



**A Premium Geospatial Industry Conference**

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e-geos

AN ASI / TELESPAZIO COMPANY

# t-Dromes - Geoinformation Integrated solutions for Land Management

Pier Francesco Cardillo







# LoB Geoinformation



## Geoinformation



600+

50% in Italy,  
50% ROW



120M € Revenue

## Partners e-GEOS



**IBF Servizi**  
Precision Farming Jolanda di Savoia



**Consorzio Tern**  
Local Services Basilicata



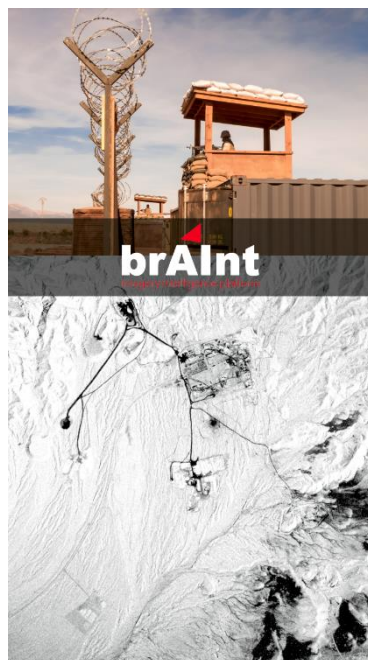
**EarthLAB**  
Digital Systems & downstream - Luxembourg



# CLEOS and the Digital Solutions for Vertical Services



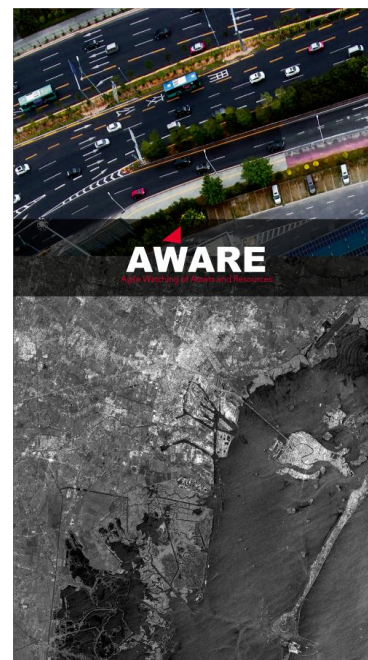
**MARITIME SURVEILLANCE**



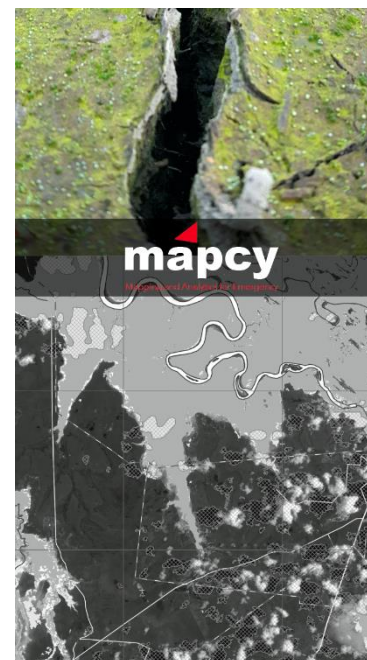
**DEFENCE AND INTELLIGENCE**



**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



**Big Data Analysis**



**Information Products**

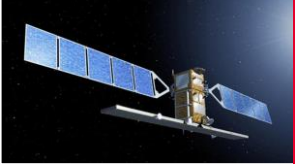


**Value Adds Services**



**Data**

# MULTISOURCE- MULTITEMPORAL- MULTISCALE



**SATELLITE**



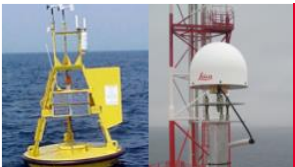
**AERIAL SURVEY**



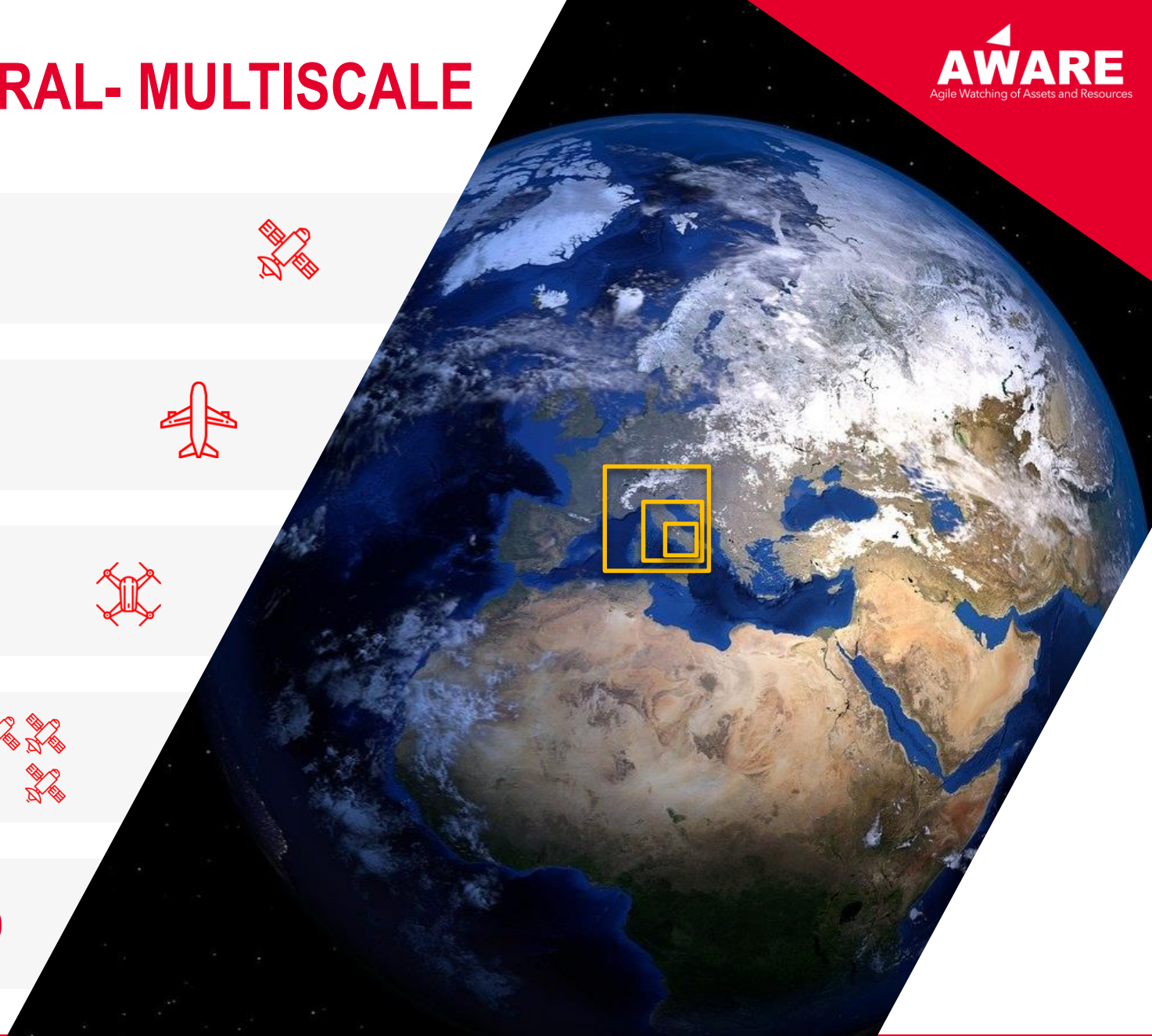
**DRONE**



**POSITIONING/GNSS**

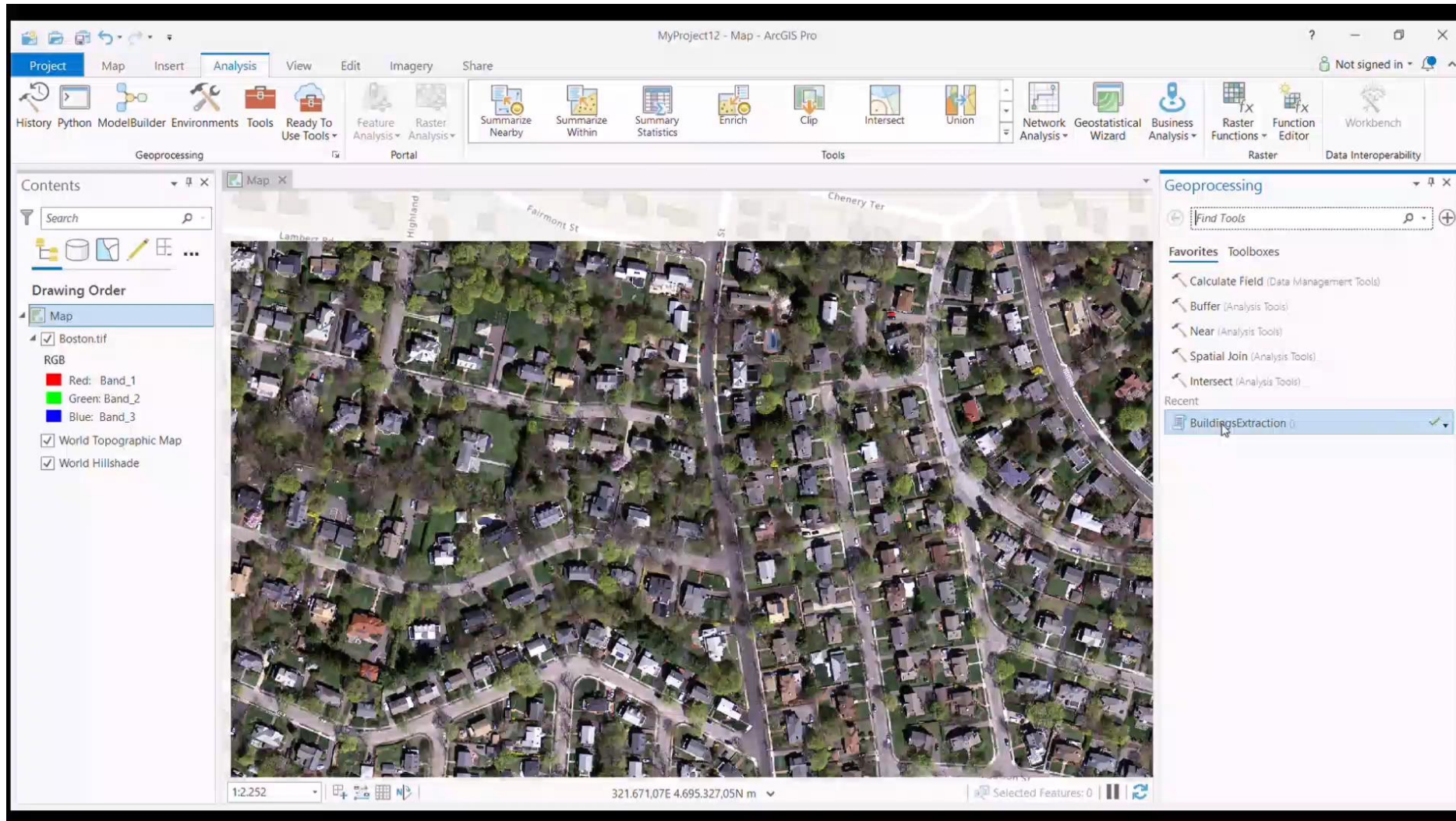


**IN SITU SENSORS**





# Developer portal in action



# FOR A GLOBAL KNOWLEDGE AND MANAGEMENT OF YOUR ASSETS.



## DEFORMATION ANALYSIS

Identifying deformation and landslides in an early stage is crucial to plan maintenance, inspections and prevent major events. PSP-IFSAR proprietary algorithm enables high quality, millimeter precision, high density InSAR analysis (historical and monitoring) for slow deformations. A continuous monitoring can be also set up through GNSS-based services for critical situations or critical assets.



## CHANGE DETECTION AND ENCROACHMENT ANALYSIS

Keeping track of the surroundings of an infrastructure can be vital to guarantee safe operations. AWARE provides multi temporal analysis based on optical/radar satellite, aerial and drones data to identify changes in the territory: vegetation along railways or toxic dumps close to aqueducts are just a couple of AWARE basic services.



## ADVANCED MAPPING

Through the AWARE platform it is possible to access the advanced mapping services responding to specific requirements characterization of the territory for planning new infrastructures: estimated population impact analysis, transport infrastructure inventory, flooding risk maps, Land Cover Change Map supporting the Sustainable management of natural resources, etc.



## 3D MODELLING

AWARE provides high resolution 3D models based on satellite, aerial and RPAS with different accuracy level from DSM to realistic models, according to the application case. 3D modelling linked to other analysis can give a complete knowledge of an asset and its health. Moreover 3D models can be used for Urban Planning, flight simulations and flooding events analysis.



# What does «land management» means

According to [UNECE](#), land administration systems should ideally:

- Guarantee ownership and secure tenure
- Support the land and property tax system
- Constitute security for credit systems
- Develop and monitor land markets
- Protect State lands
- Reduce land disputes
- Facilitate land reform
- Improve urban planning and infrastructure development
- Support land management based on consideration for the environment
- Produce statistical data



<https://www.fao.org/>

e-geos

AN ASI / TELESPAZIO COMPANY

...ZIO  
...O CAMPIONI  
... DA ANALIZZARE  
**ATTIVATO**

CONTROLLATO  
TELECOMUNICAZIONI  
IN CORSO



TEMPERATURE ESTERNA: **19°**  
VELOCITÀ MEDIA: **100km/h**  
ALTITUDINE: **35m**  
DIR: **S/E**

SANTA MARINELLA - PALIDORO

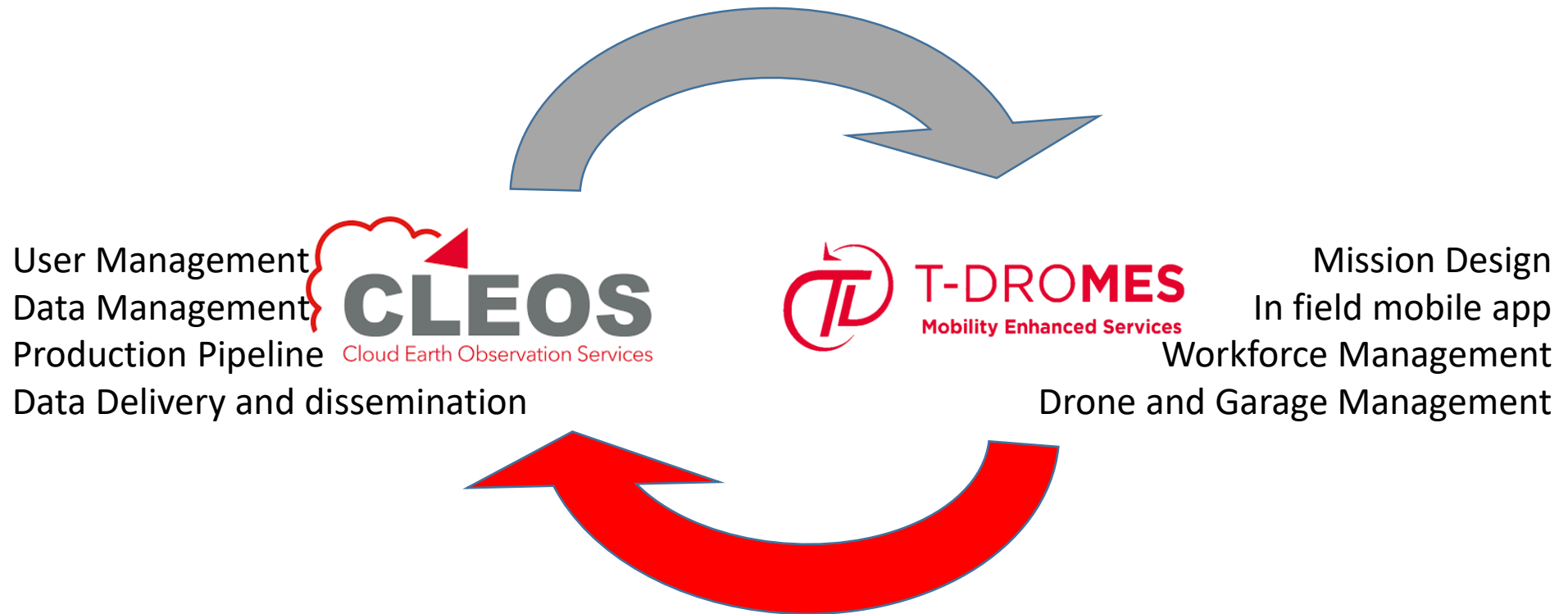




- T-DROMES is Telespazio's solution of the "Drone as a Service" (DaaS) business model which covers, through an integrated approach, the design, planning, management and execution of UAS (Unmanned Aircraft Systems) missions including:
- is a digital platform that supports all phases of the drone applications Value chain including: management of the Drone Operator and its pilots, overall mission design, authorization support, mission planning and data acquisition and management, generation of product info and access to end user data.
- A set of procedures and services, implemented in the back-end, to manage the overall workflow related to the drone mission, starting from user requests up to the exploitation of data.
- A set of SW Tools and HW payloads to interface end-user drones and external drone operators with T-DROMES.



# CLEOS and T-DROMES are working together

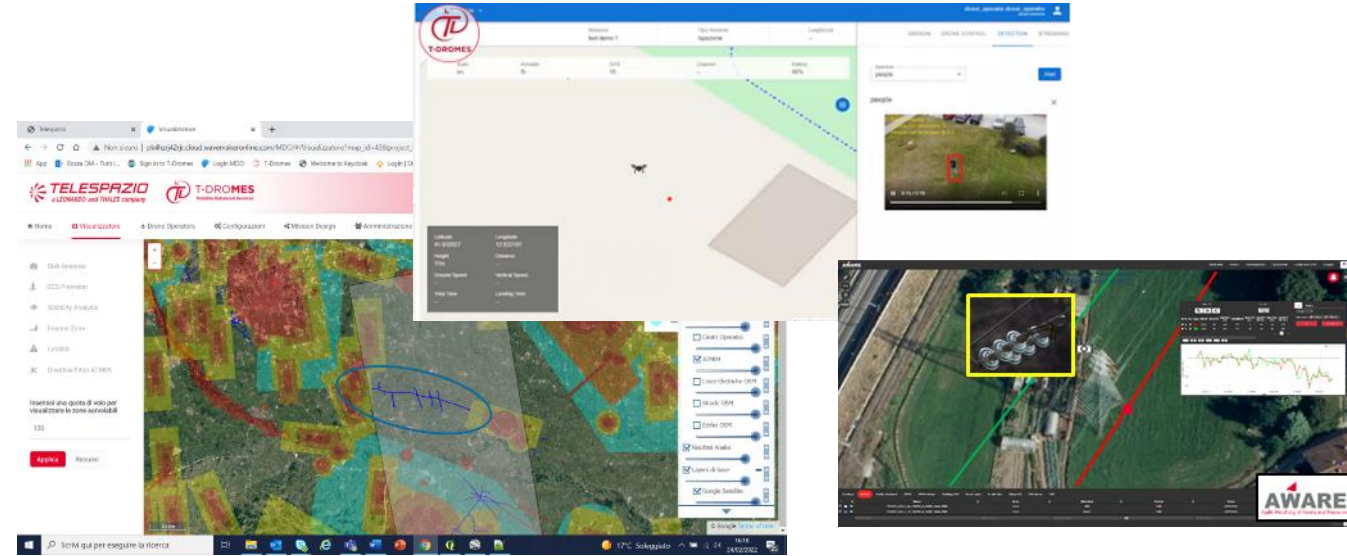






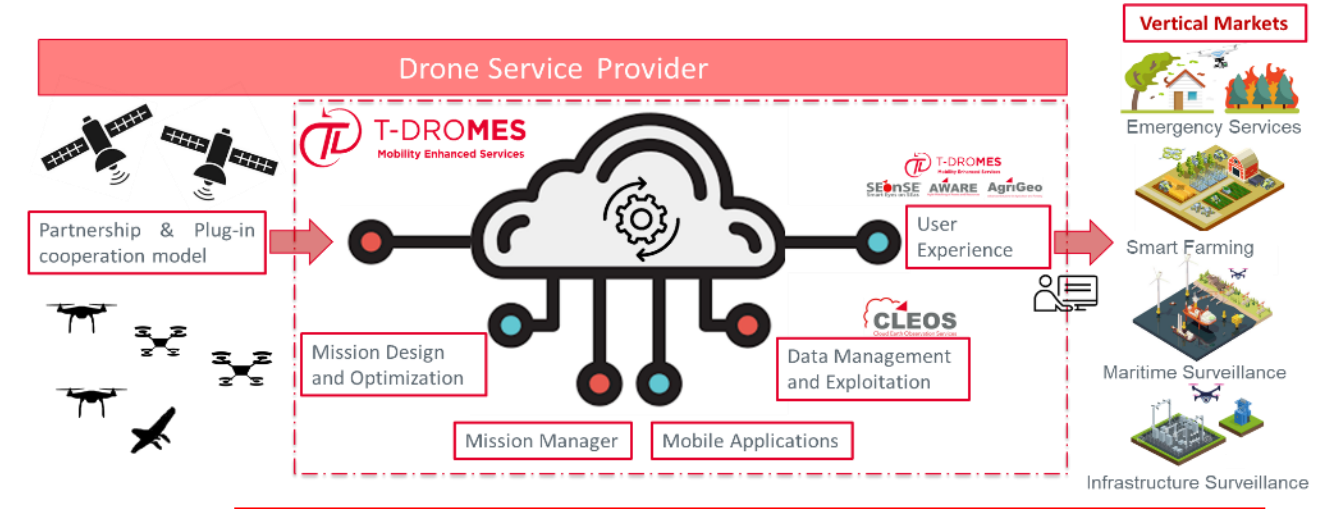
## T-DROMES®- Telespazio Solution

T-DROMES is the **end-to-end solution** for fleet management of RPAS (*Remotely Piloted Aerial Systems*), for mission management and *data exploitation* allowing to scale up on complex scenarios the operational use of drones for several vertical business cases



### T-DROMES includes:

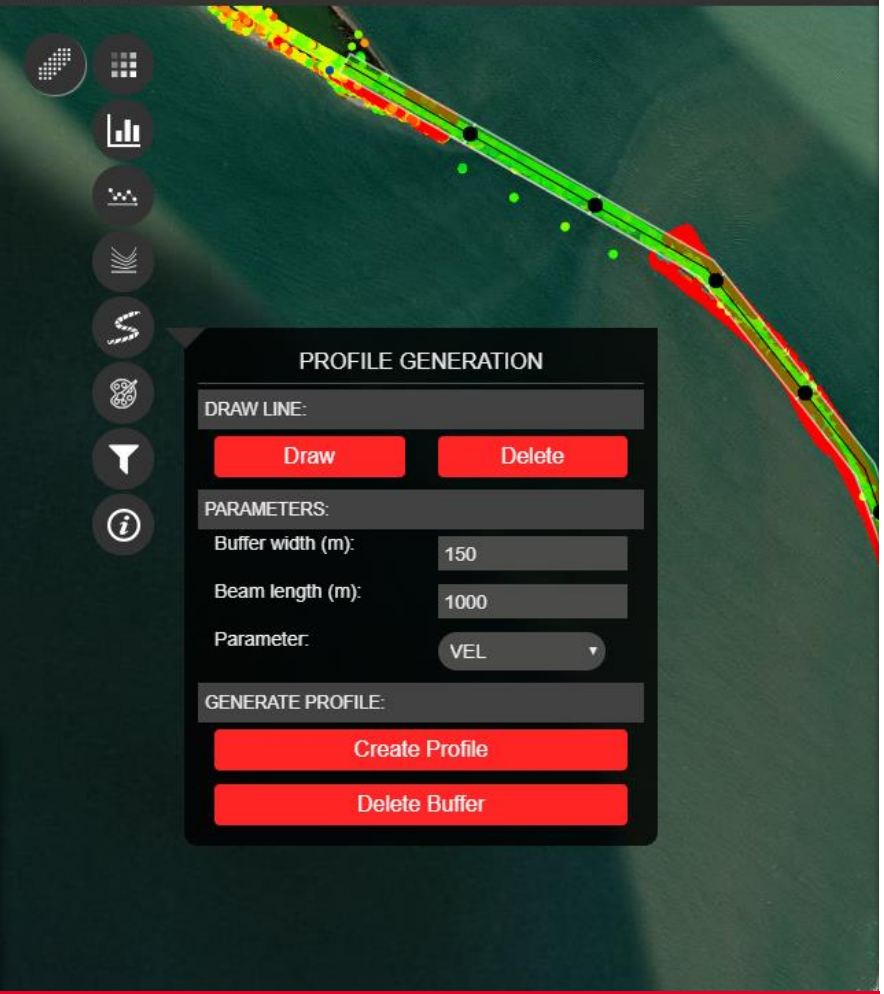
- A **digital platform** supporting all the phases of the value chain related to GI drone missions: authorization support; overall mission design; drone operator federation and/or UAS integration; mission planning and management; data acquisition and processing
- A set of back-end **procedures** to manage the workflow
- **SW and HW tools** to federate and interface drones with T-DROMES, both belonging to the end-user and belonging to external drone operators, also for BVLOS flights
- **A drone operator network**, already federated for DaaS business model (EU coverage) and some COTS and manufactured UAS (including hangar based solutions) for on-premises version



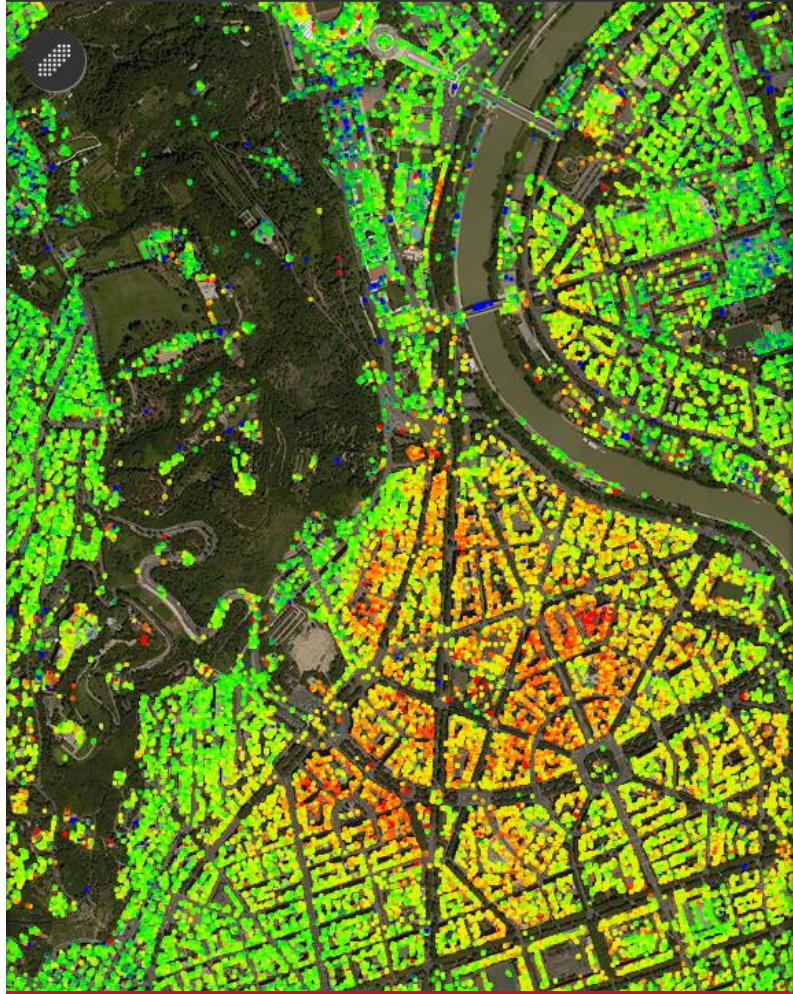
### Business Models

- **DaaS (Drone as a Service)**: User accesses to the solution that manages the overall workflow from request up to delivery of info-product
- **On Premises**: User integrates the Digital Platform within its assets and manages the workflow
- In both the cases used drones can be owned by the Customer and/or external ones.

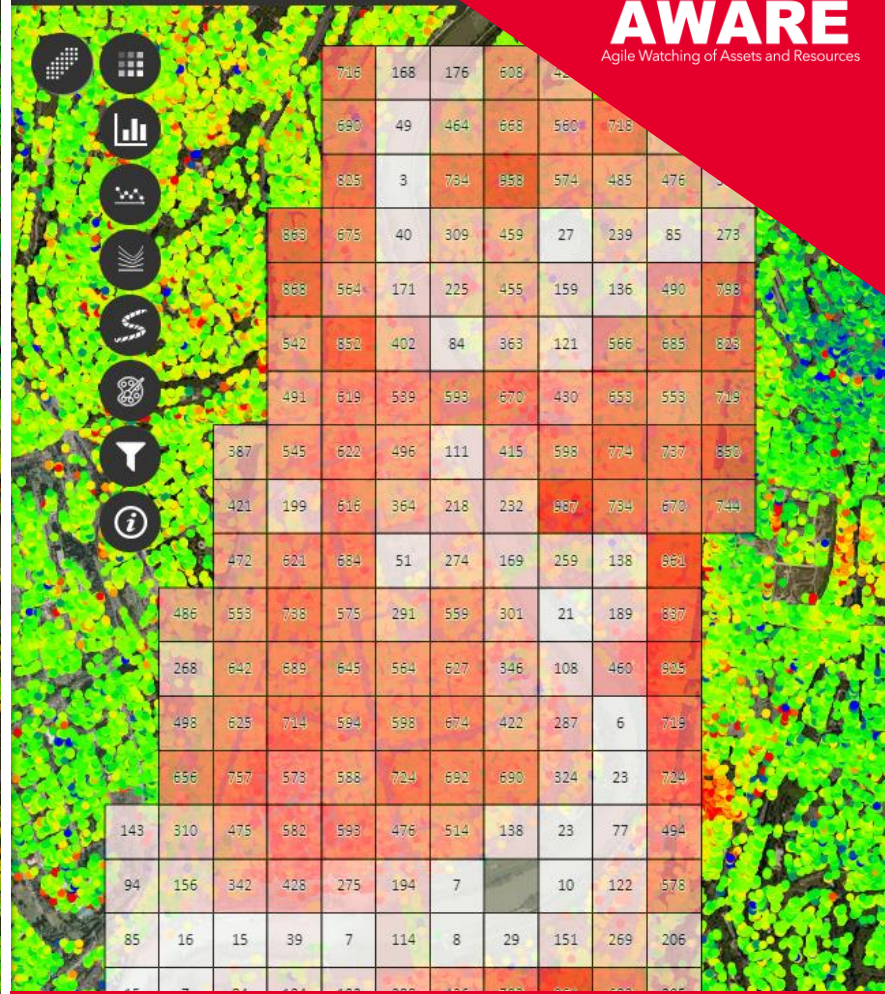




 **ADVANCED CLOUD WEB PLATFORM**



 **BIG DATA MANAGEMENT**



 **DATA ANALYTICS, REPORTS & TOOLS**





# INSAR

Deformation Analysis



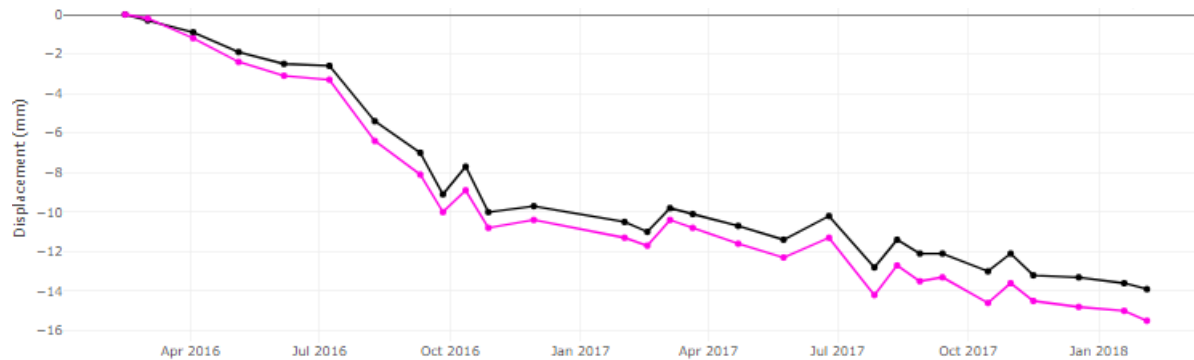
# INSAR: SAR SATELLITE INTERFEROMETRY

Slow deformation monitoring of assets, infrastructures, subsidences, landslides with PS Persistent Scatterer Interferometry providing:

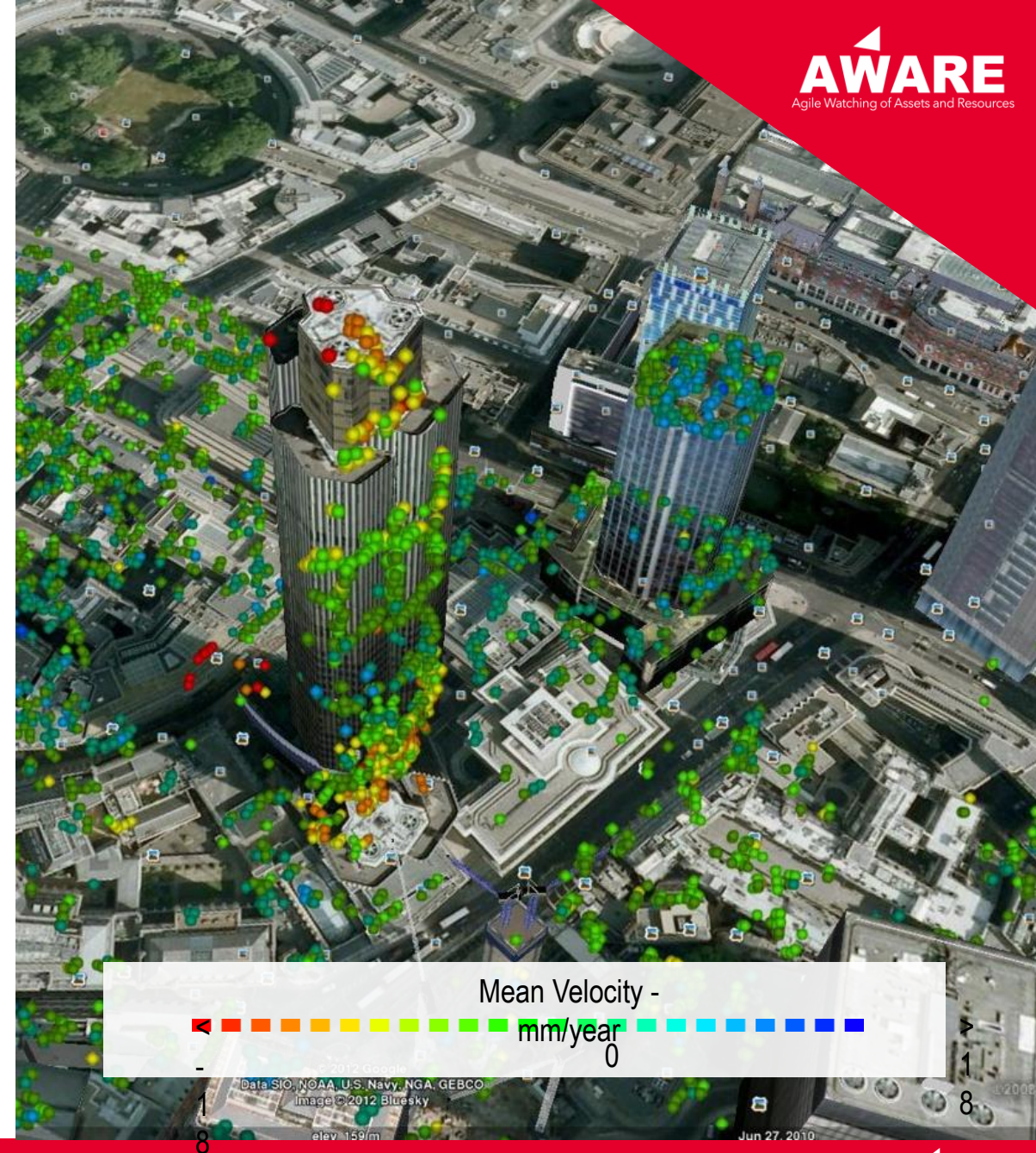
- MILLIMETRE PRECISION
- HIGH MEASURING POINTS DENSITY
- 4D INFORMATION

*Displacement and velocity*

**HISTORICAL EVOLUTION & MONITORING**



by the use of PSP-IFSAR proprietary algorithm, applicable on any SAR satellite data







## USE CASE 7

# MULTILEVEL, MULTITEMPORAL, MULTISOURCE APPROACH



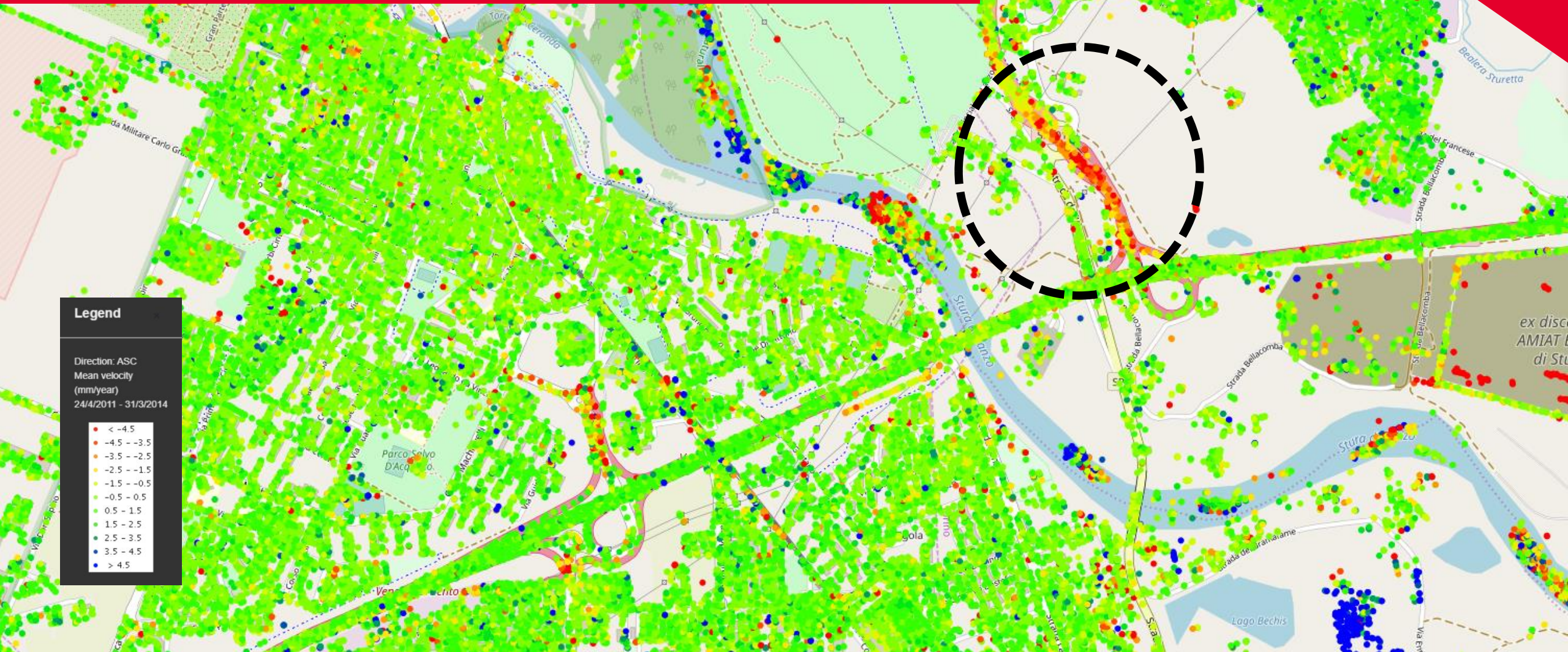
### THE CONTEXT

- Exploiting the different data sources characteristics may be a winning strategy for a proper territory management.
- Integrating the wide are/high precision satellite derived data with high flexibility of RPAS acquisitions up to real time monitoring with on site sensors support an optimization of resources and provides a complete view of the



# LINEAR INFRASTRUCTURE MONITORING

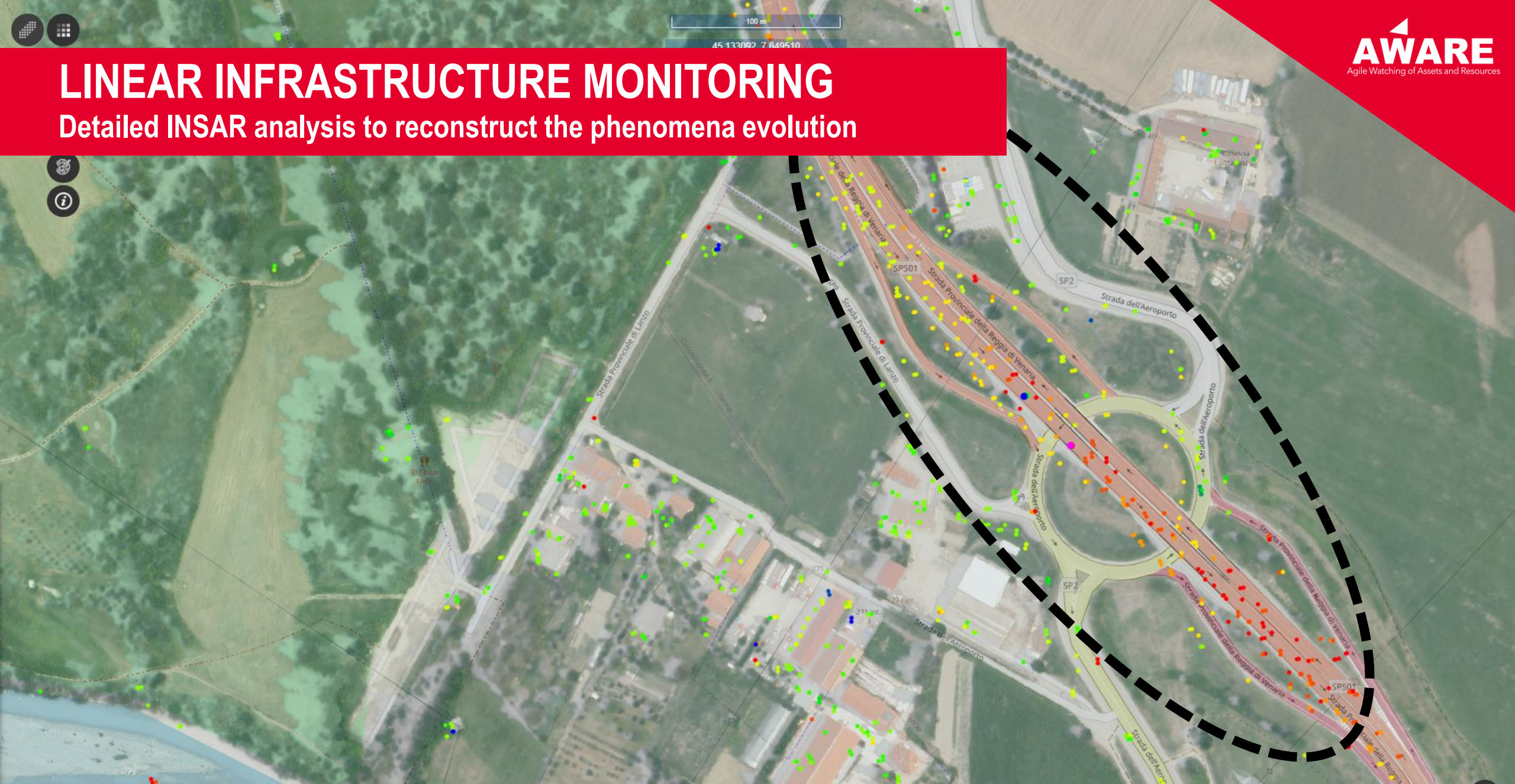
Wide Area analysis with INSAR to identify major anomalies





# LINEAR INFRASTRUCTURE MONITORING

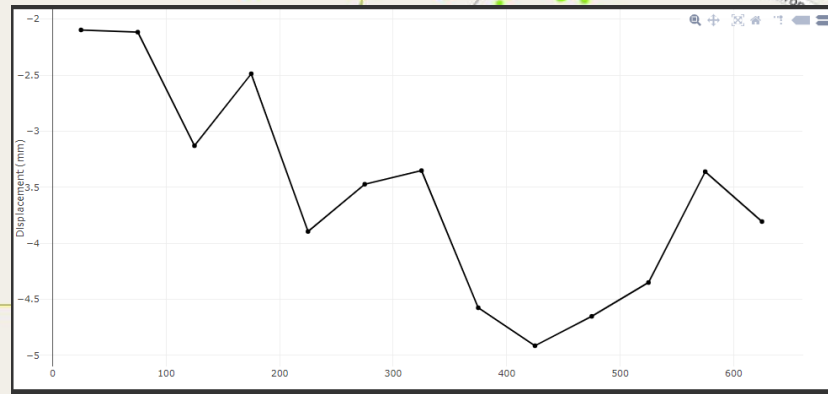
Detailed INSAR analysis to reconstruct the phenomena evolution





# LINEAR INFRASTRUCTURE MONITORING

## Deformation profile: analysis along the track



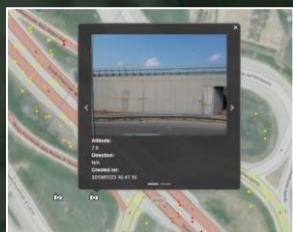


# ON SITE INSPECTION

## Linear Infrastructure Monitoring

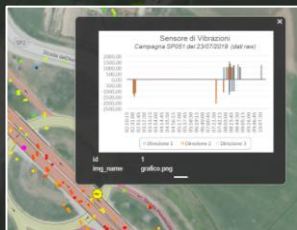
### GEOTAGGED PHOTOS

On site inspection with RPAS



### INSITU SENSOR

On site intervention with in situ sensor



RPAS VIDEO INTEGRATION

F2V\_0325  
Lon: 7.657397 Lat: 45.131109 Elevation: 248.7663666

All the information available through a single access point

F2V





## USE CASE 3

# ASBESTOS 2.0 PROJECT

### THE CONTEXT

- Asbestos has been largely used worldwide before 1977, when the International Agency for Research on Cancer (IARC) classified asbestos as a certain carcinogen for humans.
- Many roofs of sheds or other structures have not been removed yet and there is not a registry to map easily the presence of Asbestos.
- Multispectral and Hyperspectral satellite data allow to detect presence of asbestos and to activate the proper clearance operations



# ASBESTOS / CEMENT-ASBESTOS DETECTION: WORKFLOW

▶ ACQUISITION

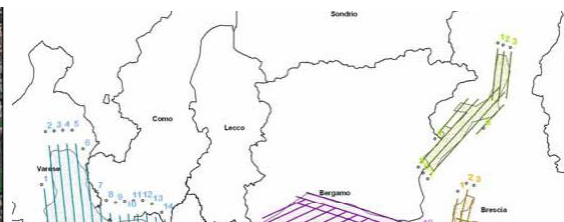
▶ ORTHOCORRECTION

▶ CLASSIFICATION

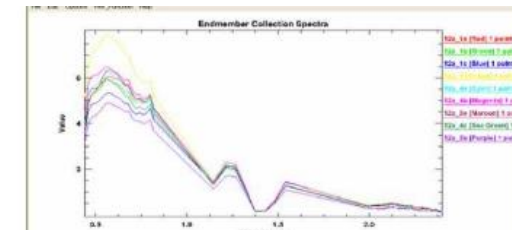
▶ VECTOR TRANSFERRING



FLIGHT



SPECTRAL ANALYSIS AND LAYER GENERATION



▶ ACCURACY EVALUATION

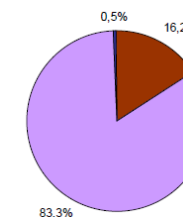
▶ REGIONAL/LOCAL  
GEODATABASE

▶ STATISTICS

▶ PUBLICATION



IN SITU VERIFICATION



- Urbanizzato di tipo residenziale
- Urbanizzato di tipo industriale-commerciale
- Altro (aree a verde, aree in trasformazione, ecc)

GIS UPDATING AND REPORTS

# ASBESTOS 2.0 PROJECT

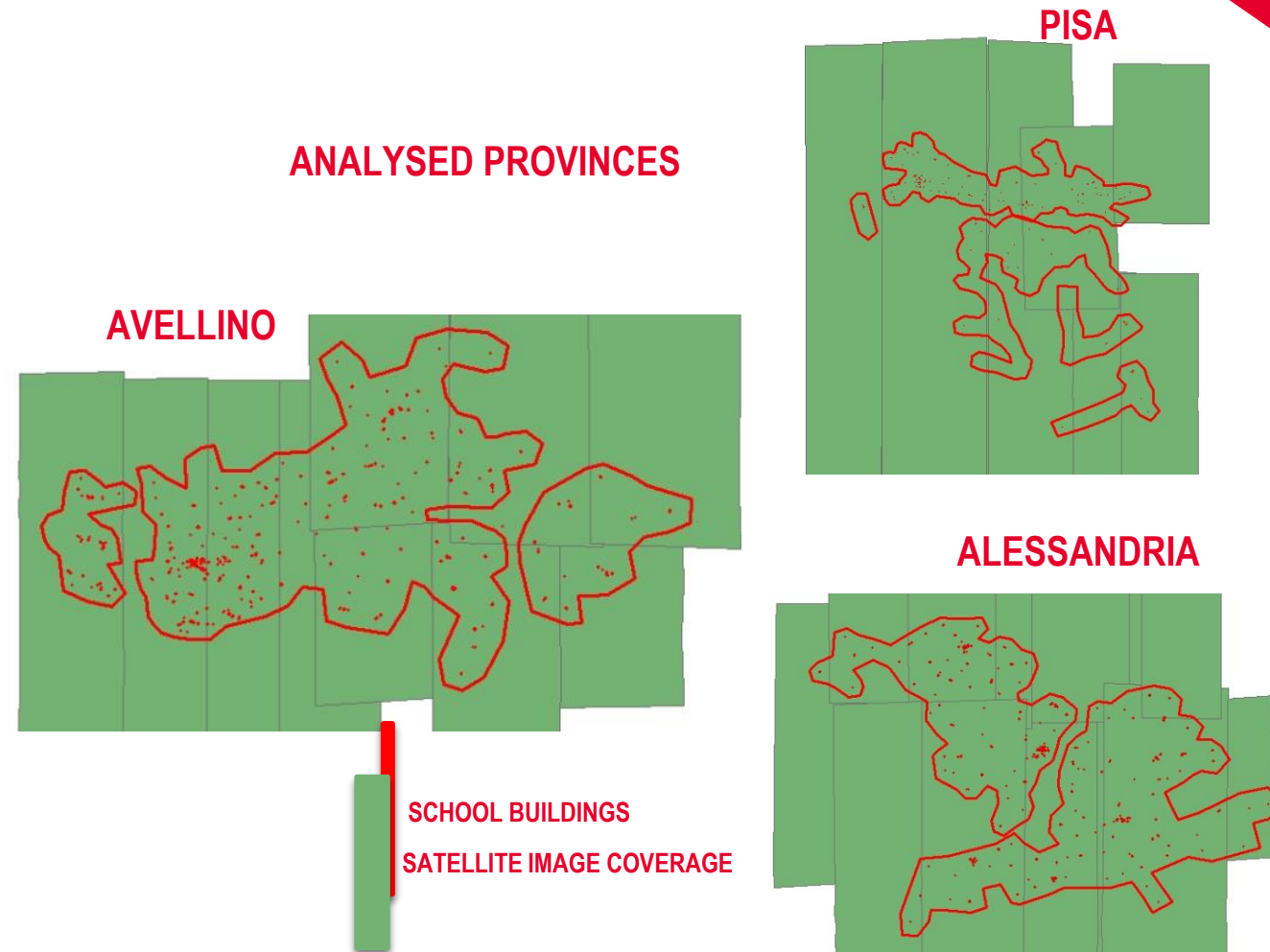
## AUTOMATIC EXTRACTION AND REFERENCE MAP COMPARISON

Many old school buildings are still covered by asbestos or by ACM (Asbestos-Containing Material).

The project aimed at mapping the presence of ACM by the use of VHR multispectral data World View 2 & 3, and at verifying the effective implementation of reclamation works over 3 provinces in Italy for a total of 6.000 sqkm.

User: National Association of Italian Municipalities (ANCI)

Project duration: 5 months





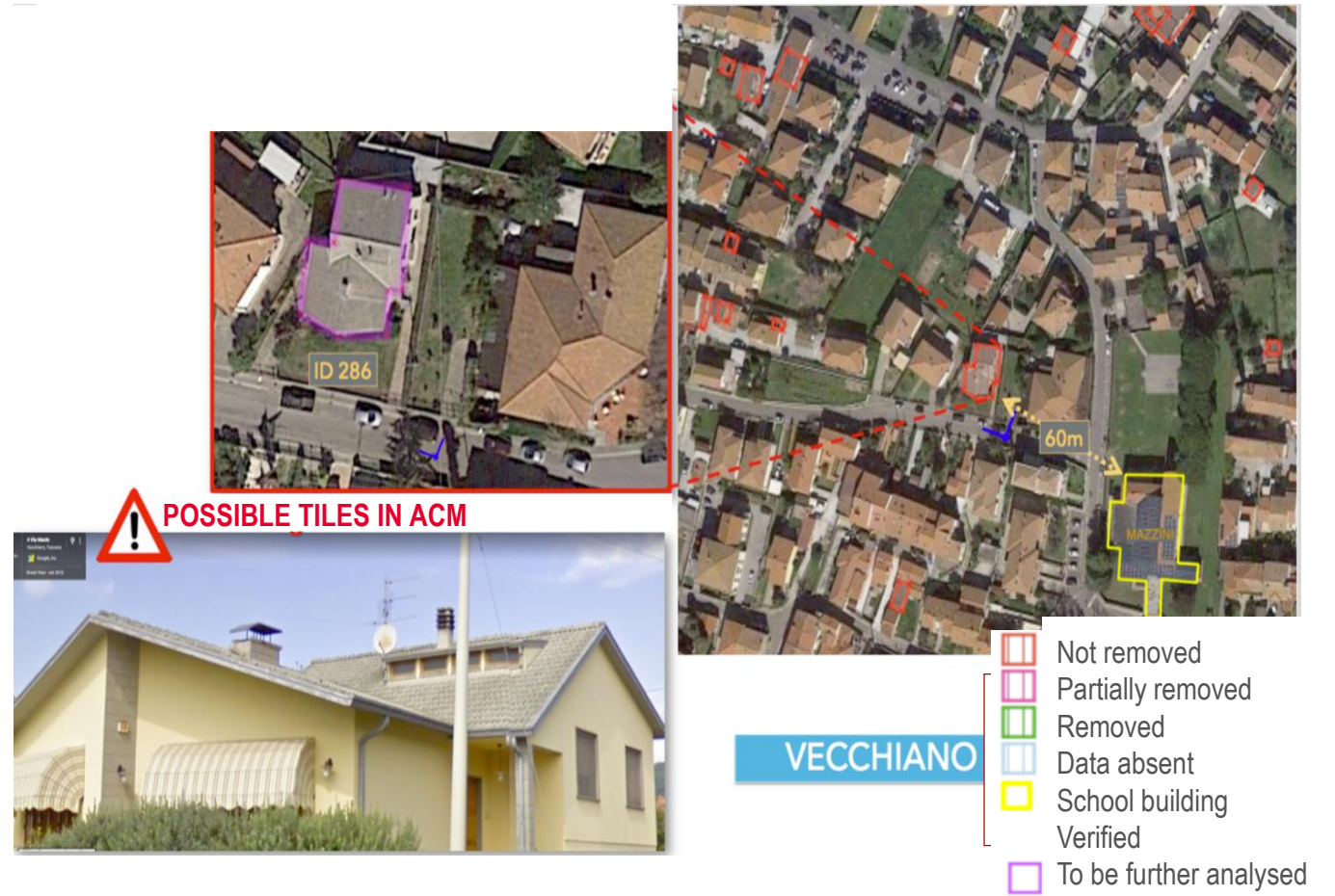
# ASBESTOS 2.0 PROJECT

## AUTOMATIC EXTRACTION AND REFERENCE MAP COMPARISON

The project involved the preparation of the **Historical Map** of asbestos-cement based on existing orthophotos, existing survey cards and other local information.

**ACM Maps** have been created based on updated data and information over school buildings and within a 1km buffer around.

A first automatic result has been obtained through an Object Based Image Analysis (OBIA), then refined and validated by expert analysts

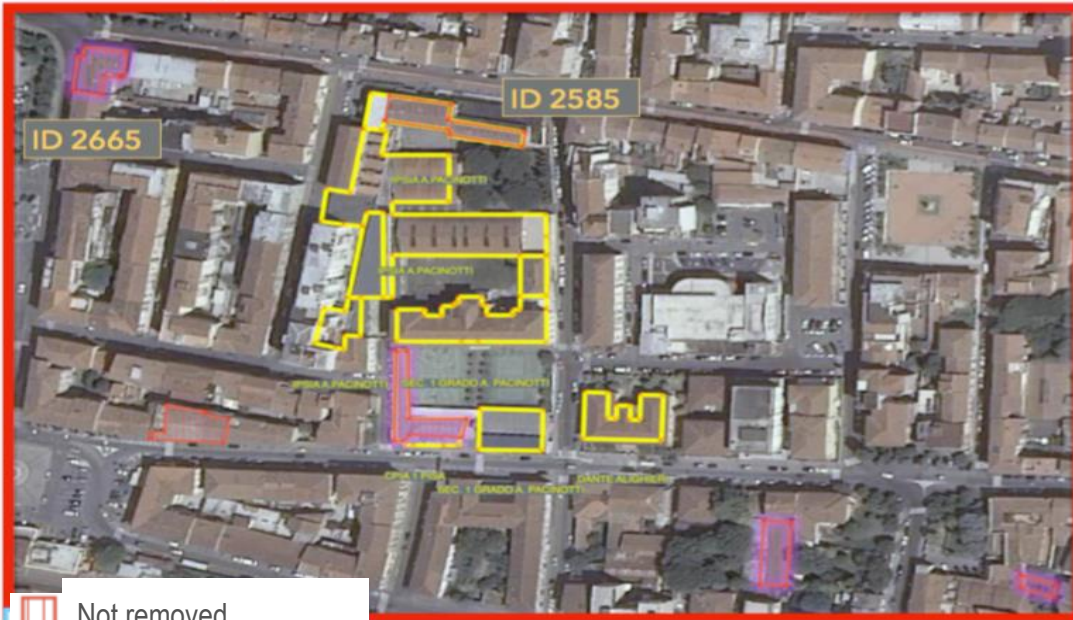


# ASBESTOS 2.0 PROJECT

## EXAMPLE OF A RESULT PROVIDED IN THE PROVINCE OF PISA

### Dettaglio – Provincia di Pisa

**ASBESTO 2.0**



- Not removed
- Partially removed
- Removed
- Data absent
- School building Verified
- To be further analysed

**PONTERERA**

gid	2585
comune	Pontedera
indirizzo	Via I° Maggio 92
proprietà	Società o persone private
categoria	edifici pubblici e privati
tipologia	Scuole di ogni ordine e grado e Istituti di ricerca
descrizione	lastre di amianto piane o ondulate
estensione_sito	500 - 5000
estensione_effettiva	541
distanza_centro_urbano	0 (nell'abitato)
tipo_bonifica	non bonificato
tipo_intervento	Non valutabile
dettaglio_bonifica	Non variato
validazione	Verificato
imm_riferimento	057136102040_01_P004
fonte_storica	Rilievo Mapsat
id_fonte_st	NULL
note	NULL
stato_precedente	Informazione assente



A large industrial building with a white base and a blue horizontal stripe. The building has a blue roll-up door and a blue door. The sky is blue with some clouds. A large black diagonal shape is overlaid on the left side of the image.

**USE CASE:**

**INDUSTRIAL SITE  
INSPECTION**

# INDUSTRIAL SITE INSPECTION – OVERVIEW ANALYSIS

Overview map supports the identification of main asset in the site and of the context in which the site is located, including the presence of industries at risk of a major accident in the surrounding



**Legenda**

<b>Informazioni Generali</b>	<b>Idrografia</b>	<b>Sito Industriale</b>
○ Toponimi	— Canale	■ Cisterna
■ Area di analisi buffer 1 km	■ Fiume	□ Fabbricato
■ Estensione sito industriale analizzato	<b>Idrografia buffer 1 km</b>	□ Parcheggio
⋯ Limiti Comunali	— Canale	≡ Nastro trasportatore
<b>Reticolo Stradale</b>	■ Fiume	— Condotte
— Secondaria		■ Area Deposito materiali
— Locale		
— Servizio		

Analysis of sites classified as at risk of Major accident in the surrounding area.

**Buildings characterization and measurements**

	Tipologia	ID Identificativo	Area mq	Cubatura mc	Coordinate	
					Lat	Long
<b>Fabbricato</b>	Uffici	1	734,8	3589,8		
	Stoccaggio	12	2719,2	33070,9		
	Officina - Stoccaggio	8	622,2	4542		
	Trattamento rifiuti frazione secca/indifferenziata	9	2533,9	43139,7		
<b>Altro Areale</b>	Scrubbers	13	200	2469,5		
	Tettoia biofiltro	14	2642,5	32634,9		
	Tettoia Parcheggi_01	3	112,1	280,4		
	Tettoia Parcheggi_02	4	26,1	73,4		
	Edificio	2	46,5	151,8		
	Edificio	6	4,2	9,5		
	Edificio	7	4,2	9,1		
	Edificio	10	62,2	265,8		
<b>Cisterne/Silos</b>	Edificio	11	5,4	19,2		
	Edificio	15	9,5	21,2		
	Riserva idrica	5	54,6	233,5		
	Cisterna	n/a	18,5	n/a		
<b>Container/Cassoni</b>	No.					8
<b>Lampioni</b>	No.					11
<b>Macchinari</b>	No.					1
<b>Condotte tubature</b>	No.					10
<b>Nastro trasportatore</b>	No.					2
<b>Alberi</b>	No.					33

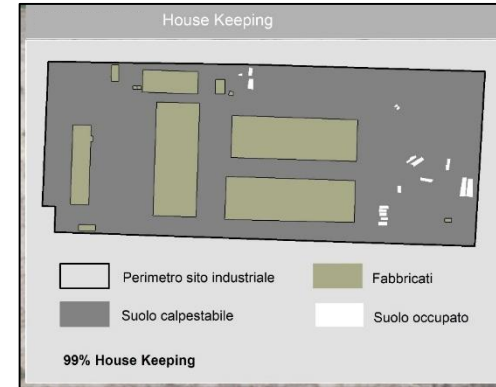


# INDUSTRIAL SITE INSPECTION – DETAIL ANALYSIS

With High resolution images it is possible to characterise each building and element of the site, including information on the sized and cubage using 3D modelling analysis, distances between buildings and so on.



## House keeping conditions estimation



## Mapping of both fix and temporary elements





# INDUSTRIAL SITE INSPECTION – WATER BODIES ANALYSIS

Water bodies are strongly connected with hydraulic risk and it is important to map the distance among them and the buildings. Thanks to 3D analysis it is also possible to extract information on the difference in altitude among banks and buildings entrance



## Analysis of the difference in altitude between buildings entrance and rivers banks

	Dislivelli										
	Idrografia										
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	F1
1	-	-	0,4	1,1	1,36	-	-	-	-	-	-
2	-	-	-	-	-	0,27	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-
<b>Fabbricato</b> 8	1,55	1,57	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	0,36	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	1,61
13	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	0,7	0,6	0,22	-
15	-	-	-	-	-	-	-	-	-	-	-

**Legenda**

**Informazioni Generali**

- Toponimi
- Area di analisi buffer 1 km
- Estensione sito industriale analizzato

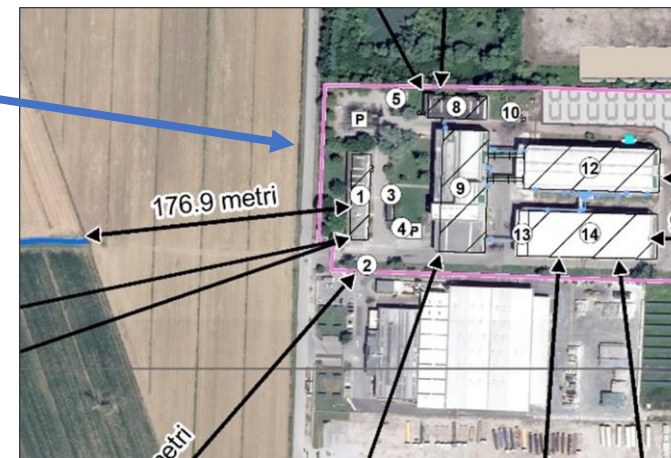
**Sito Industriale**

- Cisterna
- P Parcheggio
- Nastro trasportatore
- Condotte
- Fabbricato
- Area Deposito materiali

**Idrografia**

- Canale
- Fiume

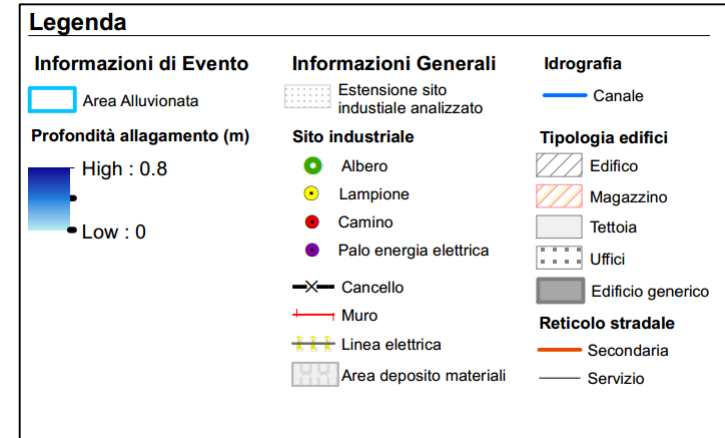
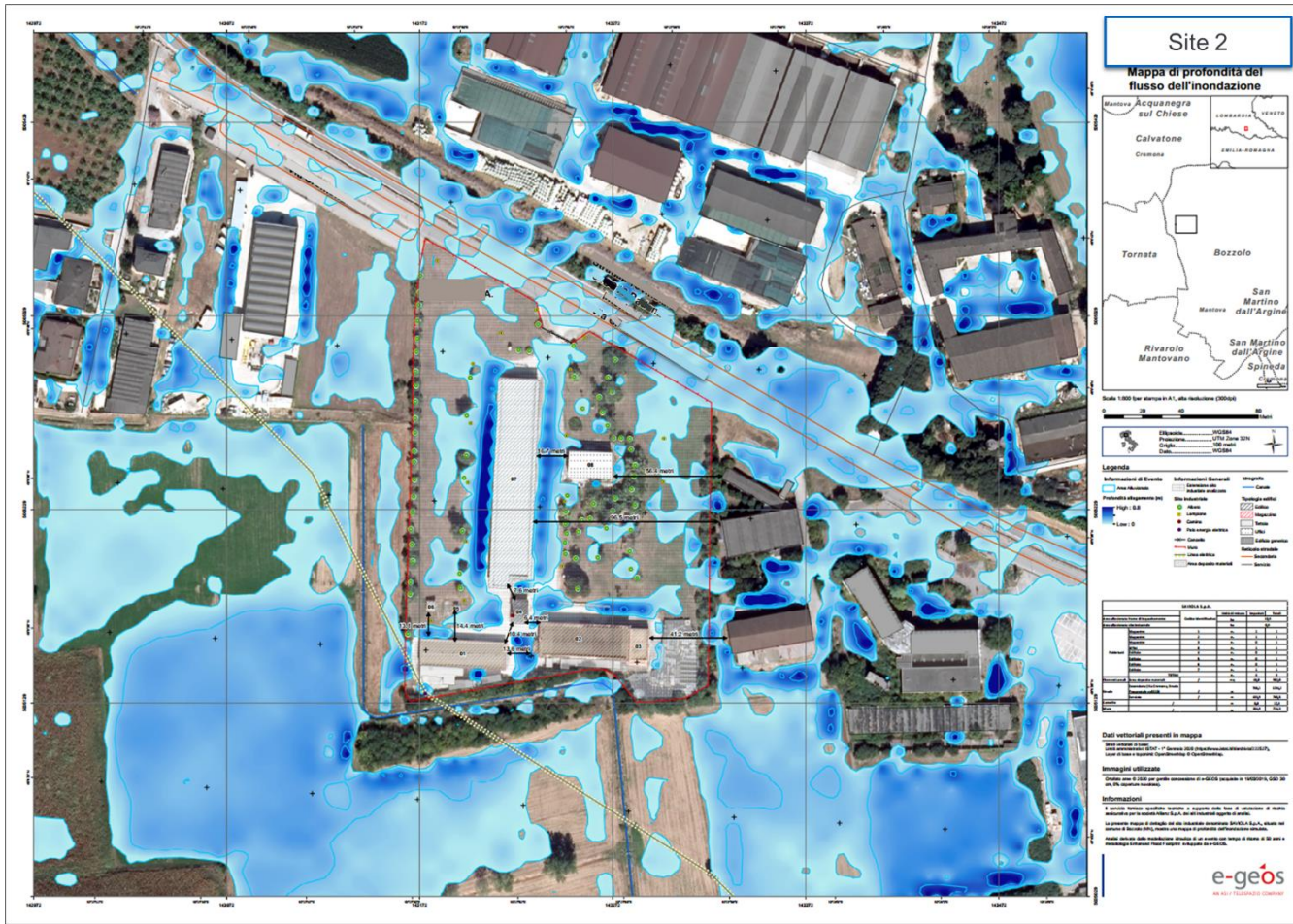
## Measurement of minimum distance between rivers and buildings





# INDUSTRIAL SITE – FLOOD DEPTH

High detail Hydraulic model simulating flooding events over the site to determine the effect of heavy rains and areas/buildings more affected by the event. The map below reports the flood depth analysis.

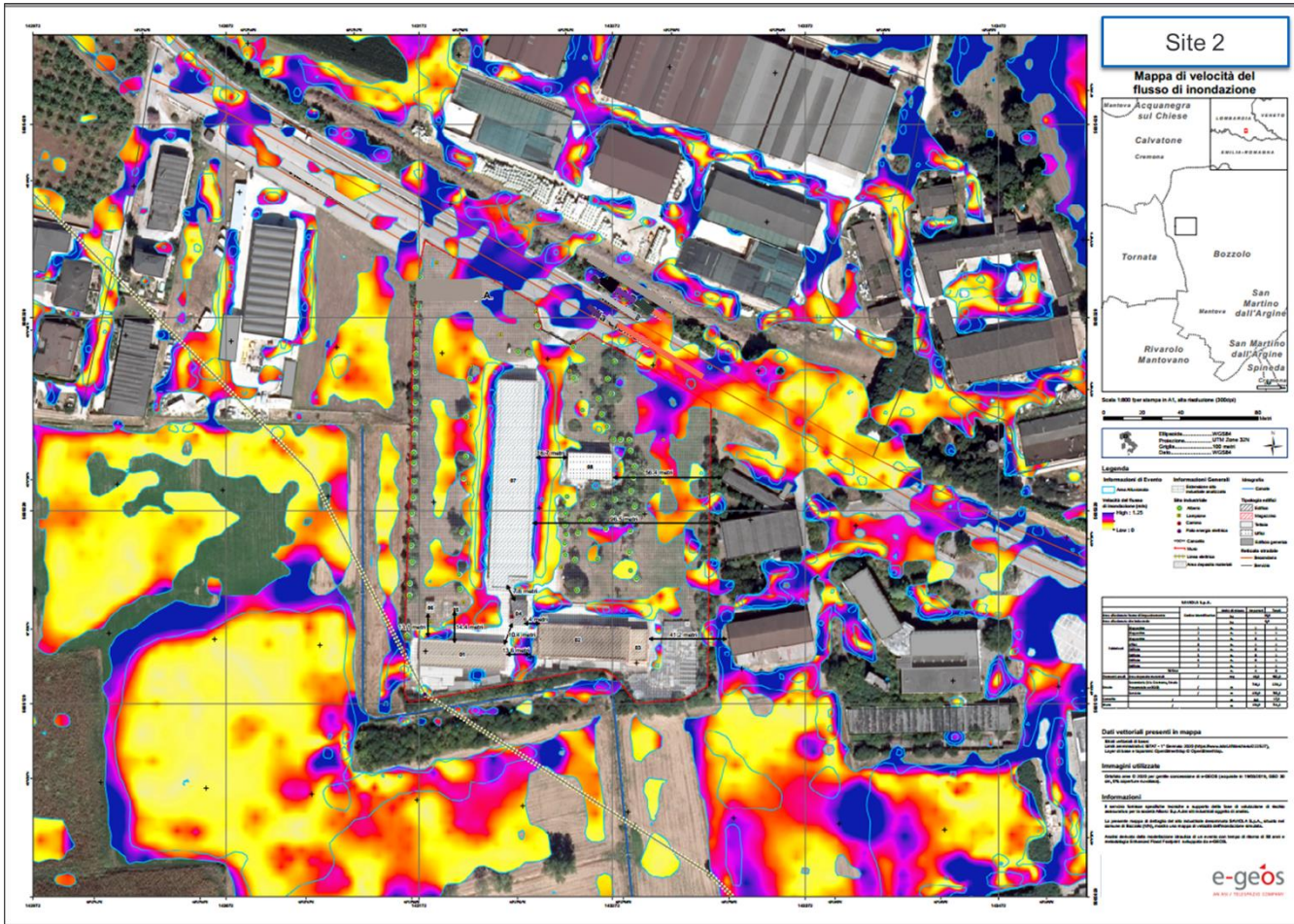


		Codice identificativo	Unità di misura	Impattati	Totali
<b>Area alluvionata frame di inquadramento</b>			ha		10,8
<b>Area alluvionata sito industriale</b>			ha		0,9
<b>Fabbricati</b>	Magazzino	1	n.	1	1
	Magazzino	2	n.	1	1
	Magazzino	3	n.	0	1
	Uffici	8	n.	1	1
	Edificio	4	n.	0	1
	Edificio	5	n.	0	1
	Edificio	6	n.	0	1
	<b>TOTALI</b>		n.	4	8
<b>Elementi areali</b>	Area deposito materiali	/	mq	48,0	902,0
<b>Strade</b>	Secondaria (Via Cremona, Strada Provinciale exSS10)	/	m	746,1	1234,2
	Servizio	/	m	433,9	765,5
<b>Cannello</b>	/	/	m	0,0	17,3
<b>Muro</b>	/	/	m	154,9	714,3



# INDUSTRIAL SITE – FLOOD VELOCITY

The Hydraulic model provides also information on flood velocity, supporting the identification of bottle necks which may amplify the destructive effect of a flood.



**Legenda**

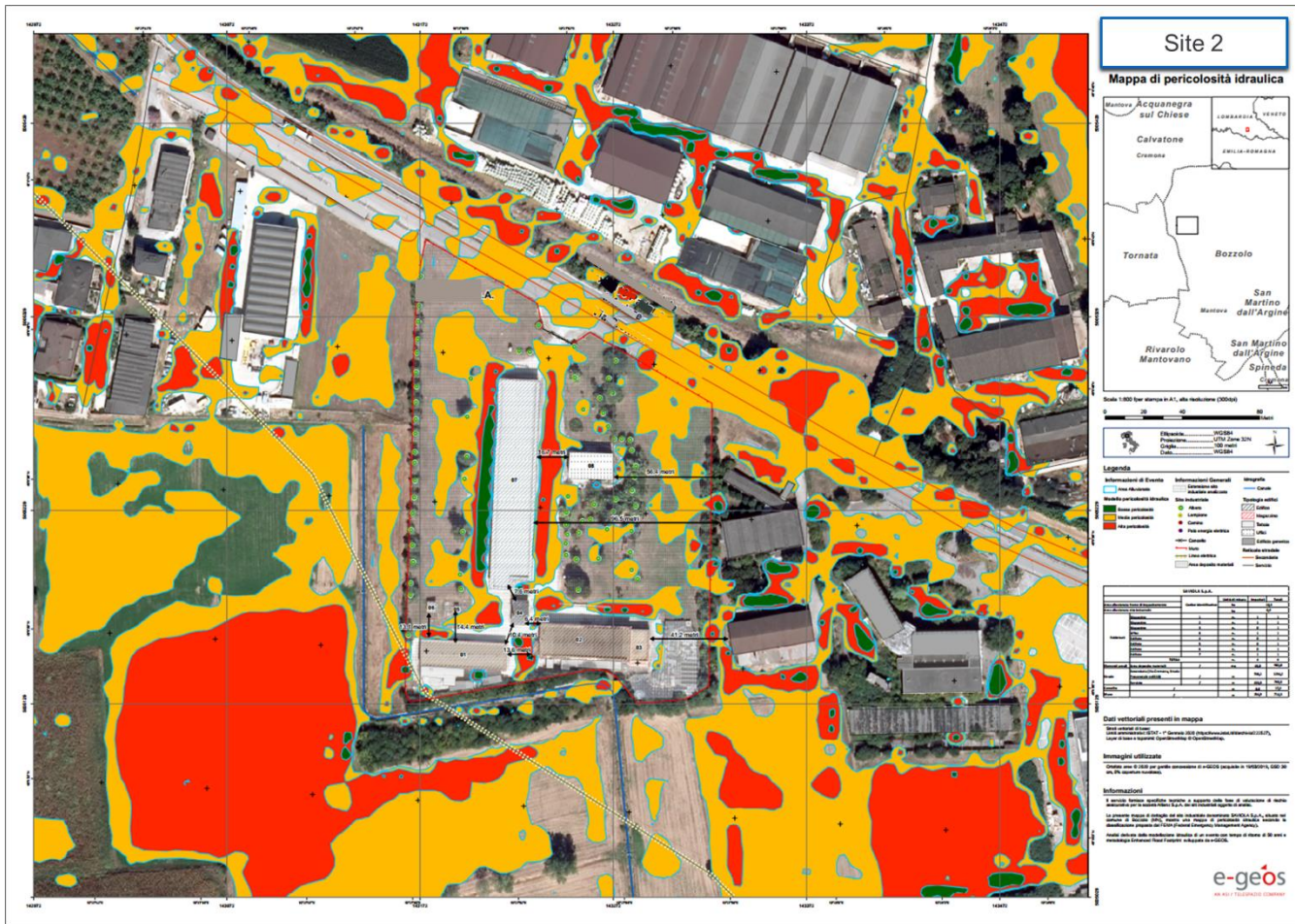
<b>Informazioni di Evento</b>	<b>Informazioni Generali</b>	<b>Idrografia</b>
Area Alluvionata	Estensione sito industriale analizzato	Canale
<b>Velocità del flusso di inondazione (m/s)</b>	<b>Sito industriale</b>	<b>Tipologia edifici</b>
High : 1.25	Albero	Edificio
Low : 0	Lampione	Magazzino
	Camino	Tettoia
	Palo energia elettrica	Uffici
	Cancello	Edificio generico
	Muro	<b>Reticolo stradale</b>
	Linea elettrica	Secondaria
	Area deposito materiali	Servizio

		Codice identificativo	Unità di misura	Impattati	Totali
<b>Area alluvionata frame di inquadramento</b>			ha		10,8
<b>Area alluvionata sito industriale</b>			ha		0,9
<b>Fabbricati</b>	Magazzino	1	n.	1	1
	Magazzino	2	n.	1	1
	Magazzino	3	n.	0	1
	Uffici	8	n.	1	1
	Edificio	4	n.	0	1
	Edificio	5	n.	0	1
	Edificio	6	n.	0	1
	<b>TOTALI</b>		n.	4	8
<b>Elementi areali</b>	Area deposito materiali	/	mq	48,0	902,0
<b>Strade</b>	Secondaria (Via Cremona, Strada Provinciale exSS10)	/	m	746,1	1234,2
	Servizio	/	m	433,9	765,5
<b>Cancello</b>	/	/	m	0,0	17,3
<b>Muro</b>	/	/	m	154,9	714,3



# INDUSTRIAL SITE – HYDRAULIC DANGER

Mixing the information on flood Depth and flood velocity it is possible to extract the general Hydraulic Danger parameter.



**Legenda**

**Informazioni di Evento**

- Area Alluvionata

**Modello pericolosità idraulica**

- Bassa pericolosità
- Media pericolosità
- Alta pericolosità

**Informazioni Generali**

- Estensione sito industriale analizzato

**Sito industriale**

- Albero
- Lampione
- Camino
- Palo energia elettrica
- Cancello
- Muro
- Linea elettrica
- Area deposito materiali

**Idrografia**

- Canale

**Tipologia edifici**

- Edificio
- Magazzino
- Tettoia
- Uffici
- Edificio generico

**Reticolo stradale**

- Secondaria
- Servizio

		Codice identificativo	Unità di misura	Impattati	Totali
<b>Area alluvionata frame di inquadramento</b>			ha		10,8
<b>Area alluvionata sito industriale</b>			ha		0,9
<b>Fabbricati</b>	Magazzino	1	n.	1	1
	Magazzino	2	n.	1	1
	Magazzino	3	n.	0	1
	Uffici	8	n.	1	1
	Edificio	4	n.	0	1
	Edificio	5	n.	0	1
	Edificio	6	n.	0	1
	<b>TOTALI</b>		n.	4	8
<b>Elementi areali</b>	Area deposito materiali	/	mq	48,0	902,0
<b>Strade</b>	Secondaria (Via Cremona, Strada Provinciale exSS10)	/	m	746,1	1234,2
	Servizio	/	m	433,9	765,5
<b>Cancello</b>	/	/	m	0,0	17,3
<b>Muro</b>	/	/	m	154,9	714,3



e-GEOS is committed to Technology Development, Innovation and Digitization as a driver for the development of society aligned towards the **Sustainable Development Goals (SDGs of the United Nations)**

We develop Space technologies and big data analysis as a tool to take care of the Planet. For sustainability purposes, for the monitoring of territories, for applications in advanced smart agriculture, for the reduction in the use of pesticides and fertilizers, to promote resilience.





A space-themed background featuring a view of Earth from space, with the sun rising over the horizon and the moon in the upper center. The Earth's surface is illuminated by the sun, showing city lights and landmasses. The sun is a bright, glowing orb with a lens flare effect. The moon is a dark, spherical object in the upper center of the frame.

**“We go further today, for the Earth of tomorrow”**

**Thank you for the attention!**

# e-geos

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