

# e-geos

AN ASI / TELESPAZIO COMPANY

**BLENDING EO AND OSINT DATA TO ADDRESS  
FRAGILE AND CONFLICT-AFFECTED CONTEXTS**

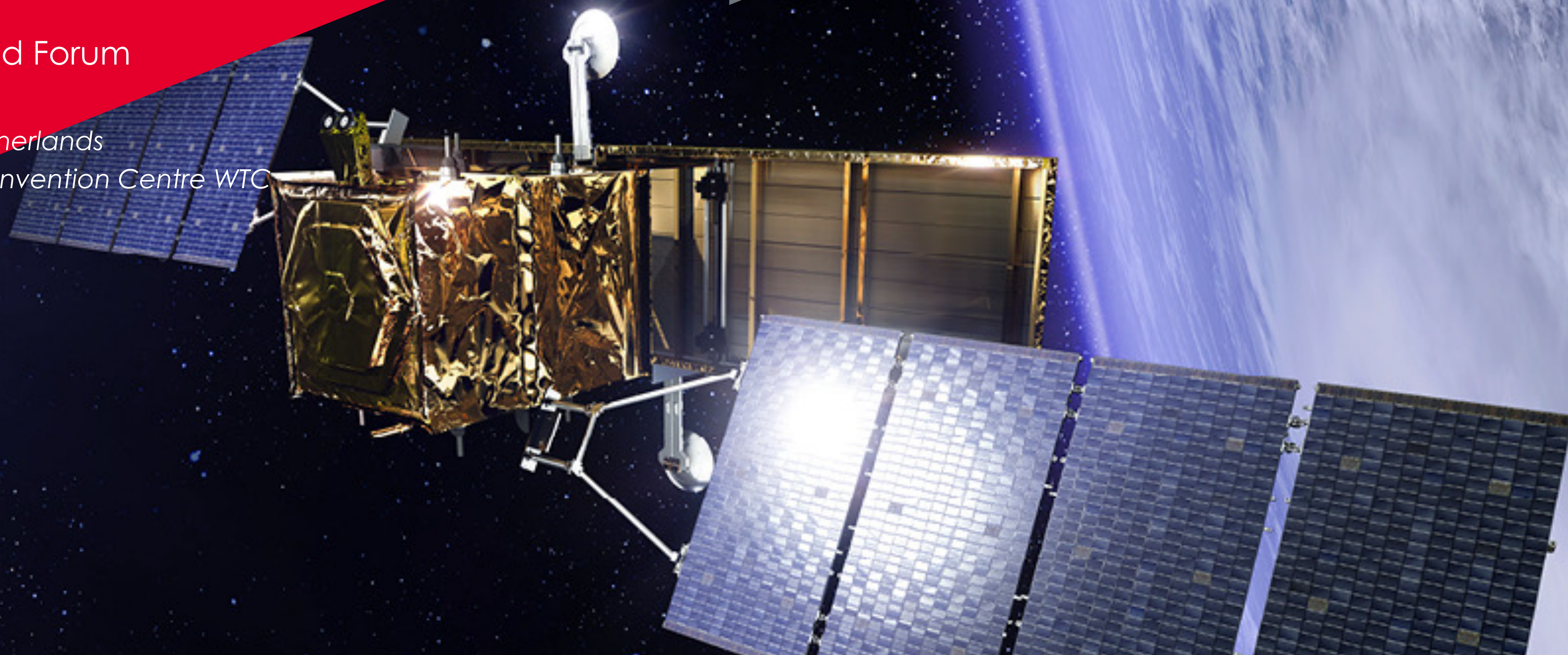


Geospatial World Forum

2-5 May 2023

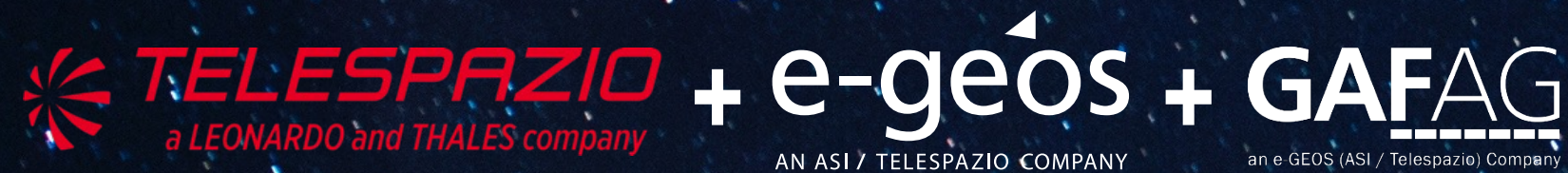
Rotterdam, The Netherlands

Postillion Hotel & Convention Centre WTC





## Geoinformation



**600+**

50% in Italy,  
50% ROW



**120M €** Revenues

## Partners e-GEOS



**IBF Servizi**

Precision Farming Jolanda di Savoia



**Consorzio Tern**

Local Services Basilicata



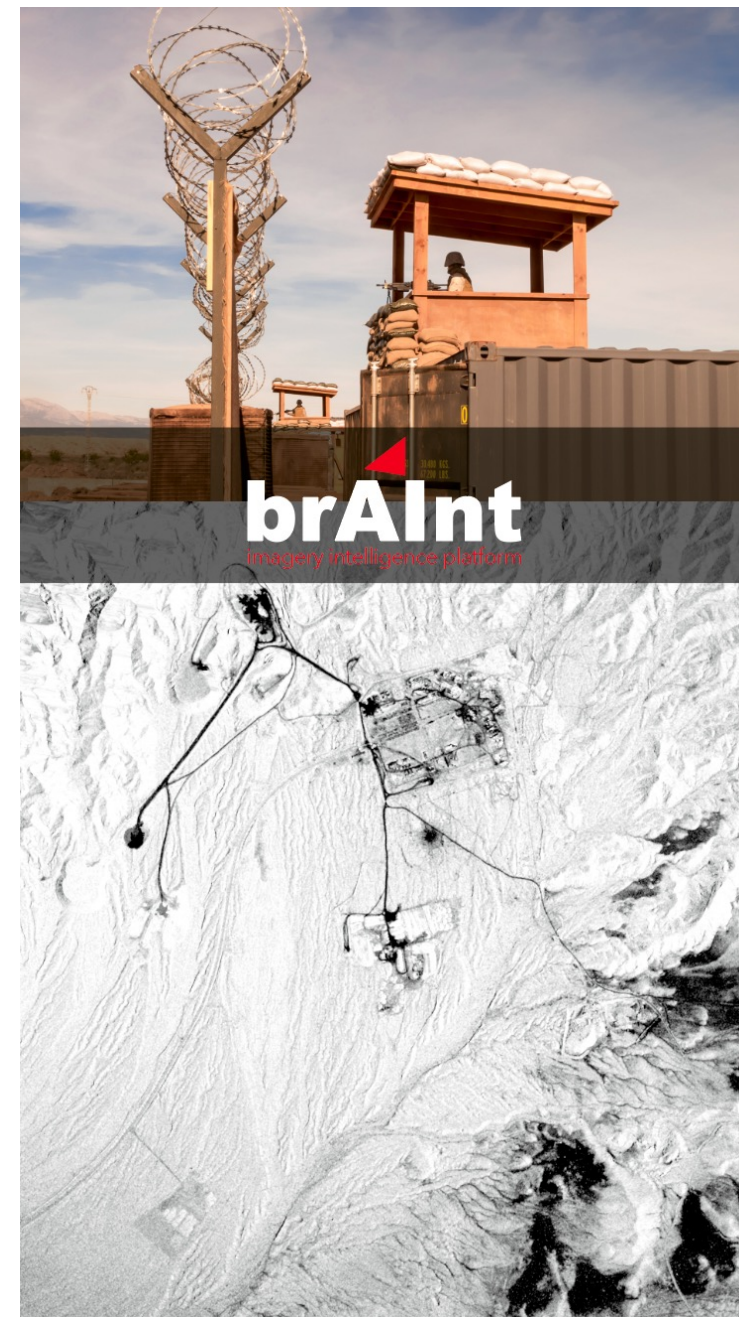
**EarthLAB**

Digital Systems & downstream - Luxembourg

# CLEOS and the Digital Solutions for Vertical Services



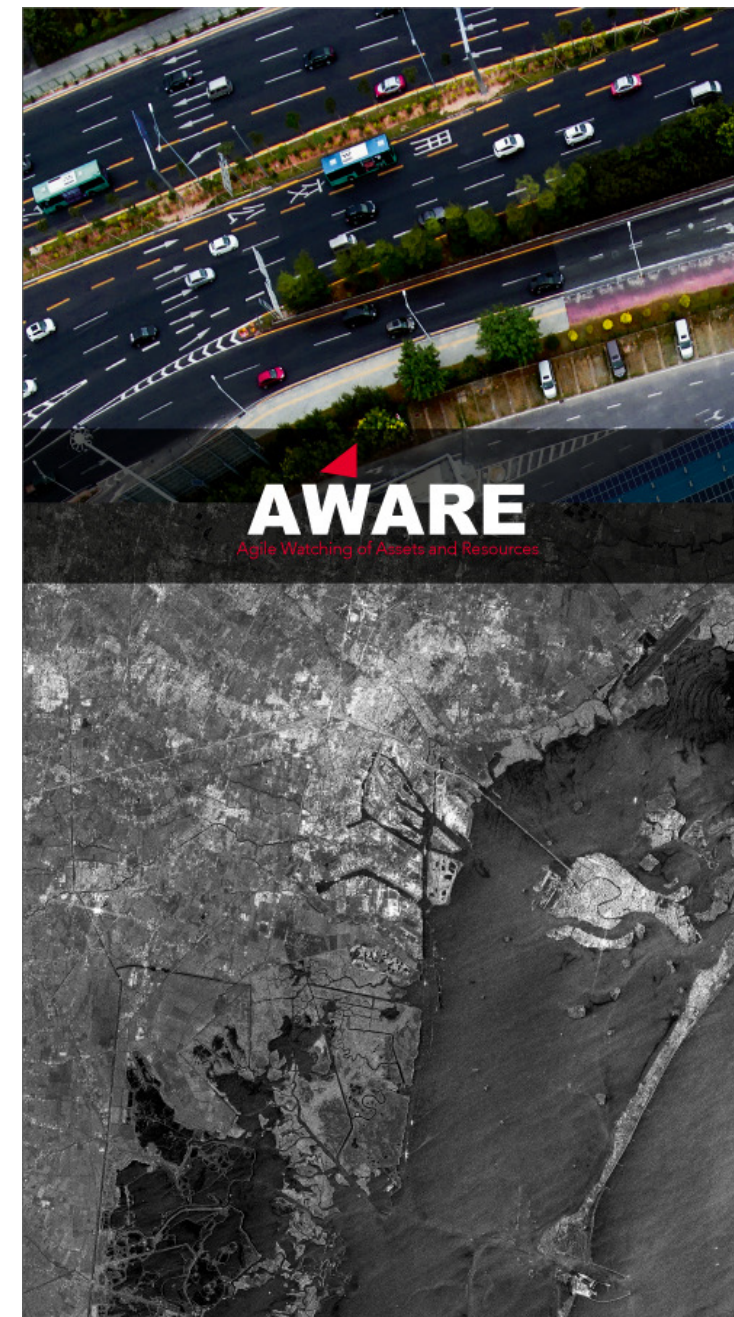
**MARITIME  
SURVEILLANCE**



**DEFENCE AND  
INTELLIGENCE**



**AGRICULTURE  
MANAGEMENT**



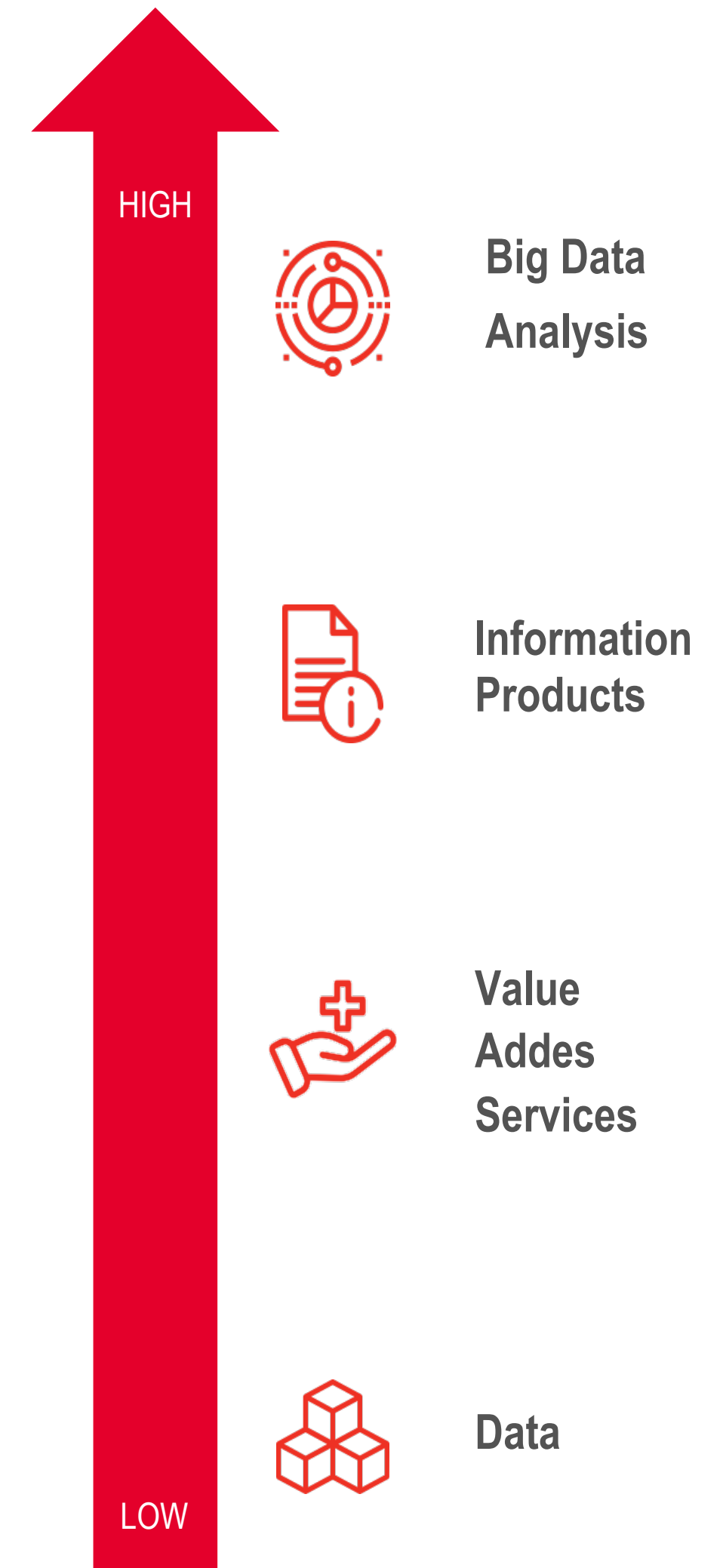
**ASSET  
MANAGEMENT**



**EMERGENCY  
MANAGEMENT**



The online marketplace to access geo information Analytics & Geoinformation Digital Service, driving the e-GEOS digital transformation process of its portfolio



# COSMO-SkyMed

e-GEOS is the exclusive commercial worldwide distributor of COSMO-SkyMed

TILL END OF  
**2026!**

We are **COSMO-SkyMed**  
constellation  
**exclusive commercial worldwide**  
distributor  
**COSMO SECOND GENERATION**  
& AI

## 4 COSMO-SkyMed + 2 COSMO Second Generation

Synthetic Aperture Satellites Radar

### 1500+

Stripmap per day

### 300+

Spotlight per day

### 1800

Scenes per day



Large area coverage  
at global scale



Left/Right  
Looking



Fastest  
Revisit Time



All weather  
Day/Night



# ESA – Global Development Assistance – Agile EO Information Development – Fragility, Conflict and Security



## 1. ESA-GDA – THE CONTEXT



ESA-GDA Mission is to accelerate impact through the power of satellite Earth Observation (EO) in international development assistance, focusing on Agile EO Information Development (GDA AID) applied to **11 thematic priority sectors**. GDA was brought to life by ESA Member States at the Space19+ Ministerial Council in November 2019 and **implemented in partnership with International Financial Institutions (IFIs) – World Bank and Asian Development Bank**.

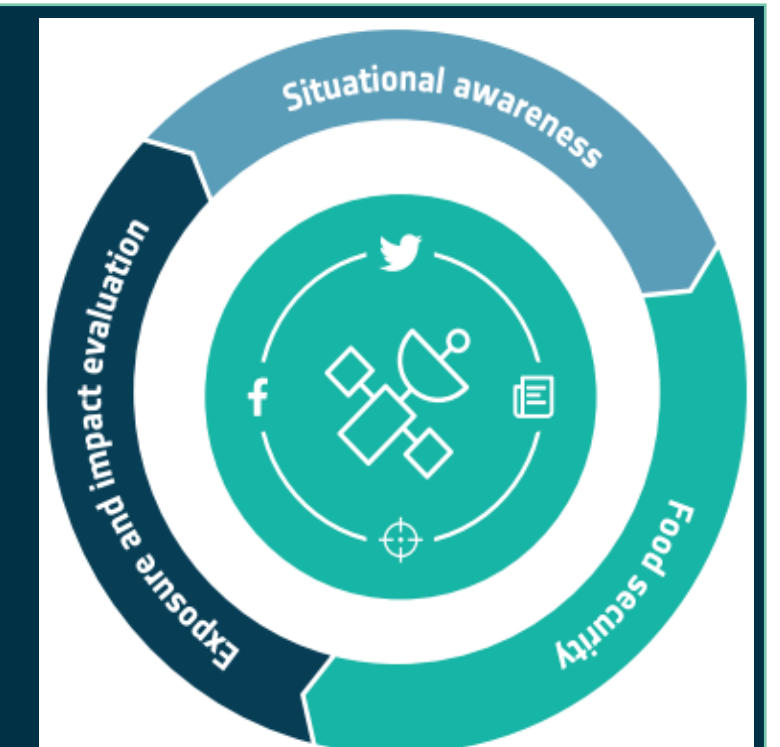
Recent regional-scale activities (since 2016) under the **Earth Observation for Sustainable Development (EO4SD)** facilitated the increase of development practitioners' acceptance of using EO for strategic approach, addressing the value chain of integrating EO.

## 2. FRAGILITY, CONFLICT AND SECURITY THEMATIC AREA - TOPICS ADDRESSED



Fragility, conflict, and security (FCS) is a critical development challenge that threatens efforts to extreme poverty, affecting low- and middle-income countries. The ESA-GDA-FCS programme engages with IFIs to co-design tools to support ongoing initiatives, fostering **situational awareness, exposure and impact evaluation, food security in countries affected by conflicts**.

Products are developed in a multidisciplinary approach, within 3 Cycle agile iterations: EO data are integrated with heterogeneous sources (OSINT), to improve decision making processes.



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## 3. TEAM, PILLARS AND APPROACH

Project launch: January 2022

Activities performed by a consortium of **six European companies led by e-GEOS (CGI, DLR, HENSOLDT Analytics, JANES, VITO)** leading in the fields of Earth Observation (EO), Remote Sensing, Open Source Intelligence (OSINT), Socio-Spatial Intelligence (SOSINT), and the integration of technology into international development contexts.

### Four project pillars:

- 1 Improved exposure assessment to fragility risks, analysis of coping capacity.
- 2 Effective characterization of dynamics and needs in FCS contexts.
- 3 Enhanced information services for planning, monitoring, management of post-conflict activities.
- 4 Better assessment of assets and natural resources.

### SATELLITE EARTH-OBSERVATION DATA



### OSINT/SOSINT






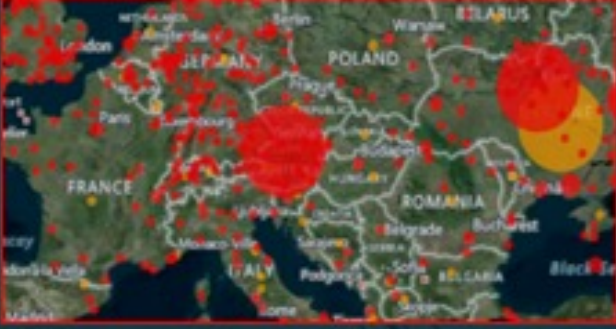
### SECURITY



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## 4. USE CASES IN SCOPE OF THE PROJECT

<p><b>UC1 - Security/ Assessment Briefings</b></p> 	<p><b>End User:</b> B. Murguet / F. OvandaMbele – World Bank  <b>WB Project:</b> P150999-Cameroon Transport Sector Development Project  <b>Main Objective:</b> EO/OSINT integrated analysis promptly warning on security risks (military movements, attacks, conflict zones) over streets under construction/maintenance in <b>Northern Cameroon</b>, preventing impacts on civilians.</p>
<p><b>UC2 - EO to Support Impact Evaluation</b></p> 	<p><b>End User:</b> B. Murguet / T. Bougna – World Bank  <b>WB Project:</b> P144852 - Impact Evaluation – Rural Access and Mobility P095003 - NG-Rural Access &amp; Mobility Project-Phase 2  <b>Main Objective:</b> indicators of impacts produced by roads rehabilitation in <b>Nigeria</b> through EO-based analysis, detecting anomalies affecting rehabilitated infrastructures.</p>
<p><b>UC3 - Smallscale infrastructures Monitoring</b></p> 	<p><b>End User:</b> M. Malik, B.N. Khan – World Bank  <b>WB Project:</b> P151075 - Pakistan Community Support Project - PCSP  <b>Main Objective:</b> monitoring ongoing activities of construction/rehabilitation of small scale-infrastructures in <b>Pakistan</b> through EO data, prioritizing activities and needs.</p>
<p><b>UC4 - Land and Conflict</b></p> 	<p><b>End User:</b> Paul Prettiore - World Bank  <b>WB Project:</b> P128950 - Assessing the Nexus of Land Administration and Resilience to Disaster and Climate Risk  <b>Main Objective:</b> integrating EO/OSINT data to identify land grabbing indicators due to the ongoing conflict in <b>Ukraine</b>, as it is producing expropriation, transactions, forced land abandonment phenomena.</p>

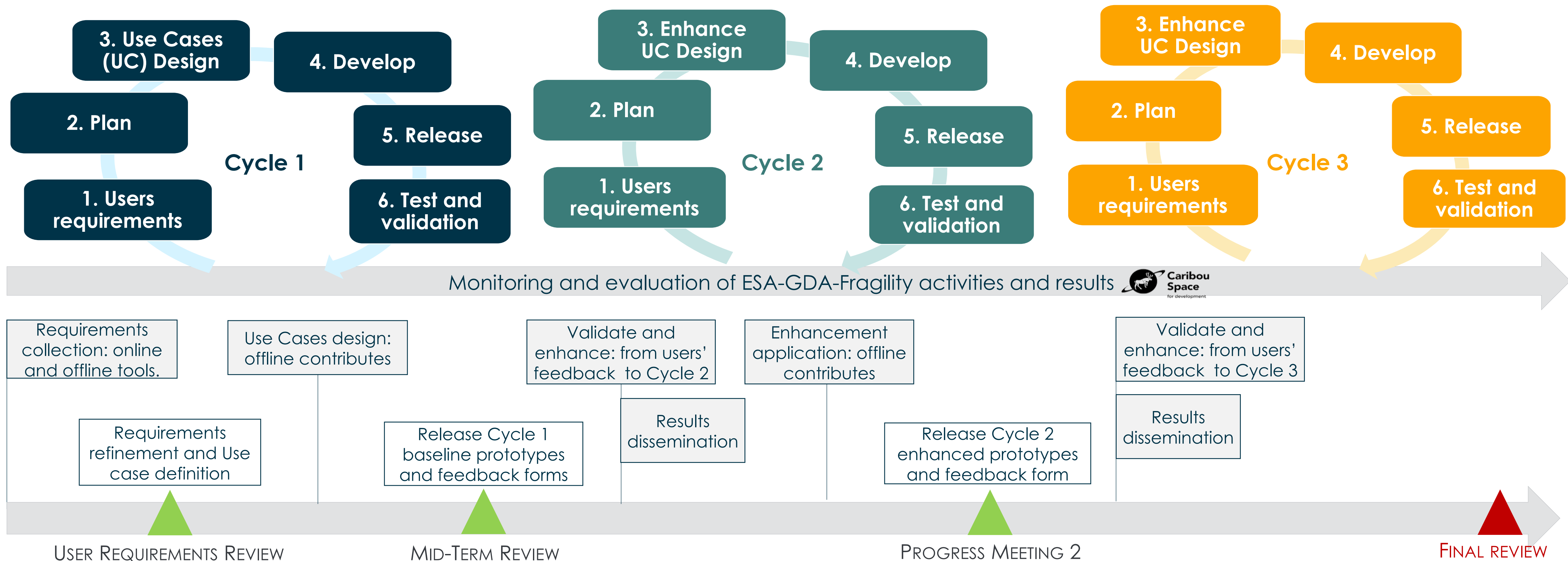
<p><b>UC5 - Effects of Displaced Population on local Economy</b></p> 	<p><b>End User:</b> Jeffrey Tanner - World Bank  <b>WB Project:</b> P172830 - The Cox's Bazar Analytical Program  <b>Main Objective:</b> integrating EO/OSINT/AI data model to monitor the impact on local economy/welfare growth from refugee camps in <b>Ukhia/Teknaf</b> districts (<b>Bangladesh</b>), to better addressing budget.</p>
<p><b>UC6 - IGAD through the Emergency Response Program</b></p> 	<p><b>End User:</b> Kenneth Mwangi - World Bank  <b>WB Project:</b> P174546 - Emergency Locust Response Project  <b>Main Objective:</b> Employing EO data to monitor desert locust flow through eastern African regions, enhancing IGAD's inter-regional platform, as locusts affect agriculture, producing food insecurity.</p>
<p><b>UC7 - Population Movement</b></p> 	<p><b>End User:</b> Valeria Fabbroni, E. De Benedetti – ADB  <b>ADB Project:</b> TA 9986 Regional: Enhancing Differentiated Approaches in Context-Sensitive Situations  <b>Main Objective:</b> monitoring migration flow from <b>North-Afghanistan/South-Tajikistan</b>, monthly basis, to consistently allocate Tajikistan financial resources, as migration flow over these areas is relevant and confirm evidence from AKDN.</p>
<p><b>UC8 - Enhanced Country Performance Assessment</b></p> 	<p><b>End User:</b> Valeria Fabbroni, E. De Benedetti – ADB  <b>ADB Project:</b> TA 9986 Regional: Enhancing Differentiated Approaches in Context-Sensitive Situations  <b>Main Objective:</b> estimating an enhanced CPA indicator of <b>12 FCAS/non-FCAS</b> countries (<b>Timor Leste, Pakistan, Tajikistan, Afghanistan, Kyrgyz Republic, Uzbekistan, Lao PDR, Papua New Guinea, Cambodia, Bhutan, Nepal</b>) through EO/OSINT-based country level indicators in AI model, to allocate adequate financial resources.</p>

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## 5. USERS ENGAGEMENT THROUGH AGILE ITERATIONS

In order to ensure a responsive, iterative and impact-driven implementation, an **agile development approach** is adopted under the GDA activities: **three 6-month sequential iteration cycles**, where users represent the key drivers for any implementation and success.





# ESA – Global Development Assistance – Agile EO information Development – Fragility, Conflict and Security



## 6. USE CASE 7 – POPULATION MOVEMENT

### 6.1 OBJECTIVE AND REQUIREMENTS

IFI & project

Asian Development Bank - TA 9986 Regional: Enhancing Differentiated Approaches in Context-Sensitive Situations

Objective

In the context of migration flow from North Afghanistan to South Tajikistan, UC7 aims at **assessing migration pressure along the borders and also on existing settlement**, as an added value for ADB to better drive investments supporting agriculture, migration, agencies etc. **ADB wants to develop capacity among the Tajik authority through a dedicated dashboard** as a means to support decision making processes.

Areas of interest

Afghanistan / Tajikistan.. Uzbekistan

Time window

Baseline: from 2014 to May 2021  
Monitoring: from May 2021 onward.  
Frequency: reporting twice a year (spring/autumn + events based)

Partners involved



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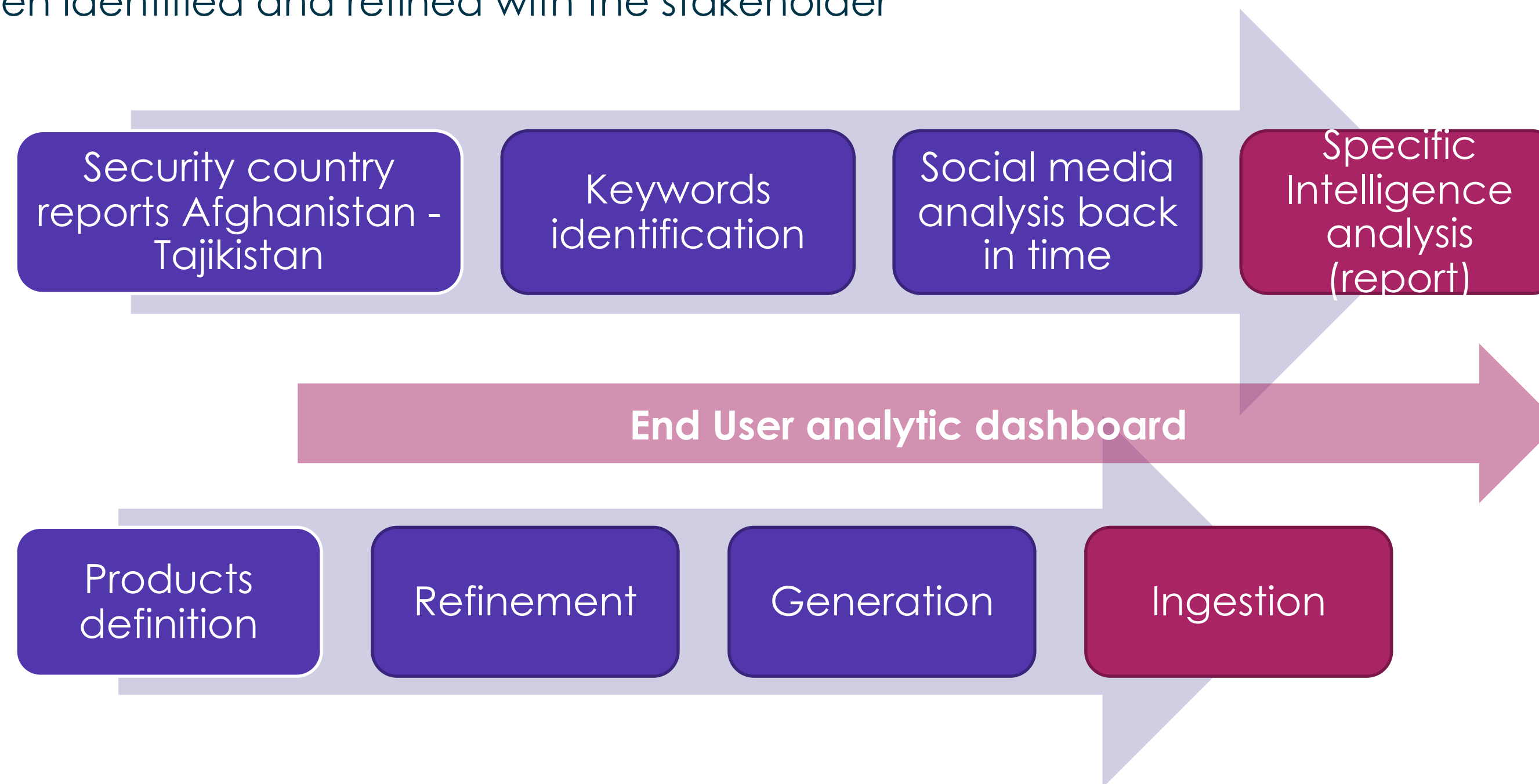
## 6. USE CASE 7 – POPULATION MOVEMENT

### 6.2 METHODOLOGY

The work logic is split into two different type of products:

1. OSINT/intelligence - based
2. EO data - based

Those products have been identified and refined with the stakeholder

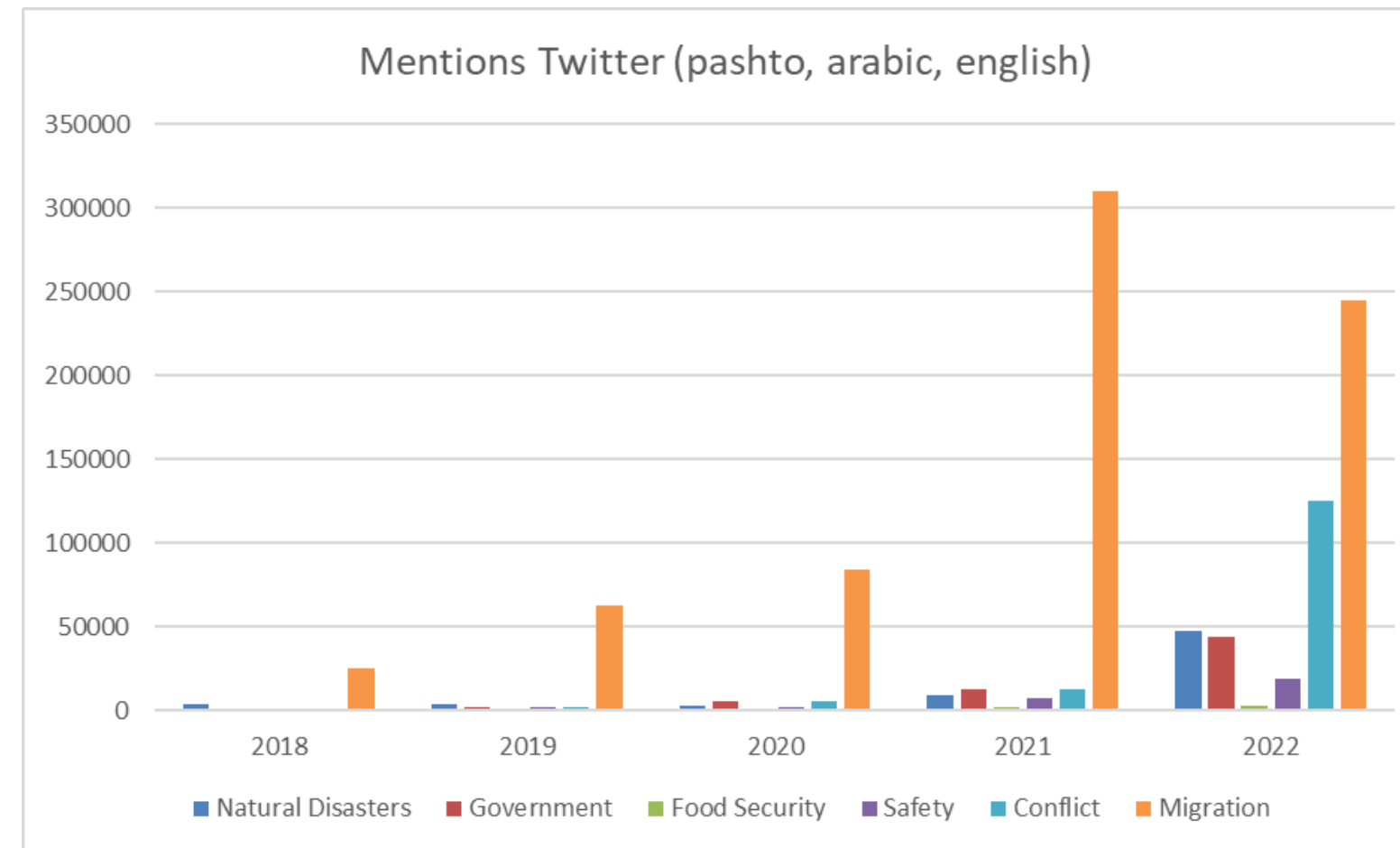
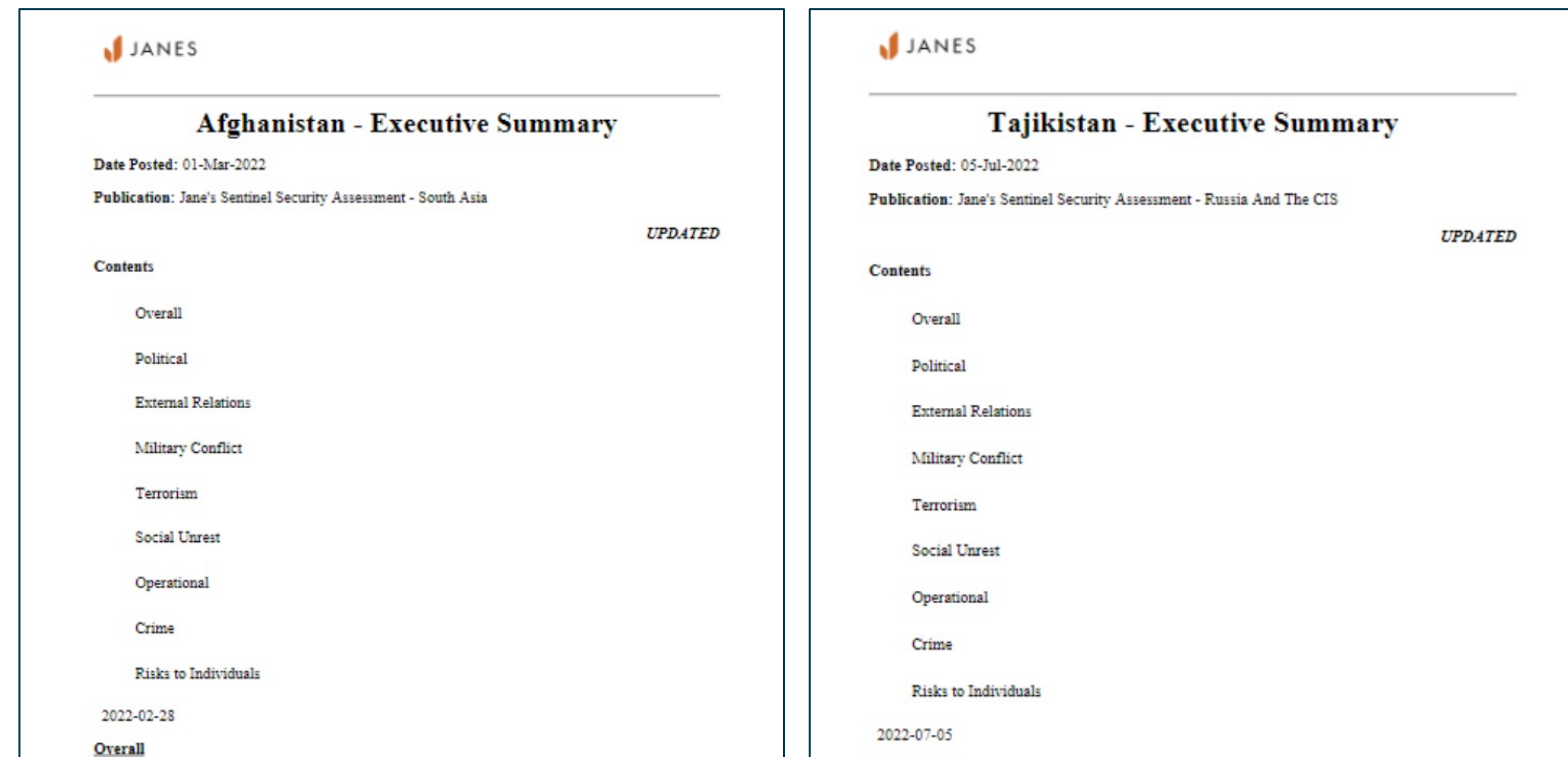


# ESA – Global Development Assistance – Agile EO information Development – Fragility, Conflict and Security



## 6. USE CASE 7 – POPULATION MOVEMENT

### 6.3 PRODUCTS EXAMPLE

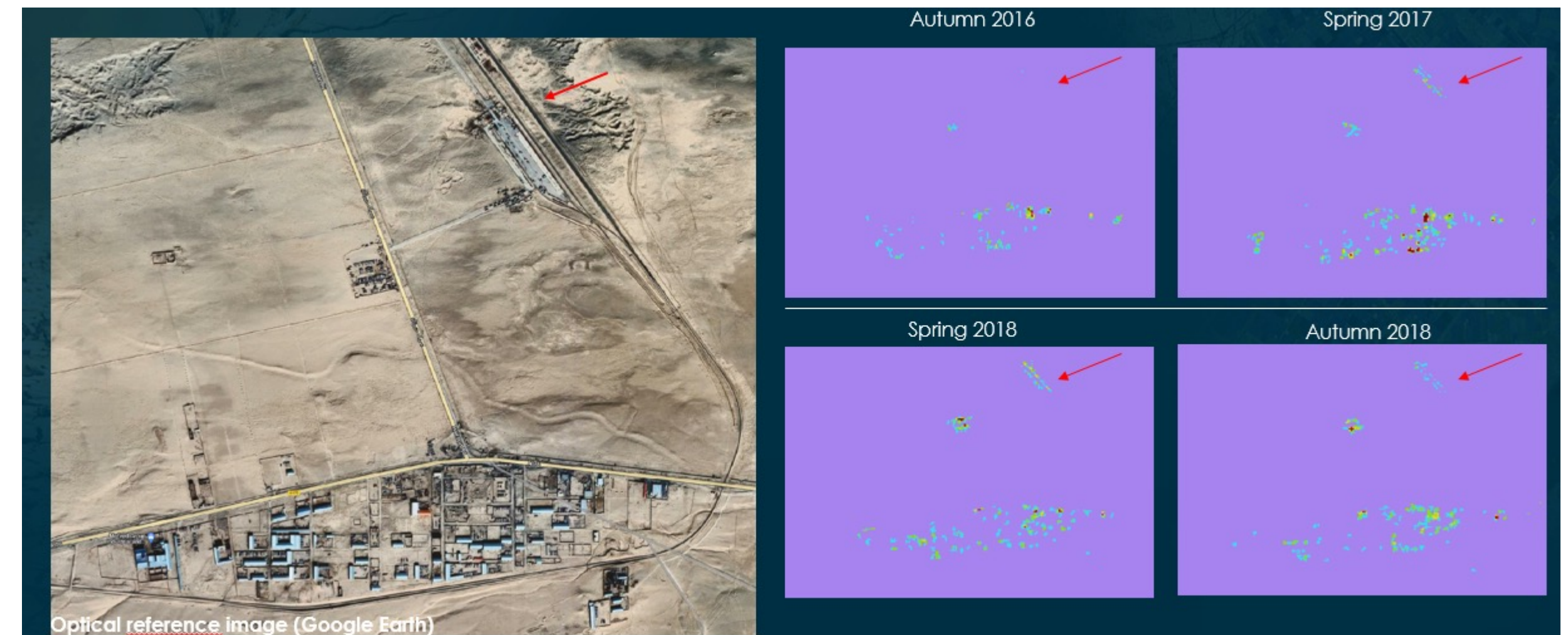


Reports and social media mentions analysis supported the identification of keywords, driving EO-based assessment through both HR and VHR data.



IDPs camps identification and monitoring through optical VHR EO data.

Checkpoint monitoring through Sentinel-1 based products.

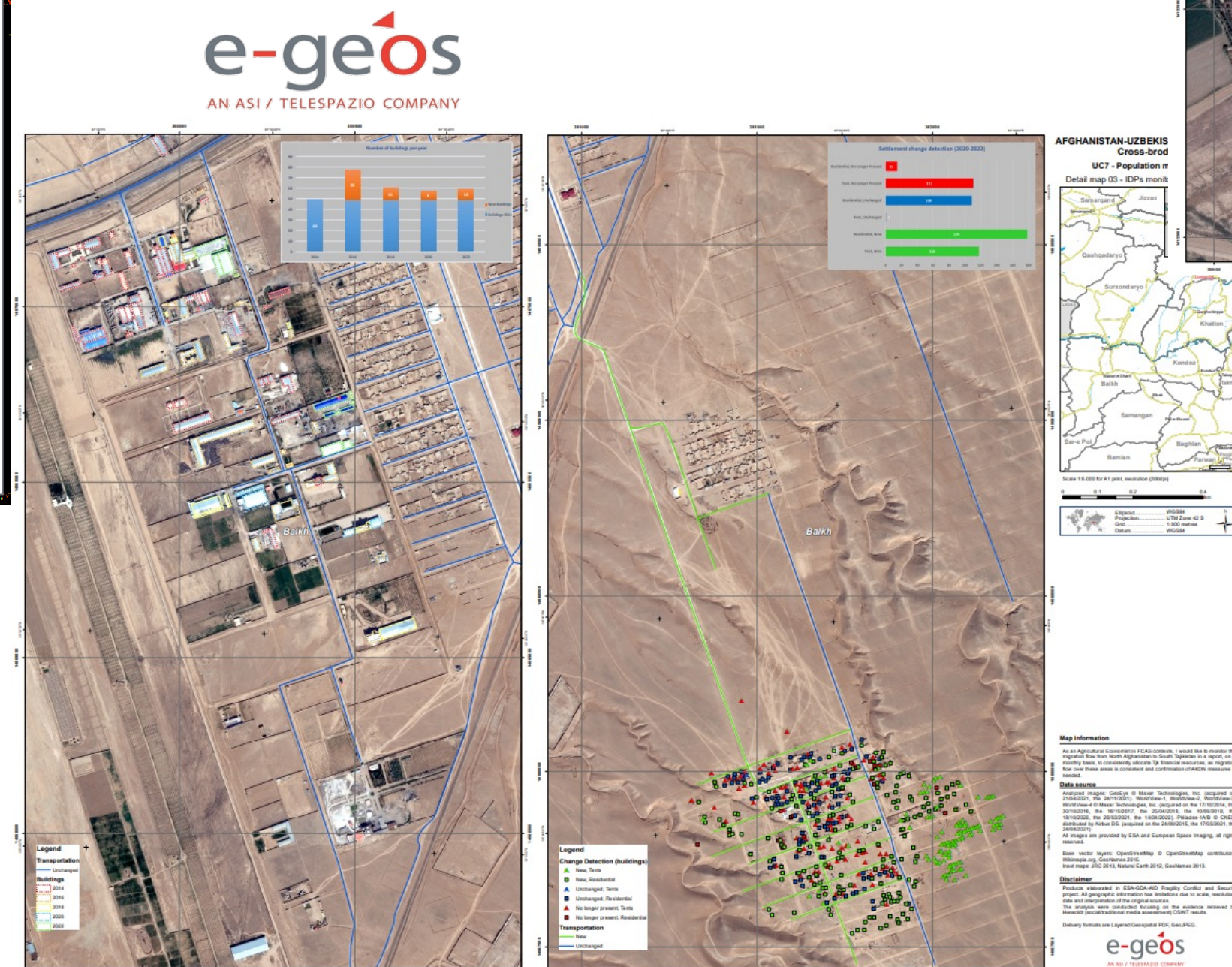


# ESA – Global Development Assistance – Agile EO information Development – Fragility, Conflict and Security

## 6. USE CASE 7 – POPULATION MOVEMENT

### 6.3 PRODUCTS EXAMPLE

Settlement extent changes over the border: the biggest change occurred in Termez (Uzbekistan). Along the border, changes are smaller and more scattered.



- Overview product (geolocation of OSINT events and relevant areas for EO-based analysis), 3 detailed products over temporary camps, checkpoints and urban areas with macro evidence of changes (optical VHR EO-based change detection).
- Statistics over assets involved in the area of interest

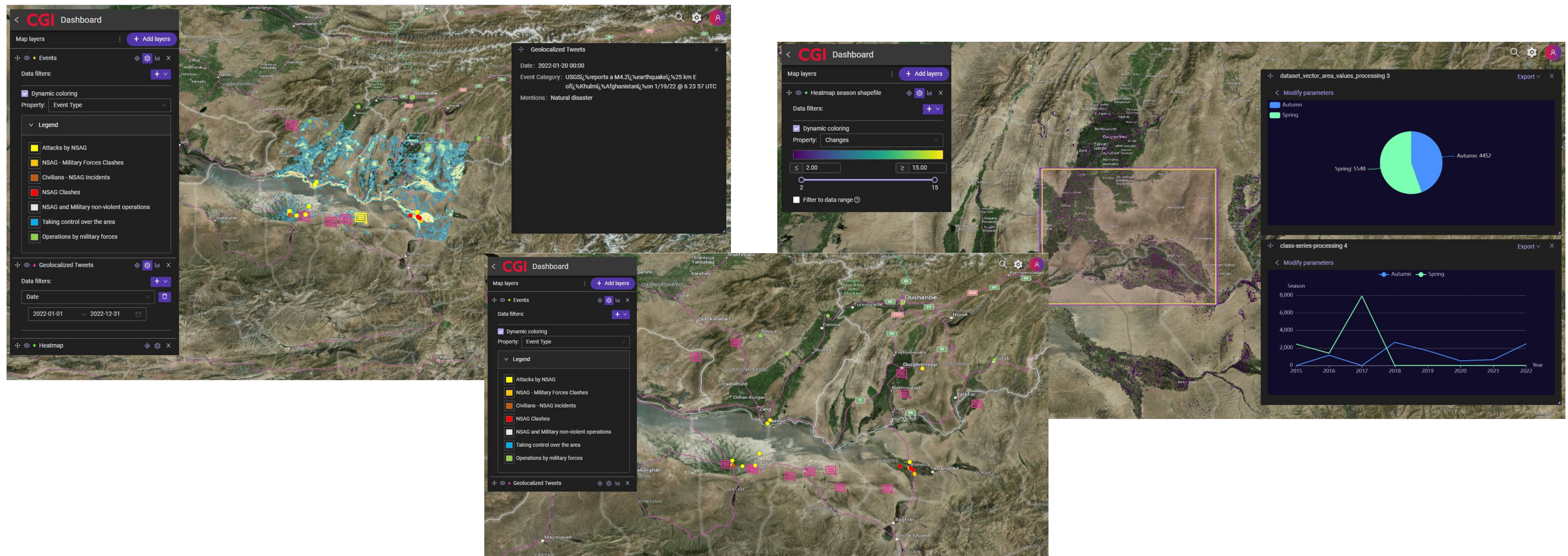
# ESA – Global Development Assistance – Agile EO information Development – Fragility, Conflict and Security



## 6. USE CASE 7 – POPULATION MOVEMENT

### 6.4 FINAL DASHBOARD VISUALIZATION

CGI is developing analytics functionality during the 3<sup>rd</sup> cycle to enable those data to be exploited by end user.



# ESA – Global Development Assistance – Agile EO information Development – Fragility, Conflict and Security



## 7. USE CASE 8 – COUNTRY PERFORMANCE ASSESSMENT

### 7.1 OBJECTIVE AND REQUIREMENTS

IFI & project

Asian Development Bank - TA 9986 Regional: Enhancing Differentiated Approaches in Context-Sensitive Situations

Objective

ADB estimates a biannual Country Performance Assessment (CPA) index at country level, for all the Asian Development Fund (ADF) eligible countries, assessing policy and institutional frameworks, coherence of structural policies, policies and institutions equity and inclusion, quality of governance, etc. CPA scores are from 0 to 6: countries with an avg. CPA of 3.2 or below are classified as Fragile Conflict-Affected Countries.

Areas of interest

First iteration: 9 countries (Timor-Leste, Afghanistan, Pakistan, Tajikistan, Uzbekistan, Kyrgyz Republic, Myanmar, PNG, Lao PDR)  
Second iteration: first 9 above and adding further 3 countries (Cambodia, Buthan, Nepal)

Time window

From 2020 – up today

Partners involved

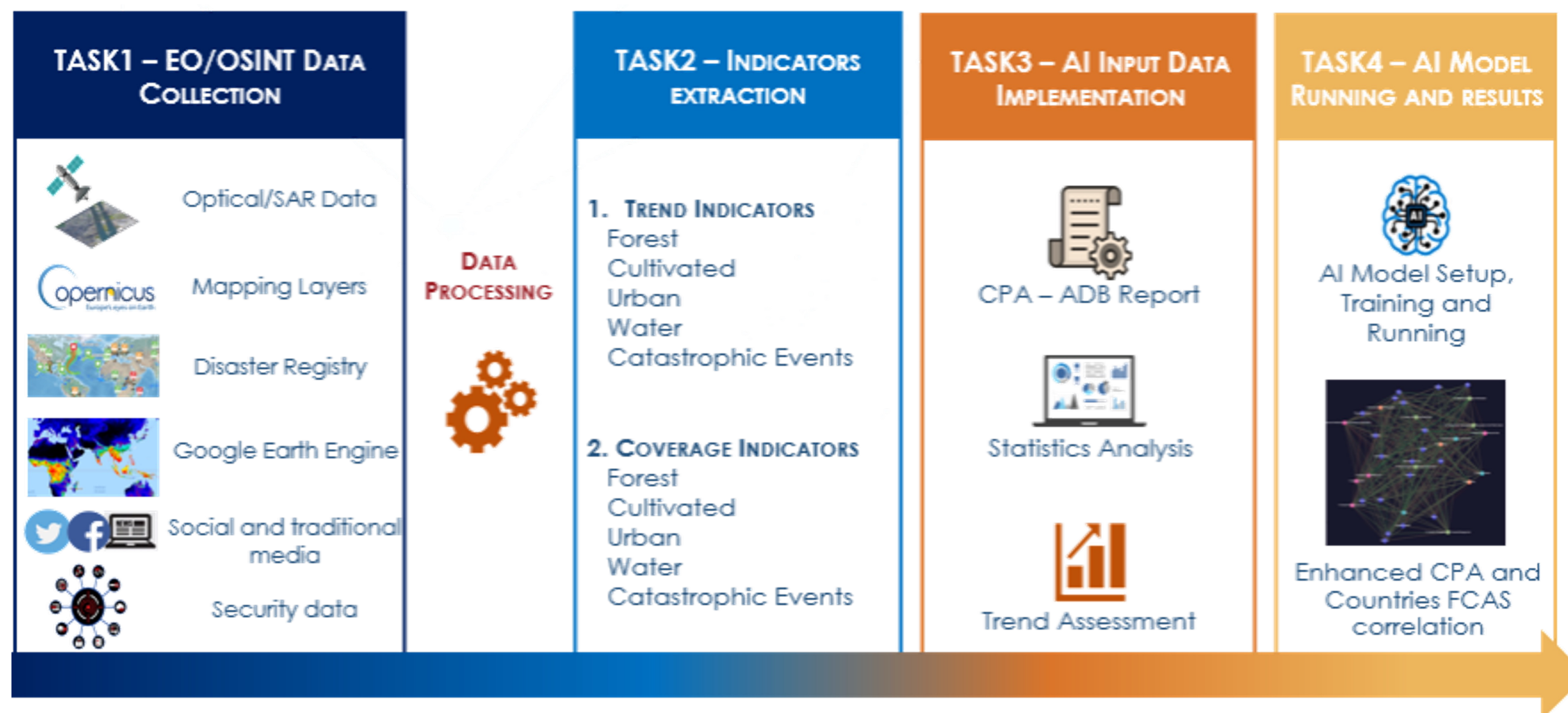


# ESA – Global Development Assistance – Agile EO information Development – Fragility, Conflict and Security

## 7. USE CASE 8 – COUNTRY PERFORMANCE ASSESSMENT

### 7.2 METHODOLOGY

As the **main constraint** refers to the **subjectivity of the CPA presently estimated**, on which the analysis of the expert economists are based, **UC8 aims at enhancing the CPA through EO/OSINT based indicators** (both in the security domain as well as social/traditional media covering non-subjective aspects and **developing an unsupervised Machine Learning (ML) model** that takes in input trends and statistics of new indicators, grouping countries that according to ML model are similar from in terms of CPA and new indicators.



# ESA – Global Development Assistance – Agile EO information Development – Fragility, Conflict and Security

## 7. USE CASE 8 – COUNTRY PERFORMANCE ASSESSMENT

### 7.3 INDICATORS IDENTIFIED AND WHERE WE ARE

Completed data collection and pre-processing (two iterations) for:

- a total of 107 indicators, EO and non EO, divided in 3 classes called economy, society and policy
- 12 countries
- 6 years (2017-2022)

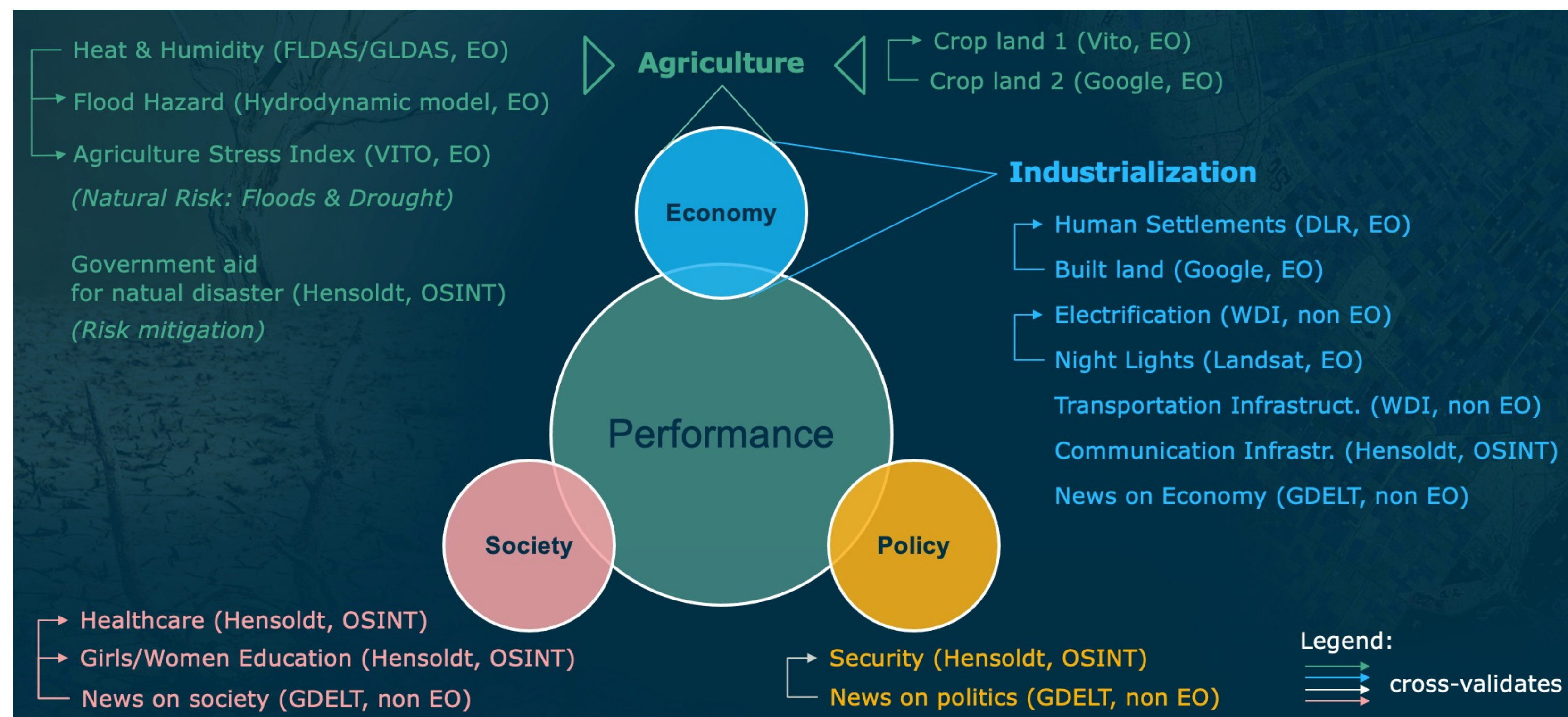
Completed data normalization

Completed data rescaling

Currently developing AI model for:

- country ranking
- country clustering
- visual assessment and comparison

Also in the process of preparing selected geographical data for ingestion in UC8 software tool.



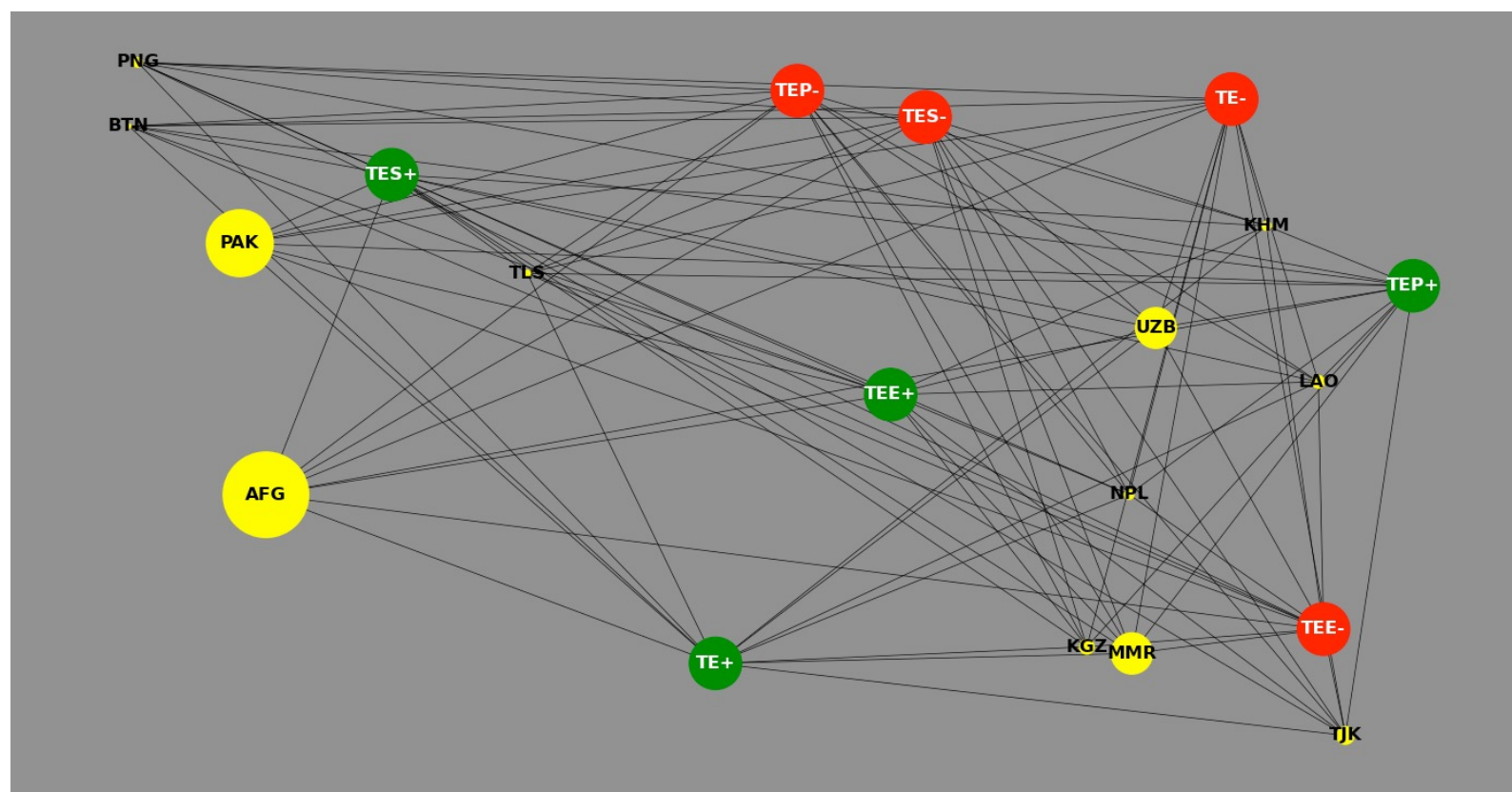
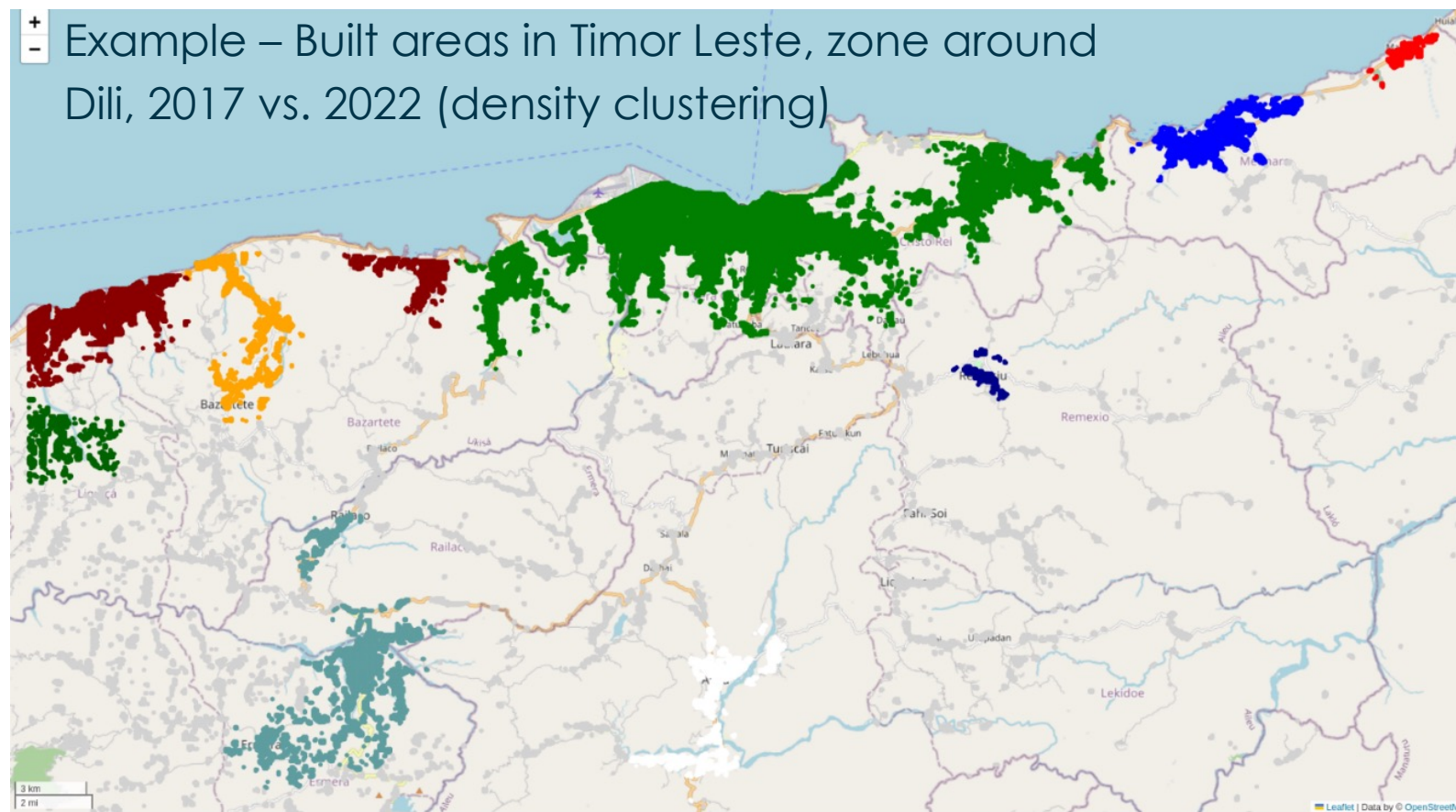


# ESA – Global Development Assistance – Agile EO information Development – Fragility, Conflict and Security

## 7. USE CASE 8 – COUNTRY PERFORMANCE ASSESSMENT

### 7.4 PRELIMINARY PRODUCTS AND REQUIREMENTS

#### 1 QUALITATIVE INSIGHTS



Example – Country Web reputation: positive and negative sentiment on Web news

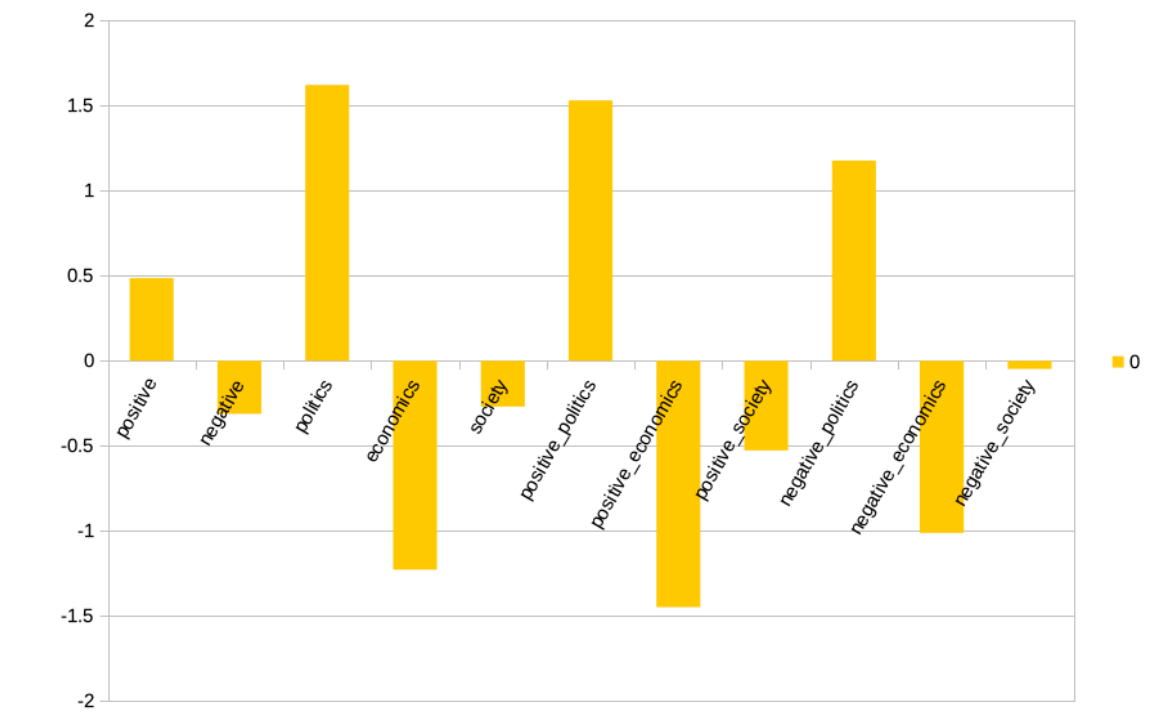
#### 2 SELECTION OF MOST RELEVANT INDICATORS

Example – Feature selection for EO indicators on heat&humidity (simulated annealing)

Rank	Number of features: 4	Number of features: 8	Number of features: 12
	Consistency: 55.7%	Consistency: 76%	Consistency: 85%
	List of features	List of features	List of features
1	FLDAS_Evap_tavg	FLDAS_Evap_tavg	FLDAS_Evap_tavg
2	FLDAS_Qair_f_tavg	FLDAS_Qair_f_tavg	FLDAS_Qair_f_tavg
3	FLDAS_Qle_tavg	FLDAS_Qle_tavg	FLDAS_Qle_tavg
4	GLDAS_Qair_f_inst	GLDAS_Qair_f_inst	GLDAS_Qair_f_inst
5		FLDAS_Lwnet_tavg	FLDAS_Lwnet_tavg
6		FLDAS_Qs_tavg	FLDAS_Qs_tavg
7		FLDAS_Rainf_f_tavg	FLDAS_Rainf_f_tavg
8		GLDAS_Qle_tavg	GLDAS_Qle_tavg
9			FLDAS_SoilMoi00_10cm_tavg
10			GLDAS_ECanop_tavg
11			GLDAS_Lwnet_tavg
12			GLDAS_SoilMoi0_10cm_inst

#### 3 MATURITY ASSESSMENT AND CLUSTERING

Example – Clustering with Web news, sample cluster with high volumes on policy with predominantly positive sentiment



#### 4 VISUAL REPRESENTATION

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## 7. CONCLUSIONS

### Conclusions and overall outcomes

The combined OSINT and EO-based techniques, also within artificial intelligence models revealed to be a high valuable approach to raise awareness, evaluate impacts and assessing countries performance in fragile and insecure contexts, at country level. Both OSINT and EO results have been delivered to the IFIs end-users of ESA-GDA-Fragility project (i.e. WB, ADB) in comprehensive reporting, dashboard for data analytics and visualization, other formats according to their request.

### Feedback from World Bank end-user

**Cycle 1:** highly satisfied, expectations fully met, ESA-GDA-Fragility, Conflict and Security proposed approach recommended by some users to be adopted in case further opportunities many come. Approaches developed are in most of the cases scalable and applicable to other contexts, with similar requirements available.

**Cycle 2:** highly satisfied, expectations fully met, results were useful.

### Next steps: addressing Cycle 3

ESA-GDA team is presently interacting with WB and ADB end-users to gather further drivers and better address cycle 3. Results dissemination by the end-users to other WB and ADB teams may be interested are ongoing for UC7 and UC8.

### Communication material

Overview video (under publication), brochure and introductory e-flyer have been realized and available on [gda.esa.int](http://gda.esa.int).

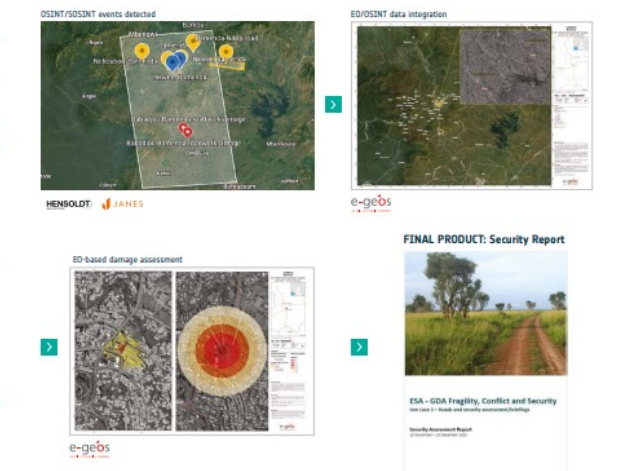


Use case examples

#### UC1 – Security/assessment briefings

WB project: P150999 - Cameroon Transport Sector Development Project

**Final product description:** operational reporting to track security events occurred along Bamenda road (Cameroon), that can affect civilians in the neighbourhood areas. Events as military attacks, militants clash, kidnappings are detected on the basis of intelligence and social media mining systems (OSINT/OSINT), from September 2022 up today, monthly basis. Focused damage assessment analysis are performed on the basis of optical VHR EO data, in buffer zones from the centre of the event. A comprehensive actual and retrospective overview of security threats are performed and provided in a security report for operational usage.



Explore GDA #AcceleratingImpact at [gda.esa.int](http://gda.esa.int)



#### ACTIVITY OVERVIEW

<b>IMPLEMENTING CONSORTIUM</b> e-GEOS (IT), James (UK), CGI (IT), VITO (BL), DLR (DE), Hensoldt Analytics (AT)	<b>INTERNATIONAL FINANCIAL INSTITUTIONS (IFI) PARTNERS</b> World Bank Group, Asian Development Bank, Intergovernmental Authority on Development
<b>LAUNCH OF THE ACTIVITY</b> January 2022	<b>MAIN THEMES ADDRESSED USING EO INFORMATION:</b>
<b>MAIN OBJECTIVE</b> ESA-Global Development Assistance (ESA-GDA) programme focuses on the targeted Agile EO Information Development (GDA-AID) applied to 11 thematic priority sectors. The Fragility, Conflict and Security programme engages with IFI partners to co-design tools in support of ongoing initiatives for reducing poverty, supporting the economic development and the environmental safety. A multidisciplinary approach is applied to developed products: geospatial data combined with heterogeneous sources to improve decision making processes.	<ul style="list-style-type: none"><li>Improve assessment of exposure to fragility risks, analysis of coping capacity.</li><li>Effective characterisation of dynamics and needs in FCS contexts.</li><li>Enhanced generation of information services for planning, monitoring and managing post-conflict reconstruction activities.</li><li>Better assessment of assets and natural resources.</li></ul>

Explore GDA #AcceleratingImpact at [gda.esa.int](http://gda.esa.int)  
For all enquiries about the GDA programme, please contact us via [gda@esa.int](mailto:gda@esa.int)

# e-geos

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e-GEOS S.p.A – L.O. Contrada Terlecchie snc – Matera / HQ Via Tiburtina, 965 – Roma

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