



# 2026 RESILIENCE LEARNING MONTH

KNOWLEDGE SHARING  
AND LEARNING EVENTS  
23 APRIL–7 MAY 2026

## Turning Data into Action: How Risk Information Systems Improve Disaster Resilience and Investment Decisions

28 April 2026 | 2:00-3:30 p.m. (Manila)

Virtual via Teams MEETING ID: 424 748 073 690 59 | PASSCODE: Zd6XE7kL



The session will focus on the importance of reliable risk information for resilient infrastructure and disaster loss reduction, highlighting the role of Risk Information Systems like the National Disaster Risk Information Systems being developed in Armenia with ADB support. Participants will learn about the fundamentals and key data sources of risk information systems, as well as practical applications in disaster risk management and infrastructure planning. Designed as an interactive learning exchange, it aims to demonstrate how improved risk data drives evidence-based policies, cross-sector coordination, and climate- and disaster-resilient investments for professionals in related fields.

### SPEAKERS



**ARTAK PIROYAN**

Head of the Chair of Cartography and  
Geodesy, Department of Geography  
and Geology, Yerevan State University



**YEVA DANIELYAN**

Project Assistant,  
ARRM



MODERATOR

**ALEKSANDR ARAKELYAN**  
Disaster Risk Management  
Officer, CCSD, ARRM

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# The Role of Academia in DRR

*Geospatial science, capacity building, and research-driven solutions*

Artak Piloyan – Yerevan State University



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# Yerevan State University

*The oldest continuously operating public university in Armenia*

**1919**

Founded — the largest university in Armenia

**21**

Faculties + 2 institutes + 13 research centers

**14,000**

Students + 2,000 postgraduates

**2,500**

Academic staff

## Faculty of Geography and Geology

Host of geospatial science, EO, and DRR research presented today



# Spatial technology in disaster risk management

The use of geospatial data enables application to the DM cycle through an understanding of the most basic question: **WHERE?**

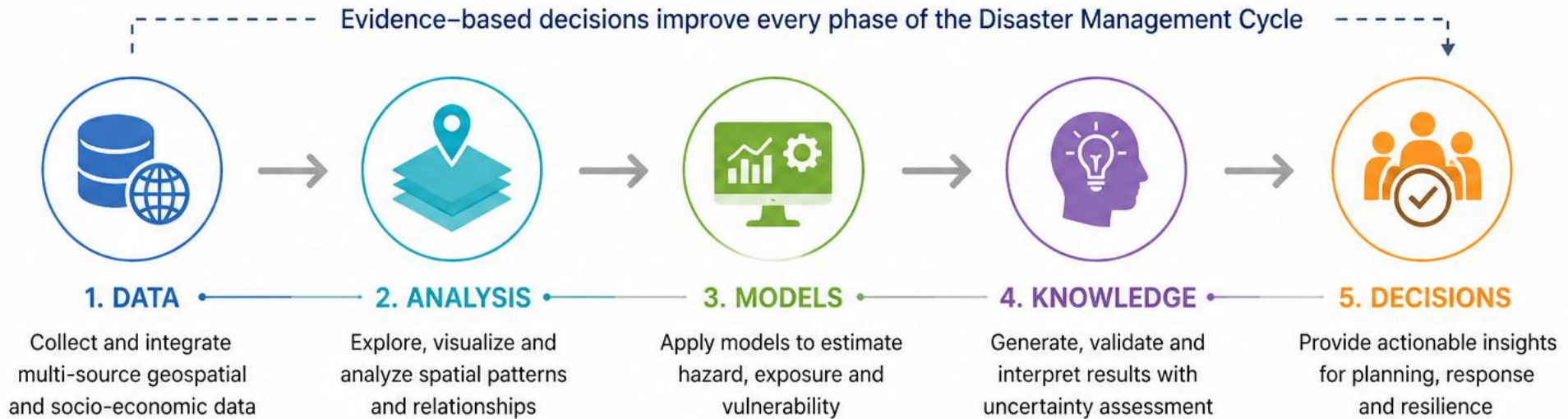
## Key questions (by phase):

- **Where** are the greatest risks of flooding? (*Risk identification and planning*)
- **Where** should levees be built to reduce the risk of flooding? (*Hazard risk reduction*)
- **Where** should boat teams be deployed for search and rescue? (*Response*)
- **Where** are structures most readily salvaged after a flood? (*Recovery*)



# From Geospatial Data to Scientific Understanding

Science transforms data into reliable knowledge for decision-making



## KEY SCIENCE ELEMENTS



### Multi-source data integration

- Remote Sensing
- GIS layers
- In-situ observations
- Socio-economic data



### Spatial analysis & modelling

- Hazard modelling
- Exposure mapping
- Vulnerability assessment
- Scenario and what-if analysis



### Uncertainty & validation

- Data quality assessment
- Sensitivity and uncertainty analysis
- Model validation
- Continuous improvement



Science turns geospatial data into reliable knowledge, enabling **risk-informed decisions** and more **resilient communities**.



# Role of Research in Disaster Risk Reduction

*Science and innovation strengthen every decision, from prevention to recovery*

## 1. UNDERSTANDING PROCESSES



- Trends, droughts, anomalies
- Climate–environment interactions
- Spatio-temporal dynamics

## 2. DEVELOPING METHODS



- New indicators (e.g. vulnerability indices)
- Machine learning / data-driven approaches
- Integration of heterogeneous data

## 3. SUPPORTING DECISIONS



- Scenario modelling
- Risk-informed planning
- Early warning systems



Research transforms geospatial data into **actionable intelligence** for risk-informed decision making and **resilient communities**.

# Hazard and Risk Landscape of Armenia














*From earthquakes to droughts: the multi-hazard context*

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# Hazard and Risk Overview in Armenia

 <b>HAZARDS</b>	 <b>LIKELIHOOD</b> (Probability)	 <b>OVERALL IMPACT</b> (Socio-economic)	 <b>HUMANITARIAN IMPACT</b> (People & communities)
 <b>Earthquake</b>	<div data-bbox="993 357 1187 422">High</div>	<div data-bbox="1533 357 1742 422">High</div>	<div data-bbox="2099 357 2308 422">High</div>
 <b>Landslides</b>	<div data-bbox="993 485 1187 551">High</div>	<div data-bbox="1533 485 1742 551">High</div>	<div data-bbox="2099 485 2308 551">Low</div>
 <b>Hail storm</b>	<div data-bbox="993 614 1187 679">High</div>	<div data-bbox="1533 614 1742 679">High</div>	<div data-bbox="2099 614 2308 679">Medium</div>
 <b>Extreme weather</b> (cold or hot)	<div data-bbox="993 742 1187 808">Medium</div>	<div data-bbox="1533 742 1742 808">Medium</div>	<div data-bbox="2099 742 2308 808">Low</div>
 <b>Floods / mudflows</b>	<div data-bbox="993 871 1187 936">Medium</div>	<div data-bbox="1533 871 1742 936">Medium</div>	<div data-bbox="2099 871 2308 936">Low</div>
 <b>Dam collapse</b>	<div data-bbox="993 999 1187 1065">Medium</div>	<div data-bbox="1533 999 1742 1065">Medium</div>	<div data-bbox="2099 999 2308 1065">Medium</div>
 <b>Drought / desertification</b>	<div data-bbox="993 1128 1187 1193">Medium</div>	<div data-bbox="1533 1128 1742 1193">High</div>	<div data-bbox="2099 1128 2308 1193">Low</div>
 <b>Strong winds</b>	<div data-bbox="993 1256 1187 1322">High</div>	<div data-bbox="1533 1256 1742 1322">Medium</div>	<div data-bbox="2099 1256 2308 1322">Low</div>
 <b>Radiological disaster / Nuclear Power plant accident</b>	<div data-bbox="993 1385 1187 1428">High</div>	<div data-bbox="1533 1385 1742 1428">High</div>	<div data-bbox="2099 1385 2308 1428">High</div>

# Earthquakes: Seismic Zoning of Armenia

## KEY FACTS

I-X

MSK-64 intensity range

5+

Major historical earthquakes

100%

Of territory in seismic zone

## Schematic Map of Seismic Zoning of Armenia

### Legend

- Cities
- Lakes and Reservoirs
- Rivers
- Marz Borders

### Seismic zones

- Accelerations
- 0.1-0.2g
  - 0.2-0.3g
  - 0.3-0.4g
  - 0.4-0.5g



0 15 30 60 90 120 Km

Copyright - Artak Pilyan ©

Schematic Map of Seismic Zoning of Armenia

# Earthquakes: Historical Events in Armenia and Adjacent Areas

DATE	REGION	MAGNITUDE	MSK-64	FATALITIES
1988-12-07	Spitak, Leninakan	6.8	X	25,000–50,000
1931-04-27	Zangezur	6.4	VIII-IX	300–2,890
1679	Garni, Yerevan, Kanaker	7.0	VIII	7,600+
1268	Ilkhanate, Antioch	7.0	VIII	60,000+
893-12-27	Dvin, Artashat	5.3–7	IX-X	30,000

*The 1988 Spitak earthquake remains the most devastating in Armenia's recent history*

# Landslides

Widespread hazard affecting communities and infrastructure

**2,500+**

Landslide districts identified across Armenia

**122 km<sup>2</sup>**

Total surface area (4.1% of the republic)

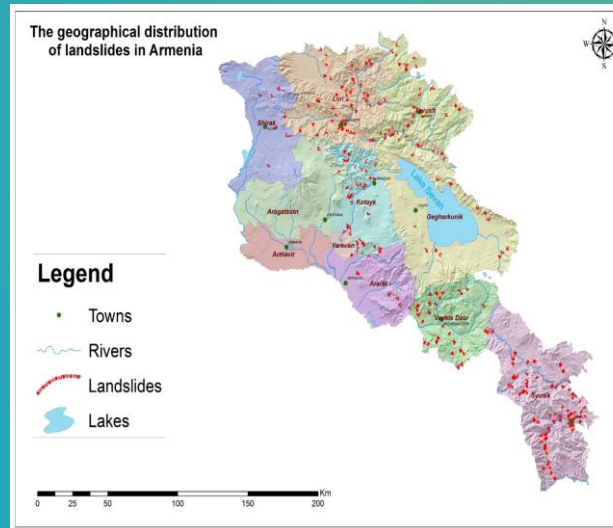
**233 / 960**

Communities affected by landslides

## INFRASTRUCTURE DAMAGED

**240 km** of road network (3.2%) — 280 landslides

**4.8 km** of railway (0.5%) — 10 landslides



# Hail and Thunderstorm

*Recurring events with major agricultural impact*



**Up to 90 days** duration (May–July)

*Coincides with the period of intensive agricultural activities, putting crops at significant risk.*



## Agriculture

Direct crop damage during growing season



## Property

Roof and vehicle damage from large hailstones



## Energy

Power outages from thunderstorms



## Safety

Risk to people in open areas



# Drought

*Increasing frequency and intensity since 2000*

## Significant increase since 2000

Frequency, intensity, and spatial extent of droughts have all grown across Armenia.

## ASSESSMENT INDICATORS

**SPI** (Standardized Precipitation Index) • **SPEI**

*Standardized indices used to track drought severity and extent.*

### SEVERE

**SPI < -1.5**

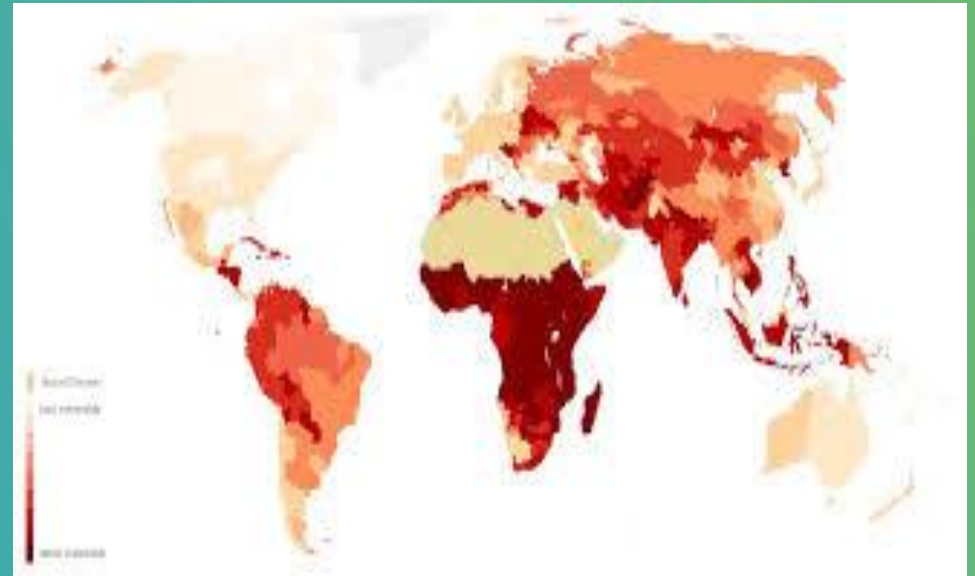
*Recurrent events*

### EXTREME

**SPI < -2.0**

*Expanding to mountainous regions*

*Recent assessments based on SPI/SPEI indicate drought events expanding into previously less affected mountainous regions.*



*Global drought vulnerability index (2023)*



# Virtual GeoScientific Environment of Armenia

Free & open-source GeoNode-based platform for the scientific community

VGSE

## Virtual GeoScientific Environment

Open scientific infrastructure connecting institutions, researchers, and decision-makers across Armenia through shared geospatial data and tools.

### OBJECTIVES



#### Geospatial data sharing

Between scientific institutions across the country



#### Map publishing

Open publishing of thematic and analytical maps



#### Metadata management

ISO-compliant metadata for discoverability



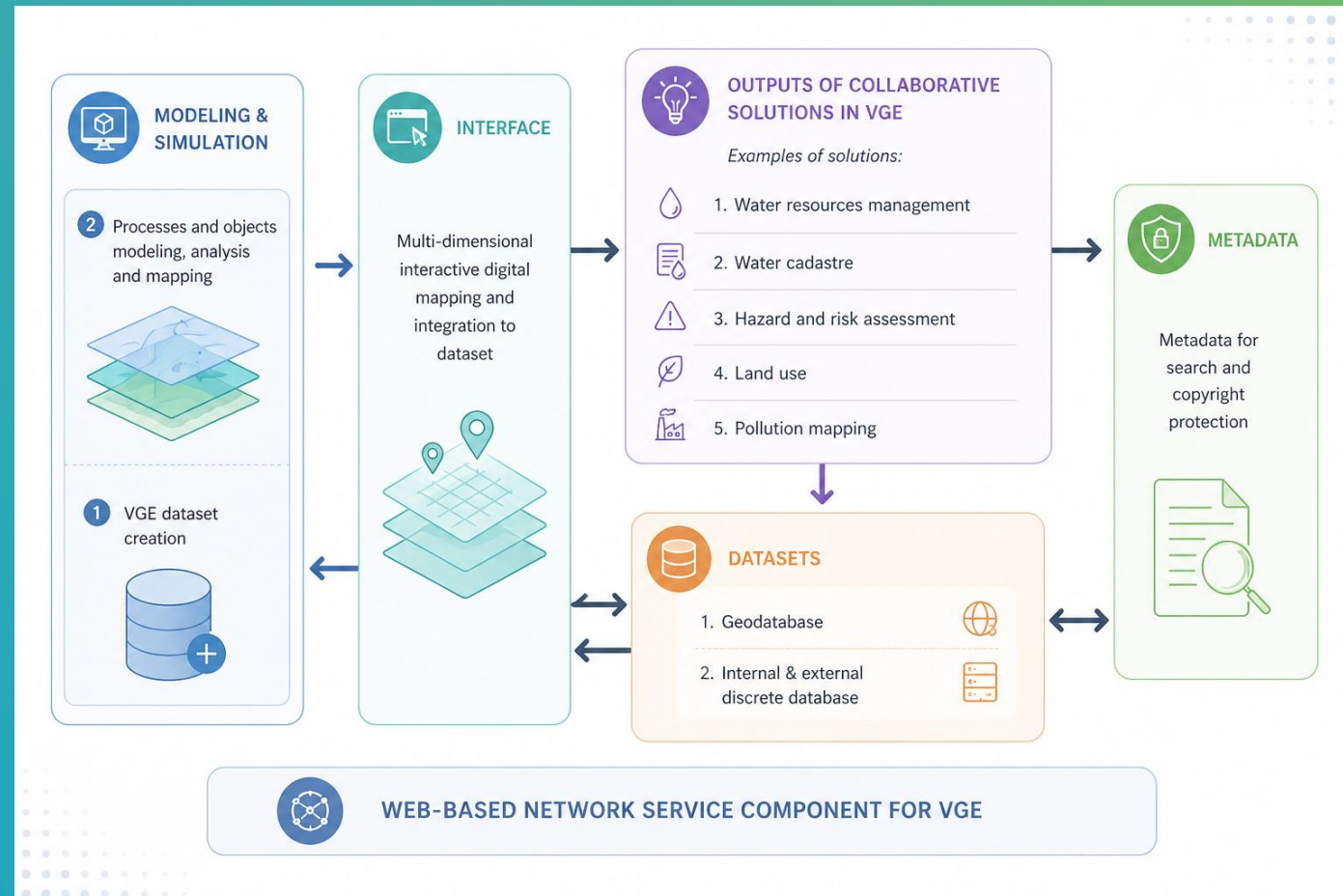
#### Analysis & visualization

Online tools for spatial analysis and visualization

# VGSE: Logical Architecture

Five integrated components forming the backbone of the system

- Datasets,
- Modeling and simulation,
- Interface for digital mapping and integration to geodatabase,
- Metadata,
- Web-based network service for collaborative



# VGSE in Armenia

## Spatial datasets

	<b>01</b> <b>Group 1.</b> <b>Basic Maps</b>	<ul style="list-style-type: none"><li>• State borders of Armenia, Marz borders, District borders, Settlements, Demography, etc.</li></ul>
	<b>02</b> <b>Group 2.</b> <b>Maps of natural conditions</b>	<ul style="list-style-type: none"><li>• Geomorphology zones, DEM, Slope, Aspect, Elevation zones, River network, Lakes, Reservoirs <i>Geology, Soil types</i>, etc.</li></ul>
	<b>03</b> <b>Group 3.</b> <b>Maps of natural hazards and risks</b>	<ul style="list-style-type: none"><li>• Recent earthquakes, Historical earthquakes, Seismic zones Landslide location, Landslide slope, Landslide risk map, Landslide hazard per region, <i>Flood hazard and risk layers</i> – Historical flood events (point and polygon), Flood hazard by regions, Flood hazard by marzes, Wildfire hazard in June, July and August, Wildfire hazard distribution by elevation zones, etc.</li></ul>
	<b>04</b> <b>Group 4.</b> <b>Industrial events hazard and risk</b>	<ul style="list-style-type: none"><li>• Location layers of installations which may trigger risks, Technological event hazard layers and risk layers by regions, Industrial event hazard layer by administrative divisions (marz), etc.</li></ul>
	<b>05</b> <b>Group 5.</b> <b>Critical Infrastructures</b>	<ul style="list-style-type: none"><li>• Administrative buildings, Airports, Health facilities, Roads, Tunnels, Bridges, Railway, Power plants, etc.</li></ul>
	<b>06</b> <b>Group 6.</b> <b>Regional Disaster Vulnerability Index</b>	<ul style="list-style-type: none"><li>• Vulnerability index layer, Social vulnerability layer</li></ul>
	<b>07</b> <b>Group 7.</b> <b>Natural resources</b>	<ul style="list-style-type: none"><li>• Non-metallic deposits, Ore deposits (operated), Ore occurrence, Tailing dams, Fresh drinking groundwater deposits, Hydro-geological wells, Soil types, Landscape types, Forests, etc.</li></ul>

# VGSE: Layers, Maps and Metadata

*Examples of the published spatial layers and their metadata records*

## PUBLISHED LAYERS & MAPS

### Hazard layers

Earthquake, landslide, flood, drought, wildfire

### Base layers

Topography, geology, hydrology, land cover

### Administrative

Boundaries, settlements, infrastructure

### Thematic risk maps

Multi-hazard composites, risk hotspots

## METADATA STANDARDS

### ISO 19115 / 19119 / 19139

International standards for geospatial metadata, services, and XML encoding ensure long-term interoperability.

## DISCRETE METADATA UNITS

Map title

Keywords

Spatial resolution

Responsible organization

Source

Author(s)

Short description

Update cycle

# Methodology: Hazard and Risk Assessment

*Spatial Multi-Criteria Evaluation based on the Analytical Hierarchy Process (AHP)*

## THE METHOD

### Spatial Multi-Criteria Evaluation

based on the **Analytical Hierarchy Process (AHP)**

The method allows **quantitative estimation** of hazard or risk by summation of weighted means of causative factors.

*Weights are assigned based on the relationships between hazard/risk causative factors.*

#### STEP 1

### Identify criteria & causative factors

*Slope, geology, land use, precipitation, seismic activity, etc.*

#### STEP 2

### Assign weights via AHP

*Weights based on factor relationships and expert judgment.*

#### STEP 3

### Aggregate weighted criteria

*Output: hazard / risk index map (raster or vector).*

# Landslide Hazard Assessment and Mapping

Combining condition factors and triggering factors into a unified hazard index

## LANDSLIDE FORMING FACTORS

### CONDITIONS OF NATURAL LANDSCAPE (weight 0.8)

Slope angles 0.5

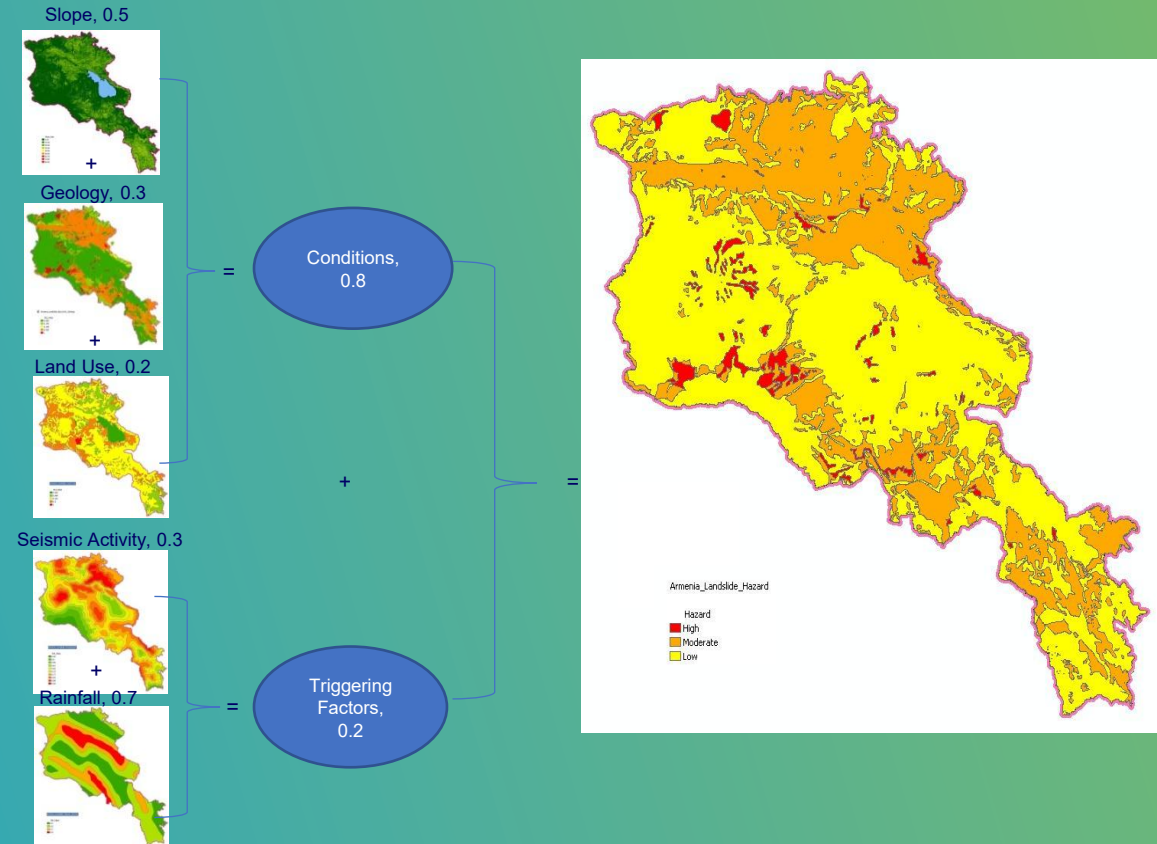
Land use 0.2

Geology 0.3

### TRIGGERING FACTORS (weight 0.2)

Precipitation 0.7

Seismic activity 0.3



## LANDSLIDE HAZARD INDEX

$$0.8 \times (0.5 \cdot \text{Slope} + 0.2 \cdot \text{LandUse} + 0.3 \cdot \text{Geology}) + 0.2 \times (0.7 \cdot \text{Rainfall} + 0.3 \cdot \text{Earthquake})$$

# Wildfire Hazard Assessment and Mapping

Hierarchical combination of fuel and weather hazard factors

## HAZARD COMPONENTS

### FUEL HAZARD (overall weight 0.81)

Land cover (Fuel type)	0.54
Slope	0.32
Aspect	0.09
Elevation	0.06

### WEATHER HAZARD (overall weight 0.19)

Temperature	0.74
Precipitation	0.26

## OUTPUT

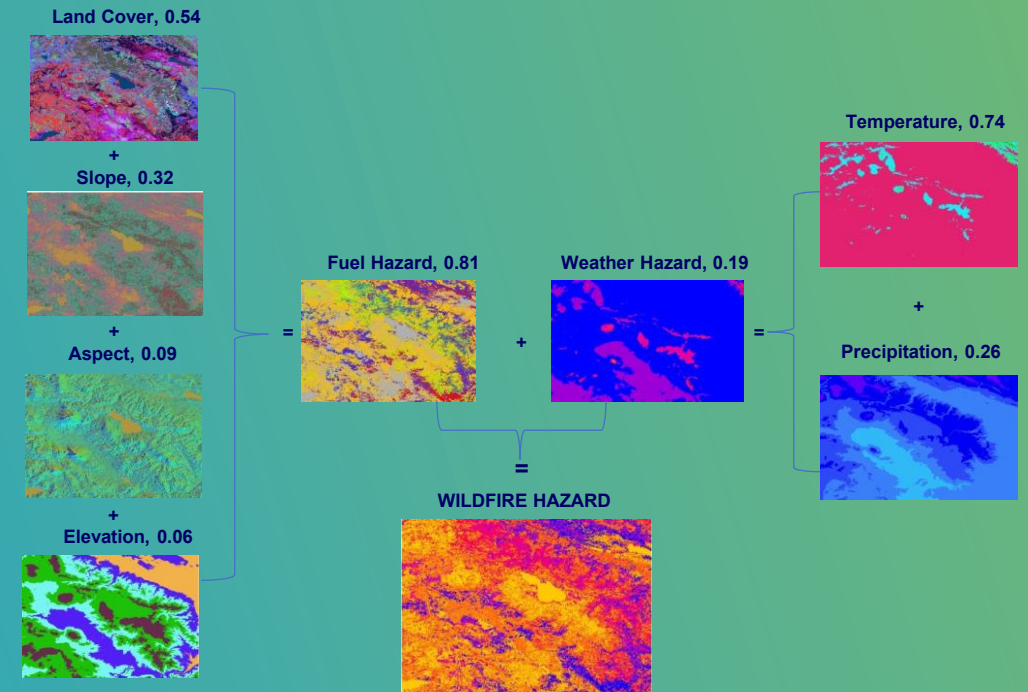
Wildfire hazard map identifying high-risk zones across Armenia, integrating both terrain and climate factors.

## WILDFIRE HAZARD INDEX

$$\text{Wildfire Hazard} = 0.81 \cdot \text{Fuel} + 0.19 \cdot \text{Weather}$$

$$\text{Fuel} = 0.54 \cdot \text{LandCover} + 0.32 \cdot \text{Slope} + 0.09 \cdot \text{Aspect} + 0.06 \cdot \text{Elevation}$$

$$\text{Weather} = 0.74 \cdot \text{Temperature} + 0.26 \cdot \text{Precipitation}$$



# Flood Hazard Assessment and Mapping

*Spatial multi-criteria evaluation aligned with the EU Flood Directive (2007/60/EC)*

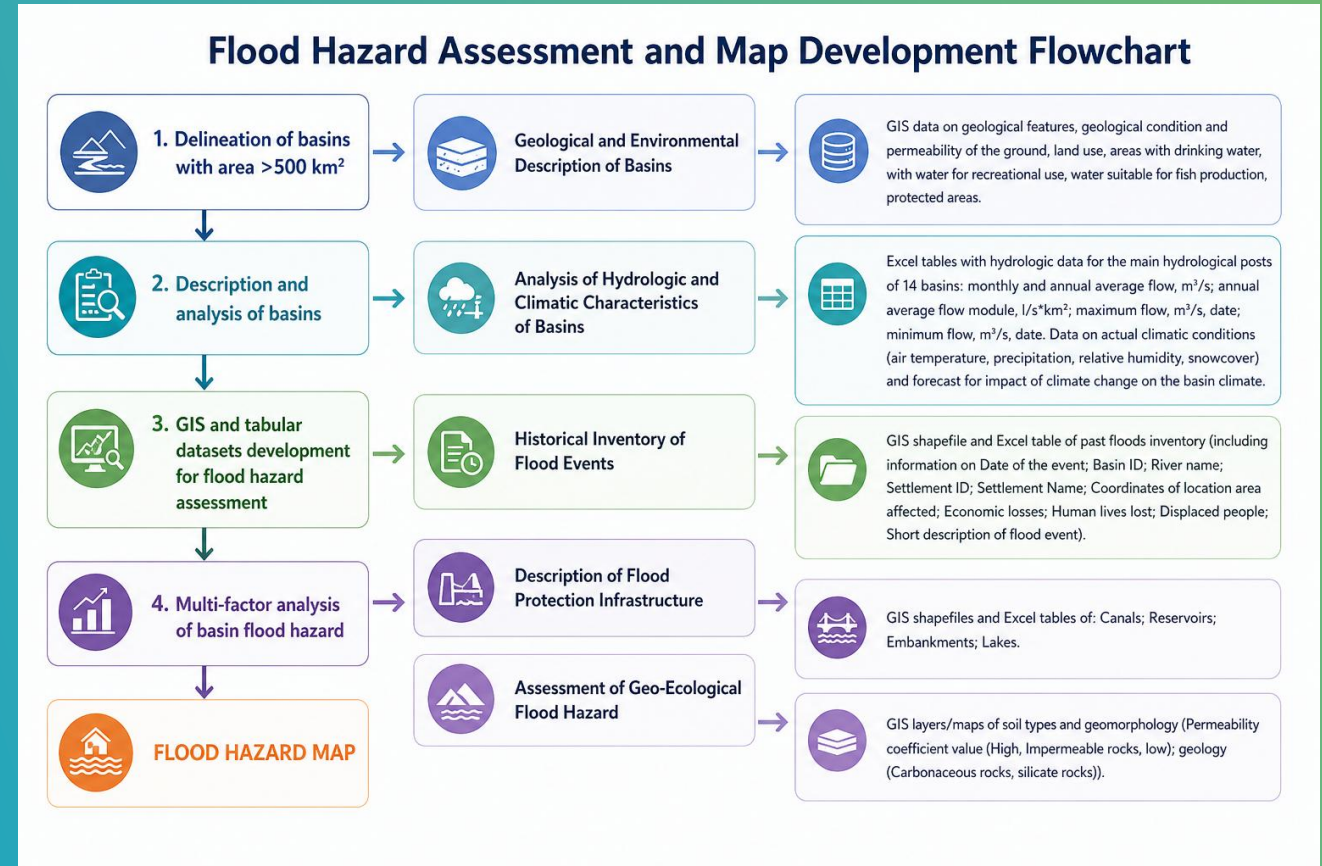
## Spatial multi-criteria evaluation

### The objectives of are to:

- Estimate the potential flood hazard based on hydro-meteorological, geo-ecological and geomorphometric parameters,
- Determine the settlements with high potential flood risk based on evaluation of past flood events,
- Develop flood hazard map / GIS layer.

### The results of this workflow are:

- A register of locations on rivers where there is a known probability of a floods within the defined structure,
- Description of basins,
- Metadata records about all existing hydrologic models available in country along with other flood maps,
- Hazard map based on the register and analysis of records,



**Flood hazard assessment based on the principles defined within the EU Flood Directive [DIRECTIVE 2007/60/EC, 2007]**

# Flood Hazard Assessment and Mapping

14 main river basins of Armenia (area > 500 km<sup>2</sup>)

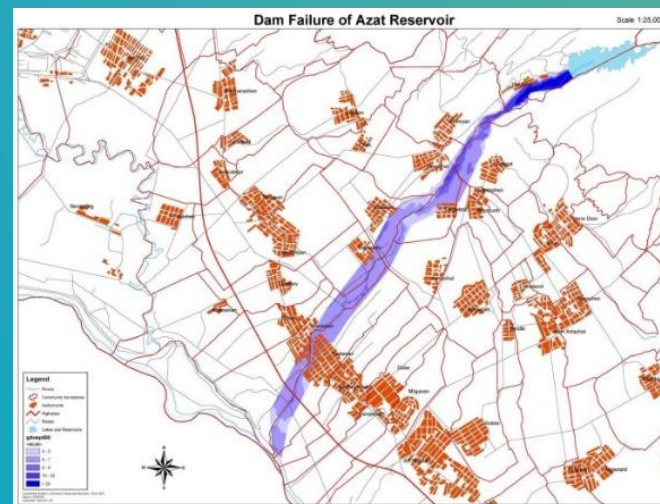
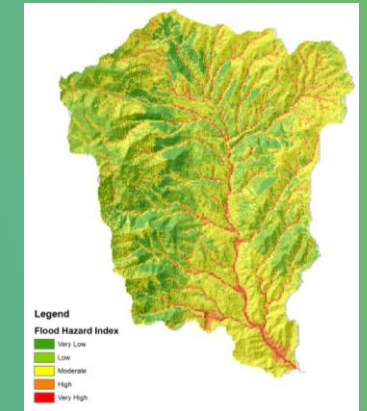
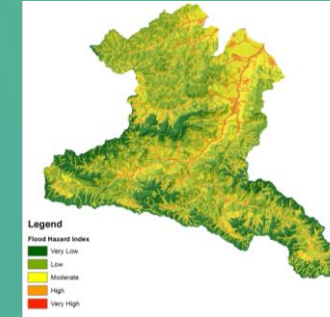
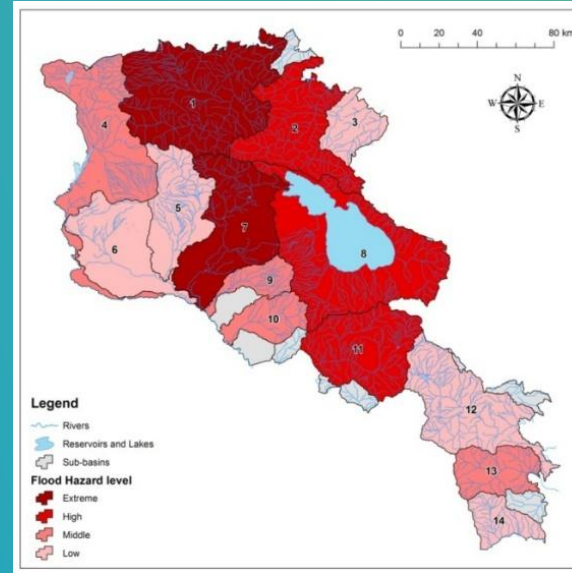
## FLOOD HAZARD COVERAGE

# 14

river basins assessed

## Methodology

Spatial multi-criteria evaluation, hydrologic monitoring posts, and historical event analysis applied across all 14 basins.



# Publications

- Avagyan, A., Manandyan, H., Arakelyan, A., Piloyan, A. (2018). Towards a disaster risk assessment and mapping in the virtual geographic environment of Armenia. *Natural Hazards*, 92(1), 283–309. <https://doi.org/10.1007/s11069-018-3208-0>
- Avagyan, A., Hilbert, R., Arakelyan, A., Piloyan, A., Yeritsian, H., Elbakyan, A., Manandyan, H. (2016). Electronic regional risk atlas: Development, structure and application practice in the Republic of Armenia. In: *6th International Conference on Cartography and GIS*. Albena, Bulgaria. Proceedings, pp. 834–846.



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# Tajikistan: Earth Observation Laboratory at FAZO

*From establishment to operational use — full lab and training programme*



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# Technology-Based Adaptation to Climate Change in Tajikistan

*Establishment of the Earth Observation Lab*



## CONTEXT

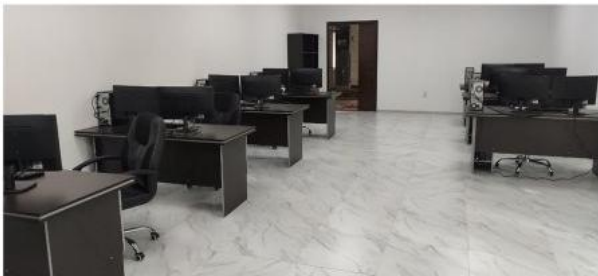
Tajikistan is highly vulnerable to climate change — among the most vulnerable countries in Central Asia. Capacity for evidence-based geodata is a national priority.

## 01

### Gap & Needs Assessment

*Feb – Apr 2021*

GAF team conducted a gap-and-needs assessment to understand staff capacity. A tailored training programme was designed based on findings.

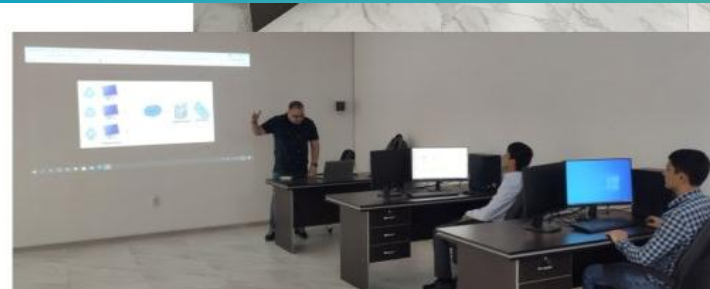


## 02

### Lab Establishment

*Jan – Jun 2021*

Procurement of servers, computers, and equipment (Jan 2021). Official launch of the Earth Observation Lab (June 2021).



## 03

### Basic Training

*May – Jun 2021*

Equipment & network installation (May 2021). Fundamentals of satellite image processing delivered to staff (May–Jun 2021).



# Advanced Training and International Engagement

*Building deeper capacity through hands-on training and global exposure*



Sep 2021

## Advanced Capacity Building

*In-depth satellite image processing*



Jun – Jul 2021

## Hands-on Training in Germany

*GAF facilities: Neustrelitz, München, Oberpfaffenhofen, Freiburg*



Nov 2021

## International Conference

*Participation in conference, Istanbul*



Nov 2022

## Final Conference

*Project closing event in Dushanbe, Tajikistan*

## OUTCOME

### Operational EO Lab

FAZO staff trained from fundamentals to advanced applications, with established methodology, equipment, and international peer network.

*Funded by GIZ  
Implementing partner: GAF AG*

# Case Study: Glacier Monitoring

Multi-temporal change detection using Landsat satellite imagery

## METHODOLOGY

1

### Data input

Landsat-7 ETM+ (2002) and Landsat-8 OLI/TIRS (2021)

2

### Spectral indices

NDWI and NSDI computed for each acquisition

3

### Mask generation

Shadows, water, snow, thermal-glacier masks produced

4

### Glacier mask raster

Combined mask:  $\text{TempSurface} \times \neg\text{Water} \times \neg\text{Snow} \times \neg\text{Shadow}$

5

### Vector glacier maps

Visual interpretation + manual editing → 2002 / 2021 vectors

6

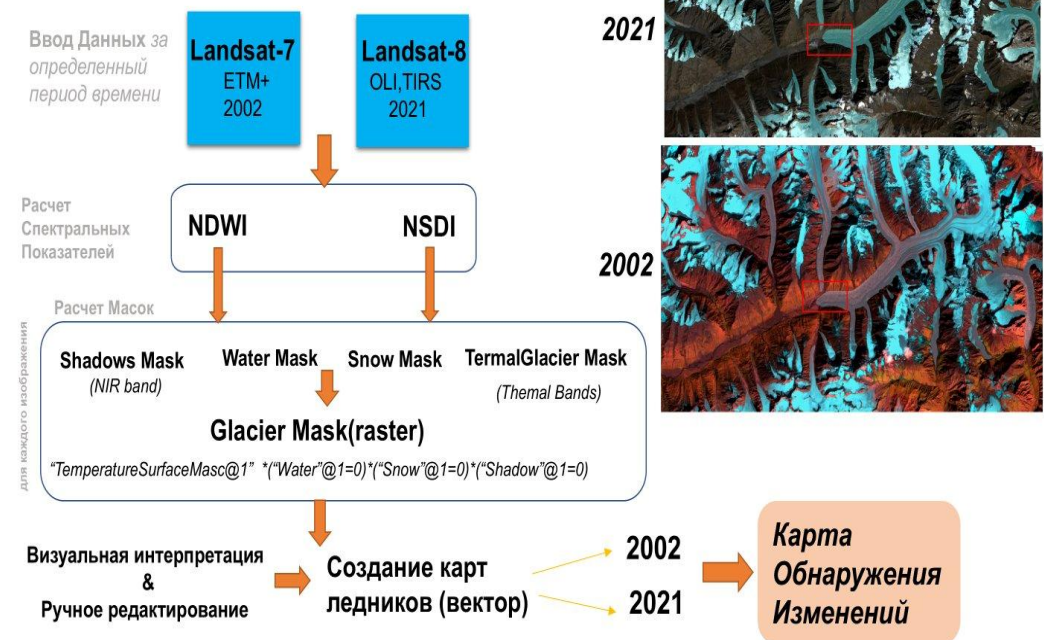
### Change detection map

Final spatial change map: glacier loss between 2002–2021

## MULTI-TEMPORAL ANALYSIS

### Мониторинг ледников

на основе спутниковых снимков Landsat



Glacier extent comparison (2002 vs 2021) reveals significant retreat — a key climate-change indicator.

# Flood Risk Mapping for the City of Pendjikent

Case study from EOL training participants

**Goal:** Provide rapid and reliable geospatial information to support emergency management and flood response.

## RAPID MAPPING WITH COPERNICUS EMS

The Copernicus Emergency Management Service (Rapid Mapping) delivers geospatial information very quickly after disasters.



### Fast service

On-demand and very fast (within hours or days) delivery



### Supports emergency response

Actionable information immediately after floods



### Data sources

Satellite imagery, DEM (SRTM), vector data and in-situ information



### Crowdsourced information

Social media data where relevant

## SERVICE LEVELS



### SL1 – First response

Fastest possible delivery; 24/7/365 operational chain



### SL2 – Detailed analysis

For less urgent cases and at night; further analysis and delivery within 24/7/365

## PRODUCTS FOR ANALYSIS

### Data & Inputs

- Copernicus satellite data (Sentinel-1/2)
- Ancillary data (DEM, SRTM)
- In-situ information



### GIS & Analysis

(QGIS workflow)

### Analysis Workflow

- 1 Flood mapping from Sentinel-1 & Sentinel-2
- 2 Risk assessment using DEM (SRTM) and other high-resolution data
- 3 Identification of buildings and critical infrastructure at risk
- 4 Integration of all layers to delineate flood risk zones

## Key Benefits



Timely decision-making

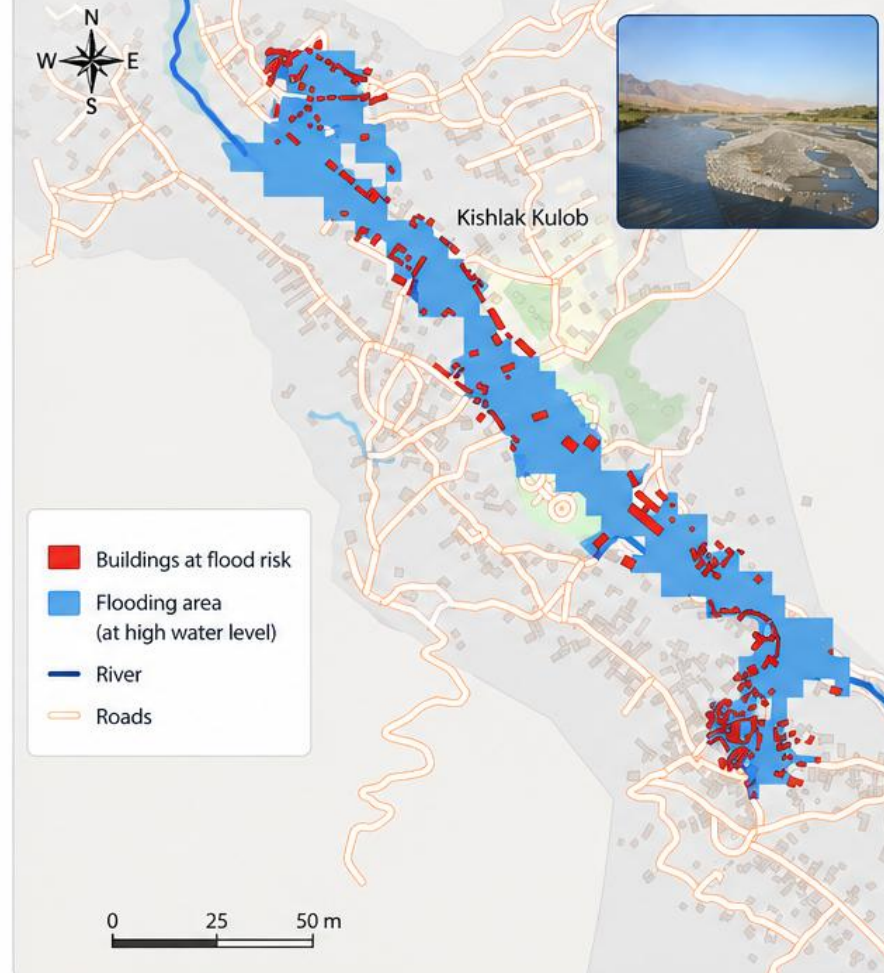


Better emergency preparedness



Reduced risks and losses

## FLOOD RISK ZONE MAP – PENDJIKENT



# Land Degradation Mapping

Case study from EOL training participants

## KEY INPUT DATA



Multispectral satellite imagery  
(e.g., Sentinel-2)



Digital elevation model  
(SRTM / ASTER GDEM)



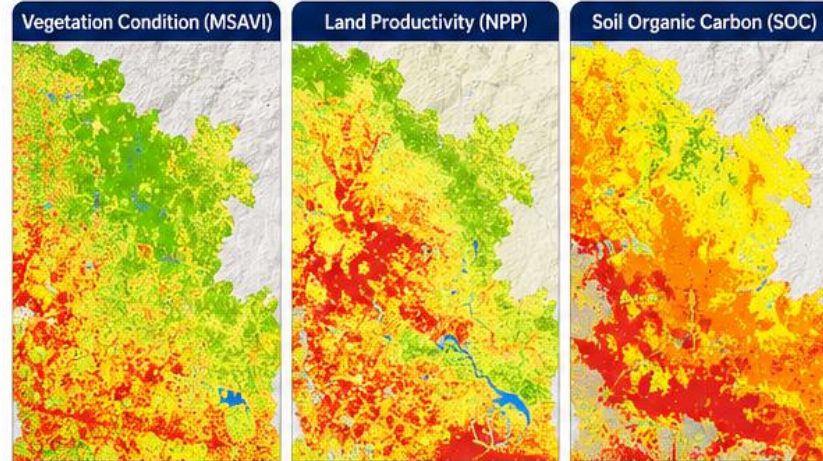
Ancillary data  
(land cover, soil map, etc.)



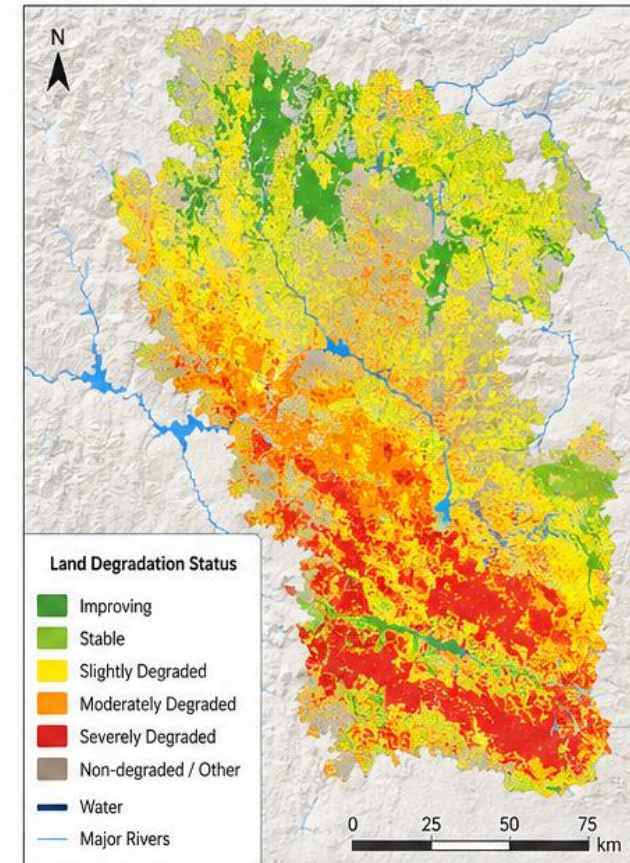
## ANALYSIS APPROACH

- 1 Derivation of indicators**  
(vegetation condition, land productivity, soil organic carbon)
- 2 Classification of each indicator**  
(positive / stable / negative)
- 3 Integration of indicators using LDN methodology (UNCCD)**
- 4 Mapping of land degradation status**

## INDICATOR MAPS (EXAMPLES)



## LAND DEGRADATION MAP (RESULT)



## OUTCOME & USE



Identify degraded areas and hotspots



Support land management planning



Prioritize actions for sustainable land use



Strengthen decision-making for climate and development



## THE GOAL

To provide a science-based geospatial tool for monitoring land degradation trends and supporting sustainable land management and policy decisions.

# Kyrgyzstan: Basic Capacity Building

*A focused training engagement complementing the regional programme*

## BASIC TRAINING ONLY

### Foundational EO capacity building

Unlike Tajikistan, no full lab was established. The engagement focused on equipping selected staff with core skills.

#### WHAT WAS COVERED

- Fundamentals of satellite image processing
- Introduction to GIS workflows
- Hands-on exercises with open EO data
- Use of free and open-source software (e.g. QGIS)

## REGIONAL COMPARISON

### TAJIKISTAN

#### Full Earth Observation Lab

- Lab establishment + equipment
- Basic + advanced training
- Hands-on internships in Germany
- International conference participation

### KYRGYZSTAN

#### Basic training only

- Foundational satellite image processing
- No lab infrastructure component

*Different country contexts require different scales of engagement — both contribute to regional capacity.*



# Armenia: Center for Spatial Studies and Urban Informatics

*Ongoing project — establishing a research hub at YSU (2025–2030)*



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# A New Research Hub at YSU

*Establishing capacity for urban informatics and spatial information science in Armenia*

## PROJECT CODE

25RL-1E009

## PERIOD

July 2025 – June 2030

## BUDGET

107 Million AMD

## HOST

YSU — Faculty of Geography & Geology

## VISION

A long-term, university-based research hub advancing spatially explicit, data-driven understanding of urban systems in Armenia. Yerevan and other Armenian cities are positioned as living laboratories for interdisciplinary urban research.

*Core focus: building seismic resilience through AI-powered vulnerability assessment.*

## INTERNATIONAL PARTNER

### University of Tokyo

*Center for Spatial Information Science (CSIS)*

Prof. Yoshihide Sekimoto  
Asst. Prof. Kotaro Iizuka

01



### Scientific

Advance methods for integrating heterogeneous urban data into unified analytical frameworks

02



### Applied

Generate spatially explicit knowledge for planning, environment, and disaster risk reduction

03



### Institutional

Strengthen research capacity at YSU and train graduate students in advanced spatial methods

# AI-Powered Seismic Vulnerability Assessment

Scalable, GeoAI-supported approach for Yerevan's building stock

## THE CHALLENGE

Engineering surveys are accurate but resource-intensive and hard to scale. Building data in Armenian cities are incomplete, fragmented, and unevenly updated.

## THE METHODOLOGICAL APPROACH



1

### Building Passport

*Dynamic spatial object*

Each building is represented as a unique spatial entity with progressively enriched attributes — geometry, height, adjacency, construction proxies.



2

### GeoAI Modeling

*ML + GIS + Fuzzy Logic*

Machine learning synthesizes multiple attributes into interpretable vulnerability estimates. Fuzzy logic handles uncertainty in proxy variables.



3

### Functionality Output

*Risk-informed decisions*

Vulnerability links to street network for post-event accessibility analysis. Outputs feed into urban planning, retrofitting priorities, evacuation modeling.

## KEY DATA SOURCES:

UAV LiDAR

Cadastre

Sentinel imagery

InSAR ground deformation

Mobility data

# GeoAI-Supported Vulnerability Modeling

*Seismic vulnerability is treated as a spatially embedded, data-driven process, not only an engineering problem*

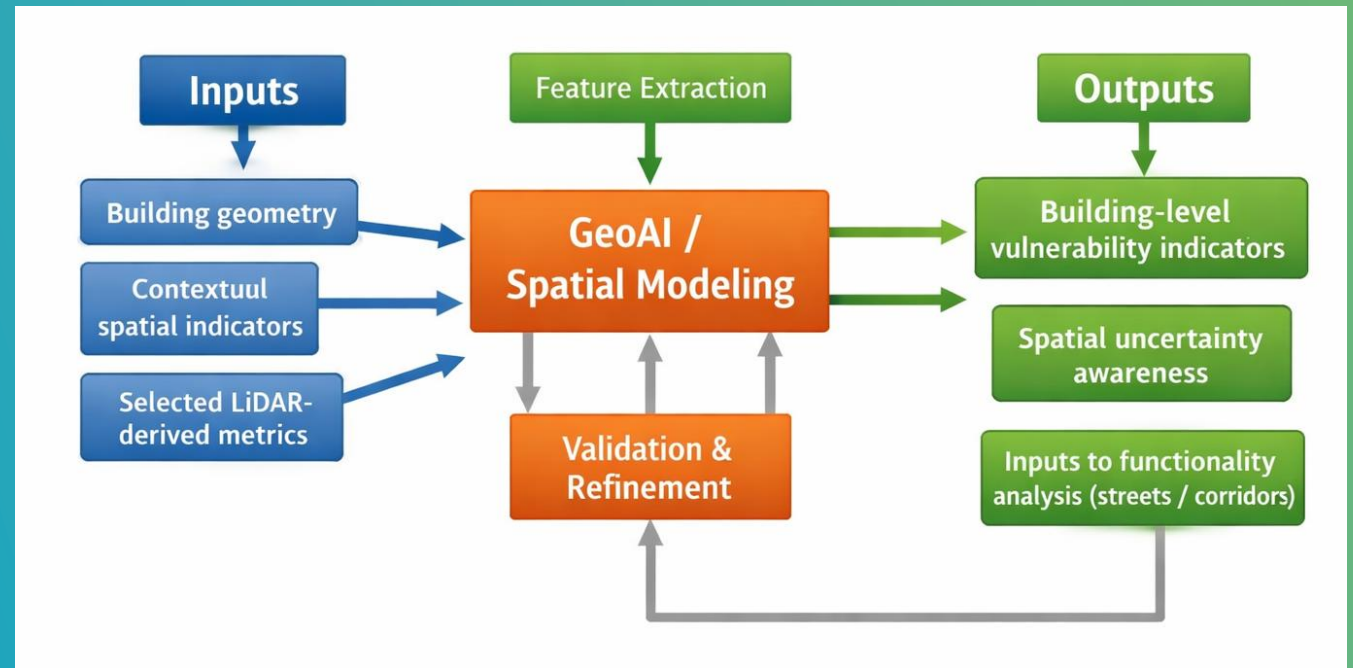
## Role of GeoAI

- Will combine **building geometry + spatial context**
- Will infer **missing attributes using proxy relationships**
- Will capture **non-linear patterns in vulnerability factors**

PHASE III

2029 – 2030

*Scaling & Toolkit*



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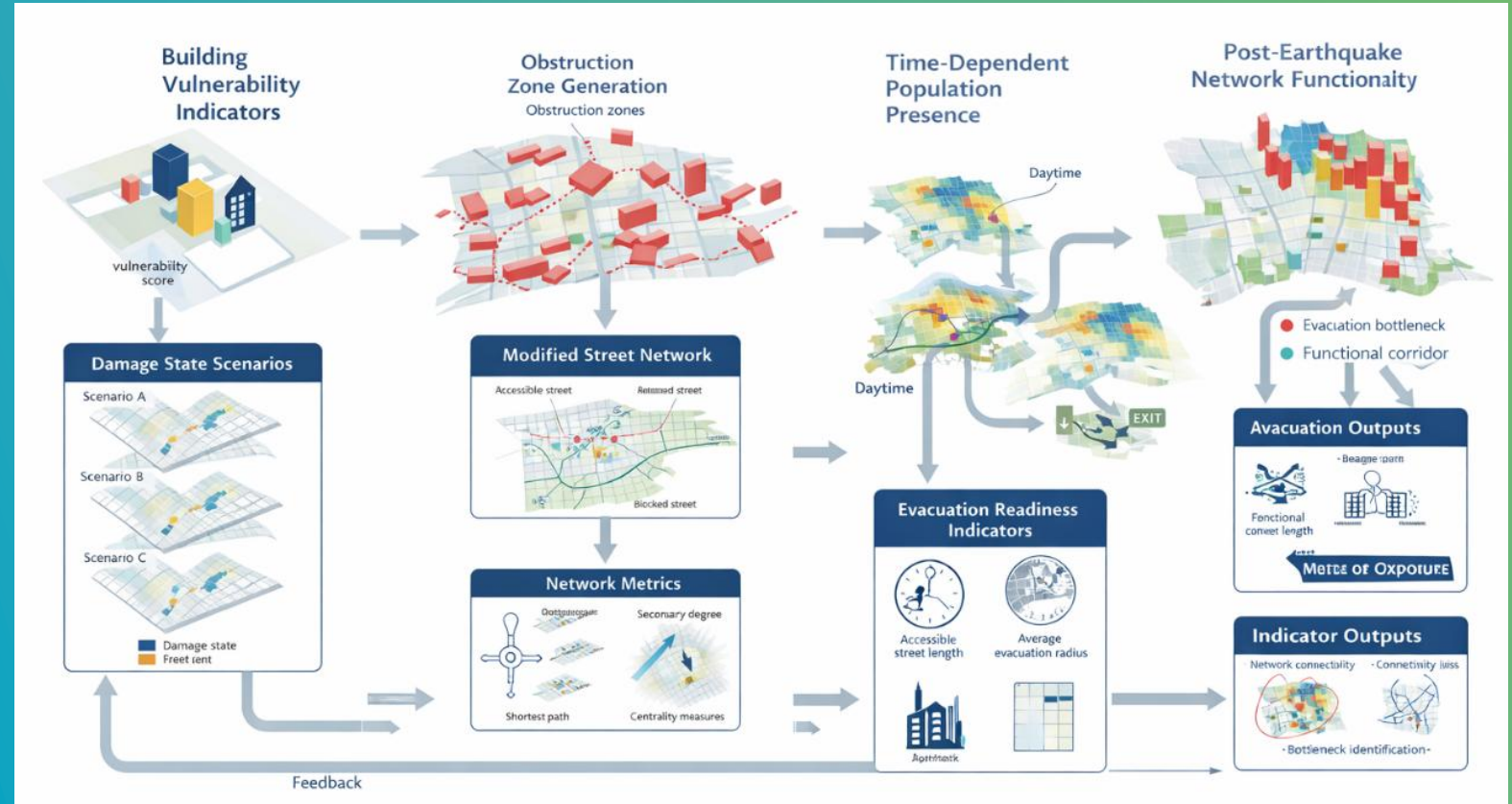
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# Scenario Modeling & Post-Earthquake Functionality

## Approach

- Vulnerability indicators will be translated into damage scenarios
- Buildings will be assessed for their potential to obstruct streets
- Street networks will be updated to reflect post-event conditions



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# Why Partnerships Matter

No single institution can build and sustain a useful risk information ecosystem alone



**Government  
Agencies**

*Ministries, civil protection*



**Data  
Custodians**

*Cadastre, geoportals, hydromet*



**Sector  
Ministries**

*Transport, health, education*



**Universities  
& Researchers**

*Methods, training, validation*



**Development  
Partners**

*ADB, GIZ, World Bank*

Effective risk information systems require collaboration across all of these — building each component without the others creates fragile systems that don't last.

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# Relevance for ADB Operations

Stronger risk information systems improve project quality and resilience outcomes



## Project screening

Hazard exposure check at concept stage



## Concept development

Risk-informed design from the start



## Climate & disaster risk assessment

Standardized, reliable inputs across DMCs



## Resilience design

Engineering and planning anchored in evidence



## Investment prioritization

Direct resources where exposure is highest



## Monitoring of outcomes

Track resilience over the project lifecycle

*Better data can support better projects — but only when translated into operational decisions.*



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# Thank you.

## Q&A

### Speakers

Aleksandr Arakelyan, ADB • Yeva Danielyan, ADB • Artak Piloyan, Yerevan State University