COPERNICUS HELPING CIVIL PROTECTION

SADGE & VIGIA decision-making platforms for civil protection based on Copernicus services and Sentinel Imagery.

The challenge

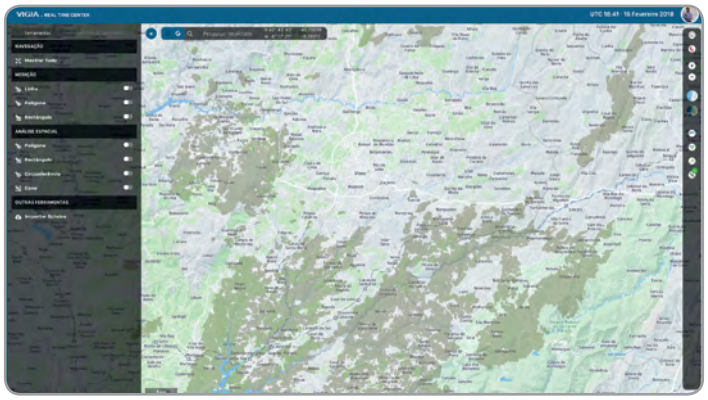
Fires have claimed 165 lives in Portugal over the last 17 years whilst climate change is triggering major river floods, destroying coastal infrastructures and changing agriculture cycles. The economic implications are enormous both for citizens and for public authorities, being intensified due to the specificity of the local territory. New dynamical computational tools must be used taking into consideration the heterogeneity and specificity of the territory, especially for civil protection purposes. Intermunicipal communities (CIM) "Região de Coimbra" and "Viseu-Dão Lafões" developed SADGE and VIGIA, respectively, combining Earth Observation and in-situ data with artificial intelligence for effective emergency response and pro-active daily decision-making, minimising social and economic implications on their citizens and infrastructures.

The space based solution

The multitude of environmental threats increase the need for the use of Earth Observation due to the smaller number of ground-level sensor networks required. The platforms use Copernicus services and Sentinels imagery intensively. Air quality is provided in a first layer by the Atmospheric Monitoring service that, combined with ground-measurements, are inserted into an algorithm to improve forecasts (where and when) and space resolution. It allows to identify hotspots of pollution such as, for instance, the 2016 and 2017 Sahara Desert aerosol events. In addition, it connects the notifications to local health services to minimise the implications, e.g., in asthmatics. Emergency Management Services are employed to characterise disaster areas and adapt local decision-making policies after the event. Sea tides and currents from marine service and climate change are employed together with Sentinel 2, cameras and ground information to analyse coastal erosion and near-sea infrastructures planning and mitigation. In the case of the rivers, Sentinel-1 and his radar sensors are used to effectively characterise floods, even in cloudy conditions. Finally, land service and Sentinel 2 provide detailed data for forest characterisation and biomass quantification analysing the risk of fire propagation.

Benefits to Citizens

The direct benefits of using Copernicus services by institutions and citizens are clear in these regions. Institutionally, the use of scientific-based tools and global perspectives of the territory are needed to make the right decisions, and make the best out of the low budgets available. Potential flooded areas are analysed using time-lapse satellite imagery knowing that local records are usually outdated. Vegetation can be monitored all year round and the fire hazard of the forest can be calculated. Using weather forecasts and local measurements the cone propagation is automatically anticipated. Taking proactive measures and decisions, the 2017 death toll can be minimized in the future. Nowadays, air pollution is a major issue in Europe with wellbeing implications. The forecast tools of Copernicus services and the improved algorithms anticipate harsh-events. All the deployed alerts in the platform are correlated with infrastructures (emergency services, schools, events, amongst



Burnt area in the 2017 forest fire at CIM Viseu-Dão Lafões (Portugal) using Copernicus Emergency Management Service visualised on VIGIA. Credits: Copernicus Service information 2017.

Thematic Area: CIVIL PROTECTION

Region of Application: INTERMUNICIPAL COMMUNITY OF COIMBRA REGION

Sentinel mission used: S1, S2, S3, S5P

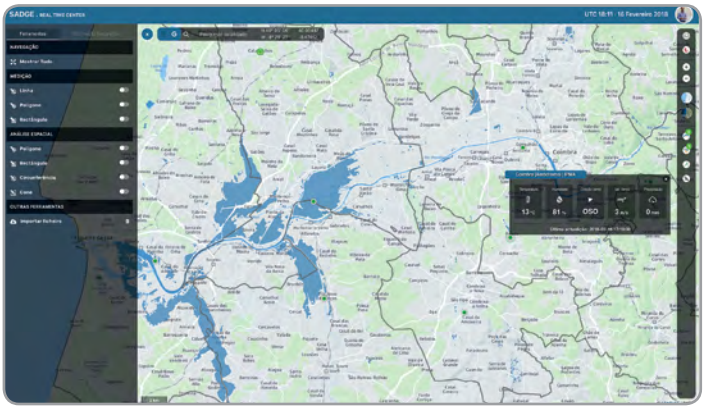
Copernicus Service used: CAMS, CEMS, CMEMS, CLMS

Usage Maturity Level: 5

others) so that the response can be optimised in each and every case. Both platforms have tools for creating notifications in case of major events to increase the safety of the citizens.

Outlook to the future

SADGE and VIGIA reached maturity with a full and efficient exploitation of cloud computing, big data and artificial intelligence, combing Copernicus and Earth Observation/remote sensing automatisation. The modular architecture allows other Copernicus Services, in particular with Sentinel 4 and 5 family imagery for air quality monitoring. From the Municipality Associations, there is a strong commitment to create a two-way information pipeline, providing data from their stations to the Copernicus ecosystem helping improving the services.



Flood areas of Mondego (Coimbra, Portugal) river visualized on SADGE platform. Data obtained from Sentinel 1 imagery processed by SpaceLayer Technologies.
Credits: Copernicus Sentinel data 2016.

> "Copernicus aids daily decision-making activities, minimising the implications of environmental threats."
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> ***Jorge Brito (CIM Região de Coimbra)***
> ***Nuno Martinho (CIM Viseu -Dão Lafões)***

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ABOUT COPERNICUS4REGIONS

This Copernicus User Story is extracted from the publication "**The Ever Growing use of Copernicus across Europe's Regions: a selection of 99 user stories by local and regional authorities**", 2018, Edited by NEREUS, the European Space Agency and the European Commission.
The model cases focus on local and regional authorities who successfully applied Copernicus data in 8 major public policy domains.
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