Planetek Hellas contribution to EOLAW

Goals:

Spatial visualization of abnormal activities related to security applications

Identification of patterns and changes in areas of interest

Fusion of multi source date, including GIS data, Earth Observation imagery, structured and unstructured data, databases as well as information from media and open sources

S O S I N T
Facebook, Twitter, Instagram, YouTube, etc

O S I N T
Internet, media, articles, reports, etc

I o T

G E O I N T
GIS, spatial solutions, etc

F I N I N T
financial affairs, money routes, etc

I M I N T
Earth Observation, satellite images, Copernicus data, etc

S I G I N T
Communication signals, FM, VHF, etc

Developed Services
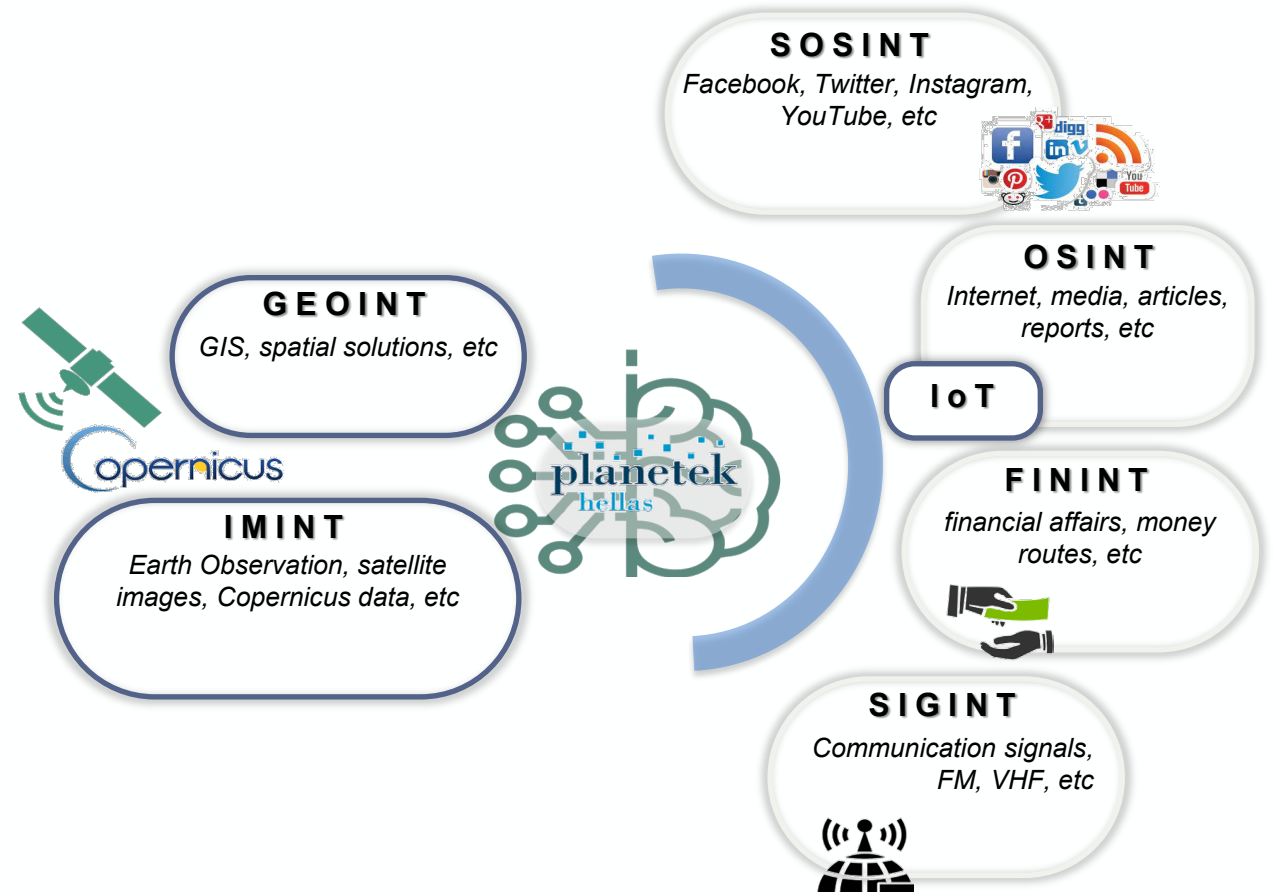
Service 1: Comprehensive and Contextual Imagery Intelligence Analysis Combining EO Data and Media Sources
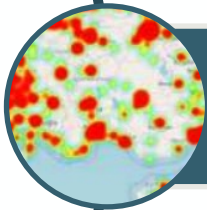
Service 2: Hotspot Detection Layer with Potential Training Camps

Service 3: Hotspot Detection Layer with Potential Abnormal Activities Related to security

Case studies

Border Situation Greece – Turkey: March 2020

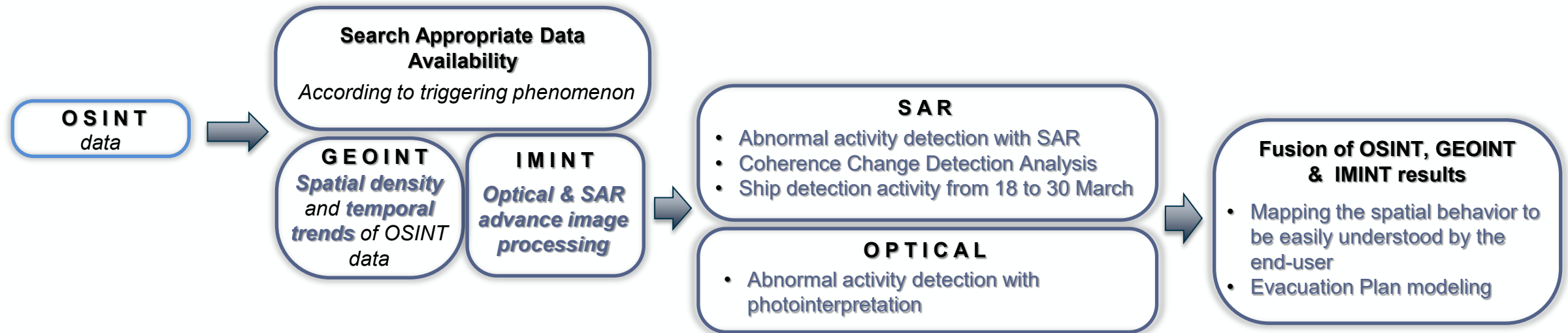Detonation in Beirut: August 2020

Mali insurgency: February 2021

Mozambique insurgency: March 2021

Support to HOTSPOT Project Activities in Albania

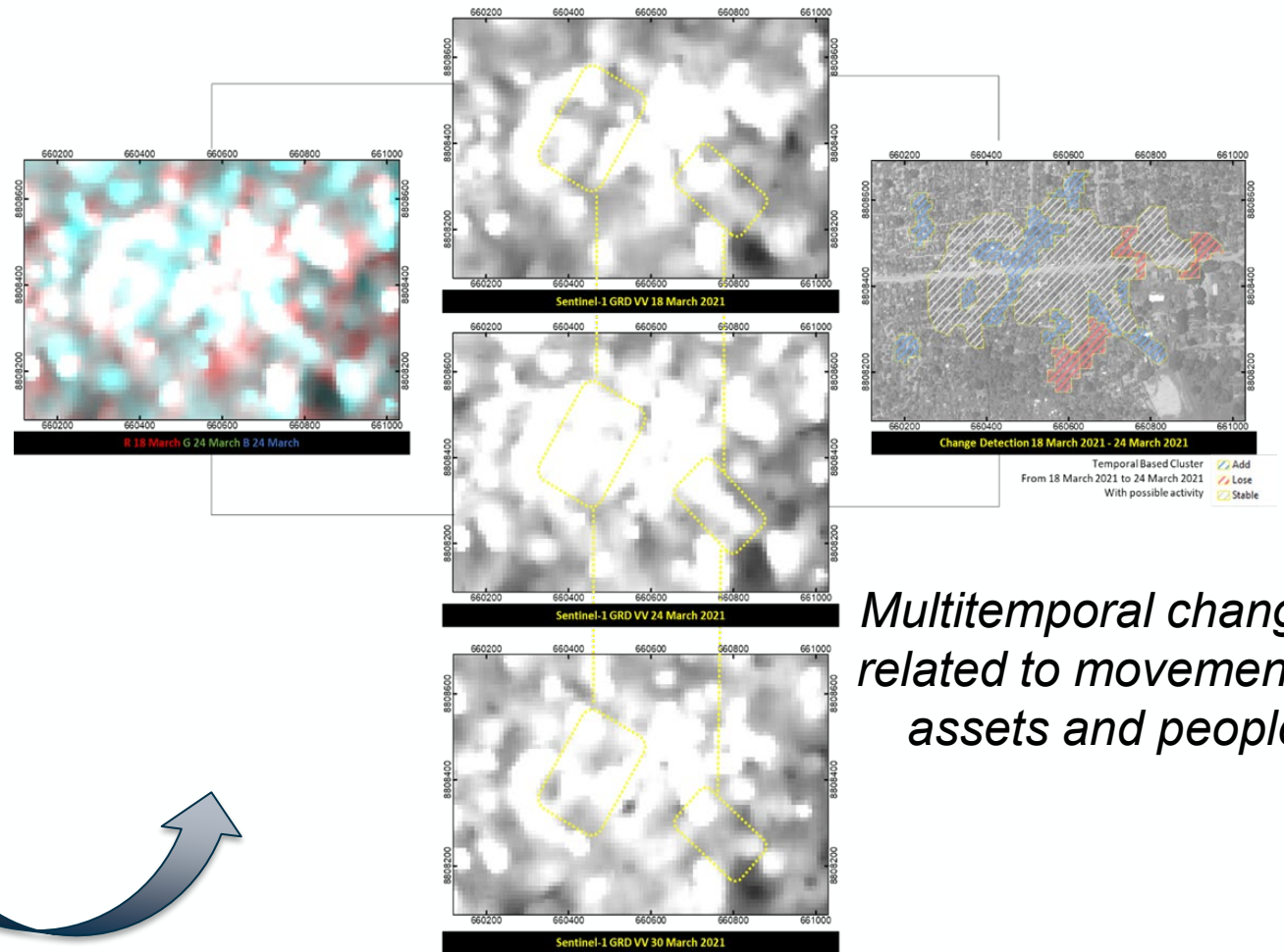FACT Activities in the Border Area of Libya and Chad

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Mozambique Case Study

➤ Comprehensive and Contextual Imagery Intelligence (IMINT) Analysis combining EO Data and Media Sources (OSINT) for the Mozambique attack

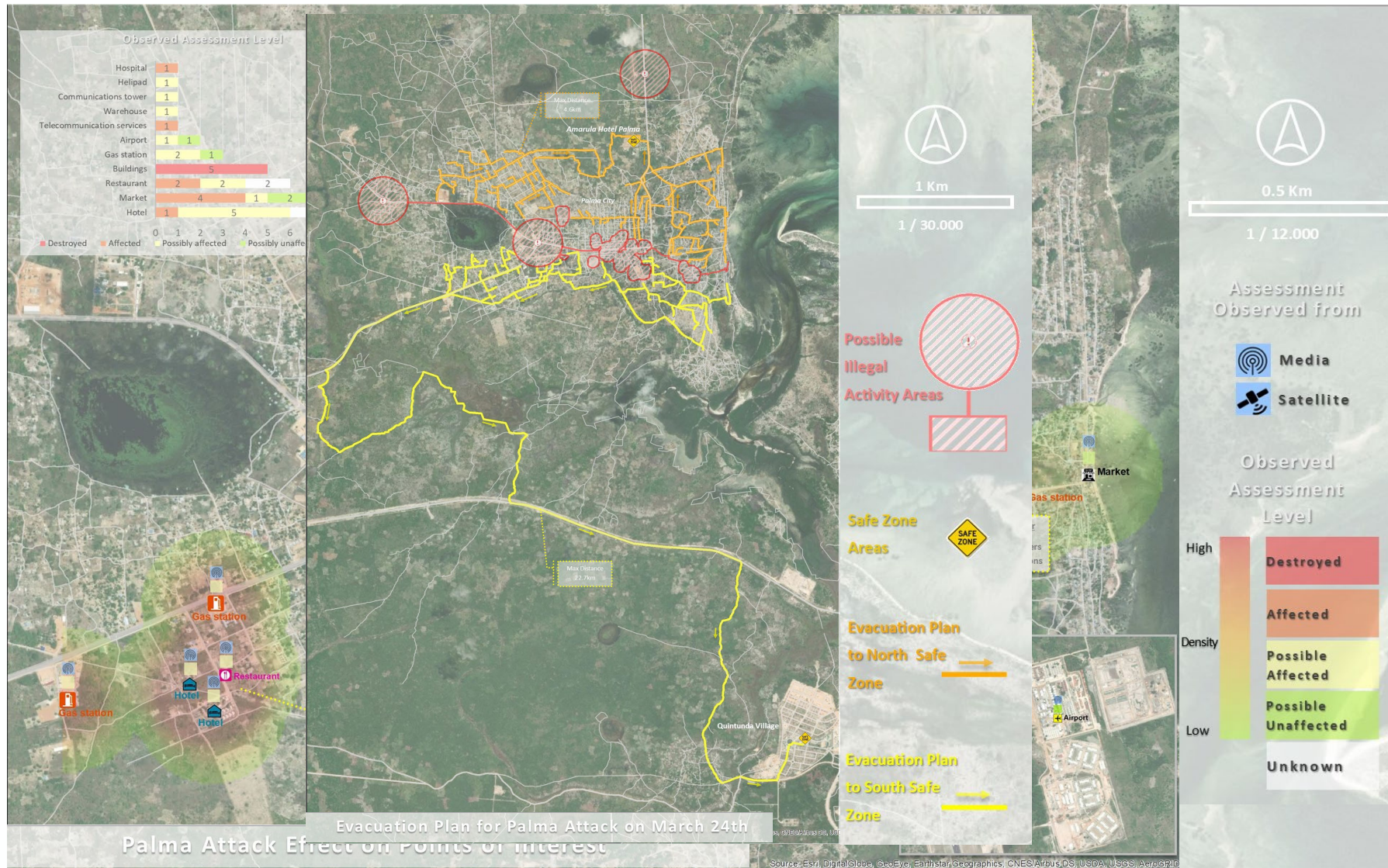|	
Stakeholder	NGO, UN, Local security agency
Objective	Analysis of the situation on the ground in Palma, Mozambique, and offer strategically valuable insights about the militant group.
Services and products	Service 1 + Damage assessment + Evacuation plan + Ship detection analysis
Technical advancement	IMINT analysis + GEOINT analysis
Capacity building/training	Demonstration of the results
Added value/impact	Identification of movement of assets, identification of safe routes, detection of locations where battle action has taken place, IDP settlements
Outputs	Reports, spatial data, maps, satellite data

Methodology

OSINT
data

→

Search Appropriate Data Availability
According to triggering phenomenon

GEOINT
Spatial density and temporal trends of OSINT data

IMINT
Optical & SAR advance image processing

→

SAR
- Abnormal activity detection with SAR
- Coherence Change Detection Analysis
- Ship detection activity from 18 to 30 March

OPTICAL
- Abnormal activity detection with photointerpretation

→

Fusion of OSINT, GEOINT & IMINT results
- Mapping the spatial behavior to be easily understood by the end-user
- Evacuation Plan modeling

Automatic collection of relative video scenes from media news

Multitemporal changes related to movement of assets and people

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Palma Attack Effect on Points of Interest

Evacuation Plan for Palma Attack on March 24th

Albania case study

➤ **Identification of "Abnormal activities" along the Greek-Albanian border:**

- Particular human flows

- Unusual movement (people and/or vehicles)

- Unofficial camps or gathering points

Stakeholder	INTERPOL
Objective	Implementation of change detection for identifying abnormal activities in the Albanian border, related to illegal immigration
Services and products	Service 1 + Least Cost Path analysis
Technical advancement	Computation of the potential walking routes used by the immigrants
Capacity building/training	Demonstration of the results
Added value/impact	Minimized areas of interest, precisely geolocated point of assembly, linear representations of migration routes
Outputs	Reports, spatial data, maps, satellite data

Methodology

```
OSINT
data
```
→

Search Appropriate Data Availability
According to triggering phenomenon

I M I N T
SAR advance image processing
→

S A R
- Multi temporal change detection using SAR data

G E O I N T
Least Cost Path analysis
→

G I S
- Model path according to different Scenarios

→

Fusion of OSINT, GEOINT & IMINT results
- Minimized areas of interest
- Mapping the spatial behavior to be easily understood by the end-user

Least Cost Path Analysis

➢ Input data to model ease of on-foot accessibility:

- ▪ Land Cover (CORINE supplemented by VHR Reference Mapping)

- ▪ Road network (OpenStreetMap)

- ▪ Elevation (SRTM)

- ▪ Points of Interest (Border Crossing Points, Towers)

CORINE Land Cover
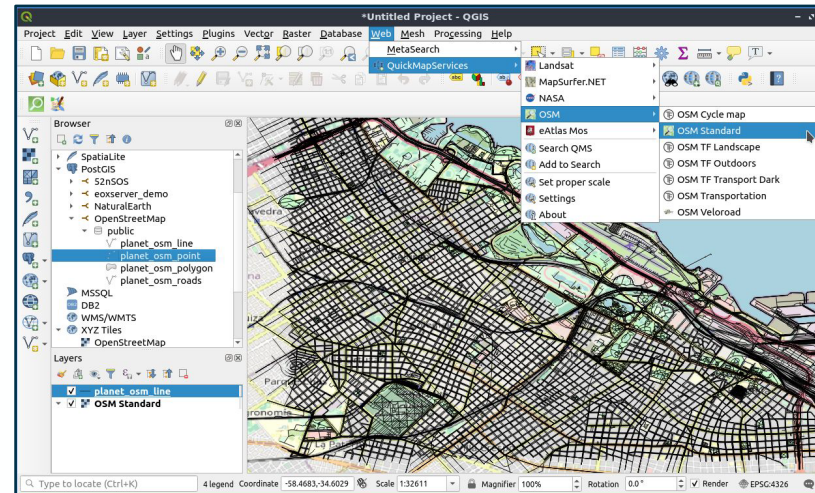
OpenStreetMap

Results – Least Cost Path Analysis

- ➢ Use of output from OSINT

  - ▪ Migrant behavior to model the costs to travel

  - ▪ Use of the placenames and assembly point as Origin-Destination points

- ➢ Computation of Cost surface and Least Cost path

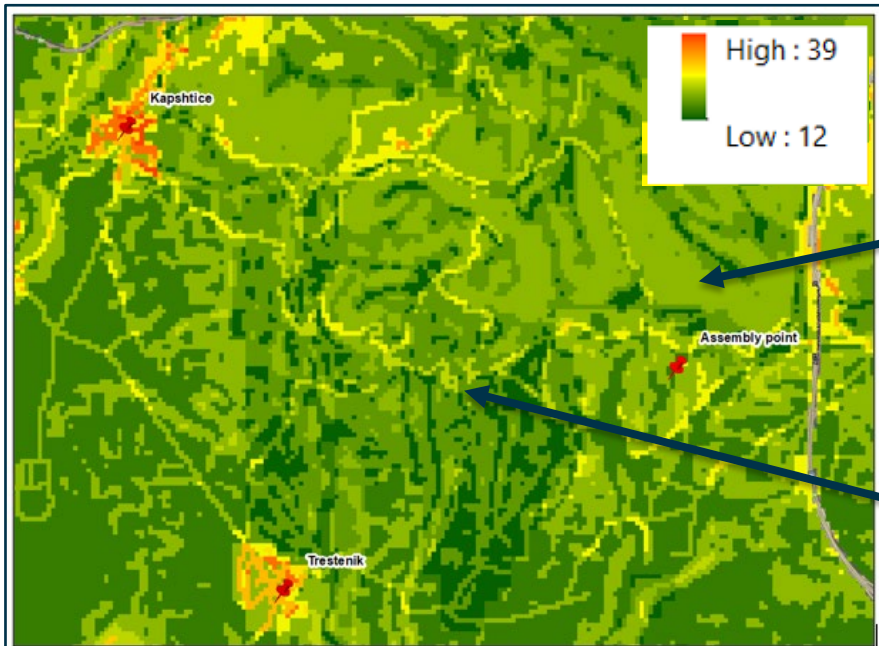- ➢ Use of a custom script in a GIS environment

High : 39

Low : 12

Mountainous areas have lower cost due to lower risk of being sighted

Roads have higher cost due to higher risk of being sighted

Detected from OSINT!

Figure 29: Cost surface for the Hide scenario (H) for OD pairs 1 and 2

Figure 30: Least Cost Paths for the Hide Scenario for OD pairs 1 and 2 (H)

Results – Satellite Image Analysis

- 4000 points of intense changes yielded

- Manual inspection with basemap

- Identification of those with interesting pattern

- Focusing on smaller Areas Of Interest

Conclusions
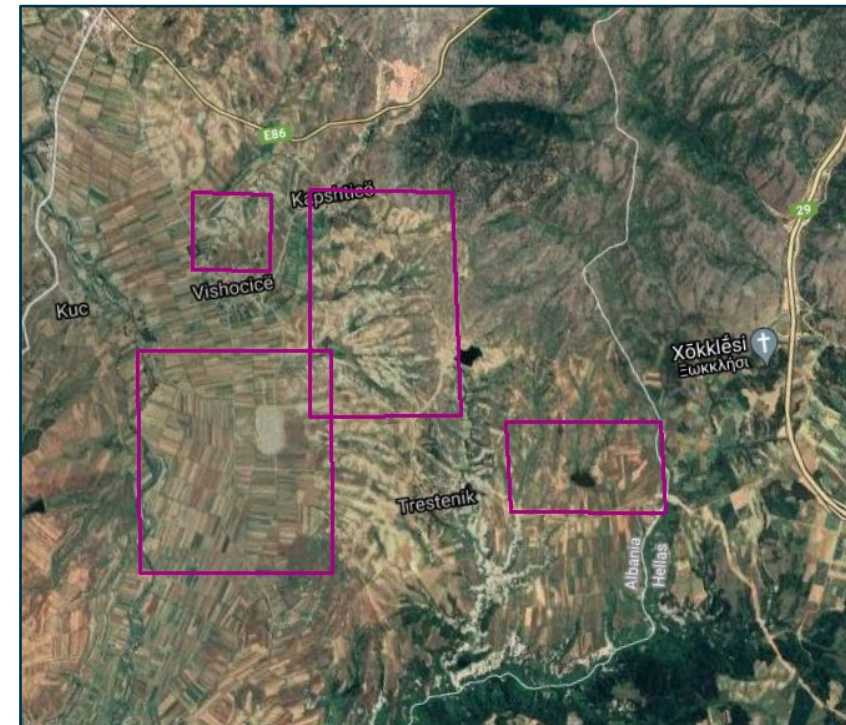
The services proved to be effective

Adjustable approach, non dependent on geographic location and time

Quick generation of outputs

Reduced extent of initial AOI and lower cost

Excellent feedback by the users

The services met user's requirements and expectations

Some solutions were integrated with user's operational workflows

Future Plans/Vision

Integration of AI and Deep learning algorithms for automatic object detection and identification

More verification exercises in various scenarios for further testing of the services

The services could be enriched with the addition of data and information gathered by other intelligence disciplines

Development of digital secure environment for handling sensitive data

Development of tools for checking and ordering VHR satellite imagery data

Implementation of a Service Authentication System based on Blockchain technology

Thank you!

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