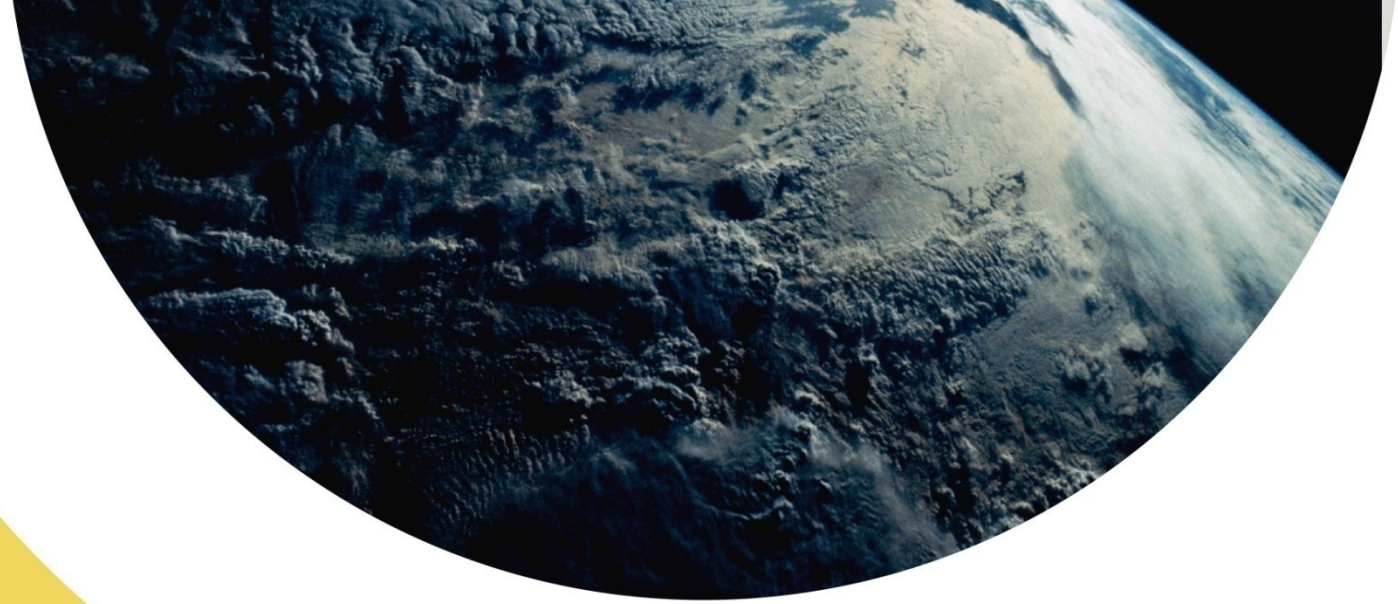


Global Monitoring for Environment and Security

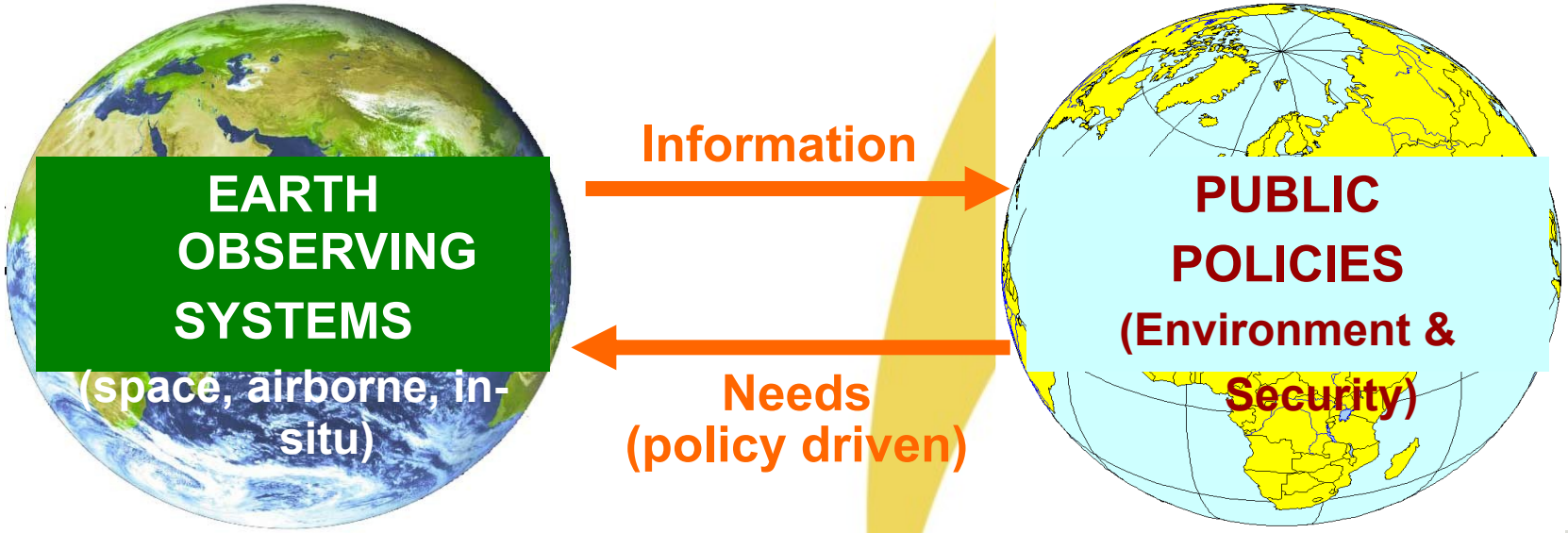
GMES in support of Emergency Management

Virginia Puzzolo
European Commission
DG Enterprise - GMES Bureau

European Commission

Overall GMES objectives

to provide information services to policy-makers and other users



Space Agencies
In-situ Observing systems
Scientific Community
EO Value Adding Industry

National Governments and Agencies
European Union Institutions
Inter-Governmental Organisations (IGOs)
Non Governmental Organisations (NGOs)

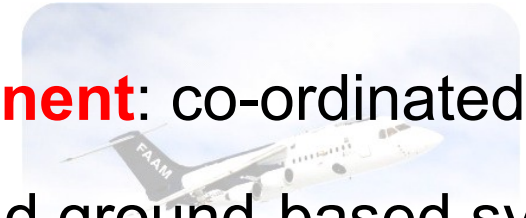
GMES components

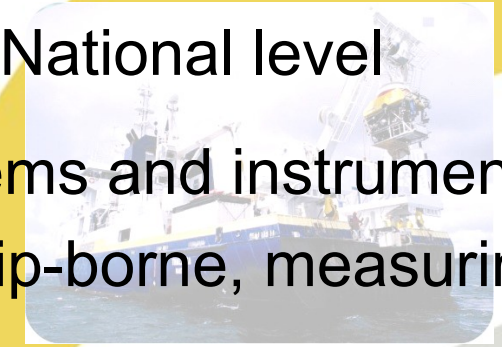
GMES consists of **3 components:**

1. **Space Component**
   - Existing or planned European space infrastructure
   - Space infrastructure co-financed by the EU and ESA
   - ESA is the coordinator, development and procurement agent for and on behalf of the EU
2. **In-Situ Component**
   - facilities, instruments and services at national, regional and intergovernmental levels inside and outside the EU.
   - EEA supports the EC for the coordination of access to in situ data and products for services
3. **Service component**
   - Marine, atmosphere, land, emergency at pre-operational stage
   - Need for contribution of GMES to security and climate change monitoring

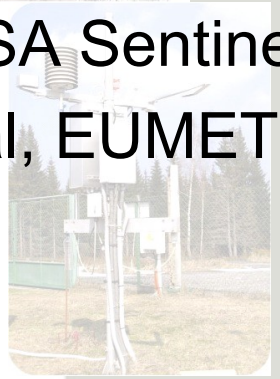
Observational infrastructures

- **In-situ component**: co-ordinated at National level
  - air-, sea- and ground-based systems and instruments (e.g. airborne, balloons, floats, ship-borne, measuring stations, seismographs, etc)
- **Space component**: different missions co-ordinated at European level
  - Dedicated GMES missions: the ESA Sentinels
  - Contributing missions: EU National, EUMETSAT and third parties





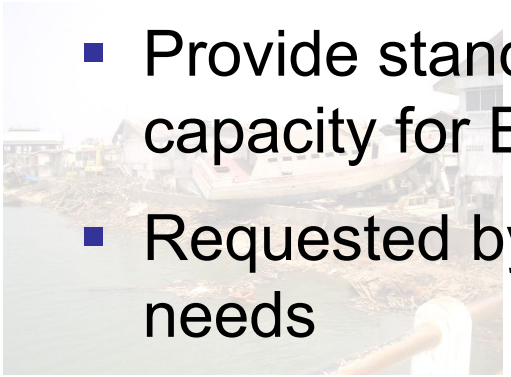


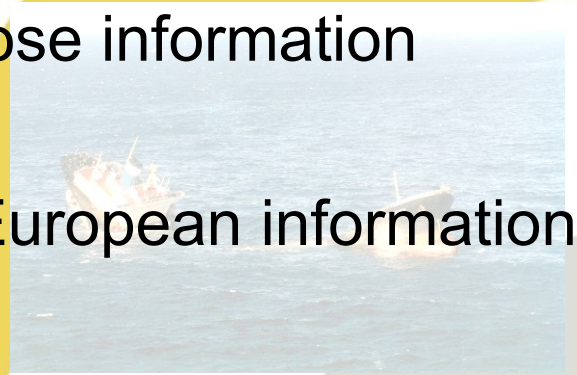



GMES Services

Core services

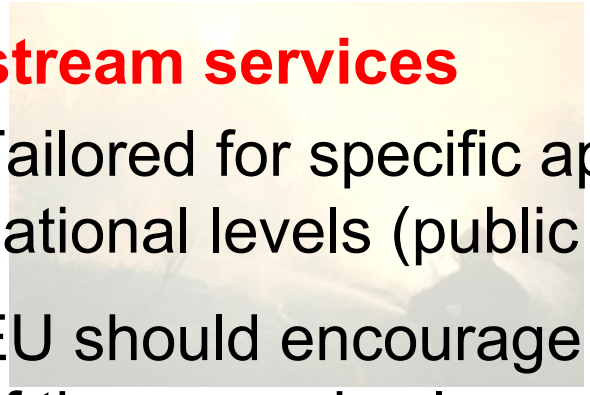
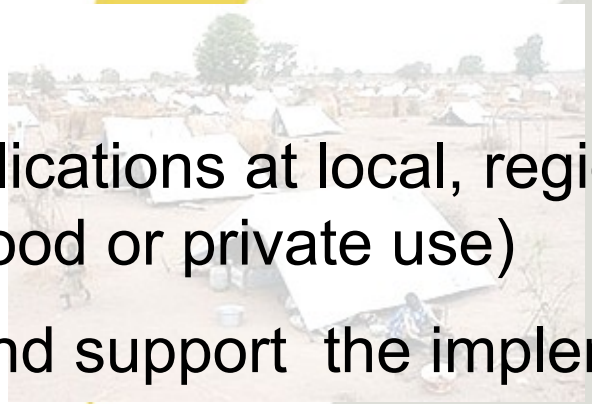
- Provide standardized multi-purpose information capacity for Europe
- Requested by the EU: link with European information needs



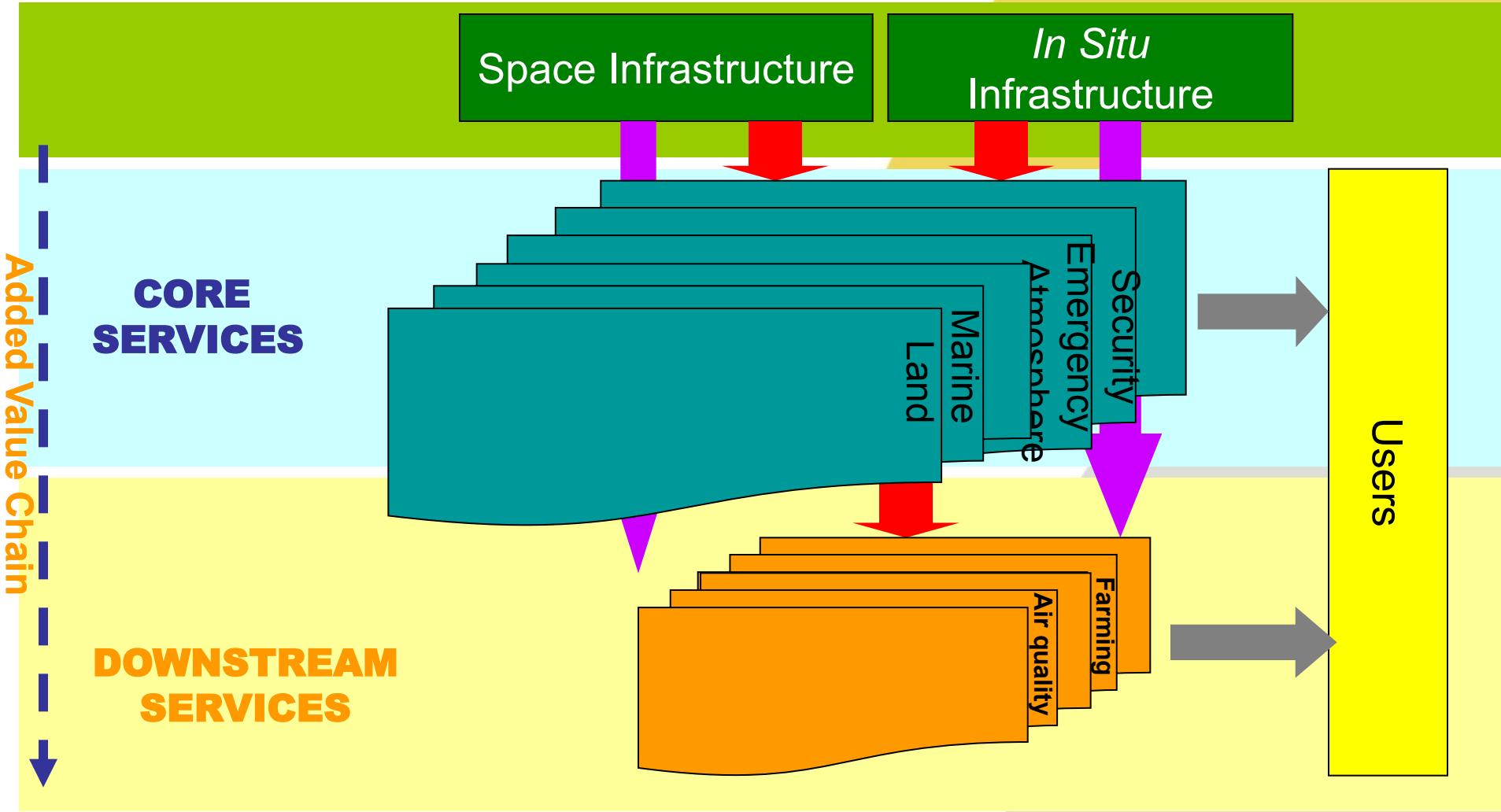


Downstream services

- Tailored for specific applications at local, regional, national levels (public good or private use)
- EU should encourage and support the implementation of these service layer

Overall architecture



GMES Core Services

Three on Earth systems:

Land

Marine

Atmosphere

Three horizontal:

Emergency Response

Security

Climate Change

ERCS objective

To support ERCS users during crises due to:

- **natural disasters**
  - floods
  - Forest fires
  - volcanoes
  - earthquake
  - landslides
  - tsunamis
  - Storms
- **man-made disasters**
  - humanitarian aid
  - chemical hazards

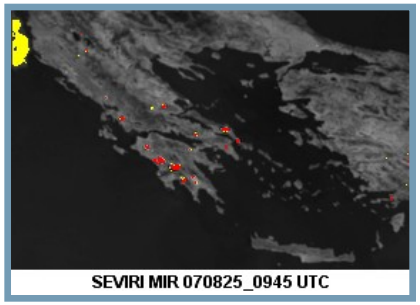
ERCS users

= all actors involved in the crisis management

- **Civil Protection:**
  - National Civil Protection Services of Europe
  - DG ENV (European CP Unit)
  - more globally all risk management actors in Europe at different territorial scales
- **Humanitarian Aid:**
  - DG RELEX, DG ECHO
  - NGOs
- **Security crises:**
  - European Council
  - Member States

Four main types of products:

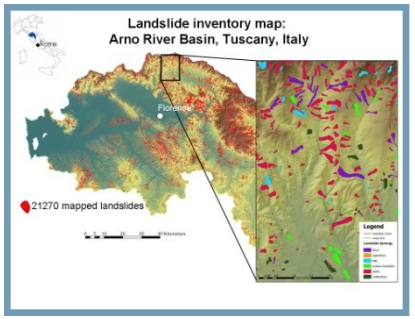
Early warning



Reference maps

Assessment maps

Thematic maps



For headquarters, decision-makers and in-field operatives In Europe and worldwide

ERCS 1st priority

Rapid mapping on demand in case of humanitarian crises, natural disasters, and man-made emergency situations within & outside Europe

- **Reference maps** available within 6 hours over crisis area
- **Damage assessment maps** available within 24 hours & daily updated
- **Situation maps and forecasts** of evolution of situations within the few days-weeks after crisis

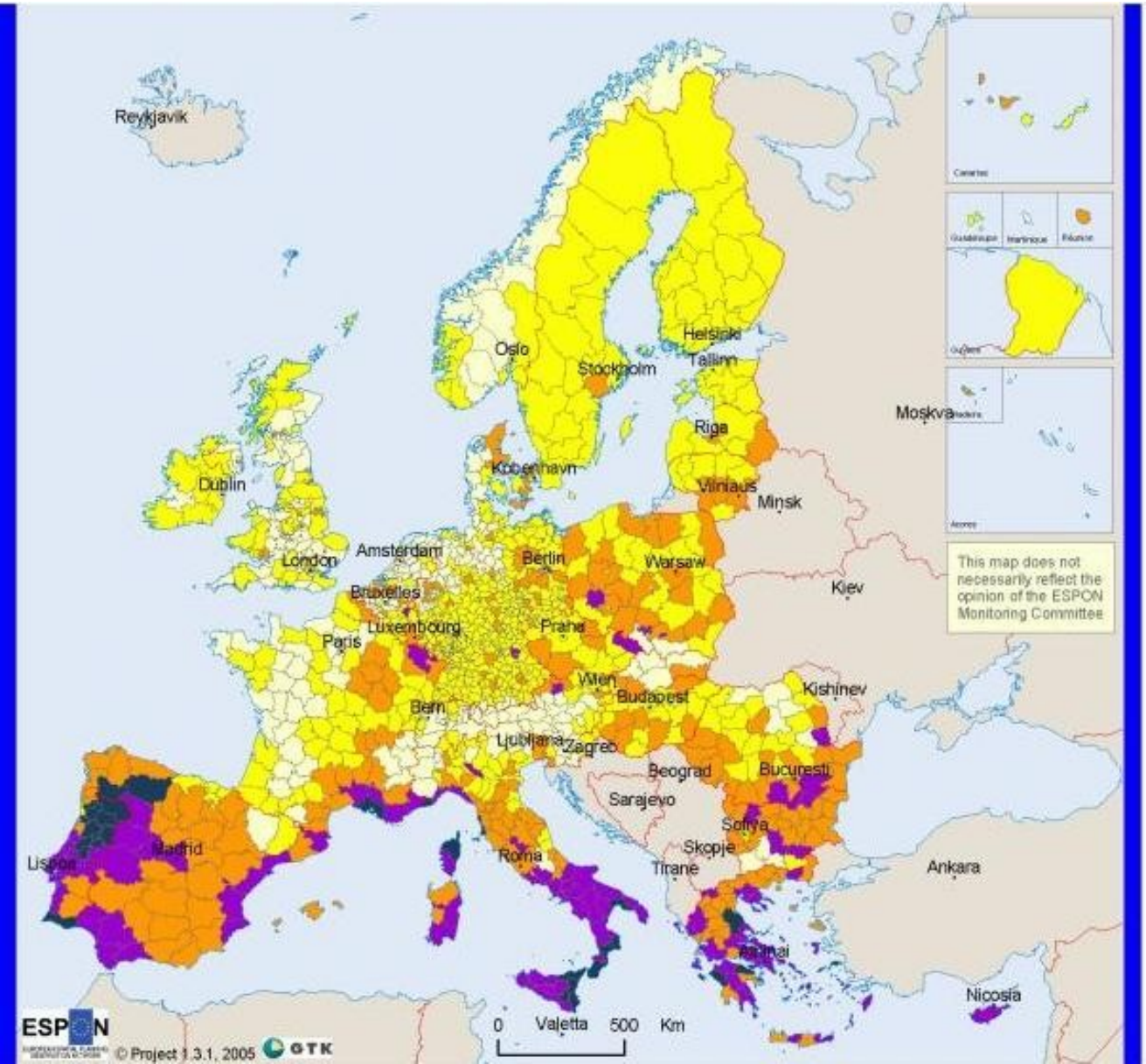
ERCS 2nd priority

extension of the service towards crisis-prevention and post-crisis management part of the cycle:

- **hazard and risk analysis,**
- **forecasting and early warnings**

Examples

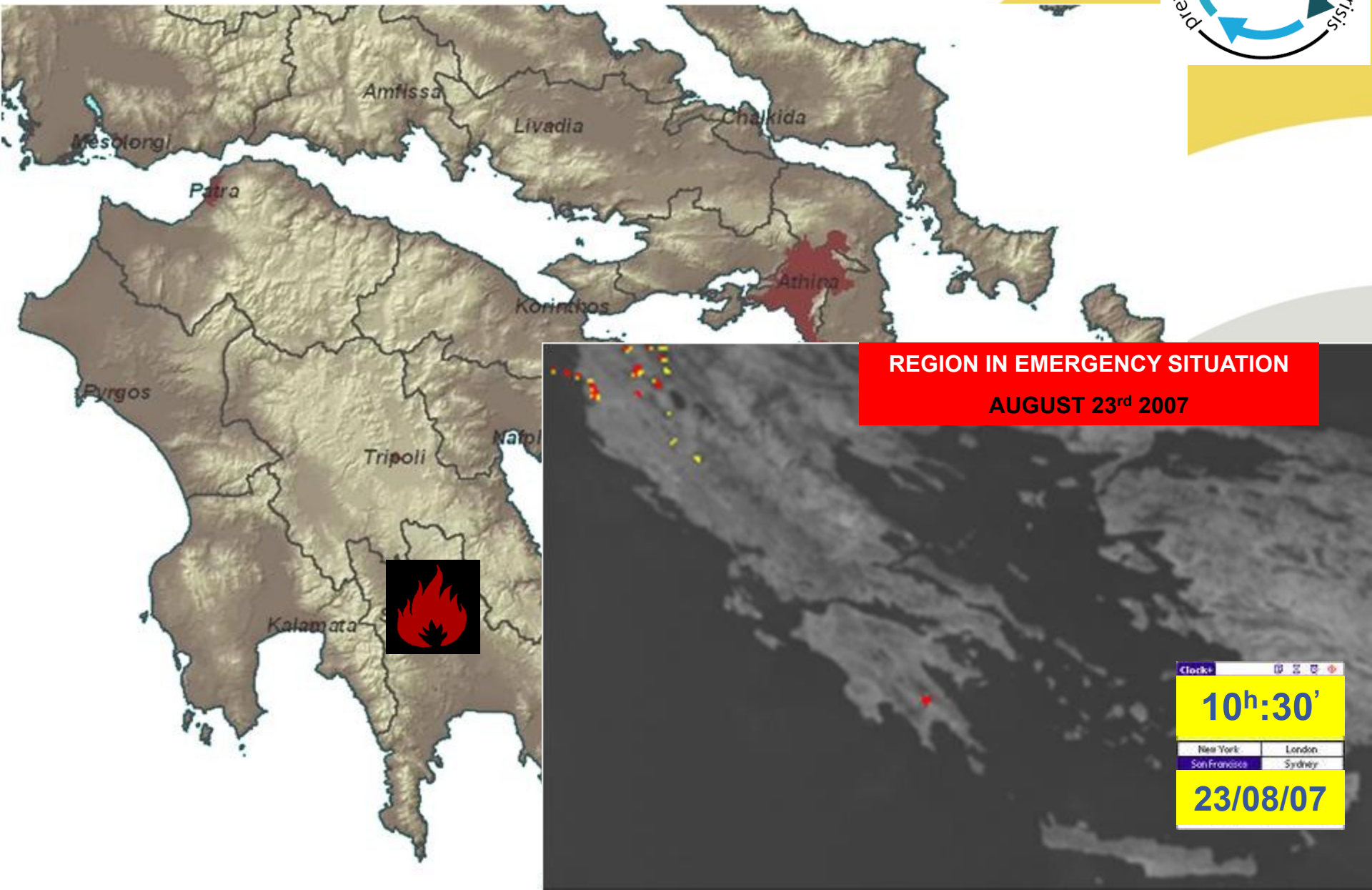
Forest fires in Europe
Example: the summer 2007 event in Greece



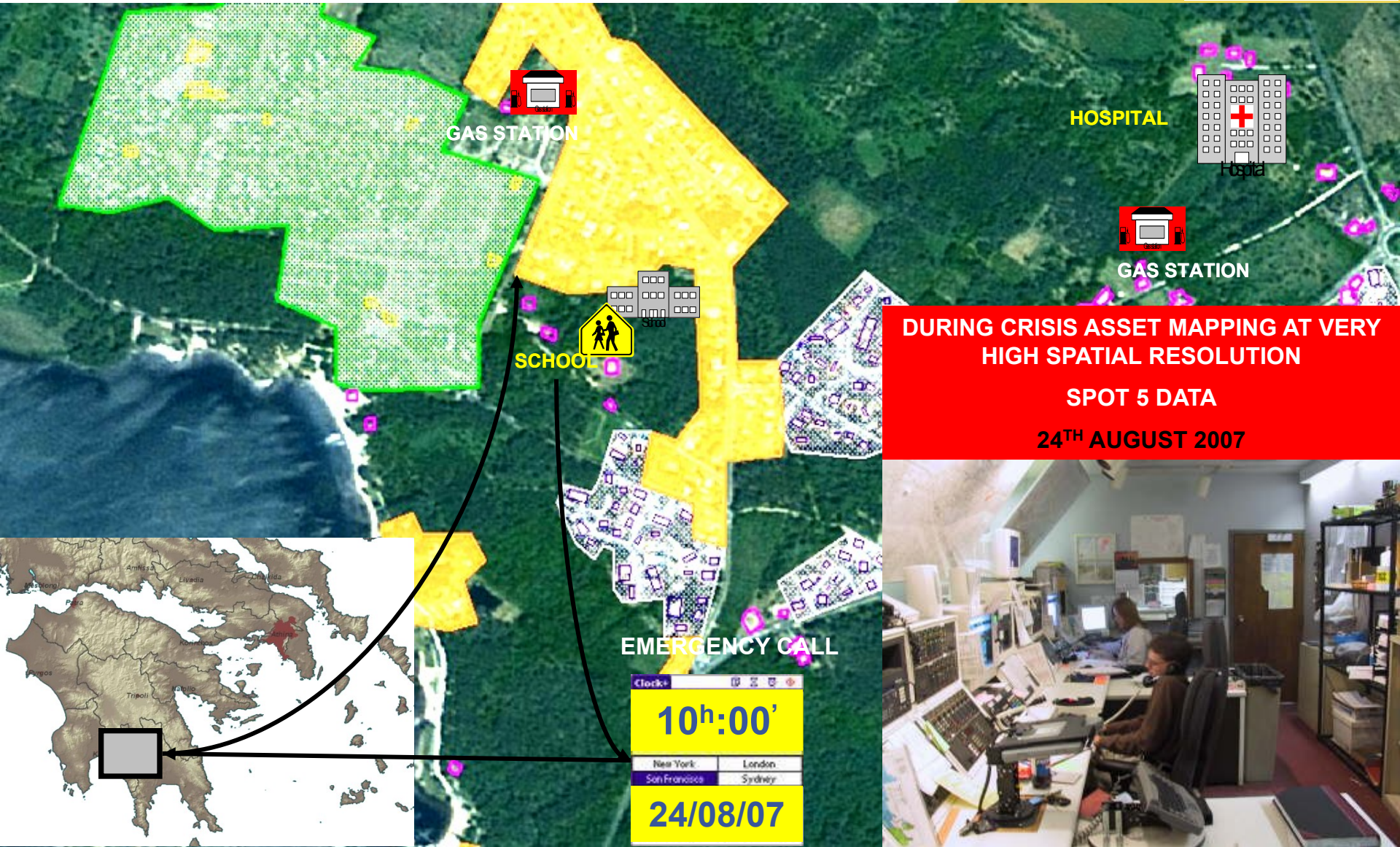
Forest fire hazard

- Very low
- Low
- Moderate
- High
- Very high
- Non ESPON space

Early warning and alert
Hot spot detection and monitoring



Asset mapping

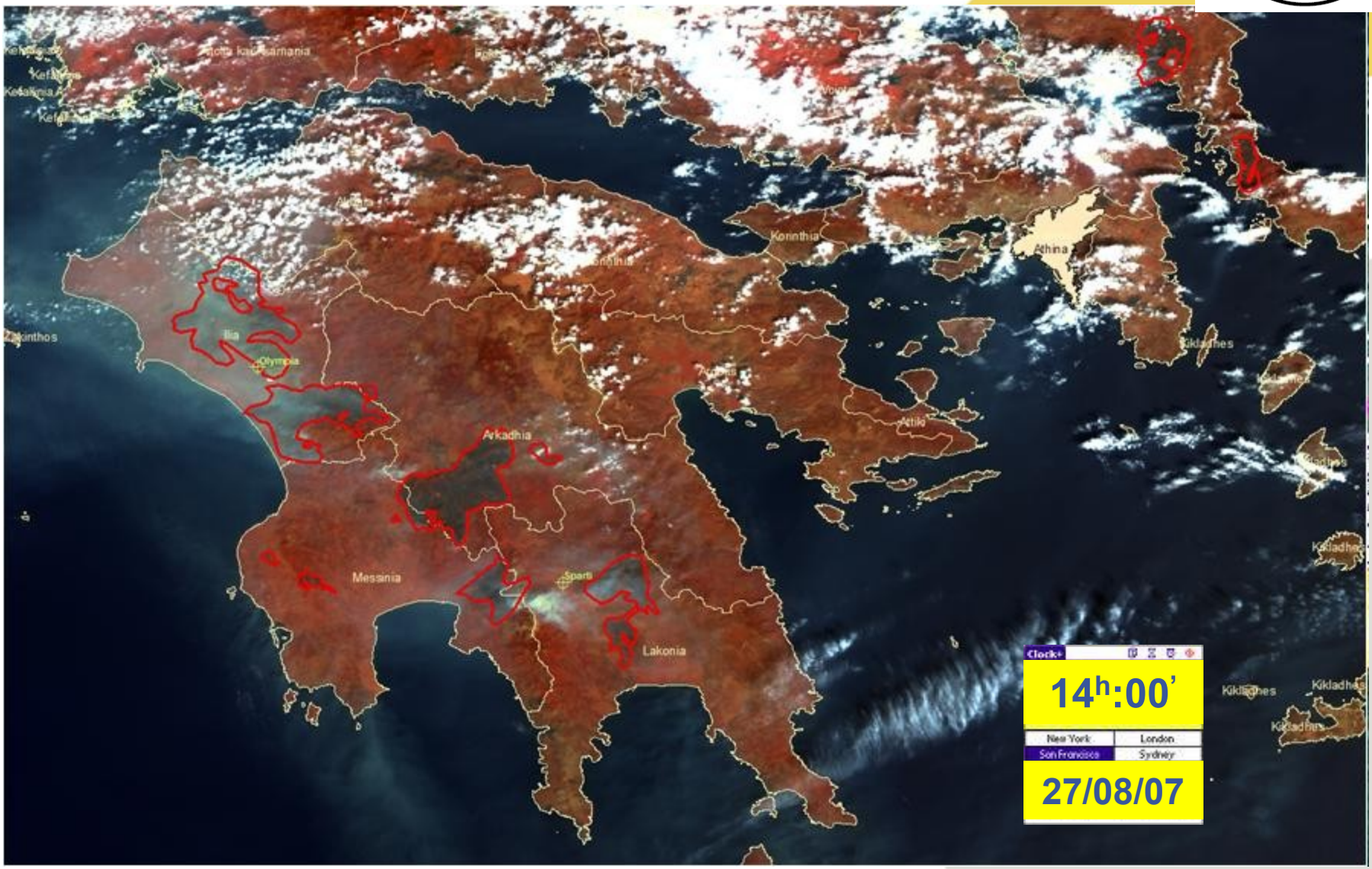


DURING CRISIS ASSET MAPPING AT VERY HIGH SPATIAL RESOLUTION

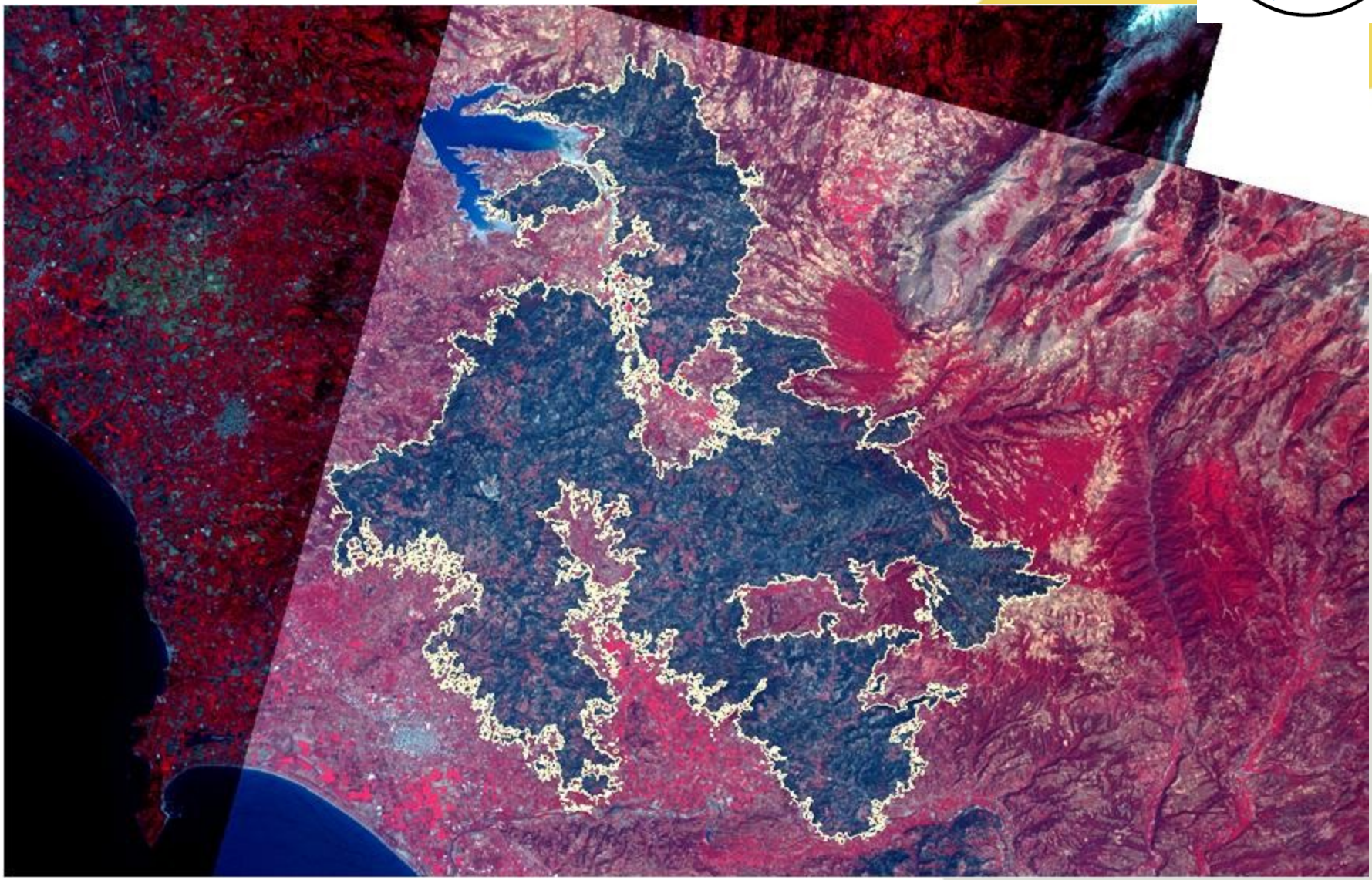
SPOT 5 DATA

24TH AUGUST 2007

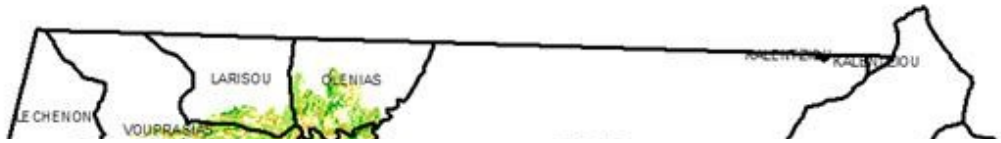
Rapid mapping

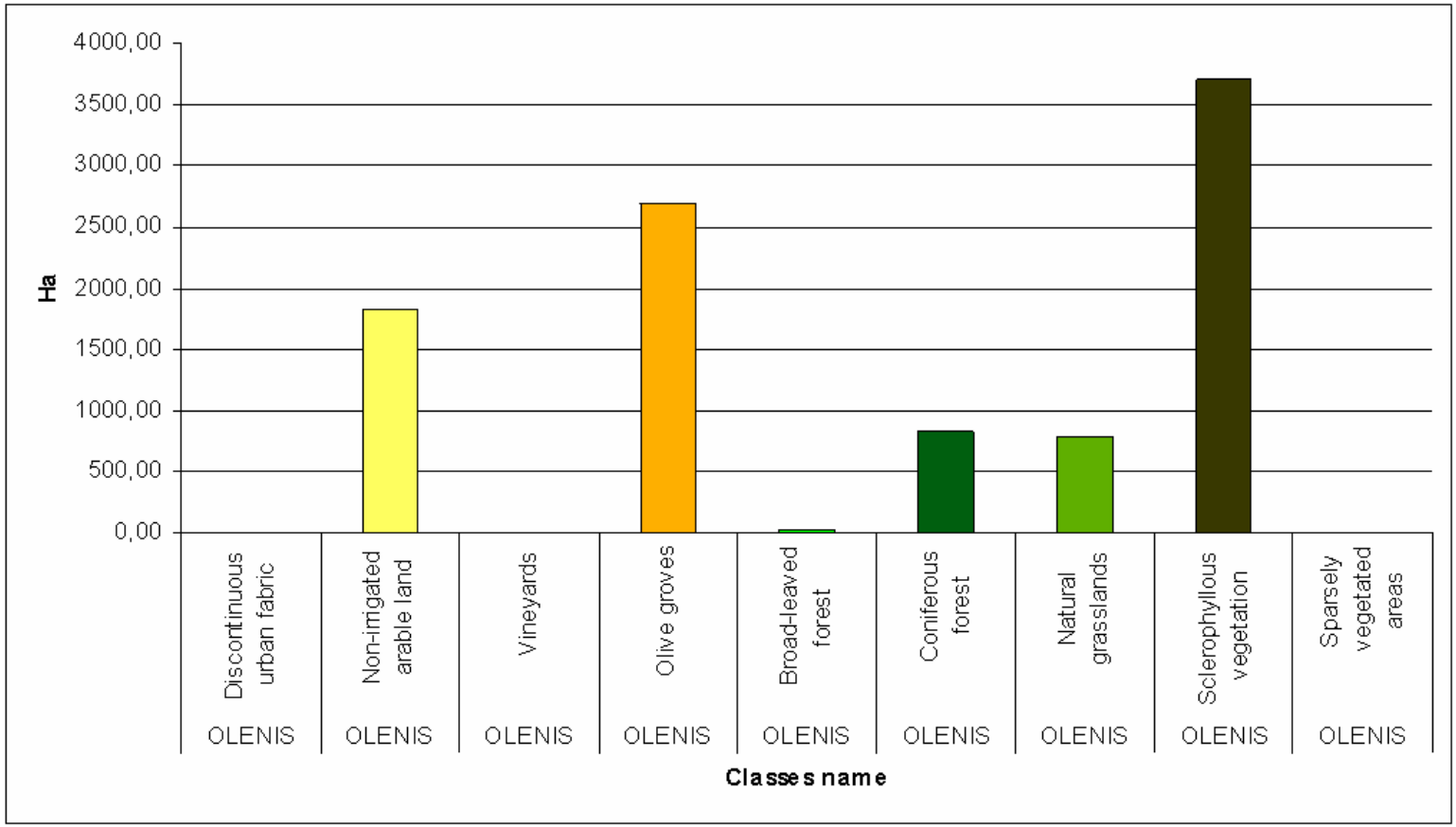


Rapid fire mapping during crisis

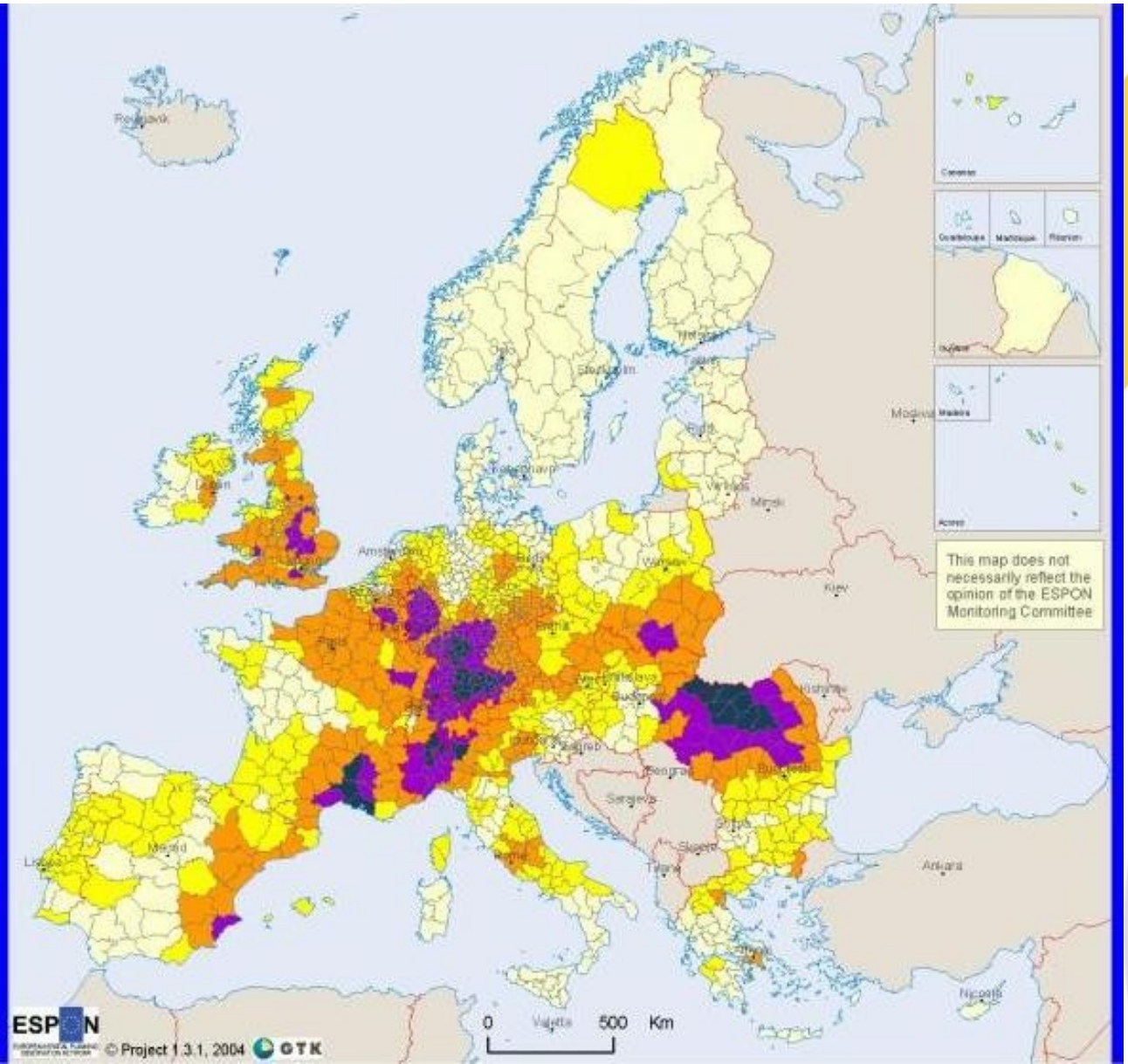


Damage assessment



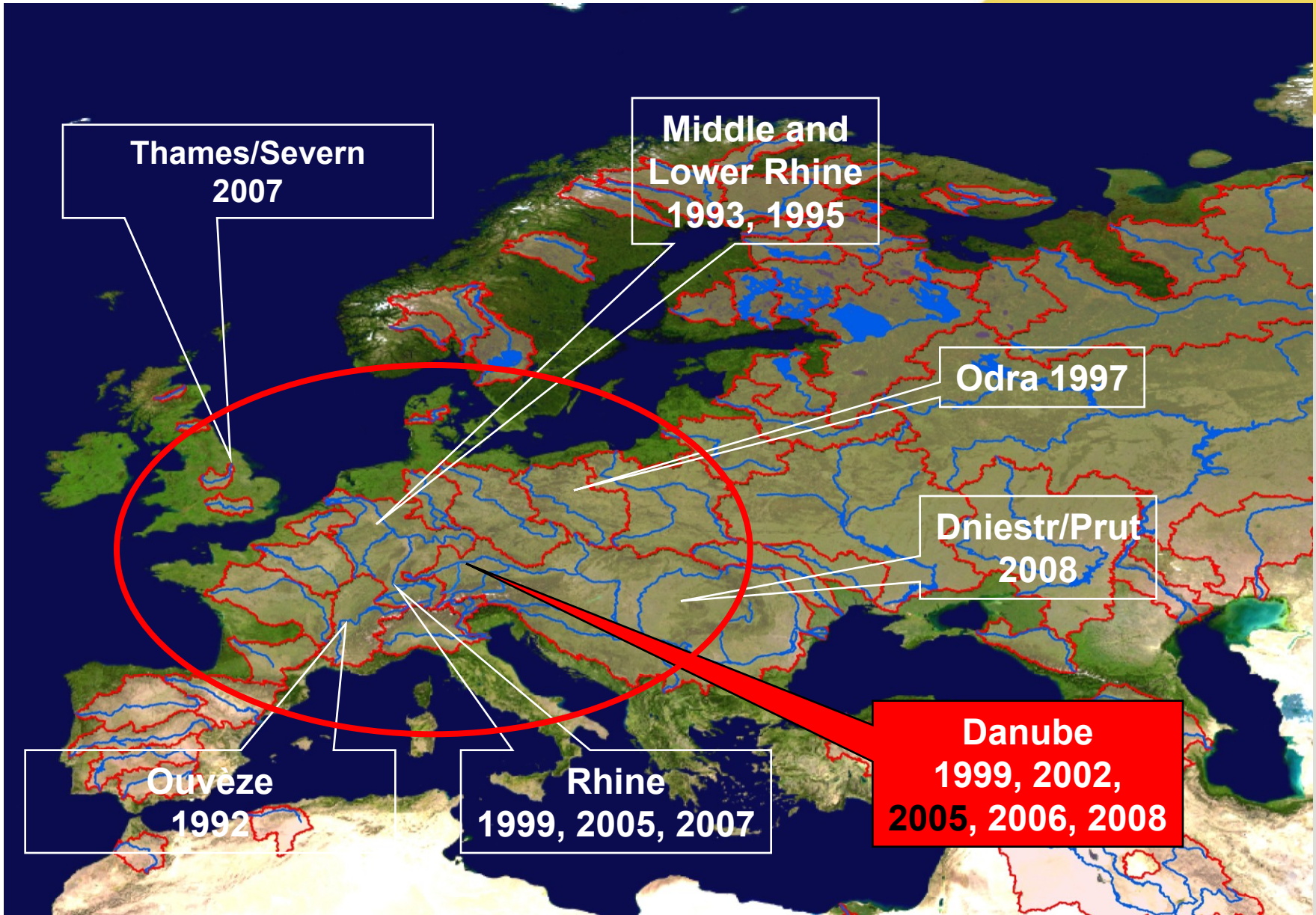


Floods management in Europe
Example: The Bavarian Danube region event

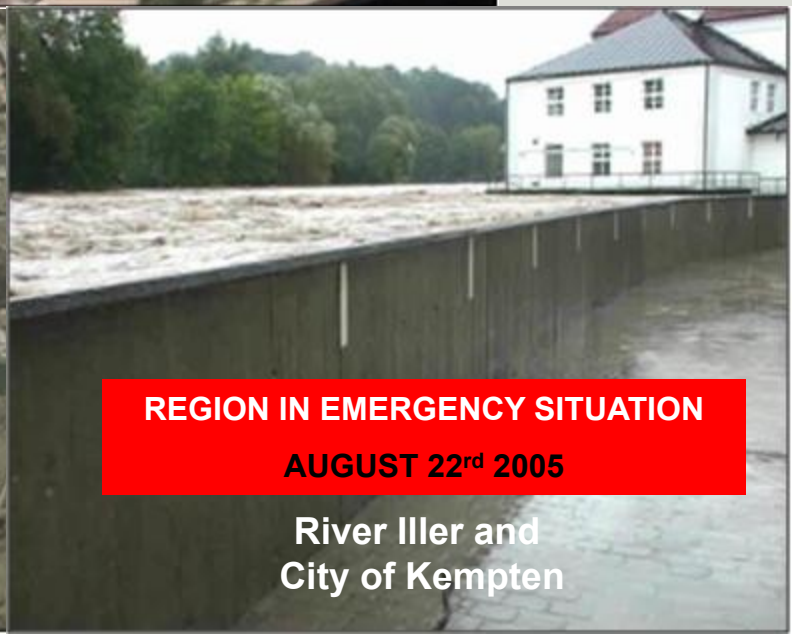


Flood recurrence
- Very low
- Low
- Moderate
- High
- Very high
- Non ESPON space

Major flood events in Europe



Hazard map



REGION IN EMERGENCY SITUATION

AUGUST 22rd 2005

River Iller and
City of Kempten

Assets map

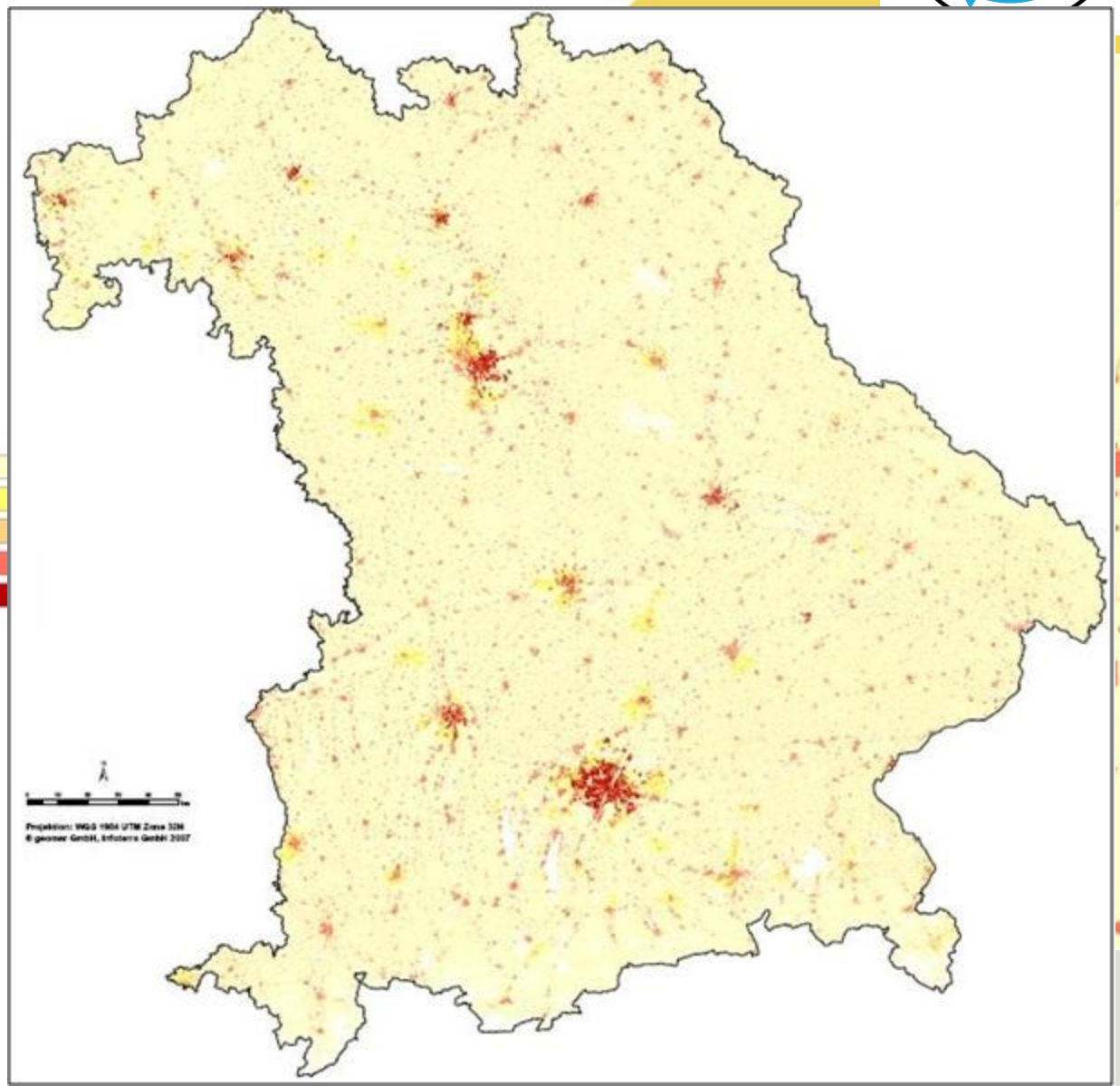
Input data:

- Land cover information
- Statistics on municipality level

Result:

Assets map [€/m²]

A	B	C	D	E
Community (ID)	Auto-mobiles	Motor-cycles	Household goods	Residential buildings
9161000	2671,47	56,58	12622,88	15242,48
9162000	20013,52	460,32	129120,50	155916,38
9163000	986,17	26,91	6109,15	7376,98
9171111	209,60	5,54	1387,60	1675,58
9171112	301,54	7,54	2179,17	2631,47
9171113	179,96	5,37	1172,65	1416,00
9171114	73,60	2,74	485,72	586,52
9171115	23,05	1,36	165,49	199,83
9171116	23,54	1,02	146,19	176,53
9171117	151,25	6,39	1014,11	1224,57



Damage potential map

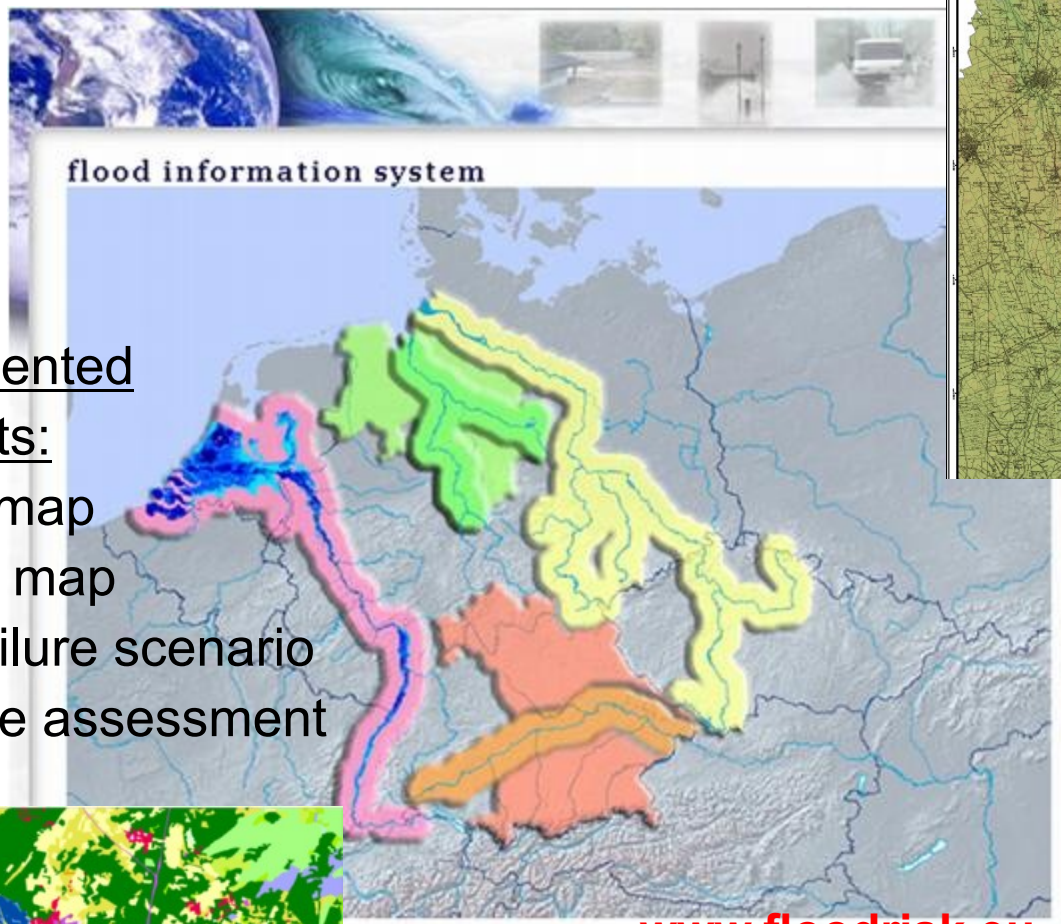
Input data:

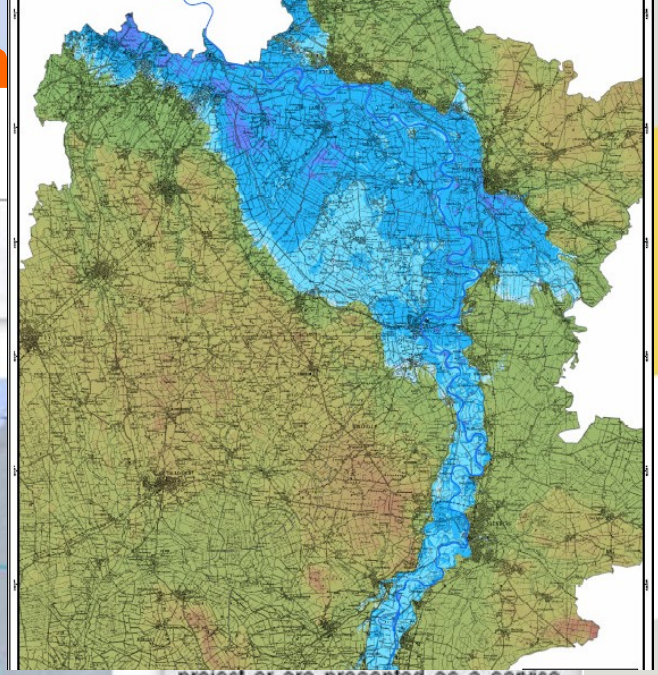
- Assets map
- Flood extent map

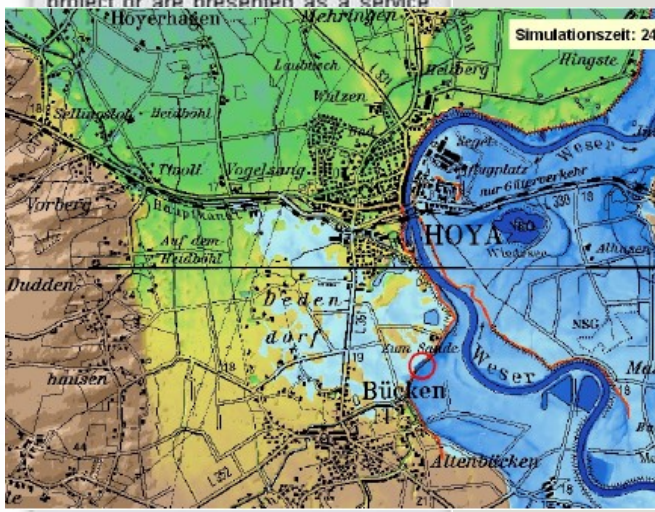
Result:

- Map showing **high** **medium** and **low** damage potential [€/m²]

Flood Information

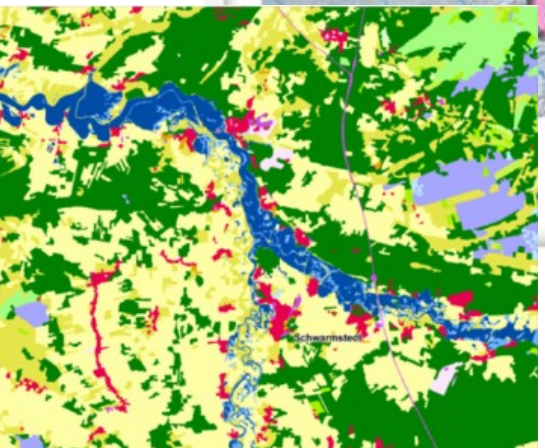






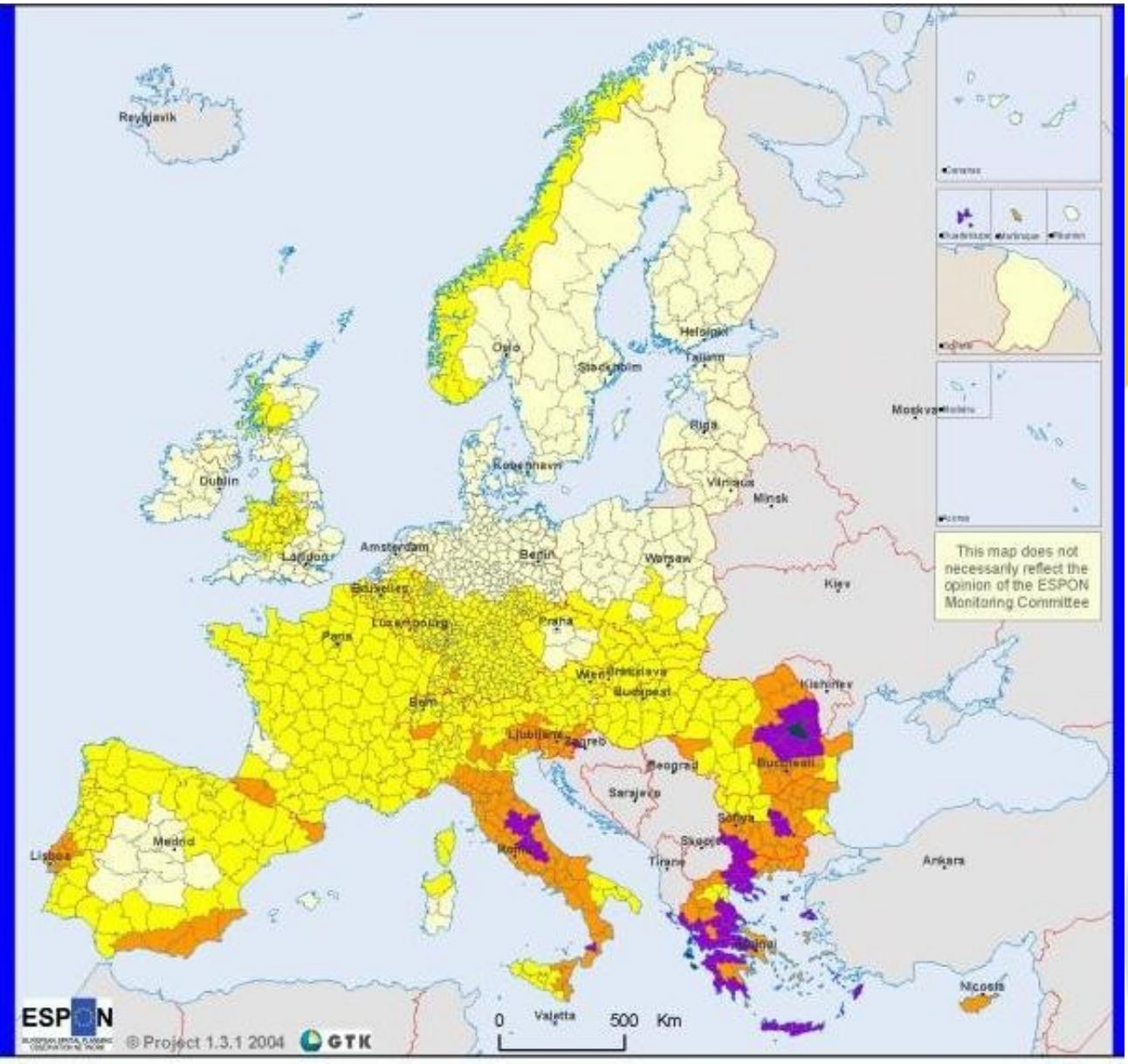
Implemented Products:

- Extent map
- Hazard map
- Dam failure scenario
- Damage assessment



www.floodrisk.eu

Earthquakes
Example: Turkey

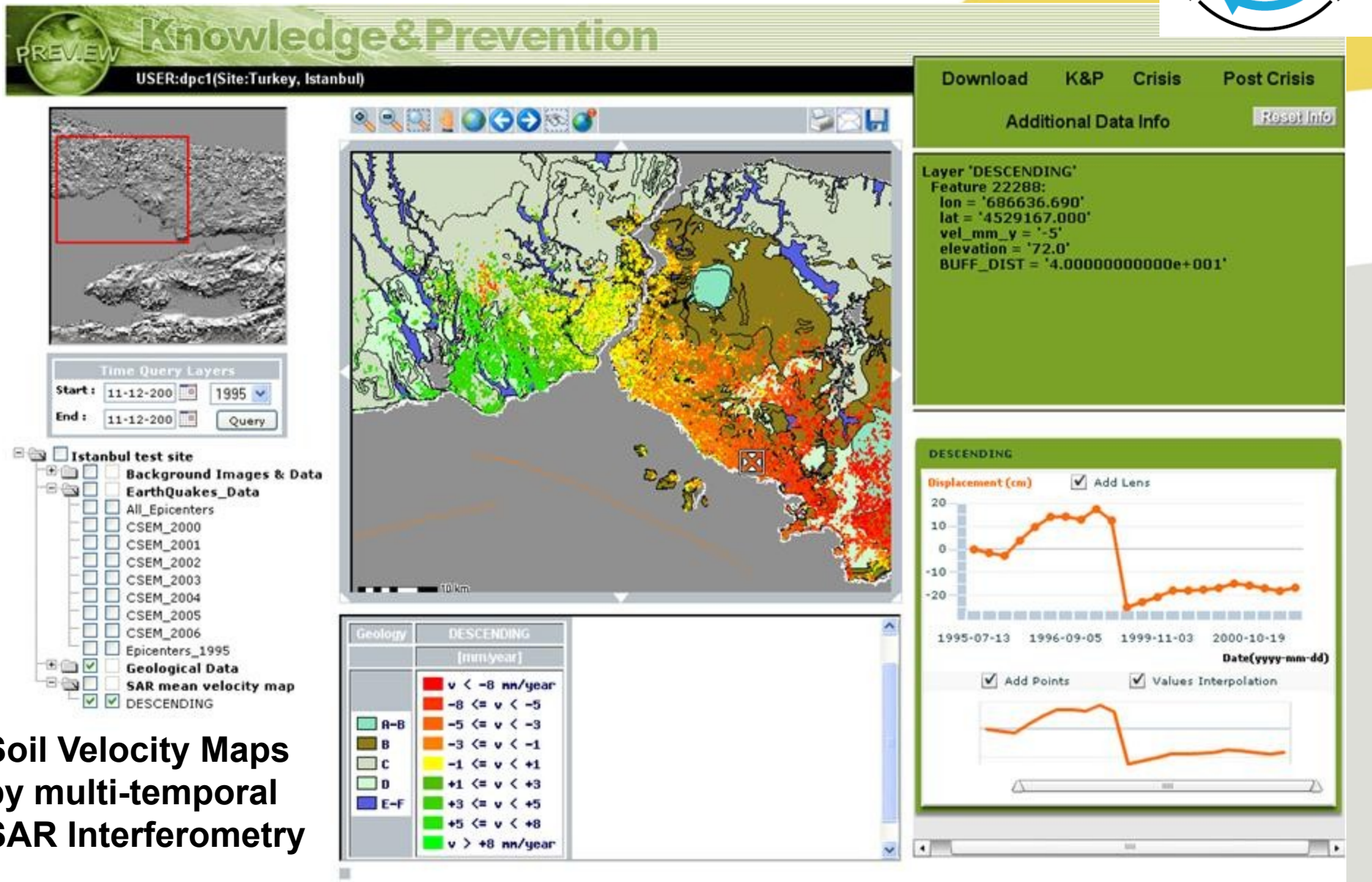


Earthquake hazard potential

Potential classification

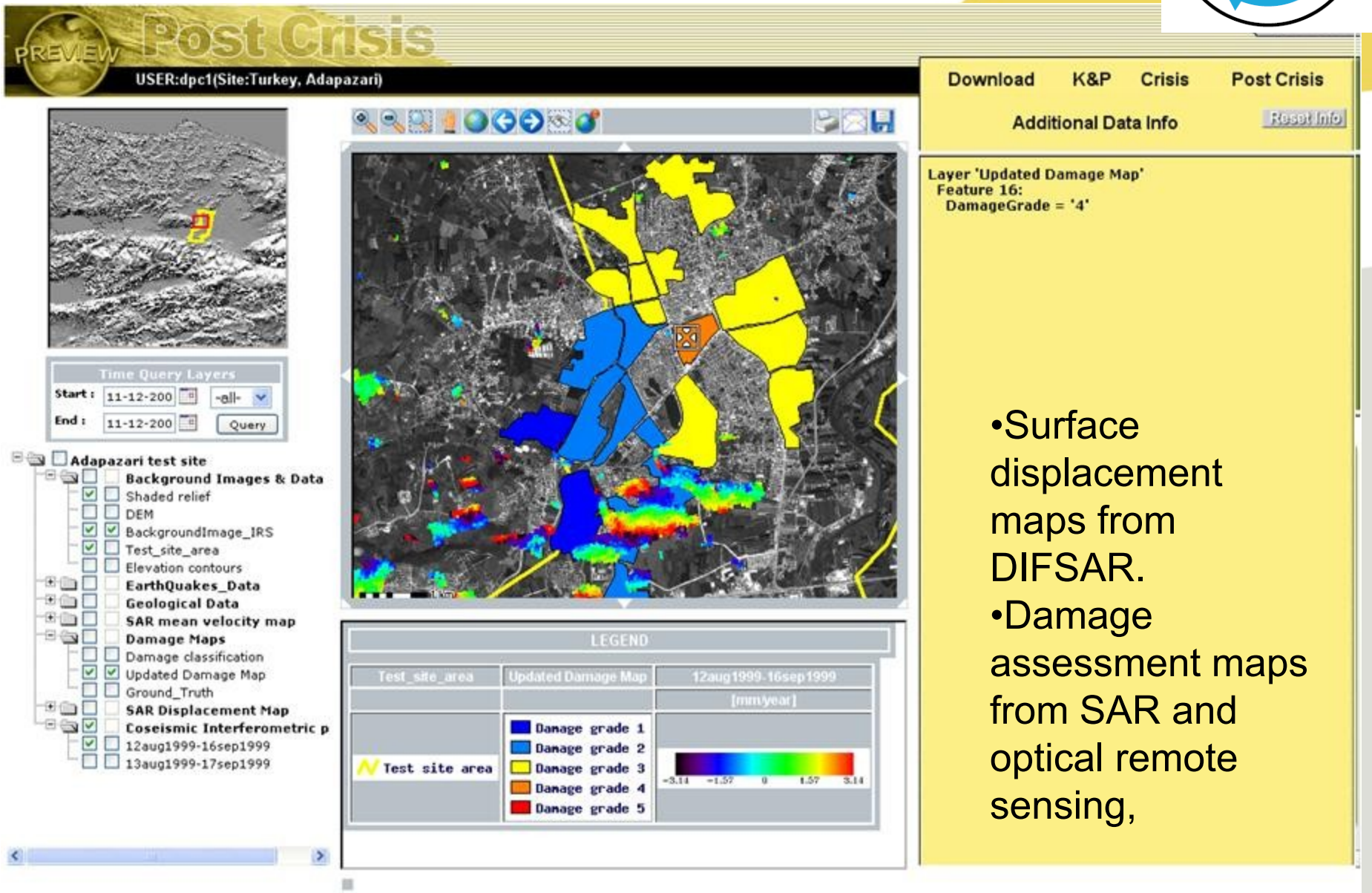
- Very low hazard
- Low hazard
- Moderate hazard
- High hazard
- Very high hazard
- Non ESPON space

Seismic areas monitoring sub-service

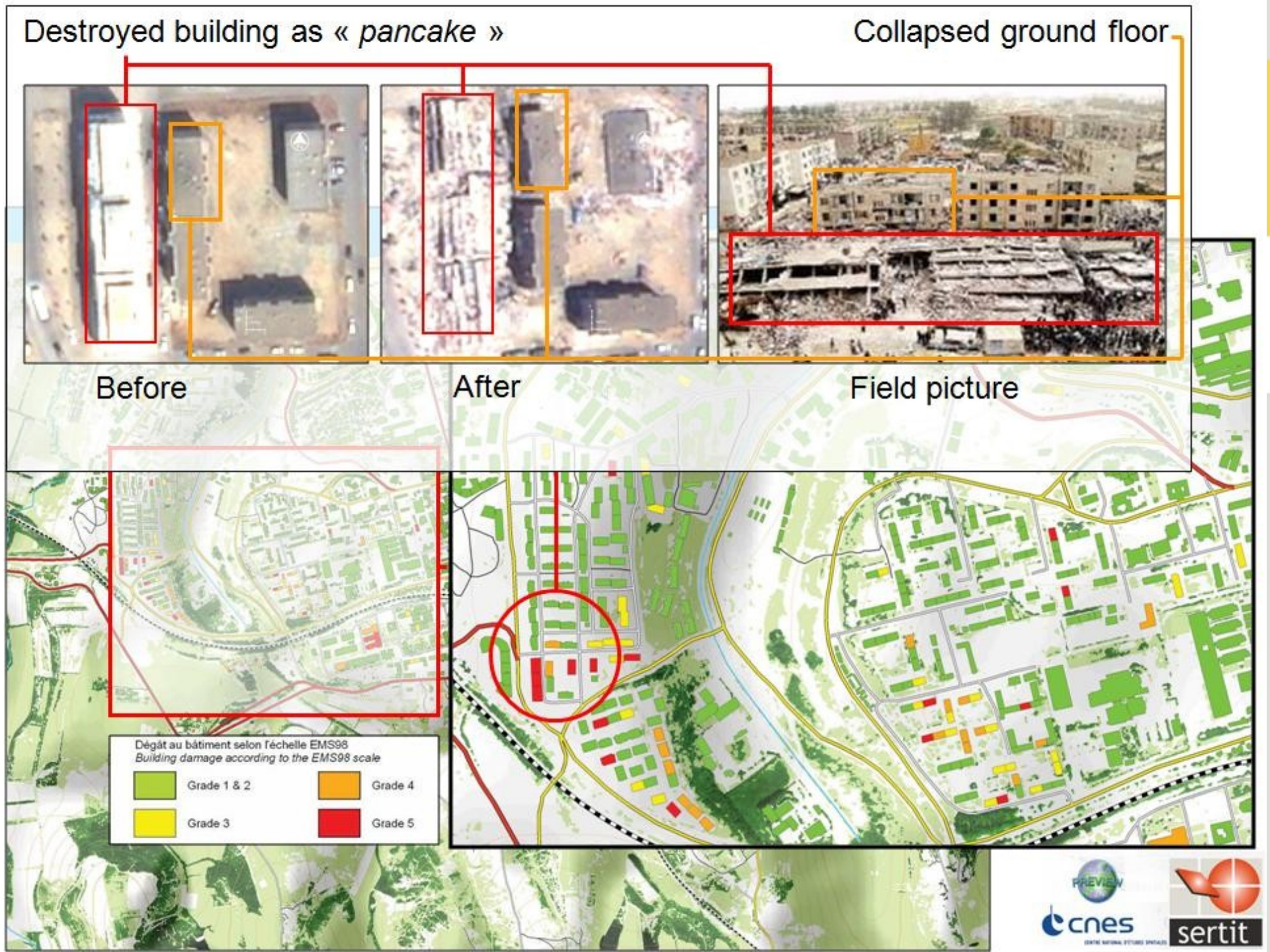


Soil Velocity Maps by multi-temporal SAR Interferometry

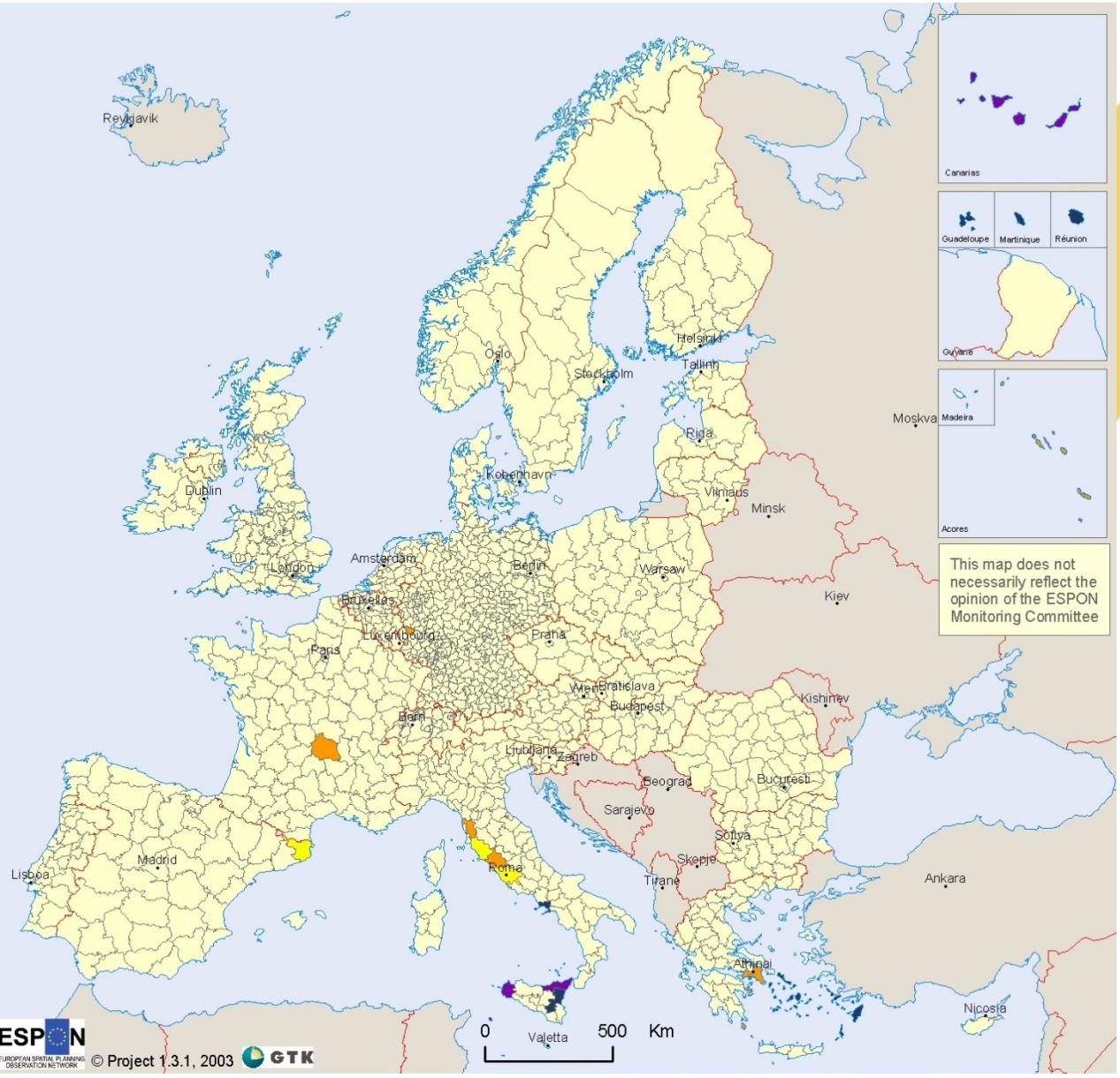
Surface displacement maps and Damage maps



- Surface displacement maps from DIFSAR.
- Damage assessment maps from SAR and optical remote sensing,


Destroyed building as « *pancake* »
Collapsed ground floor
Before
After
Field picture
Dégât au bâtiment selon l'échelle EMS98
Building damage according to the EMS98 scale
Grade 1 & 2
Grade 4
Grade 3
Grade 5

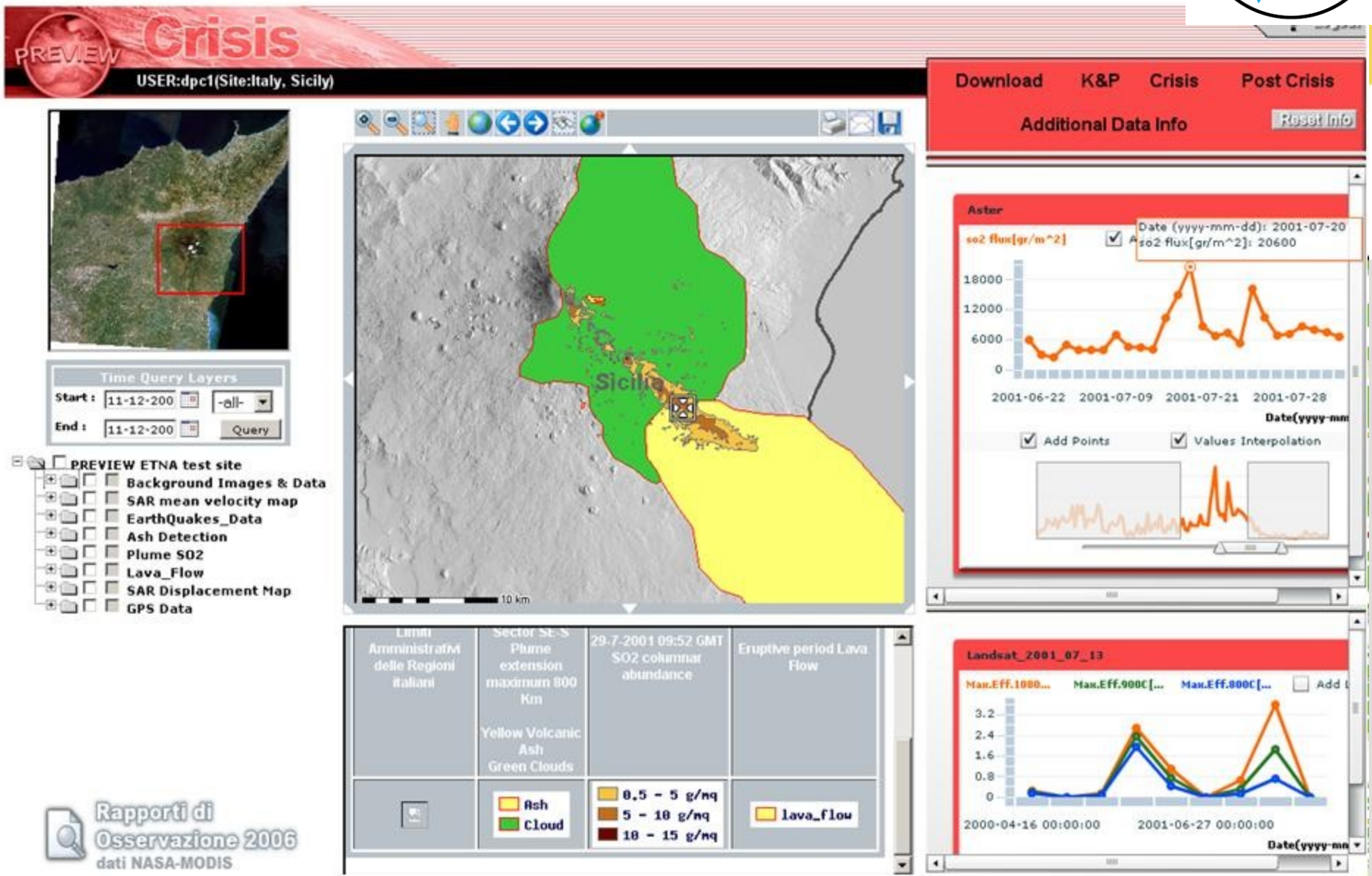
Volcanic risk in Europe
Example: Mount Etna Eruptions



Known volcanic eruptions

- No eruptions
- The status of eruption is uncertain
- Last eruption before 1800 AD
- Last eruption after 1800 AD
- Particularly hazardous vulcanoes
- Non ESPON space

Volcanic monitoring



Ash detection

PREVIEW

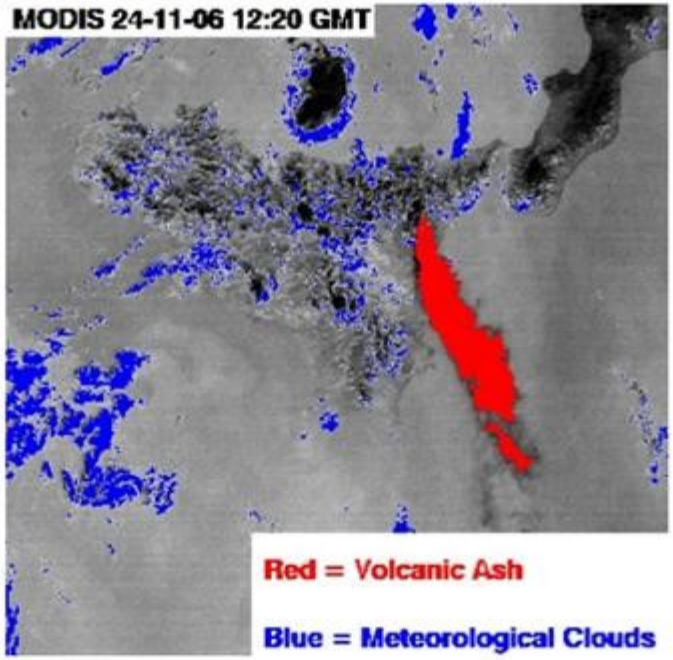
NASA-MODIS Observation Report

PROPOSES TO DEVELOP NEW OR ANHANCED INFORMATION SERVICES FOR RISK MANAGEMENT

INGV

Volcanic ash detection

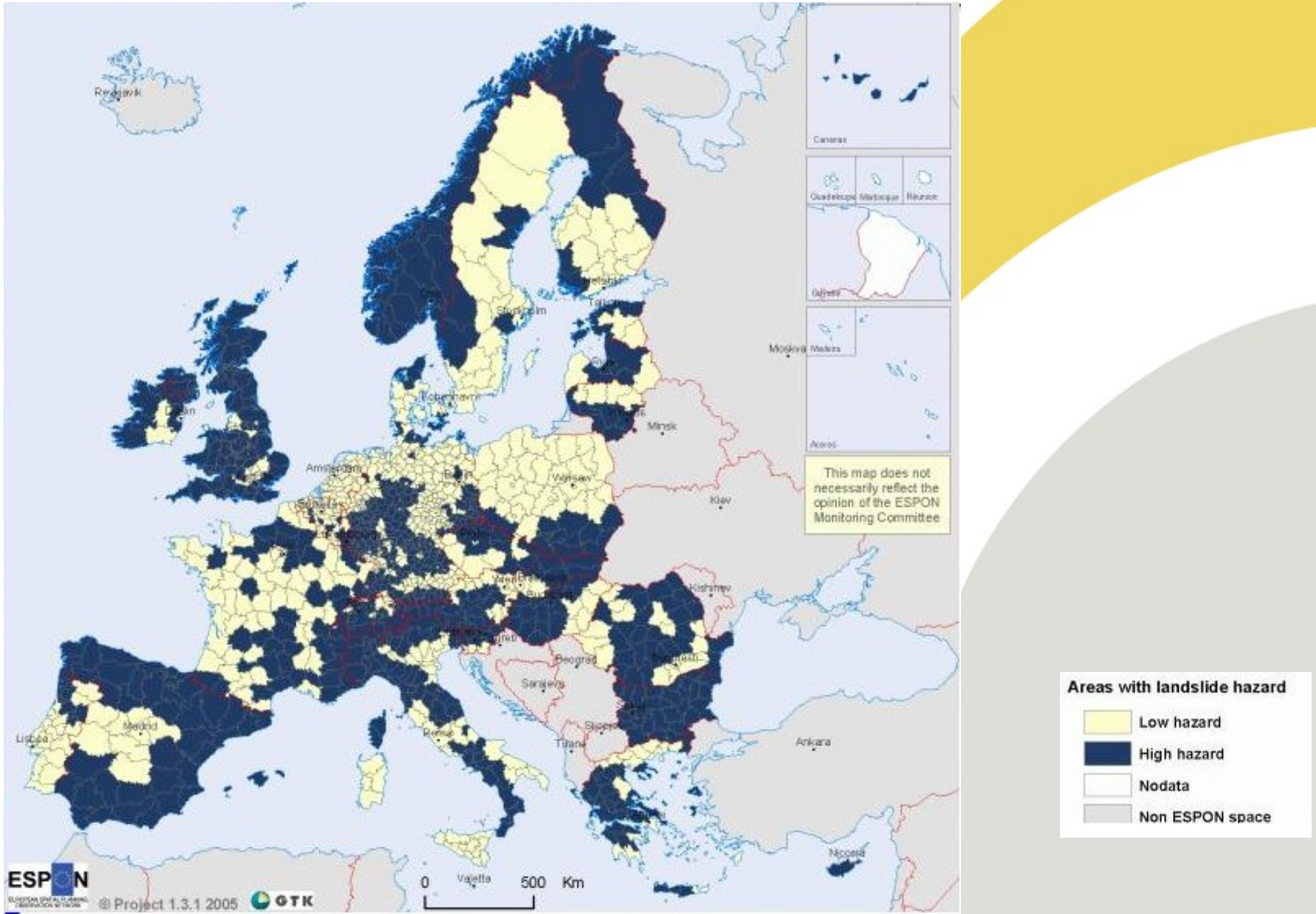
MODIS 24 nov 2006 12:20 (GMT)



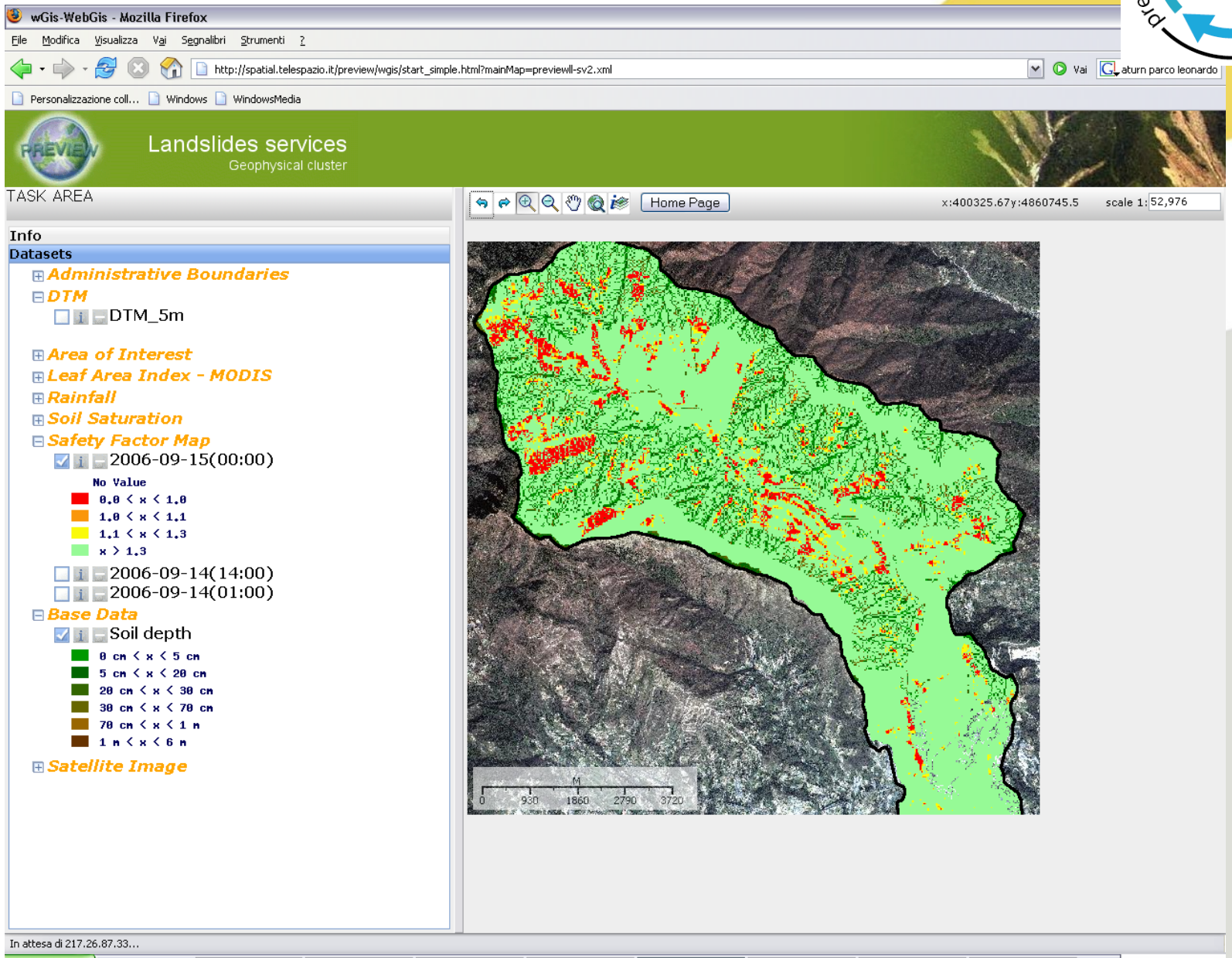
Posted on: 2008-02-22 16:28:20

Plume Direction	Ash Content Maximum Extension. Length-Width (Km)	Maximum Plume Altitude	Minimum Plume Brightness Temperature (°C)	Ash Loading
SE	90-25	4500-5000 m a.s.l.	-7	4600 t

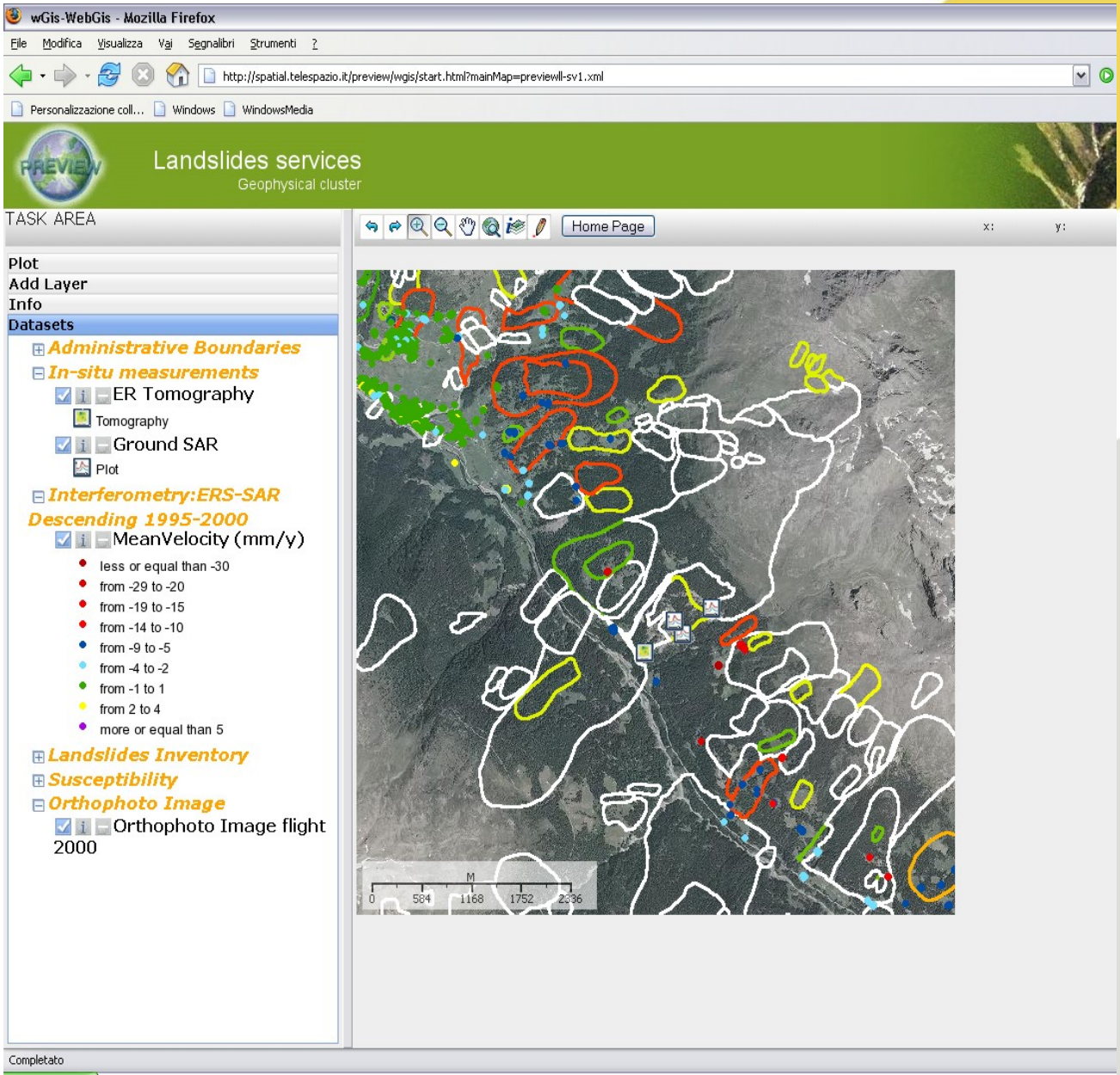
Landslides impact in EU



Forecasting and Early Warning of Shallow Rapid Slope Movements

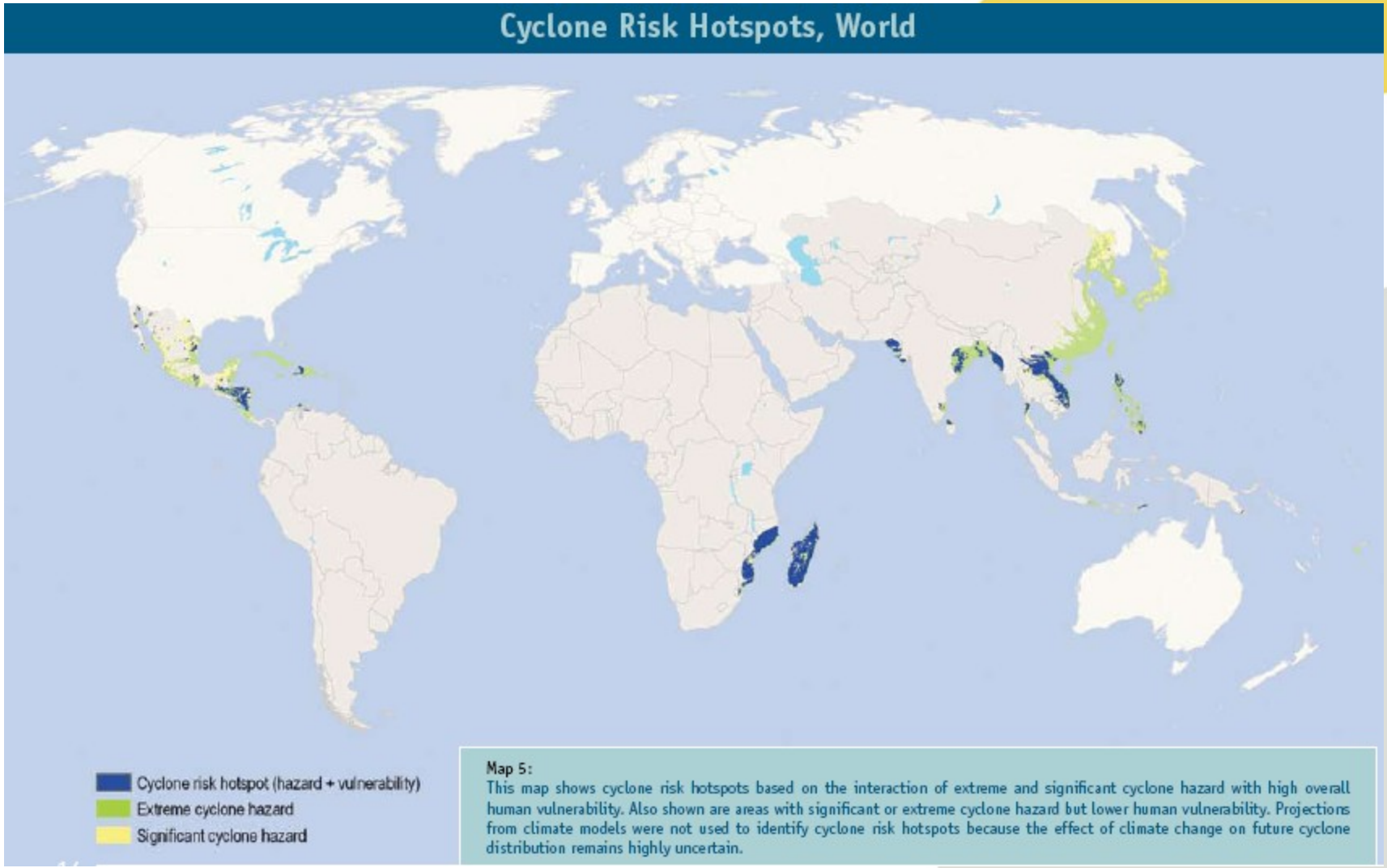


Monitoring of deep seated slow moving landslides



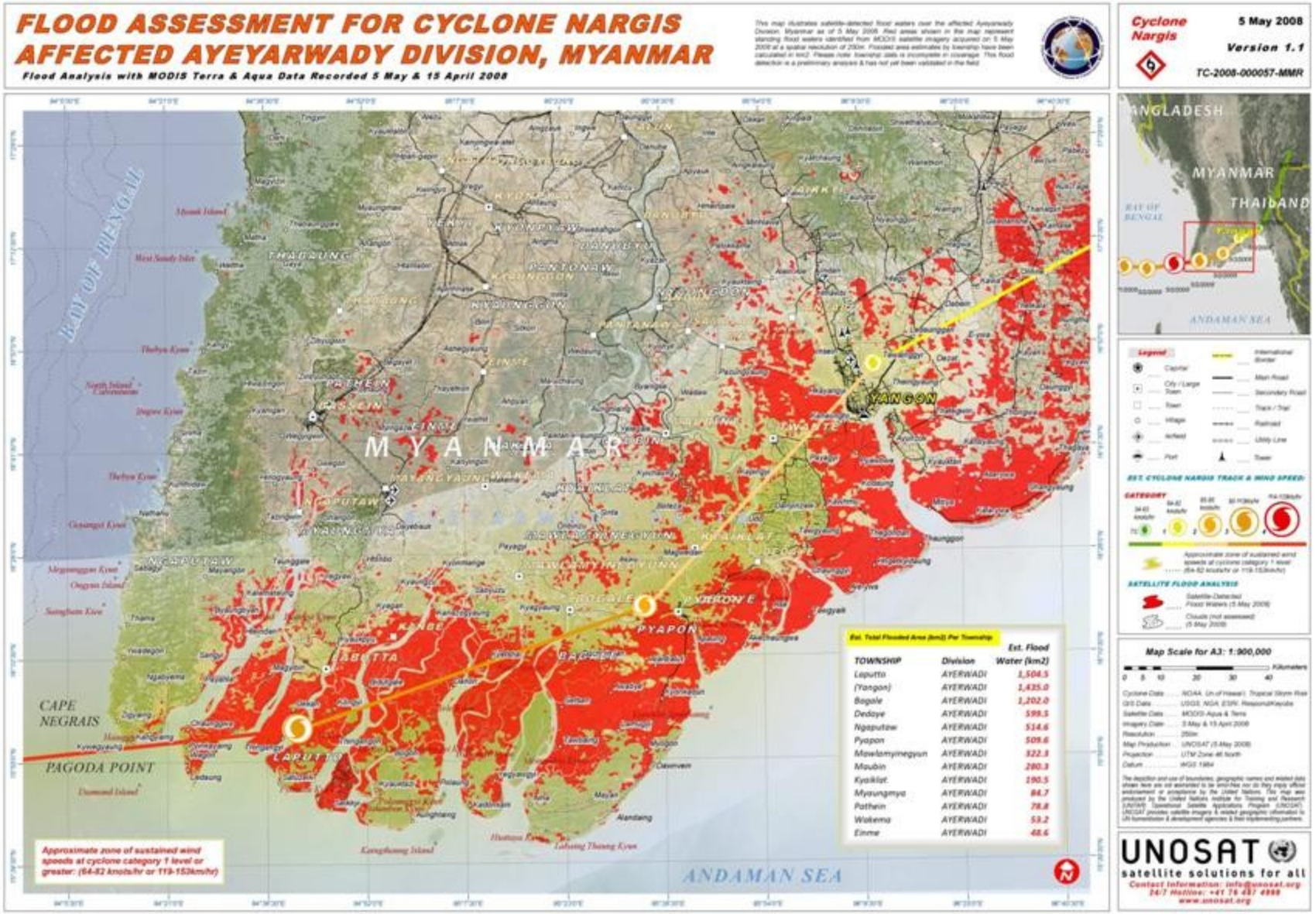
Humanitarian Aid

Example: Myanmar disaster (may-june 2008)

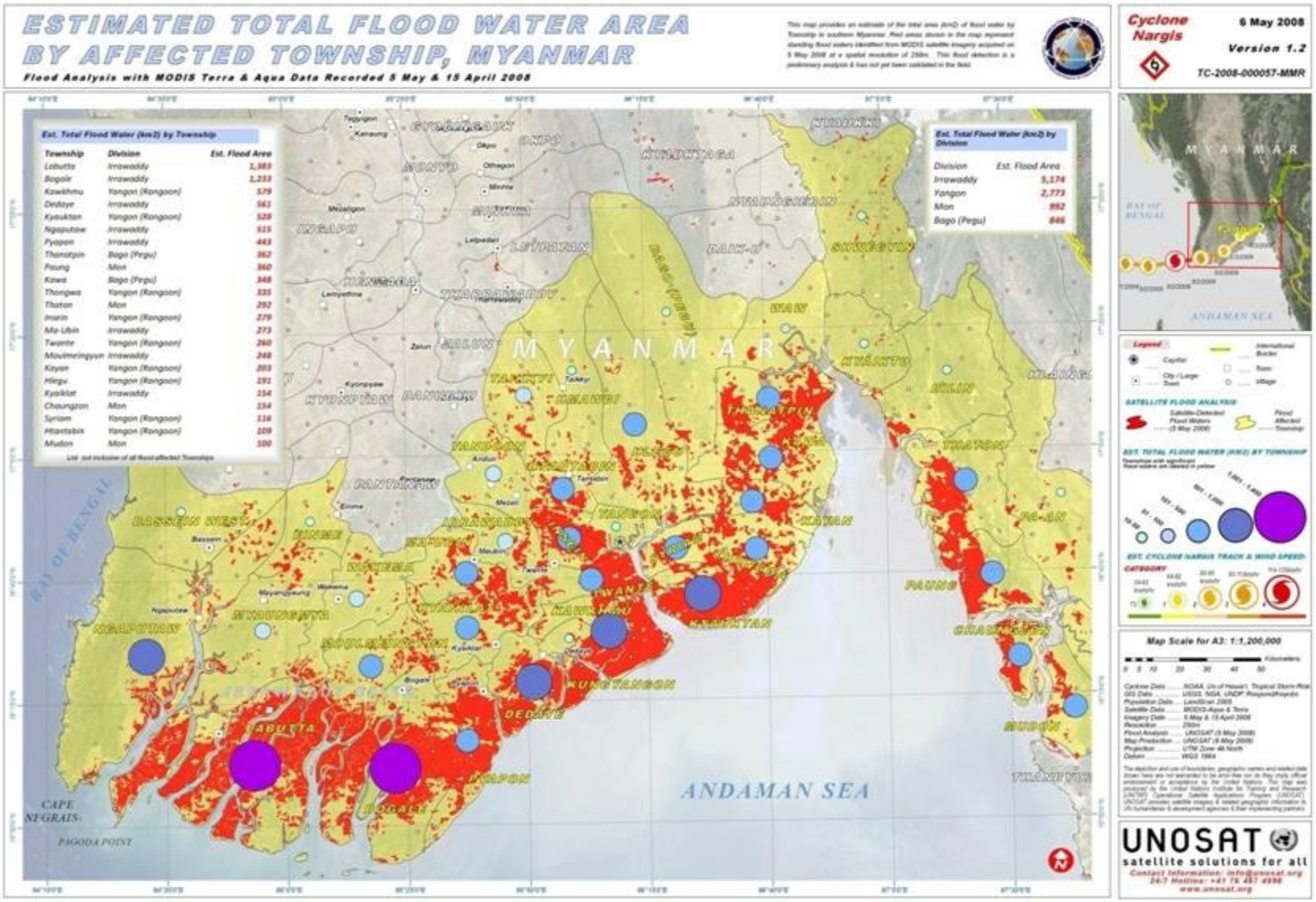


http://www.alertnet.org/thefacts/satelliteimages/122173708023.htm

Emergency response after the Nargis cyclone

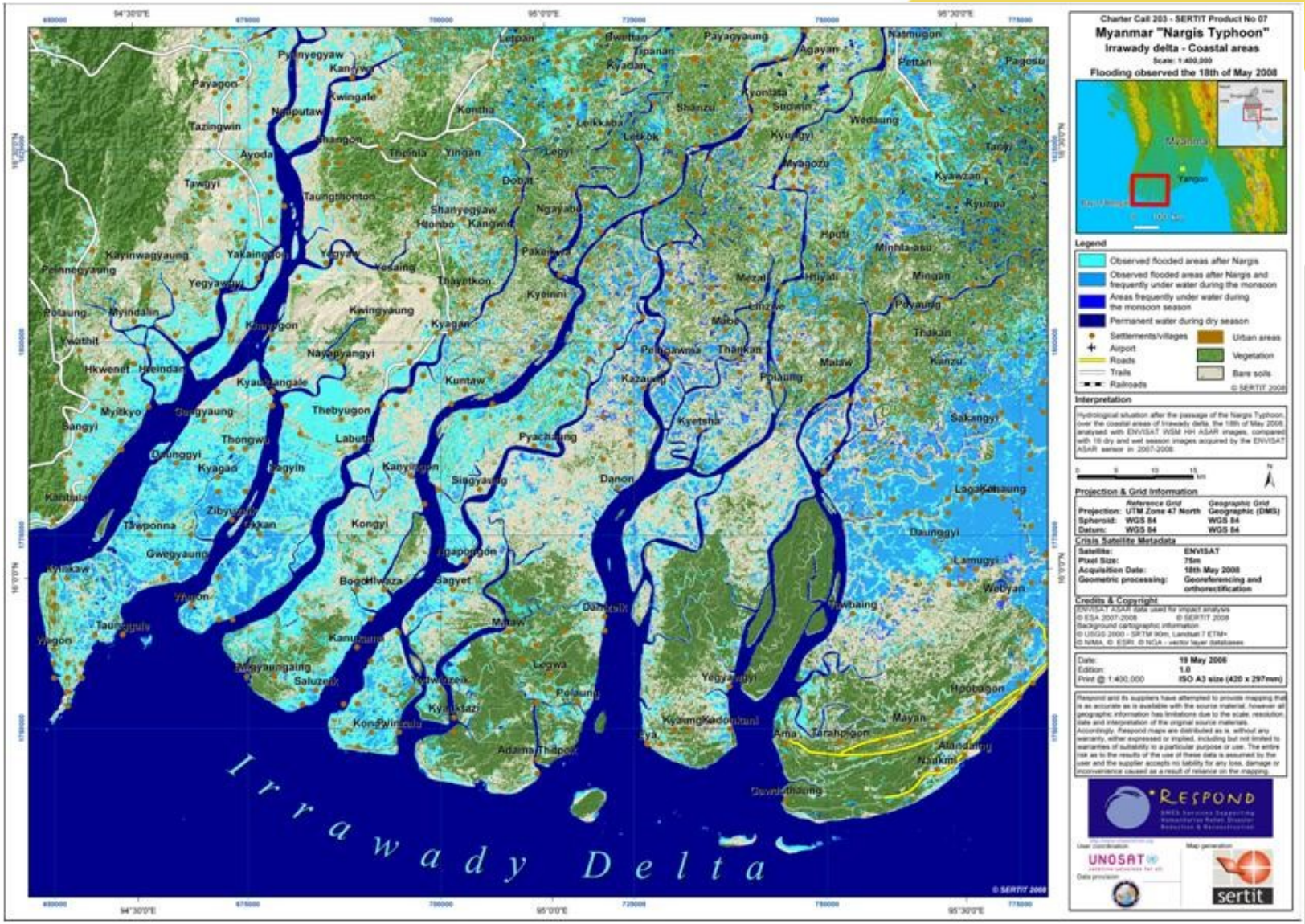


The first days: understanding the situation on the ground

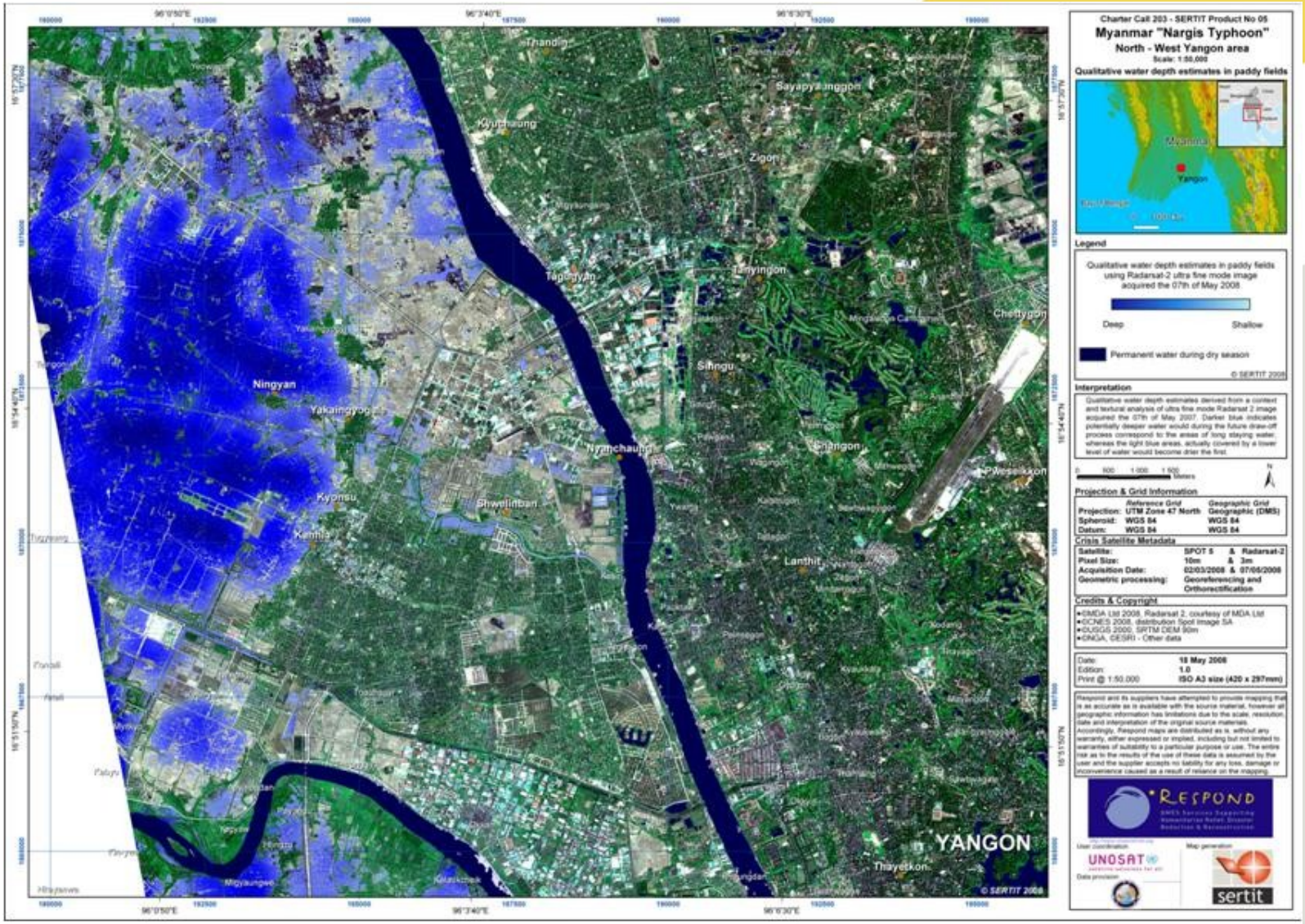


Flood extent

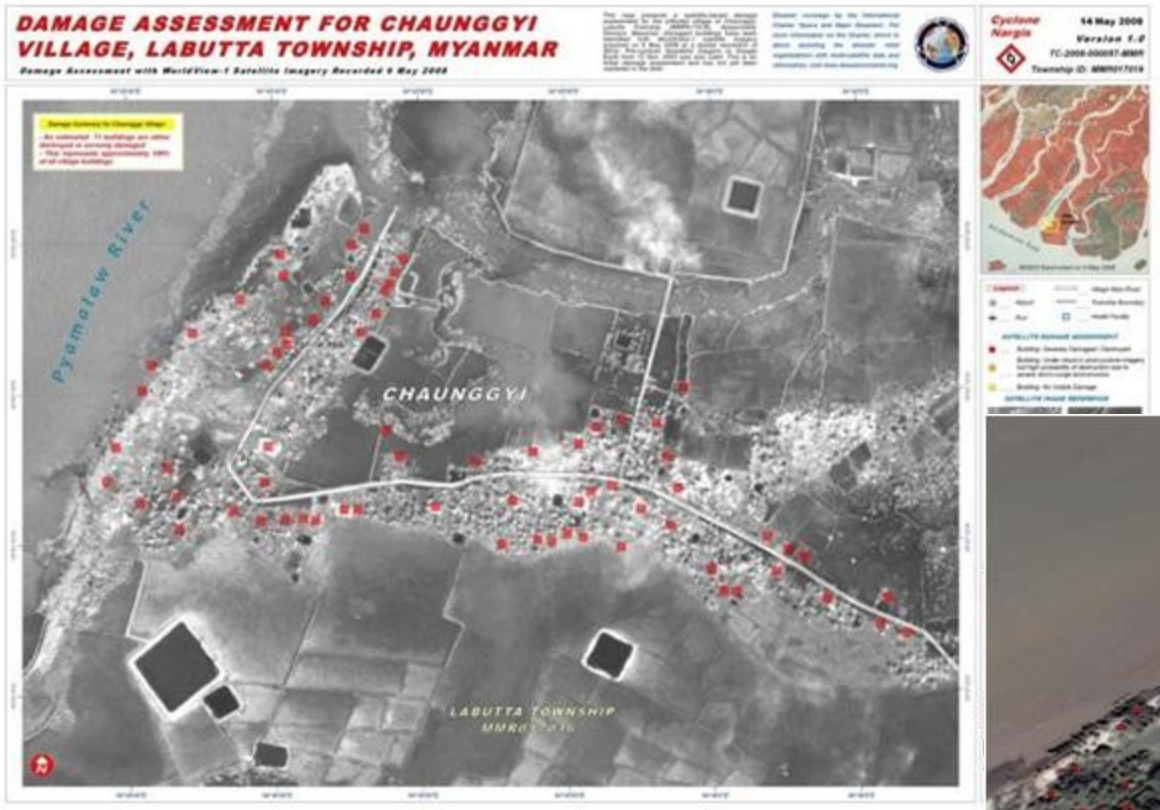
Flood extent map



Water deep maps in paddy fields



Damage assessment



Detailed impact assessment
Benefits for national users
Building reference databases

From damage assessment maps to dynamic online information (example of Google Earth)

ERCS Pre-operational services

Pre-operational services for Crisis management support:

- **ESA GMES Service Element (GSE):**
  - **RESPOND** for Humanitarian Relief
  - **RISK-EOS** for Civil Protection
- **FP6 and FP7 projects:**
  - **PREVIEW (FP6)**
    - portfolio of specific services on Floods, Landslides, Volcanoes, Earthquake monitoring and windstorm risk and forecast
    - general services: asset mappings, disaster intensity assessment and damage rapid mapping
  - **SCHEMA (FP6)**
    - assessment of the vulnerability to tsunami.
    - Test areas: Mediterranean coast, Atlantic Ocean and Black sea
    - work connected to UNESCO IOC
  - **SAFER (FP7)** will start Jan 2009, continuity of previous ones, validation of pre-operational project

FP7 SAFER Project
Portfolio of products

Flood products

- Flood risk maps based on hydraulic simulation and historical data based on RISKEOS approach
- Plain flood Early Warning based on EFAS
- Flash Flood Early warning based on RISKEOS FFEW and PREVIEW, connected with meso-scale meteo forecasting

Fire Products

- Global Fire Risk Index: fire danger mapping, daily delivery
- Fire Monitoring at Medium Resolution: NRT mapping of active fires

Landslide mapping

- Landslide monitoring: mapping ground movements for single large landslides, using InSAR data (interferometry) and geological expertise

Volcanoes - Earthquakes monitoring

Preparatory Action 2008

Objective: to support the implementation of the operational GMES emergency service establishing the necessary interfaces between the users and the providers to allow service integration into the user's operational workflow.

Tasks:

- building interfaces between users and ERCS providers;
- testing and validating the interfaces and information workflows;
- organising training and communication activities for users.

Tool:

- Call for tender
- Duration: 3 years
- Budget: 3 Meuros

Kick-off: 27.01.2009

Credits – acknowledgments

- Infoterra Group / Astrium Services
- National Observatory of Athens / Institute of space applications and remote sensing - NOA
- International Charter Space & Natural Disasters
- German Aerospace Centre - DLR
- Centre National d'Etudes Spatiales – CNES
- European Space Agency – ESA
- SERTIT, Strasbourg
- Bavarian Environment Agency, Munich
- City of Kempten
- Federal Institute of Hydrology, Koblenz
- Geomer GmbH, Heidelberg
- Institute of Hydraulic Engineering, Stuttgart
- Institute for Meteorology and Climate Research, Karlsruhe
- Leibniz Institute of Ecological and Regional Development, Dresden
- Institute Nationale di Geofisica e Vulcanologia
- UNOSAT
- JRC
- EC funded projects: PREVIEW, BOSS4GMES
- ESA funded projects: RISKEOS, RESPOND

Useful links

- **GMES:**
  http://ec.europa.eu/gmes/overview.htm

- **Emergency Response portal:**
  http://www.gmes.info/195.0.html

- **Examples:**
  http://boss4gmes.customers.arjuna.eu/index.php?id=mmp#section=2
  www.preview-risk.com
  http://www.respond-int.org/respondlive/
  http://www.risk-eos.com/

Thank you for your attention !

virginia.puzzolo@ec.europa.eu