# OPERATIONAL SPACE SERVICES

Fabio Volpe
e-geos

**TAIEX-PI**
**ASEAN Multi-Country Workshop on Space Applications**

# e-GEOS Company Profile

LEONARDO 67%

THALES 33%

TELESPAZIO a LEONARDO and THALES company

- Contracts
- People
- Assets

agenzia spaziale italiana

COSMO-SkyMed
exclusive world wide rights

80%

20%

e-geos AN ASI / TELESPAZIO COMPANY

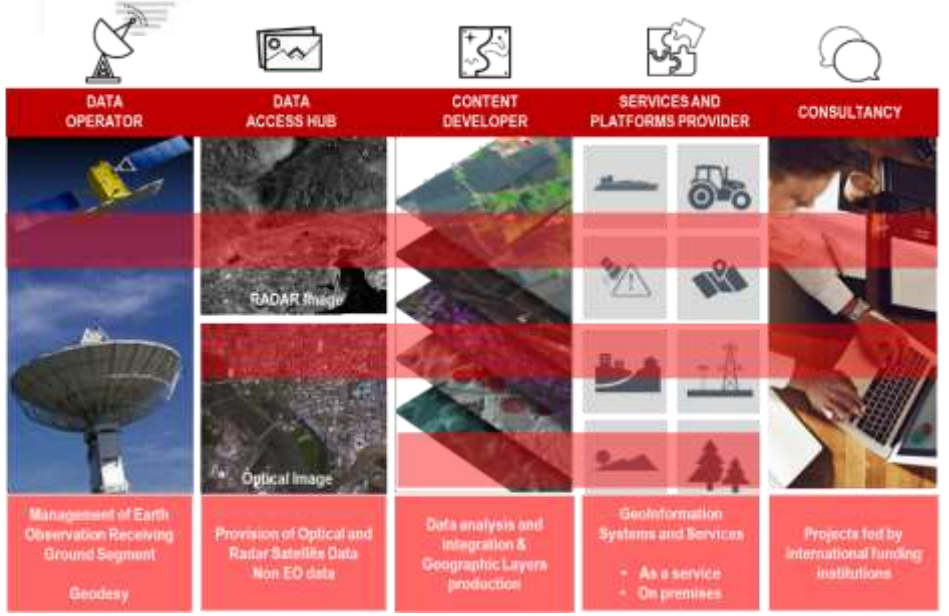
100%

GAFAG

INTERNATIONAL MARKETS 80%

MARKETS

DOMESTIC MARKETS 20%

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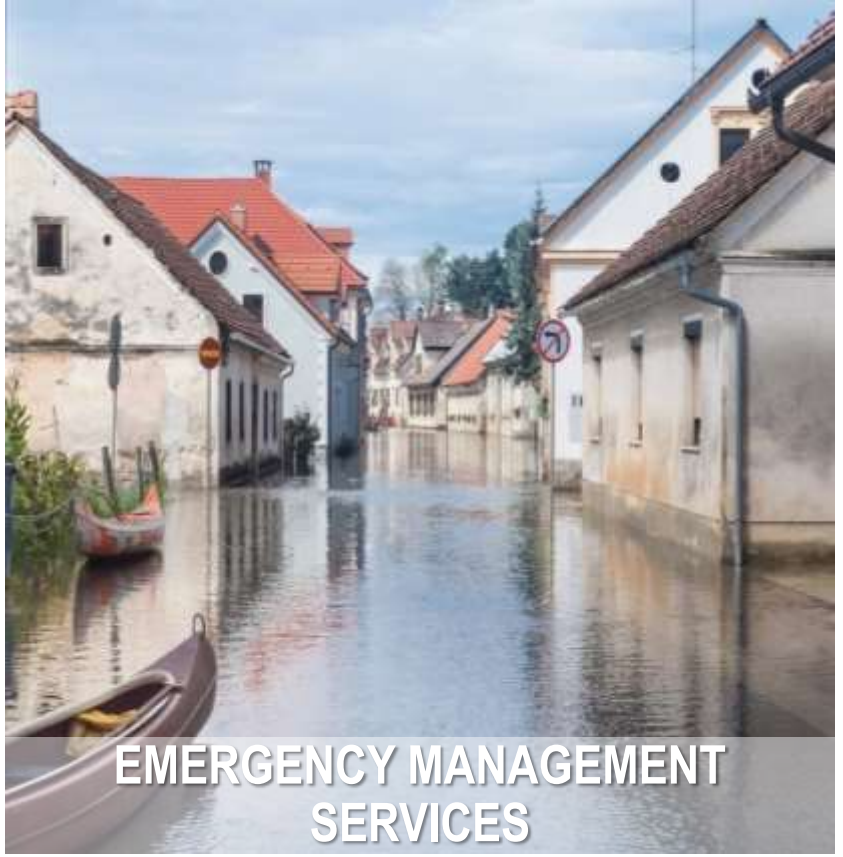
GAFAG

TELESPAZIO a LEONARDO and THALES company



# OPERATIONAL SERVICES

Are available:

- **Data** : starting data you need for service provision
- **Processing workflows**: what you need for turning data into information
- **Platforms**: what you need for accessing the service and browse through the provided information

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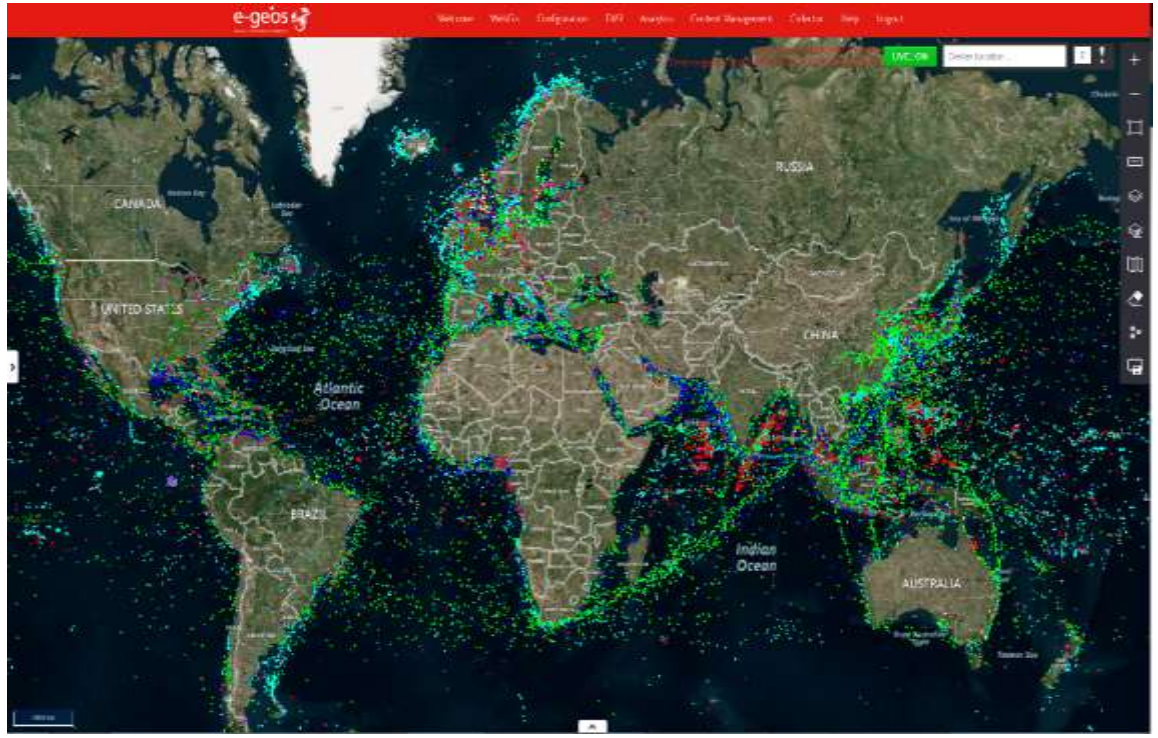
# MARITIME SOLUTIONS

SEonSE
Smart Eyes on SEas

e-GEOS Maritime Solution providing multi-sensor Maritime Situational Awareness picture for:

- security and intelligence organizations
- environmental protection
- resources management
- market analysis and business intelligence




INSTITUTIONAL SECTOR

FRONTEX
Management of Operational Cooperation at the External Borders

EMSA
European Maritime Safety Agency

Italian Coast Guard

European Fishery Control Agency

Italian Ministry of Interior

Italian Ministry of Environment

Australian Maritime Safety Authority

PRIVATE SECTOR

TOTAL

Shell

REPSOL

eni

BR PETROBRAS

O&G companies

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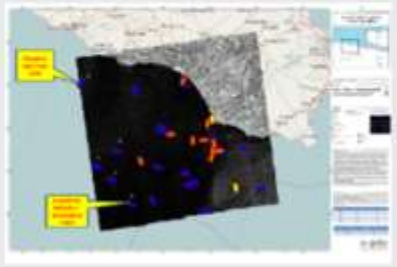
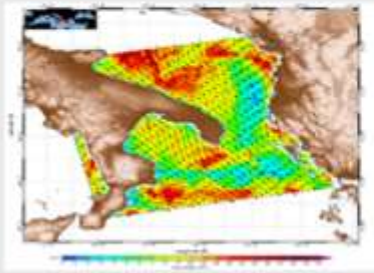
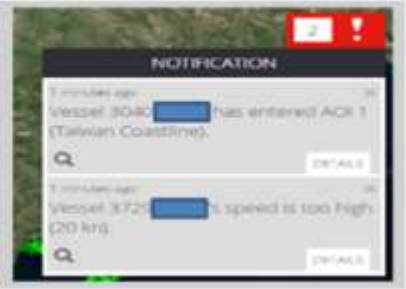
SEonSE
Smart Eyes on SEas

# Generated contents

| Vessel detection | Activity Report | Oil Spill Detection | Wind & Wave | Geospatial Analysis and Alert Notifications |
|---|---|---|---|---|
| |  | |  |  |

## POINTS OF STRENGTH OF THE SERVICE

- Ground Receiving Terminal Network
- Wide and Global coverage
- Multisensor solution
- Validated by Institutional User
- Secure data access
- Experienced Operators on maritime surveillance Satellite image analysis
- Operational h24/7
- Fully Automatic and/or supervised processing

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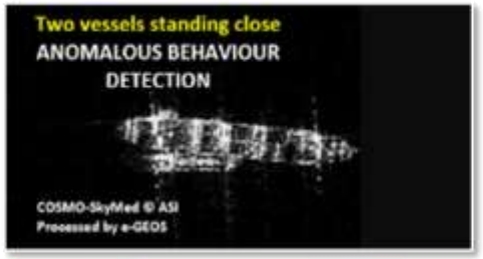
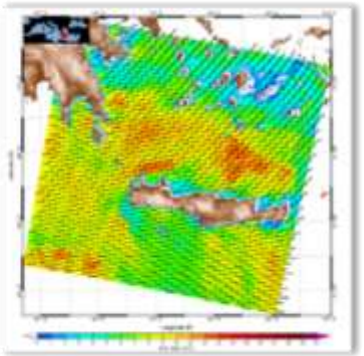
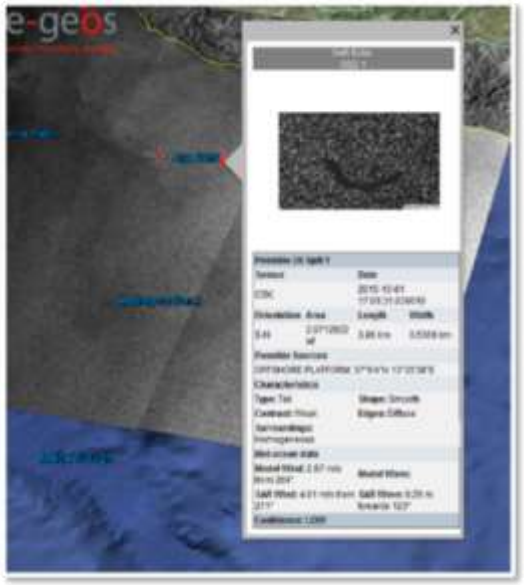
# Multi-sensor data fusion

| | | Satellite Ship Detection | Satellite Oil Spill Detection | Identification and Tracking Systems (AIS, SatAIS, …) |
|---|---|---|---|---|
| AOI | Entering | X | X | X |
| | Approaching | X | X | X |
| | Distance to Shore | X | X | X |
| Knowledge discovery | Persistent/Recurrent feature detection | X | X | X |
| | Heatmap | X | X | X |





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# Maritime and port traffic monitoring

## Rio de Janeiro traffic volumes

**Cargo**

**Tanker**

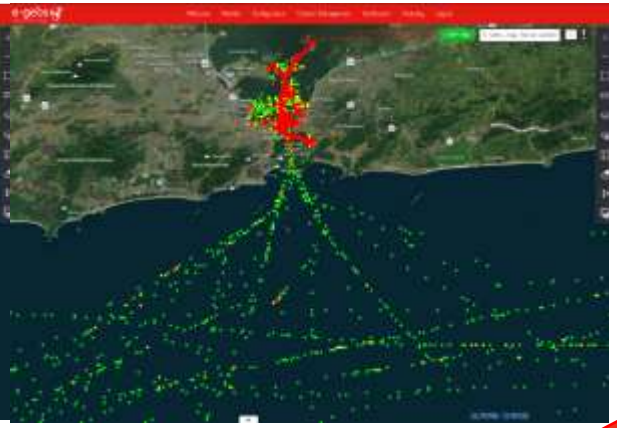
Cargo

Tanker

**Fishing**

**Passenger**

Fishing



Passenger

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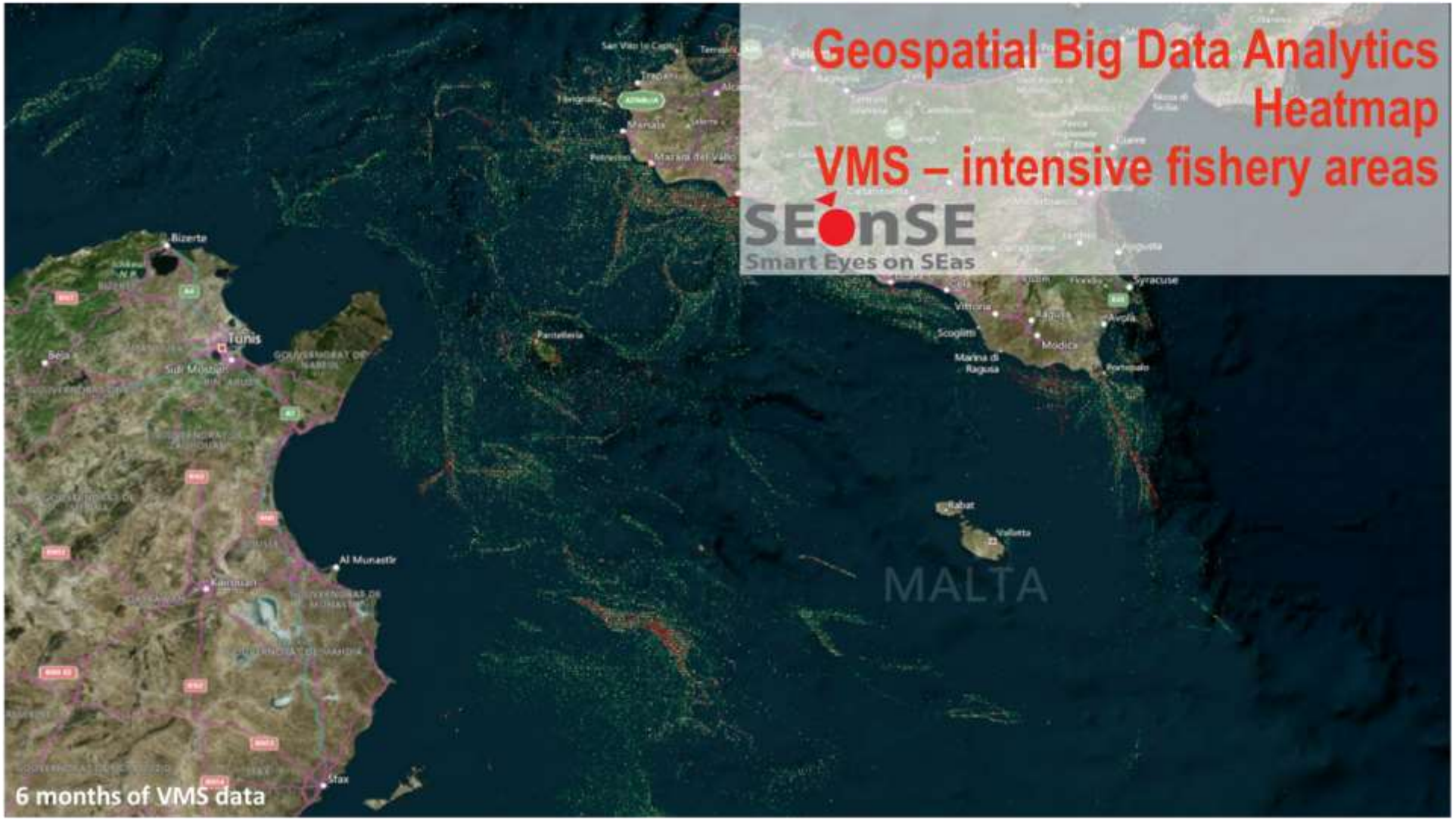
# Geospatial big data analytics



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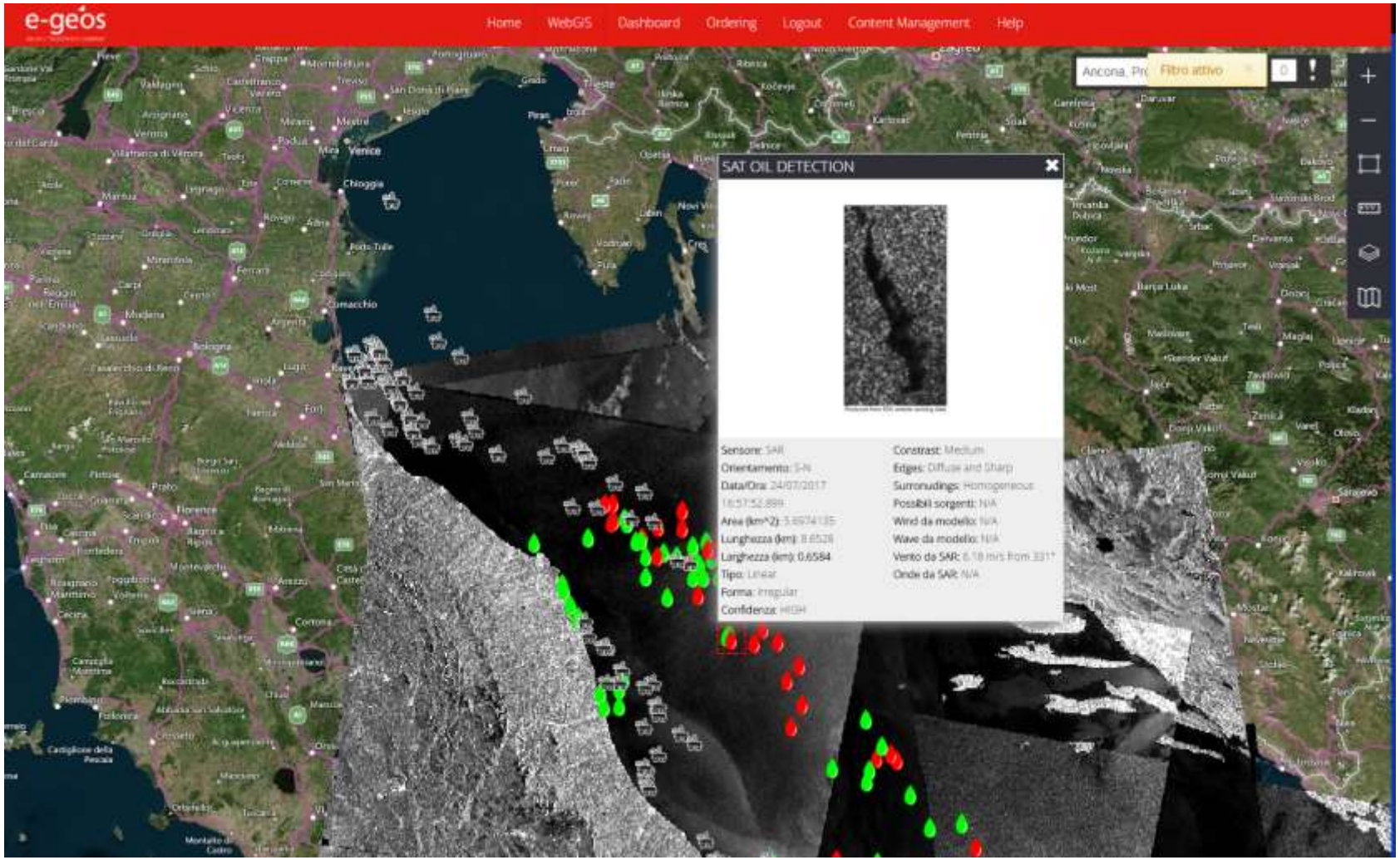
# Oil spill monitoring




Multi-time oil spill monitoring over the Adriatic Sea (where the off-shore platforms activity is concentrated)

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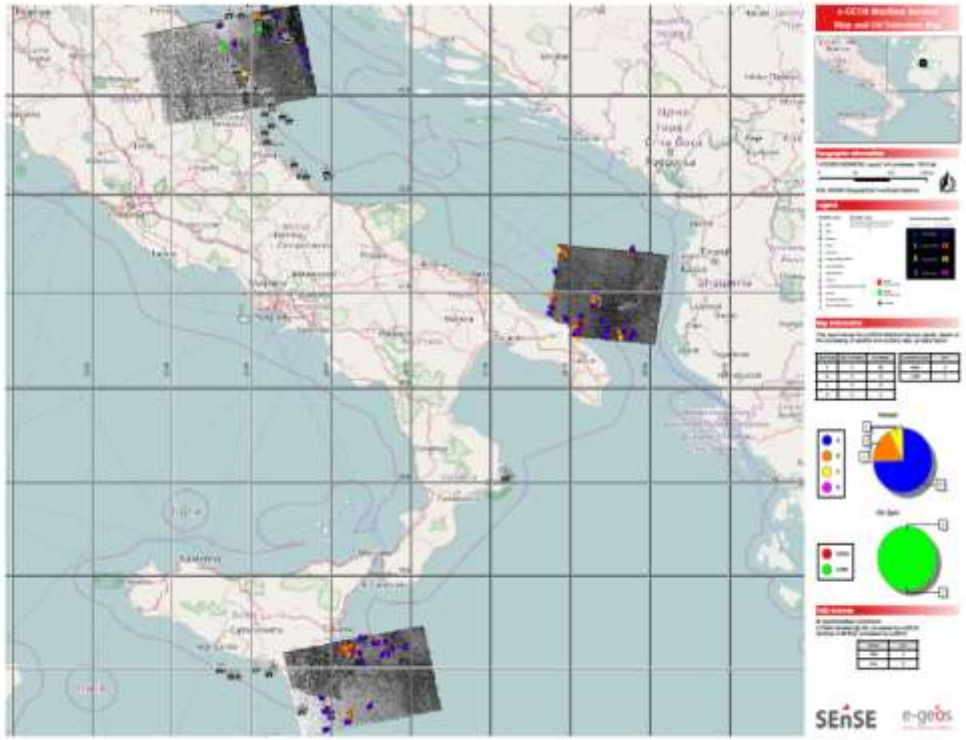
# Automatic reporting






## Satellite detected vessel data

| vsdid | datetime | heading (°) | speed (kts) | length (m) | width (m) | class | mmsi |
|---|---|---|---|---|---|---|---|
| 6 | 2016-05-15T04:33:51Z | 81 | -1,94 | 388,10 | 36,10 | A | N/A |
| 11 | 2016-05-15T04:33:52Z | 96 | -1,94 | 146,70 | 19,00 | A | N/A |
| 23 | 2016-05-15T04:33:54Z | 7 | -1,94 | 99,50 | 14,80 | B | N/A |
| 34 | 2016-05-15T04:33:54Z | 272 | -1,94 | 100,60 | 14,90 | A | N/A |
| 16 | 2016-05-15T04:33:55Z | 96 | -1,94 | 146,80 | 19,00 | A | N/A |
| 5 | 2016-05-15T04:33:56Z | 77 | -1,94 | 121,00 | 16,80 | A | N/A |

## Satellite detected oil spill data

| osdid | datetime | conflevel | length (km) | width (km) | orientation | possiblesource |
|---|---|---|---|---|---|---|
| 1 | 2016-05-15T04:35:44.018Z | LOW | 7,09 | 0,21 | S-N | -1 |
| 2 | 2016-05-15T04:35:44.018Z | LOW | 0,89 | 0,07 | S-N | -1 |

## Data sources

| datetime | sensor | mode |
|---|---|---|
| 2016-05-15T04:33:51Z | CSKS4 | WR |
| 2016-05-15T04:35:36Z | CSKS4 | WR |
| 2016-05-15T16:22:13Z | CSKS4 | WR |

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# Geospatial big data analytics

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# e-GEOS for EMSA - CleanSeaNet

**7500+**
Product delivered

## Assets

3 antennas

3 NRT processing chains

**10 YEARS**
Service

## Satellites

CURRENTLY IN ORBIT

- Envisat
- Radarsat 1
- Radarsat 2
- COSMO-SkyMed
- Sentinel 1A
- Sentinel 1B

**60+**

## People

Project Manager
Operational manager
NRT Team
Emergency Team
Algorithm developers
NRT chain engineer

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# EMERGENCY MANAGEMENT SERVICES

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# Emergency Response Service – Service Performance

e-GEOS is the GIO and Copernicus Rapid Mapping Service provider since 2012 with **100% service reliability.**

311
rapid mapping activations

3.800+
maps

3.000.000+
kmq delivered

50+
Countries worldwide

# How it works

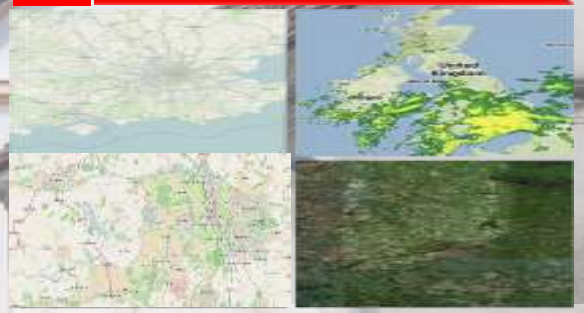
## 1 Service activation

What happened, When, Where

## 2 Plan satellite images

Based on disaster type and weather forecast

## 3 Find available geodata/info



From official and open data sources

## 4 Prepare pre-event map

Make it available on the web site

## 5 Acquire 1st Satellite image

Image processing and analysis

## 6 Prepare post-event map

Make it available on the web site

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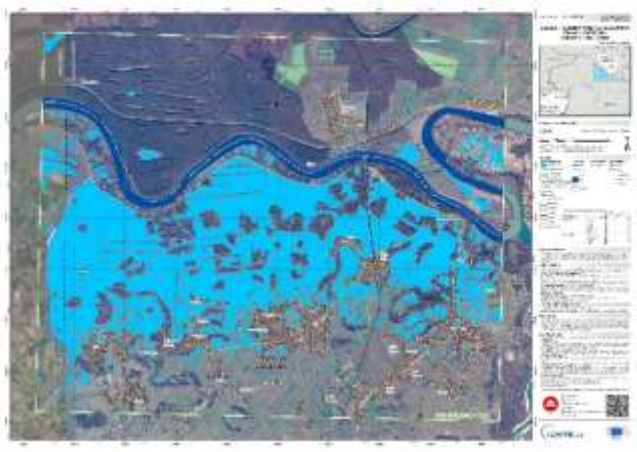
# Emergency Mapping Portfolio

PRODUCT TYPE

**Reference Map**
Pre event map

**Delineation Map**
Post event disaster extent



**Grading Map**
Post event damage extent

PRODUCT FORMAT

- **Digital raster data products**
  - Full-colour, Format ISO A1
  - Resolution 100 – 200 – 300 dpi
  - JPG + World-File
  - GeoTiff
  - GeoPDF
  - Metadata
- **Digital vector data products**
  - Depending on the requirements (Crisis Information, administrative boundaries, toponyms, water, settlements, ....)
  - ESRI shape Format
  - Google Earth KML Format

SERVICE LEVEL

**Service Level 1 (SL1) delivery time**

- Reference maps: **9 hours**
- Delineation/Grading maps: **3 hours** (FAM), **12 hours** (Final)

**All times are considered starting from the availability of suitable satellite data**

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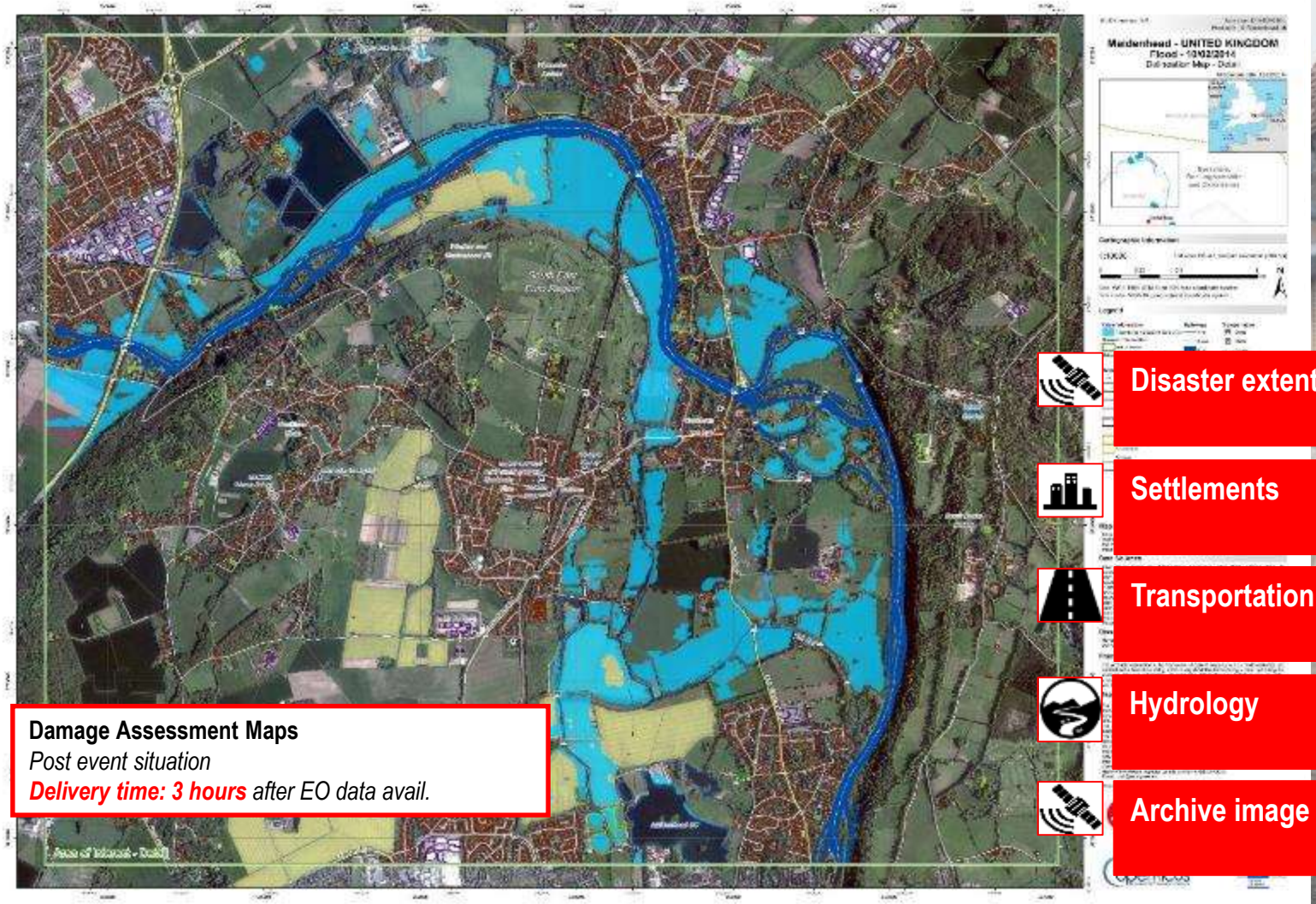
# Emergency Mapping Production




**Damage Assessment Maps**
*Post event situation*
***Delivery time: 3 hours** after EO data avail.*

- Disaster extent
- Settlements
- Transportation
- Hydrology
- Archive image

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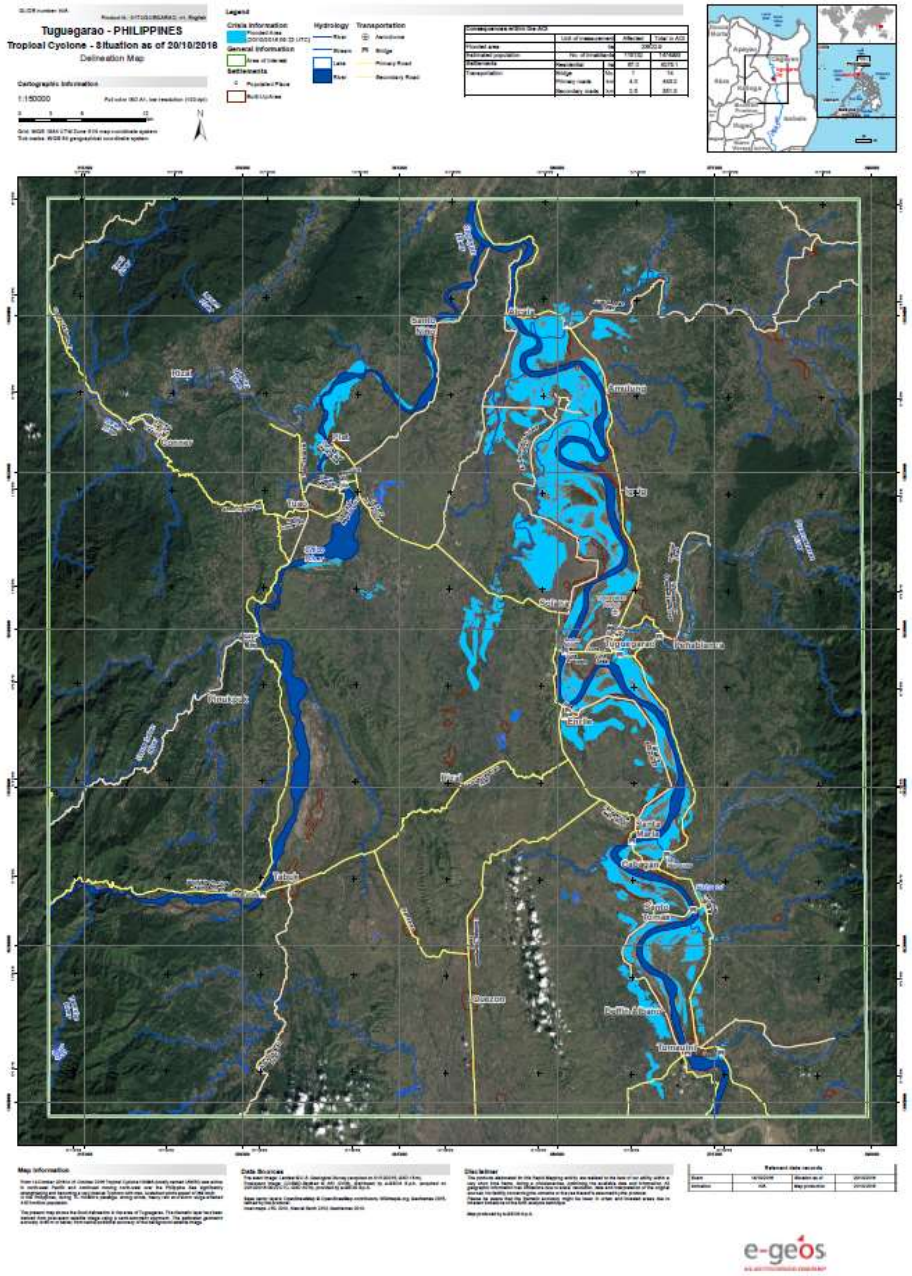
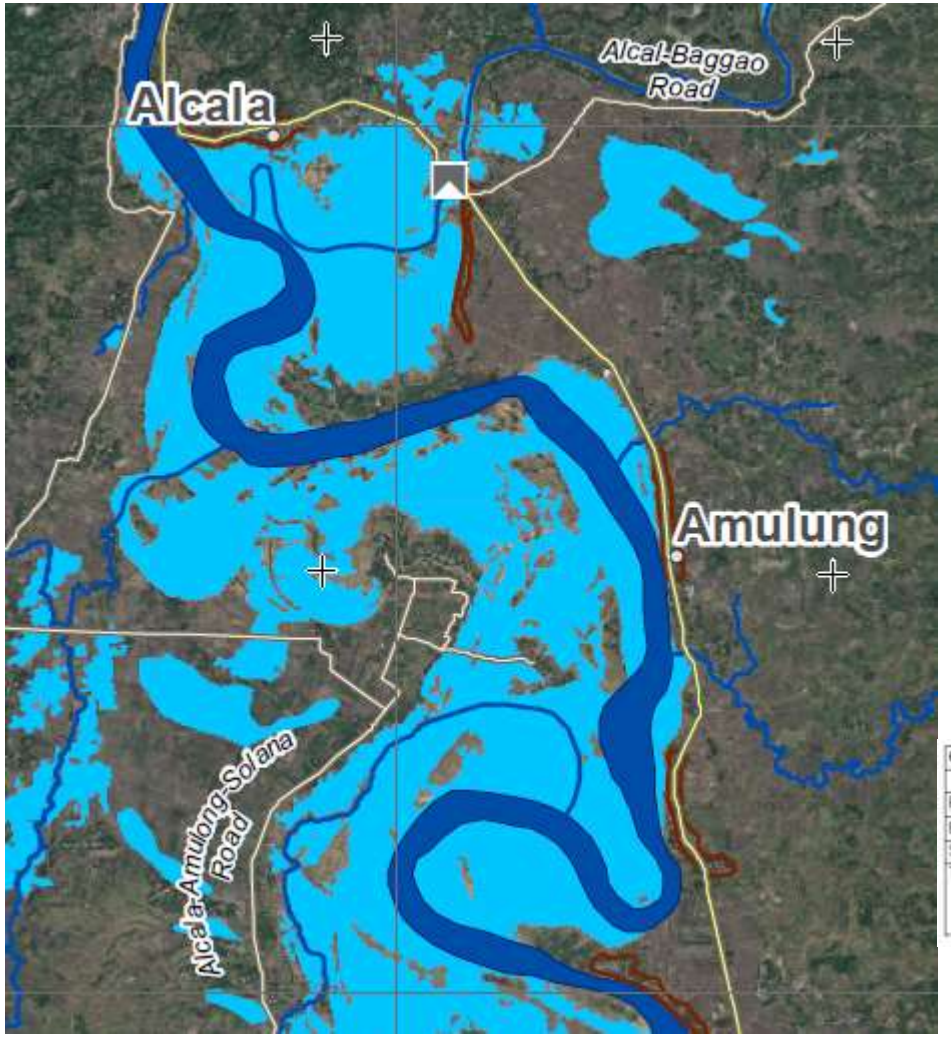
# Emergency Response Services: Flood in Philippines (October 2016)




**Legend**

**Crisis Information**
- Flooded Area (20/10/2016 09:22 UTC)

**General Information**
- Area of Interest

**Settlements**
- Populated Place
- Built-Up Area

**Hydrology**
- River
- Stream
- Lake
- River

**Transportation**
- Aerodrome
- Bridge
- Primary Road
- Secondary Road

**Consequences within the AOI**

| | Unit of measurement | | Affected | Total in AOI |
|---|---|---|---|---|
| Flooded area | ha | | 23822.9 | |
| Estimated population | No. of inhabitants | | 115132 | 1474993 |
| Settlements | Residential | ha | 67.0 | 8275.1 |
| Transportation | Bridge | No. | 1 | 14 |
| | Primary roads | km | 4.0 | 443.2 |
| | Secondary roads | km | 2.5 | 351.3 |

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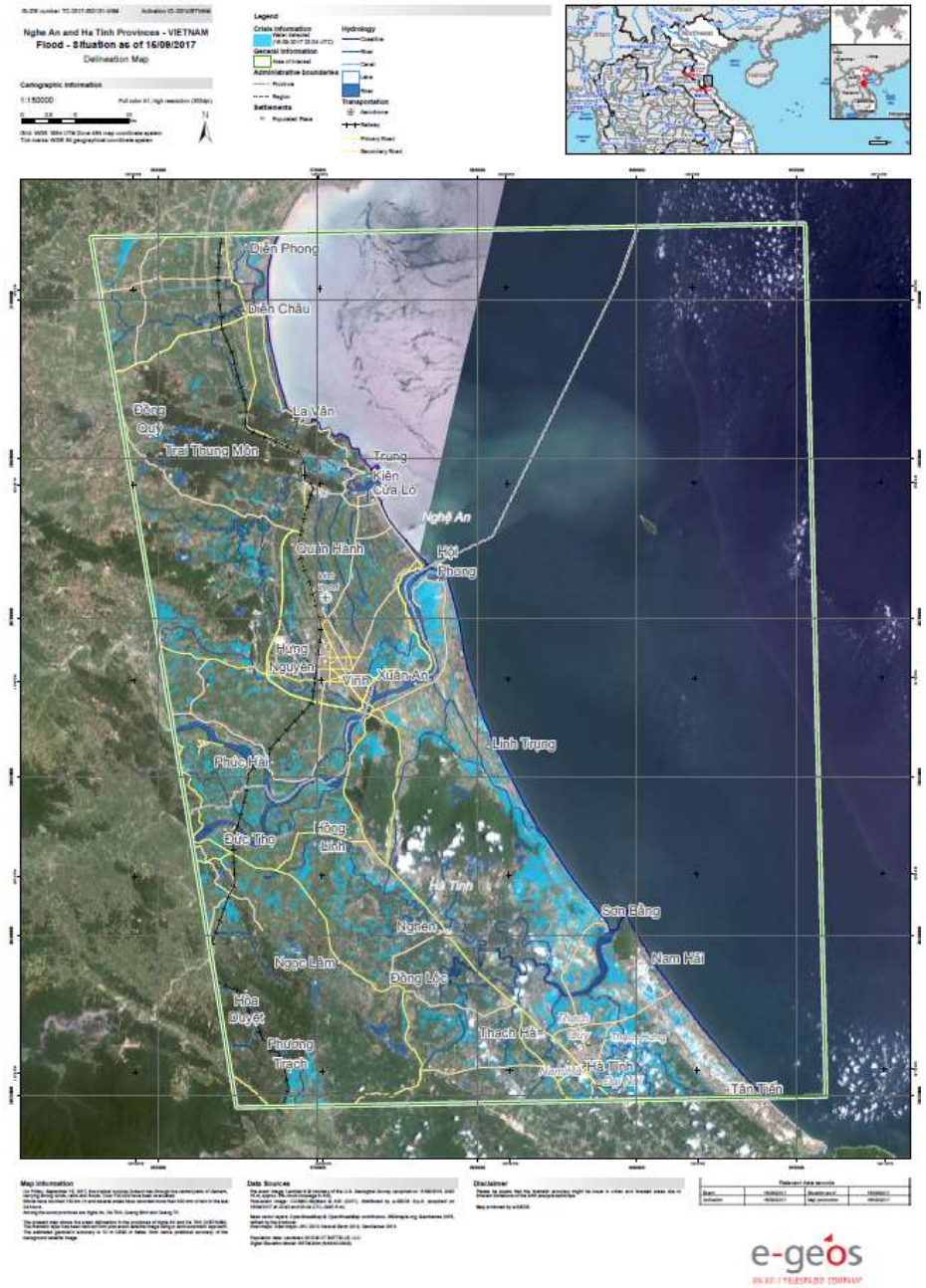
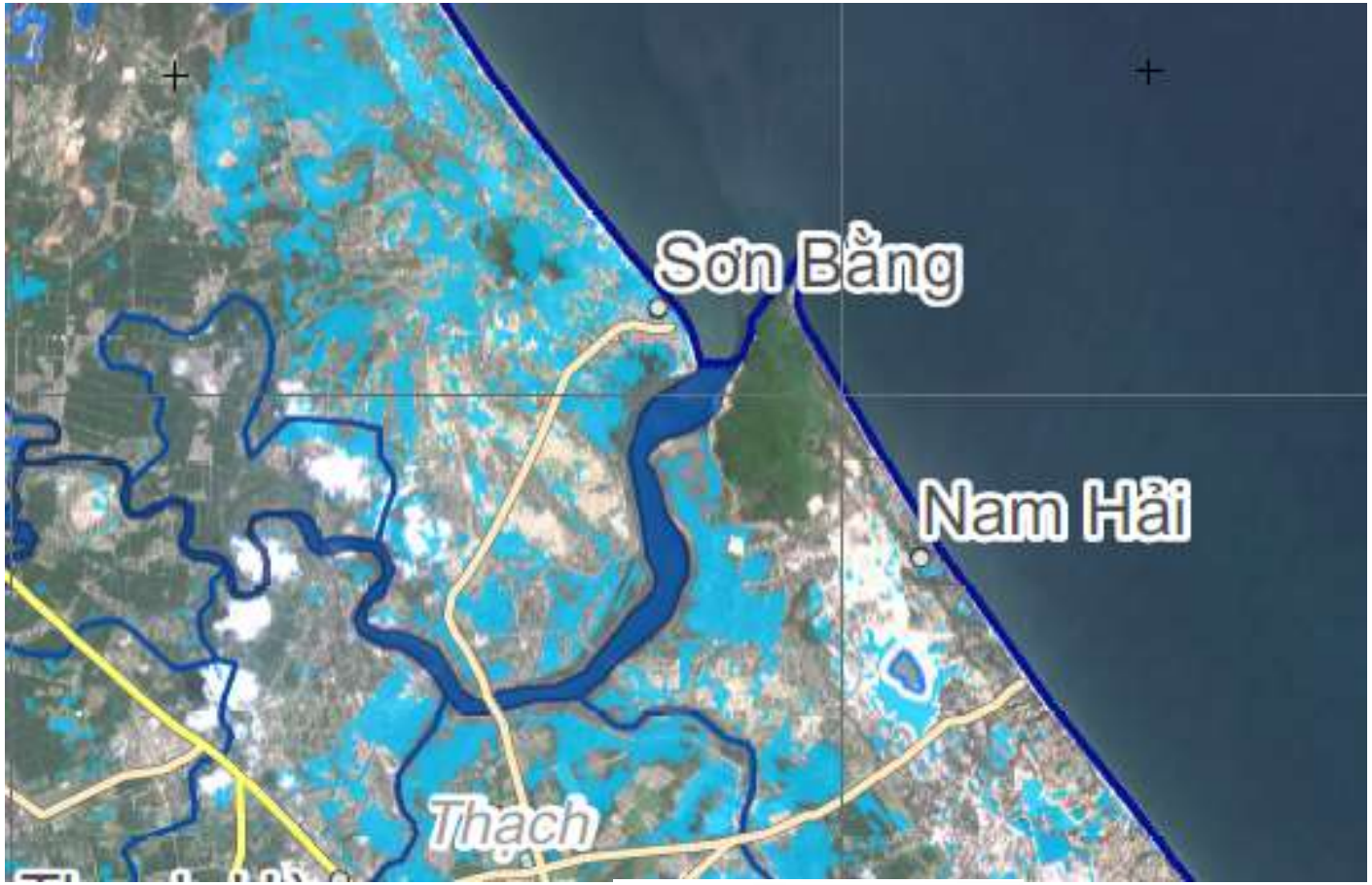
# Emergency Response Services: Flood in Vietnam (August 2017)




Legend

Crisis Information
Water detected (18-09-2017 23:04 UTC)

General Information
Area of Interest

Administrative boundaries
Province
Region

Settlements
Populated Place

Hydrology
Coastline
River
Canal
Lake
River

Transportation
Aerodrome
Railway
Primary Road
Secondary Road

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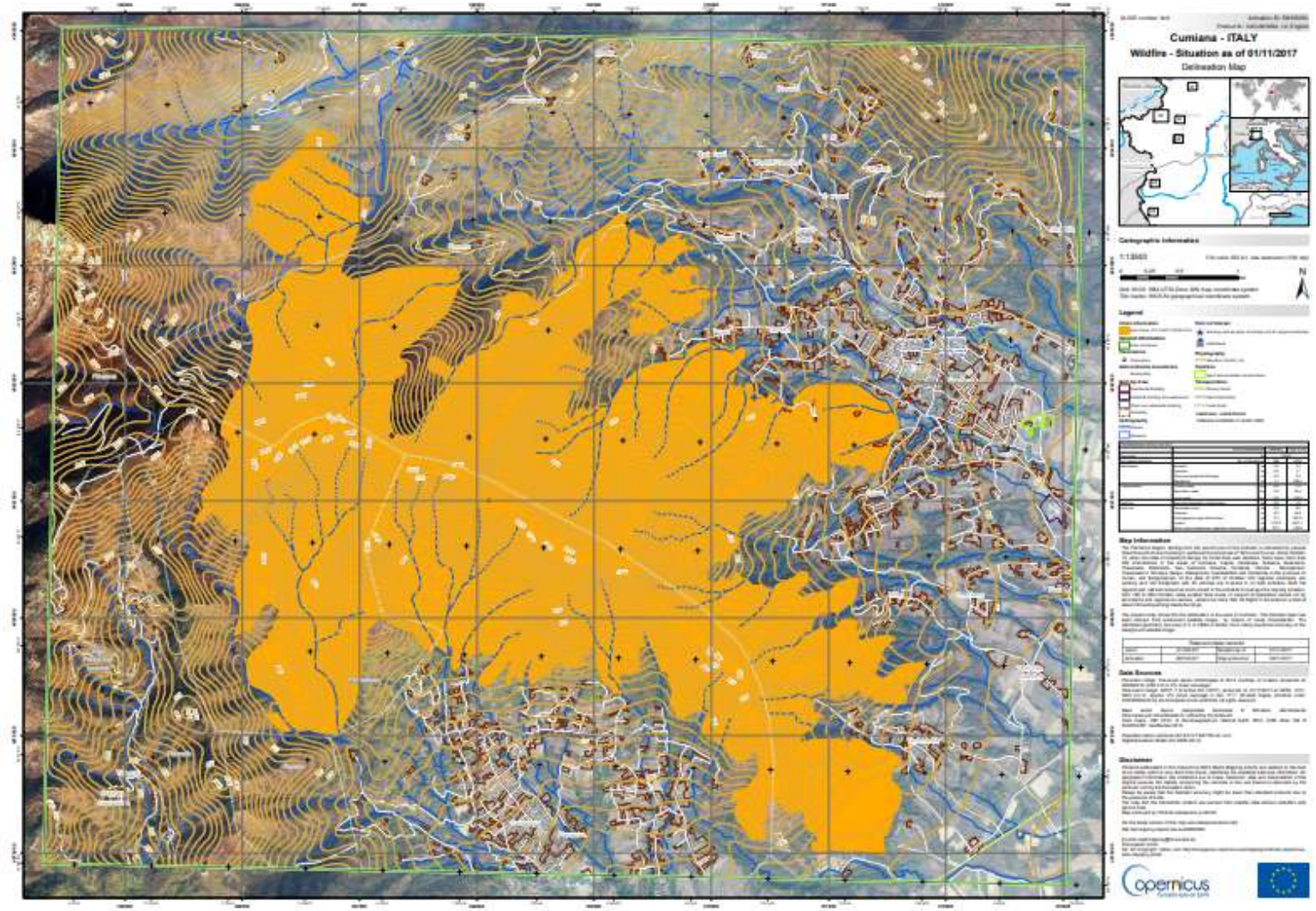
# Emergency Response Services: Forest Fires in Piemonte (November 2017)





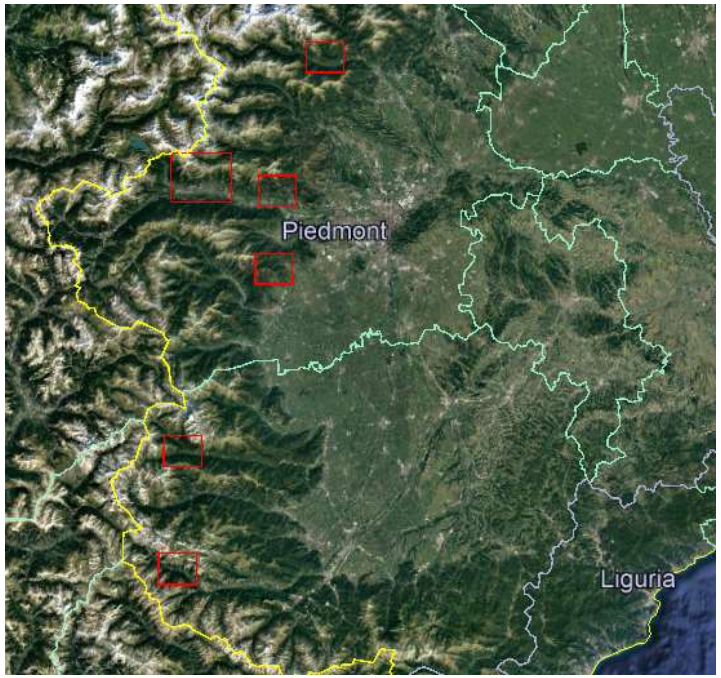

**Legend**

**Crisis Information**

Burnt Area (01/11/2017 09:59 UTC)

- Authorised User: Italian Civil Protection (DPC)
- 6 Areas of Interest
- 7 Grading maps based on VHR optical imagery

| Consequences within the AOI | | | | |
|---|---|---|---|---|
| | Unit of measurement | | Affected | Total in AOI |
| Burnt area | ha | | 1818.7 | |
| Estimated population | No. of Inhabitants | | 388 | 5439 |
| Land use | Permanent crops | ha | 0.0 | 0.8 |
| | Pastures | ha | 0.0 | 44.0 |
| | Heterogeneous agricultural areas | ha | 2.9 | 861.6 |
| | Forests | ha | 1747.8 | 4877.1 |
| | Shrub and/or herbaceous vegetation association | ha | 67.9 | 228.9 |

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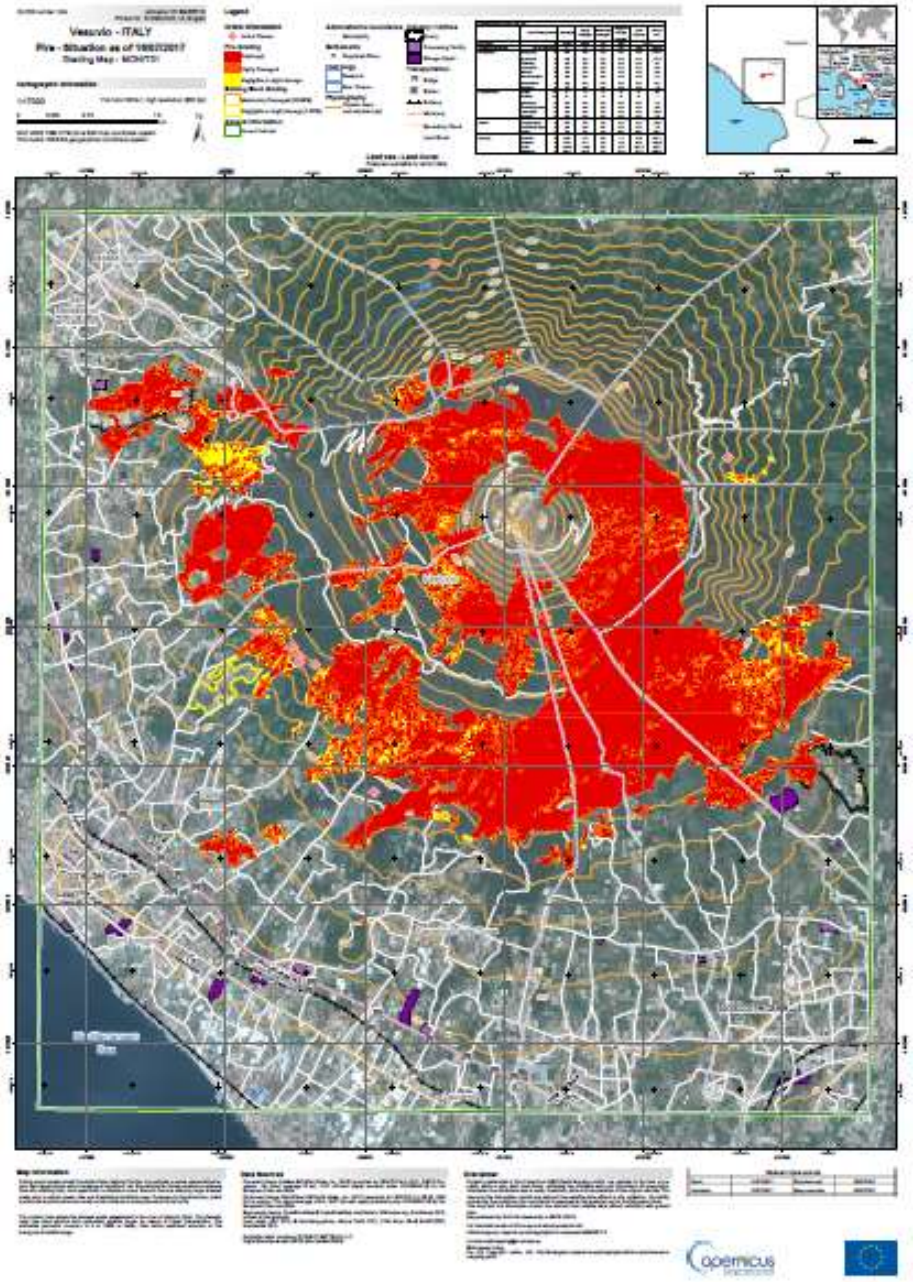
# Emergency Response Services: Forest Fires in Southern Italy (summer 2017)



- Authorised User: ***Italian Civil Protection*** (DPC)
- 22 Areas of Interest
- 29 Grading maps based on VHR optical imagery

| Consequences within the AOI | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Unit of measurement | | Destroyed | Highly damaged | Moderately damaged | Negligible to slight damage | Total affected | Total in AOI |
| Burnt area | ha | | 1055.8 | 304.9 | 0.0 | 186.4 | 1547.1 | |
| Estimated population | No. of inhabitants | | 0 | 0 | 0 | 1311 | 1276 | 102142 |
| Land use | Bare soil | ha | 38.6 | 7.9 | 0.0 | 1.4 | 47.9 | 257.1 |
| | Cropland | ha | 49.9 | 19.1 | 0.0 | 14.4 | 83.4 | 1949.0 |
| | Scrub | ha | 446.2 | 113.6 | 0.0 | 47.4 | 607.2 | 940.1 |
| | Woodland | ha | 509.1 | 161.0 | 0.0 | 121.3 | 791.4 | 3095.7 |

**Legend**

**Crisis Information**

Active Flames

**Fire Grading**

Destroyed

Highly Damaged

Negligible to slight damage

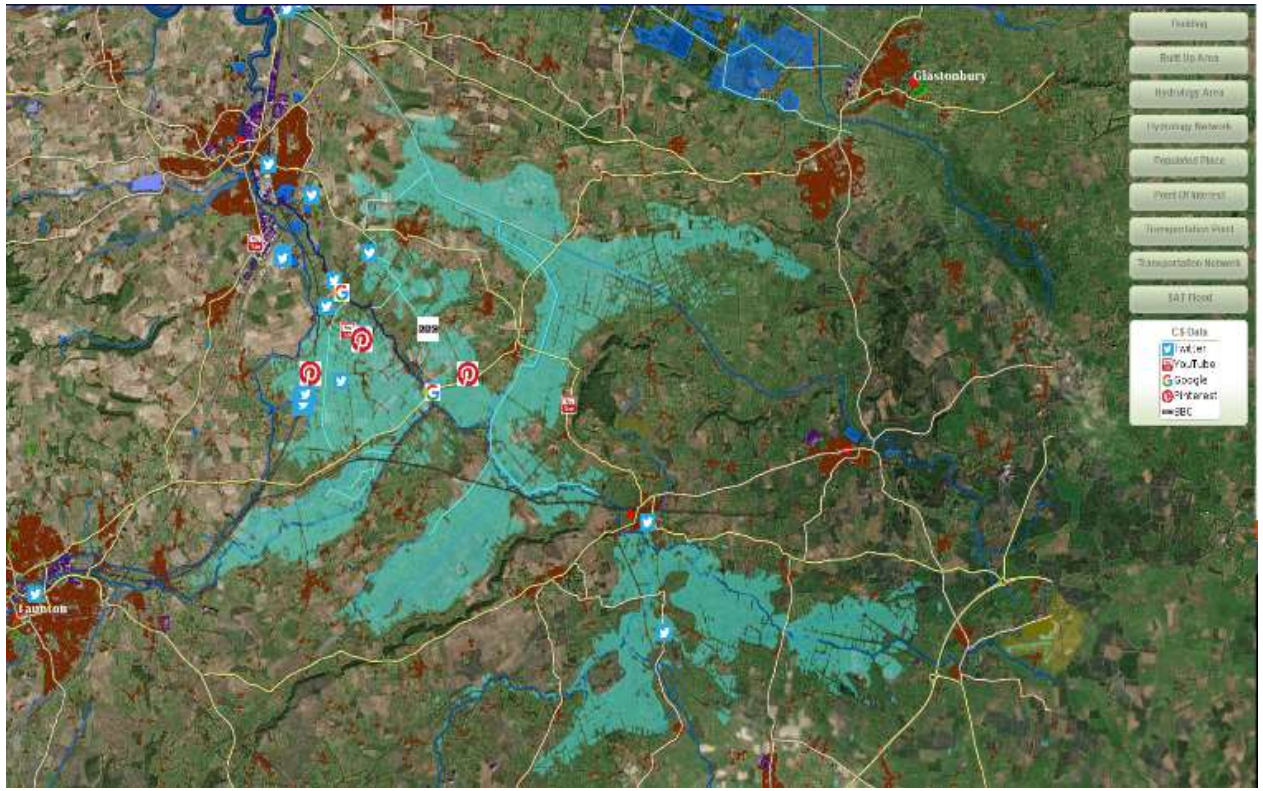
**Building Block Grading**

Moderately Damaged [40-69%]

Negligible to slight damage [1-39%]

# Emergency Response Services

- On demand tailored Geo-Information mapping and monitoring services based on cartographic standard, with provision of maps and analytics
- Leveraging on the analysis of **big multitemporal data series** integrated with Geo-Information derived by **crowdsourcing data**
- Provided on a **24/7 basis** for Emergency mapping services



…anywhere…

…anytime…

…any sensor…

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# CRITICAL ASSETS MONITORING

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# DISPLACEMENT ANALYSIS

**FULLY BASED ON SATELLITE INTERFEROMETRIC DATA WITH ANALYSIS BASED ON PROPRIETARY TECHNIQUE**

- Measuring points position (x, y, z)
- Average annual displacement rate (mm/y) of the point in the observation period (mean velocity) with **millimetre precision**
- Displacement time series of the point for each observation date

Quality proven by in situ validation

Independent instrumental measure

Complementary to other means of measurements

Historical evolution the of phenomena

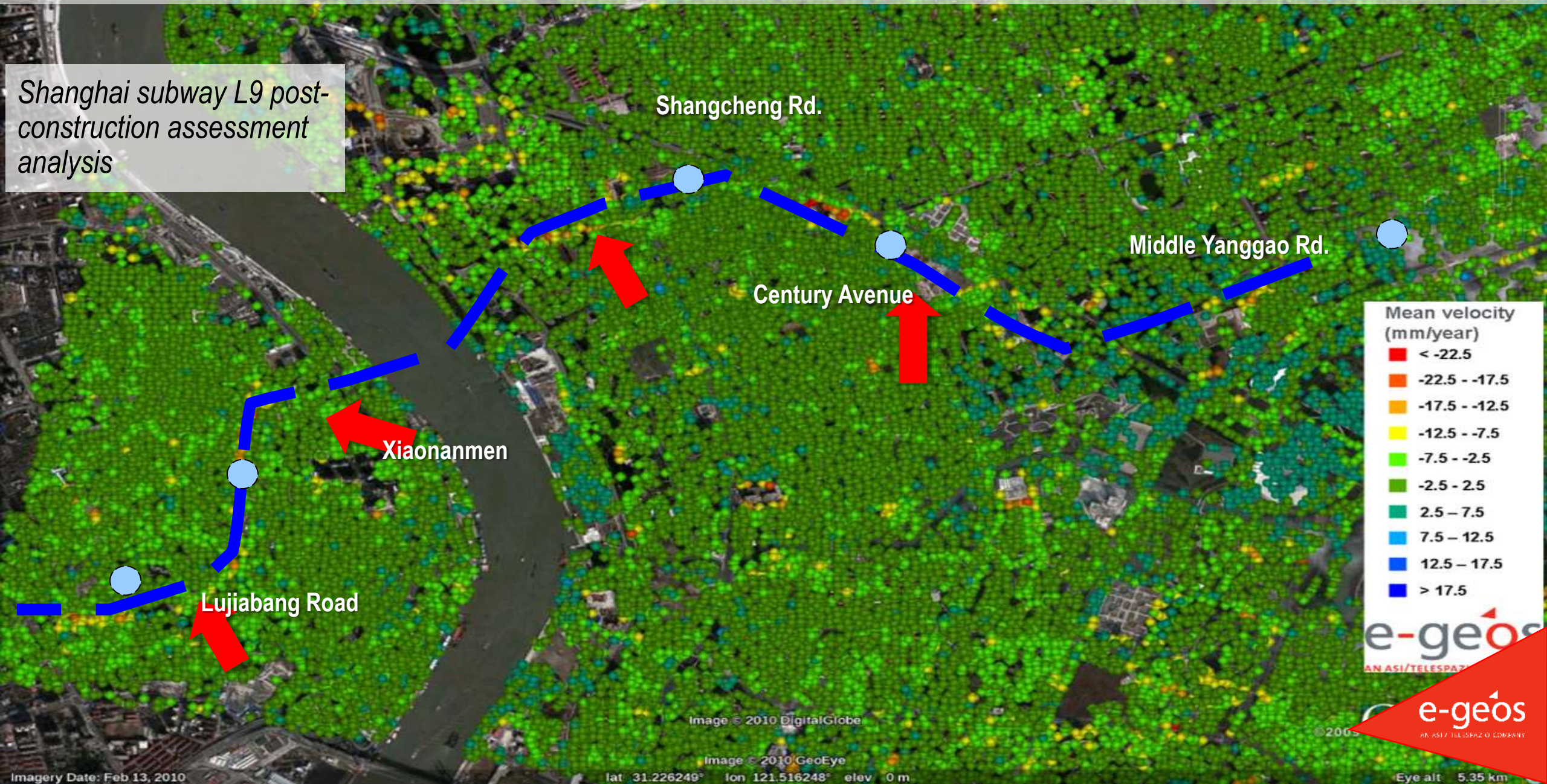
e-geos

e-geos
Welcome
Home
Documents
Configuration
Logout
DU
500 m
41.870497, 12.446312
Displacement analysis with e-Geos AssetWatch platform
e-geos

# LINEAR INFRASTRUCTURES MONITORING

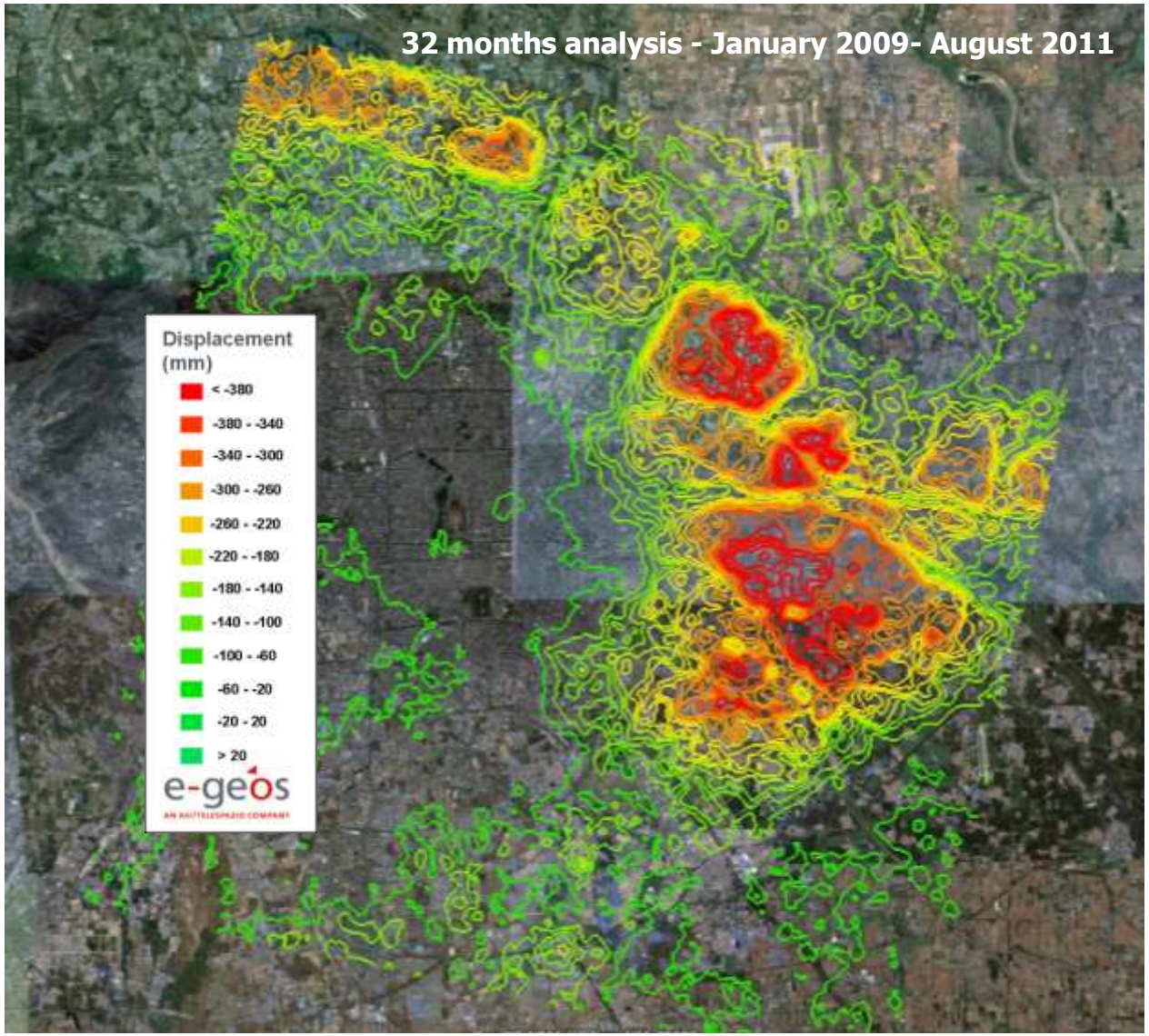
# LINEAR INFRASTRUCTURES MONITORING

*Shanghai subway L9 post-construction assessment analysis*



# INFRASTRUCTURE MONITORING

beo



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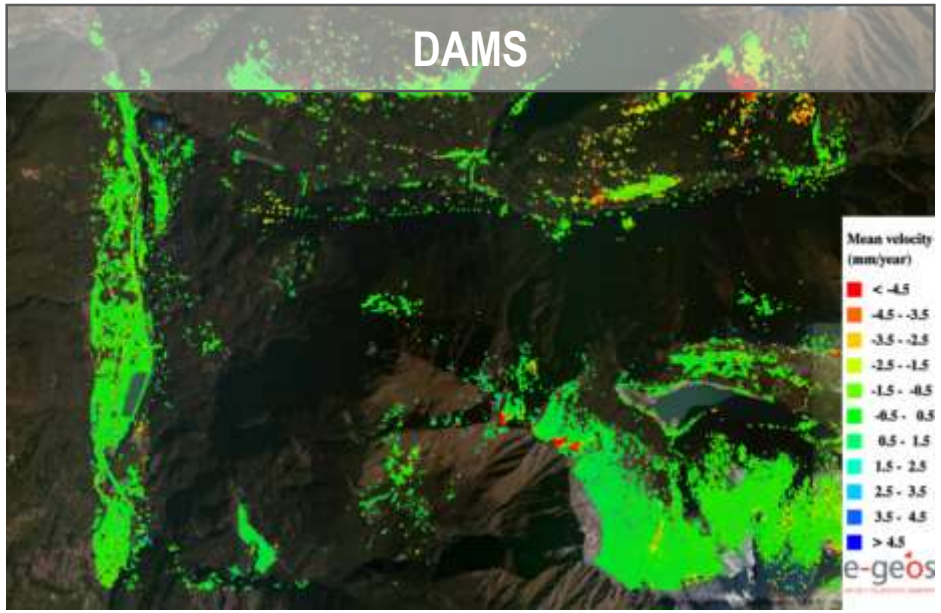
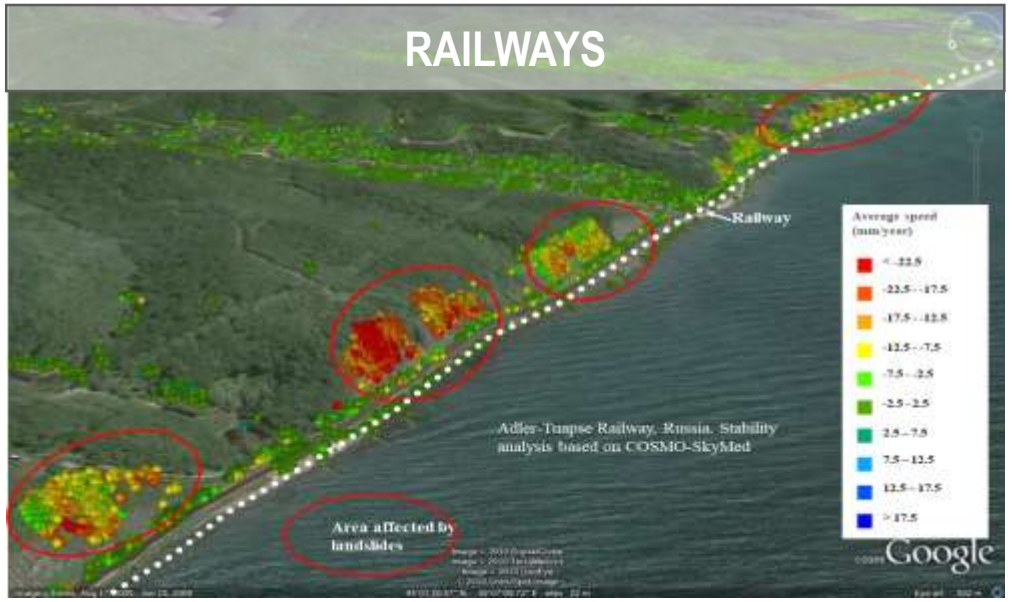
# OTHER ASSETS MONITORING

## DAMS




## RAILWAYS




## INDUSTRIAL SITES

## BRIDGES

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For more information:

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fabio.volpe@e-geos.it

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