protect vulnerable populations. Their versatility and capacity to collect near real-time data make UAVs valuable tools for enhancing humanitarian response and promoting sustainable development.

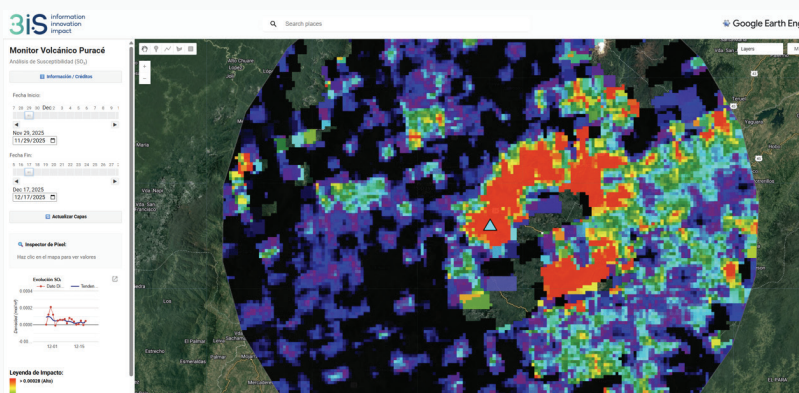


- **Request / Frequency:** On demand
- **Support available in the following countries:** Colombia, Ecuador, and Venezuela
- **Format:** Digital



Orthomosaic of La Fortaleza Settlement in Cúcuta, published on the 3iS Geoportal

Volcanic Sentry: SO₂ Dispersion Monitoring System for Puracé Volcano



Volcanic Sentry is a cloud-based operational solution (Google Earth Engine) that transforms invisible spectral data into actionable geospatial intelligence. It monitors, in near real time (NRT), the dispersion footprint of sulfur dioxide (SO₂) emitted by the Puracé Volcano. This is not merely a gas map; it is a critical proxy for anticipating volcanic

ash trajectories and assessing surface magmatic activity, enabling humanitarian response agencies to visualize the atmospheric impact zone before it affects vulnerable populations or aviation operations.

Capabilities: What can the user do?

Using this tool, decision-makers and analysts can:

- **Visualize the Threat Footprint:** Quickly identify the direction and spatial extent of the gas plume within a strategic 100 km radius.
- **Differentiate Noise vs. Risk:** Through a calibrated color palette, visually distinguish background passive degassing (low risk) from anomalous magmatic injections (elevated risk).
- **Analyze Temporal Trends:** Using the integrated chart, assess whether activity is increasing or decreasing through a 5-day moving average analysis, effectively filtering out daily noise.
- **Data Interrogation (Inspector):** Click on any pixel to retrieve the exact SO₂ vertical column density value (mol/m²), allowing validation of cloud severity at specific locations (e.g. over a municipality).

Technological Core: Sentinel-5P TROPOMI

“Our source of truth is the Copernicus Sentinel-5P constellation and its **TROPOMI sensor (TROPOspheric Monitoring Instrument)**.”

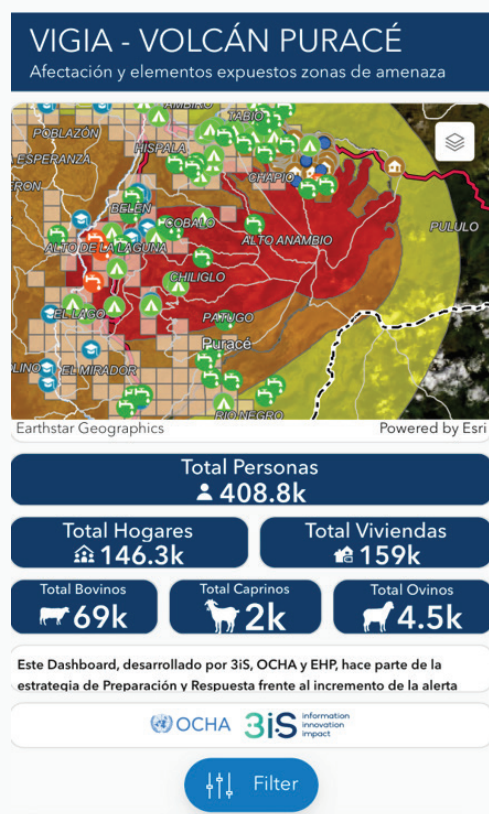
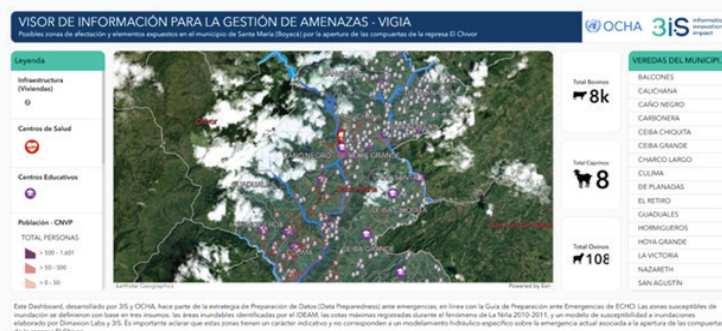
- **Why this satellite?** It currently provides the highest available spatial resolution for global atmospheric monitoring (approximately 3.5 × 5.5 km per pixel). This enables the detection of small volcanic plumes that earlier sensors (such as OMI or GOME-2) could not reliably capture.
- **What does it measure?** It does not measure visible “smoke.” Instead, it measures the **Vertical Column Density of SO₂**, using ultraviolet differential absorption spectroscopy to quantify the number of gas molecules present between the satellite and the Earth’s surface.

Threat Management Information Viewer – VIGIA

- A **data preparedness** strategy designed to **consolidate, update, and visualize key information** on hazards and exposure at the vereda (sub-municipal) level in Colombia, with the aim of strengthening **analysis, preparedness, and emergency and disaster response processes**.

The strategy is structured around two core processes:

- Acquisition and consolidation of estimated exposure data**, this process aims to compile and periodically update geospatial information related to key exposed elements in emergency contexts, particularly those relevant to humanitarian sectors.
- Generation of pre-visualization inputs for rapid response**, this process seeks to anticipate emergencies through the pre-configuration of **maps, geo-viewers, and geographic products** that are ready to be published and used in evolving or crisis contexts.



Strategic Components:

- Population:** projections and distribution at the vereda level (Source: DANE)
- Critical Infrastructure:**
 - Health facilities (Source: Ministry of Health, OpenStreetMap OSM)
 - Educational institutions (Source: Ministry of Education, OpenStreetMap OSM)
 - Primary, secondary, and tertiary road networks (Source: INVIAS, OpenStreetMap OSM)
- Livelihoods and Productive Areas:** Agricultural and livestock activities (Source: UPR, Ministry of Agriculture, DANE, IDEAM)
- Strategic Ecosystems and Protected Areas** (Source: Ministry of Environment, IDEAM)
- Housing Typologies and Settlements** (Source: Ministry of Housing, DANE)

Agentic Risk & Environmental Management System

ANTICIPA

3iS was selected as a beneficiary of the Google.org Generative AI Accelerator, in recognition of our innovative approach to building AI-powered solutions for resilient communities.

Vision:

To transform complex risk data into simple, **life-saving conversations**, enabling anyone, anywhere, to take proactive action.

A future in which anticipatory action is co-created by fusing **global data with local wisdom**, giving every community a voice in shaping its own resilience.

Our Solution:

ANTICIPA empowers vulnerable populations to become agents of their own resilience. Our agentic AI platform **integrates complex data with community-based, on-the-ground knowledge**. It transforms this combined intelligence into actionable alerts, adaptive capacity-building, and life-saving guidance, delivered through simple, conversational interactions. This approach fosters a truly collaborative ecosystem in which **technology and communities work together to build resilience**.

Designed around community engagement to:



Co-Create Knowledge: Community members share observations, hazard reports, historical events and traditional coping strategies via accessible channels like WhatsApp, Telegram, and simple mobile forms. **AI agents validate, contextualize, and integrate** these inputs with geospatial data (Google Earth Engine, GIS), climate metrics, and humanitarian feeds (HDX, ReliefWeb). This information is then structured into knowledge graphs and semantic datasets, **building a rich, locally grounded risk picture** and enabling the identification of complex relationships and trends through queries in **natural language**.

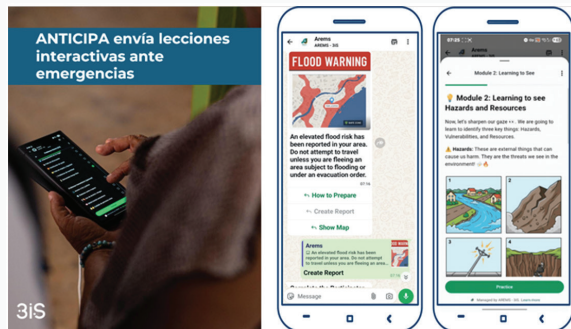


Empower Local Actors through Sustained Capacity Building: Tailored training modules, delivered through WhatsApp and Telegram with an **adaptive learning approach**, are designed to engage communities in disaster preparedness and resilience building, and introduce top-tier technologies (like AI Agents and remote sensing analysis) and significantly **reduce barriers to accessing and utilizing complex information**. This approach aims to ensure **users are not just recipients of information but active**, skilled participants in the risk management process, capable of leveraging sophisticated tools for local benefit.



Catalyze Collective Action: Through **participatory mapping** and natural language queries, communities and humanitarian teams jointly identify triggers, prioritize interventions, and monitor impact. The system produces **clear, automated dynamic reports**, actionable recommendations, and tailored assessments that inform stakeholders, ensuring solutions are **context appropriate and community-owned**, fostering the adoption of anticipatory actions.

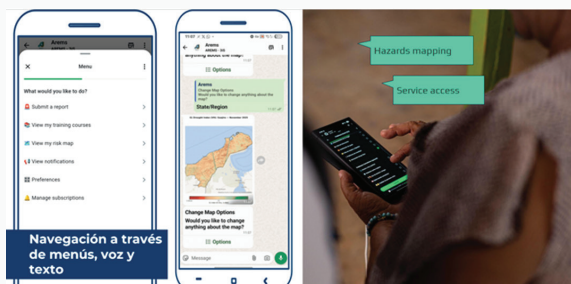
ANTICIPA delivers interactive lessons during emergencies:

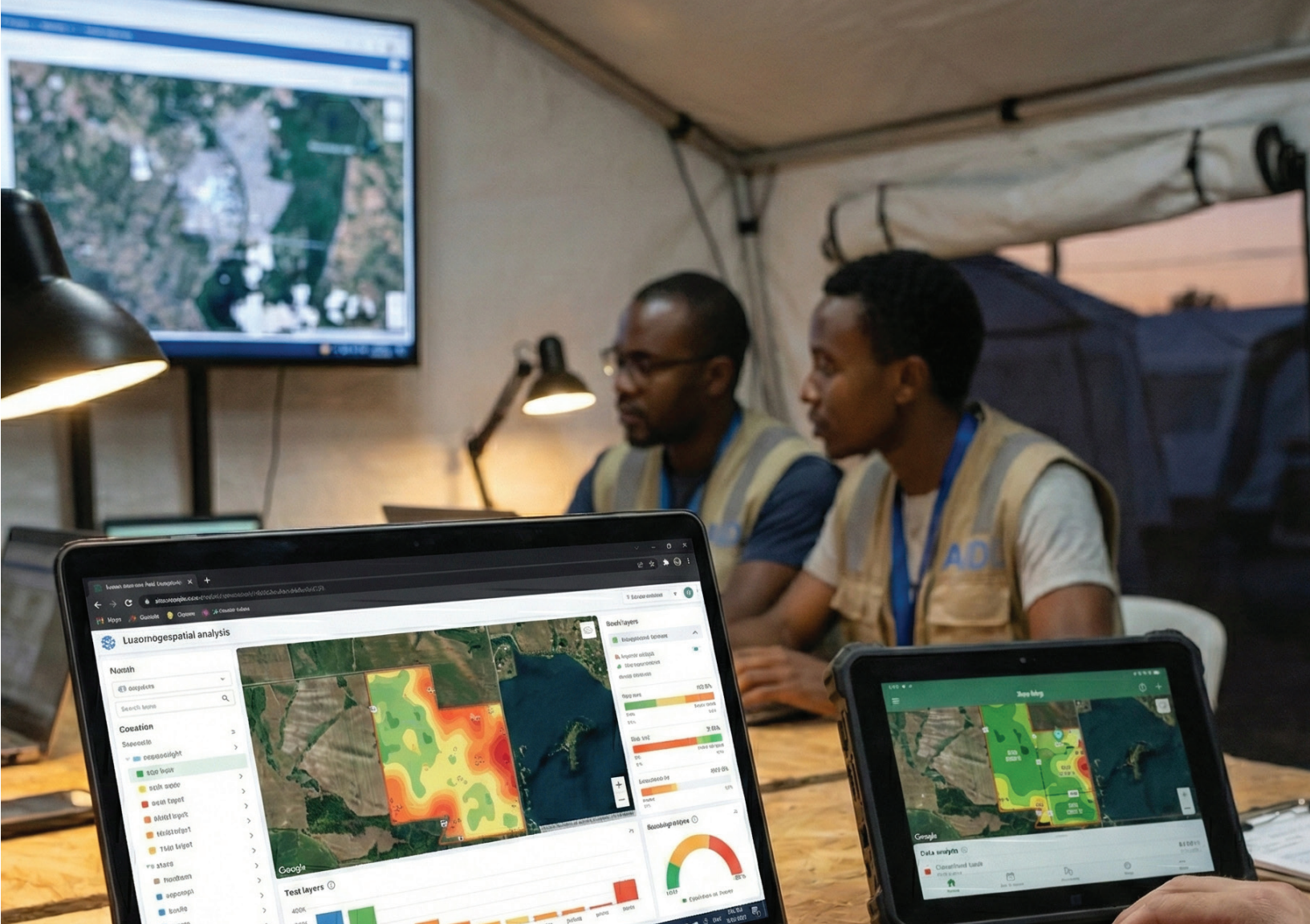


ANTICIPA guides individuals and provides personalized lessons:



Navigation through menus, voice, and text:





3iS information
innovation
impact