

WILDFIRE MANAGEMENT IN GREECE

Copernicus Sentinel data is being used by regional authorities on the island of Crete to assess the extent of natural disasters such as wildfires and aid in coordinating relief efforts.



THE CHALLENGE

The summer of 2022 set many unwelcome records in terms of extreme heat. The average temperature over Europe was the highest on record, surpassing the temperatures seen in the summer of 2021 by a substantial 0.4°C. Many parts of Asia and North America also experienced one their warmest summers ever recorded, with several regions in China also being subjected to extreme drought conditions. Unfortunately, the temperature spikes seen in 2022 are not an anomaly or outlier but a wholly expected peak on a continuing trend of rising global average temperatures. Since the 1980s, each decade has been hotter than the last, with the 7 hottest years ever recorded all occurring since 2015. All of this has profound and sometimes disastrous implications for the regions and people subjected to these extreme conditions.



Extreme heat leads to a plethora of health and safety concerns for people living in or near affected areas. According to the World Health Organization, at least 15,000 people died in Europe as a result of extreme heat in 2022. Another inevitable consequence of such dry and hot conditions is the proliferation of wildfires. The summer of 2022 resulted in increased wildfire activity and intensity across Europe. The total cumulative burnt area in the EU from the start of the year to September alone had already amounted to over 750,000 hectares, compared to an average of just over 260,000 hectares in 2006-2021. This increased wildfire activity is also reflected in smoke and carbon emissions. According to data from the Copernicus Atmosphere Monitoring Service (CAMS) Global Fire Assimilation System (GFAS), total wildfire emissions in the EU and the UK between June 1st and August 31st 2022 were estimated at 6.4 mega tonnes of carbon, the highest level since 2007. Coupling all of this with mass evacuations, the destruction of peoples' property and the burning of croplands paints a frightening picture. In Greece, a country particularly affected by extreme heat and wildfires, Sentinel data is being used to prepare for such disasters and help in alleviating their effects...

HOW SATELLITES CAN HELP

Geospatial Enabling Technologies (GET) is an SME specialising in marketing and supply of geospatial products and software services. In collaboration with the Region of Crete, in 2021 GET developed a Spatial Data Infrastructure (SDI) called "GIS Crete" which aims to support the regional administration in planning and decision making and in the achievement of the strategic goals that have been set by the Region.

GIS Crete is a multifunctional platform powered by Sentinel-2 data amongst other data sources. It is used for several applications, including monitoring and fulfilling the goals of sustainable development, understanding and managing environmental issues, dealing with natural disasters, saving natural and financial resources, supporting healthy entrepreneurship and improving the quality of life for residents of the island.

Through the use of Sentinel data, the platform gives users the ability to visualize EO data in the form of predefined multiband (RGB) georeferenced imagery. It also allows for the visualisation of commonly used remote sensing indices such as Normalised Difference Vegetation Index (NDVI), or Leaf Area Index (LAI) which, among other applications, can help in assessing the extent of burnt areas across the island. Users also have the ability to compare satellite images and remote sensing indices over time. This way, changes in land use related to man-made interventions or natural disasters such as floods or fires can easily be identified.

The open nature of Sentinel data allows GET to obtain rich and widespread data over the region of Crete, all free of charge. This allows them to develop impactful tools that serve the needs of the regional authority in making important decisions when it comes to protecting citizens, property, and critical infrastructure from wildfires.

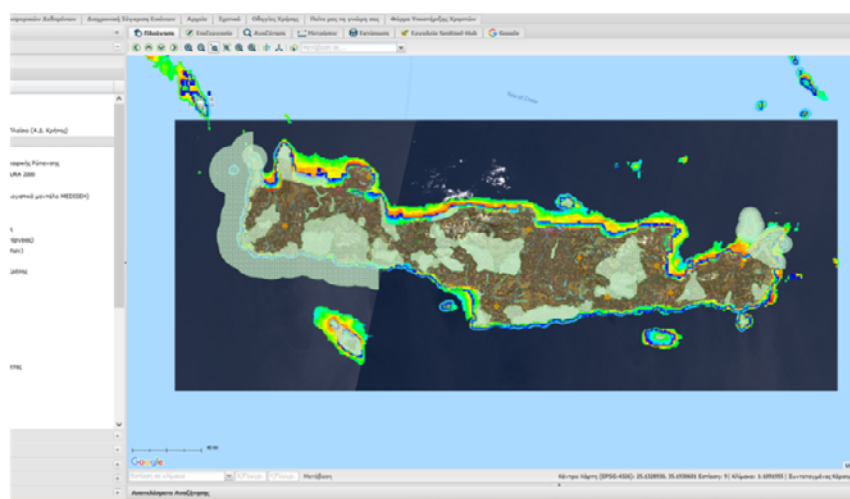


Figure 1: GIS Crete interface – Source getmap.eu

The satellite data:



Sentinel-2 carries an innovative wide swath high-resolution multispectral imager with 13 spectral bands. The combination of high resolution, novel spectral capabilities, a swath width of 290 km and frequent revisit times provides unprecedented views of Earth. Sentinel-2 images can be used to determine various plant indices such as leaf area chlorophyll and water content providing information useful for agricultural and forestry practices and for helping manage food security. Sentinel-2 also provides information on pollution in lakes and coastal waters. Images of floods, volcanic eruptions and landslides contribute to disaster mapping and help humanitarian relief efforts.

Copernicus Sentinels data are available under an open and free data policy.

Sentinel-2 data can be accessed at <https://scihub.copernicus.eu>

More info: <https://sentinels.copernicus.eu>

The Service Provider

Geospatial Enabling Technologies (GET), founded in 2006 and located in Athens, is an SME specialising in marketing and supply of geospatial products and software services in the field of Geoinformatics in Greece, Europe and Africa.

Amongst several of their business units, GET use Copernicus data in conjunction with other data sources to build and provide geospatial solutions for customers across a range of markets.



www.getmap.eu

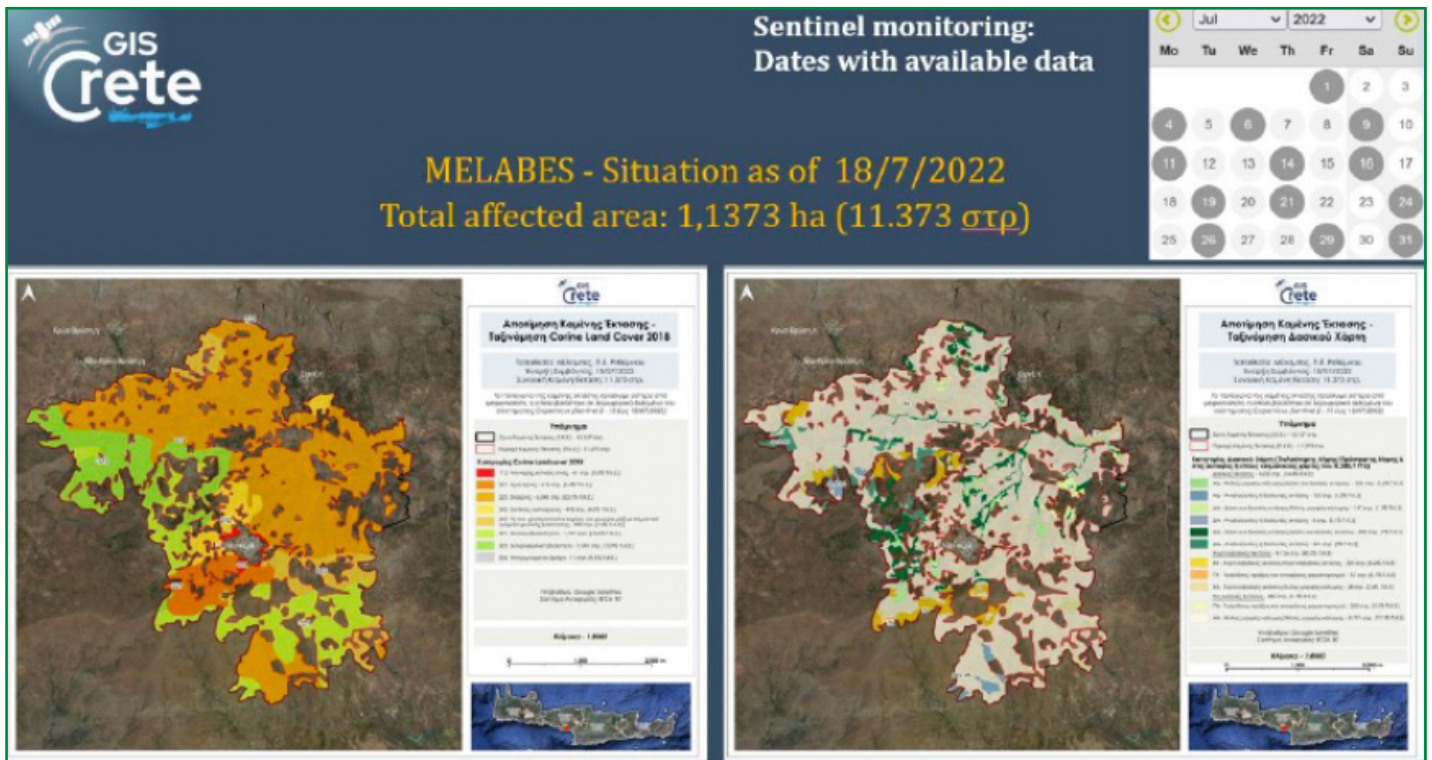


Figure 2: GIS Crete being used to assess Melabes wildfire – Source getmap.eu

WHO IS CONCERNED?

Region of Crete is a local self-government authority of Greece who are tasked with the regional governance responsibilities and strategic planning for the geographical territory of the island.

They utilise GIS Crete for several applications, such as supporting the administration in planning and decision making as well as in cases of natural disasters such as wildfires. The platform allows an immediate and accurate assessment of an affected area, both in terms of area-extent and land-type. This means the regional authority can make fast and effective decisions when it comes to the management of natural disasters. Moreover, due to its operational autonomy, GIS Crete offers flexible and independent emergency management functionalities which allow for swift reaction to issues closer to the source.

Since 2021, amongst other uses, Region of Crete has availed of the GIS Crete platform and the insights it provides on several occasions for the evaluation and estimation of burnt areas following 7 high profile wildfires distributed across the island. One of the most recent wildfires analysed was the case in Melabes, a town in the Rethymno regional unit of Crete in July 2022.

This devastating wildfire ripped through the countryside surrounding Melabes and forced the emergency services to completely evacuate the town. In totality, the fire affected almost 20,000 acres of land and destroyed the livelihoods of many residents. By using the Sentinel-enabled service, the Region of Crete estimated that almost 39% of the destroyed area affected olive plantations, 13% affected agricultural lands and 5% affected vineyards.

The Primary Users

Region of Crete is one of the 13 regional governance authorities of Greece. Its services expand to the entire geographical territory of the island of Crete and are administratively divided into four regional units, Heraklion, Lasithi, Rethymnon, and Chania.

Region of Crete is responsible for the strategic planning at regional level in accordance with the principles of sustainable development, social cohesion, and active environmental management.



<https://www.crete.gov.gr/>

The authorities were tasked with coordinating the relief effort for the fire and quickly called upon GIS Crete to help them analyse the situation. Thanks to various indices derived from Sentinel-2 data, the extent of the damage could easily be quantified and analysed. Using this data, important information could be derived and practical measures put in place. For example, safe areas could be identified from where relief operations to be set up, the extent of the crop damage in surrounding farmland could be analysed, the number of houses and important pieces of infrastructure affected could be quantified and even rough estimates of finances needed to support the relief effort could be calculated.

WHAT ARE THE BENEFITS?

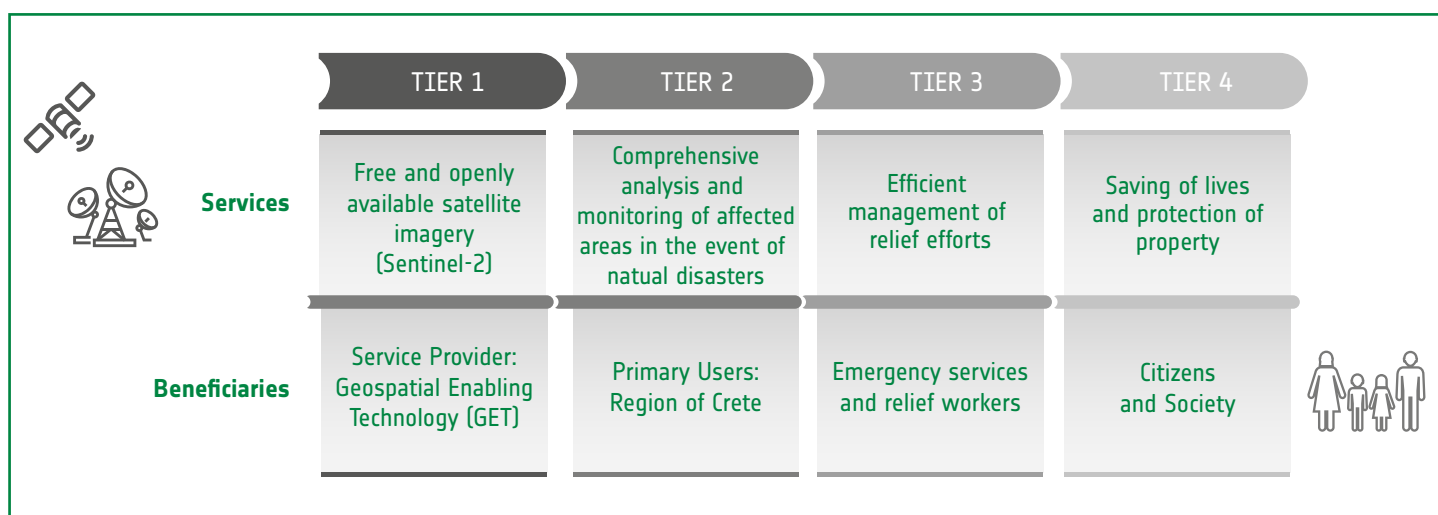


Figure 3: Value chain of the main stakeholders and beneficiaries

Thanks to the free and open nature of Copernicus data, GET can build impactful Spatial Data Infrastructures such as GIS Crete for their clients while simultaneously saving in data purchasing costs. This enables entities such as GET to build robust and sustainable business models which can lead to the provision of valuable services across a plethora of applications.

Using this Sentinel-enabled service, Region of Crete can fulfil their various governance mandates, which include monitoring and analysing the impacts of natural disasters such as wildfires or floods. For example, throughout the Melabes wildfires, traffic diversion maps were made openly available through a GIS Crete link to citizens living in the area, meaning they could go about their day in a safe manner with as little disruption as possible. This tool ultimately aids in serving the citizens of Crete in a much more efficient and impactful manner.

Other beneficiaries in this value chain include the emergency services. Thanks to the rich and extensive data obtained from Sentinel-2 following a disaster, emergency services can get a comprehensive view of the most affected areas, the least affected areas, and potential further issues they could be facing. These invaluable insights can be used to take informed actions such as where to locate resources and focus efforts.

Finally, the citizens of affected areas benefit from efficiently planned disaster relief efforts. Being able to comprehensively assess damage to local infrastructure, homes and farms allows for the resources needed to rebuild these communities to be distributed efficiently.

The key benefits are:



Economic

The comprehensive overview of how finances should be distributed in the aftermath of a wildfire allows for efficient use of economic resources (Tier 2 & 3).



Environmental

The use of Sentinel data helps to understand where and to what extent ecosystems have been affected, meaning efforts to rebuild them can be swifter and more informed. Firefighting and fire prevention can also help reduce the release of large amounts of carbon into the atmosphere (Tiers 3 & 4).



Regulatory

The use of Sentinel data helps the Region of Crete uphold their operational mandate (Tier 2)



Societal

Citizens and society benefit from the efficient management of disaster relief efforts (Tier 4).

EXTENDED IMPACT

The use of GIS Crete is not only limited to monitoring the aftermath of a natural disaster but is now also being used to help the regional authority prepare for potential future disasters. Using the available extensive data from Sentinel-2, regional authorities can better design infrastructure to withstand catastrophic events, build local amenities in less vulnerable locations or implement disaster reducing measures such as flood drainage or firebreaks. Moreover, with the global coverage of Copernicus data, developing solutions like GIS Crete for other regional authorities is completely scalable across any part of the world.

Although not used in this specific case, it is worth pointing out that the Copernicus Emergency Management Service (Copernicus EMS) is another resource which provides all actors involved in the management of natural disasters, man-made emergency situations, and humanitarian crises with timely and accurate geo-spatial information derived from satellite remote sensing and completed by available in situ or open data sources. The Copernicus EMS consists of two components; a mapping component and an early warning component. The mapping component provides the likes of Civil Protection Authorities and Humanitarian Aid Agencies with maps based on satellite imagery that can be combined with other data sources (e.g., as digital feature sets in a geographic information system) to support geospatial analysis and decision-making processes of emergency managers. The early warning component consists of three different systems; the European Flood Awareness System (EFAS), the European Forest Fire Information System (EFFIS) and the European Drought Observatory (EDO). All three also have global scale counterparts.



Figure 4: Sentinel-2 image of burned area surrounding Melabes - Source giscrete.gov.gr

ABOUT THE PROJECT

The Sentinel Benefits Study (SeBS) is conducted by EARSC (European Association of Remote Sensing Companies) with partners The Greenland, IIASA (International Institute for Applied Systems Analysis) and Evenflow on behalf of the European Space Agency (ESA). It has the goal to study 20+ full cases by analysing the impact of the use of Sentinel data along a value-chain. This short case has been prepared where there has been an interesting use made of Sentinel data, but it has not (yet) been possible to conduct a full case. It tells the story of the use of Sentinel data without going deeply into the economic or environmental benefits.



We acknowledge that the understanding of the case was supported by discussions with Maria Pahoula from GET and Ermioni Gialiti from the Region of Crete. We thank them for their valuable insights and availability.

Do you know an interesting case demonstrating the benefits derived from the use of Sentinels data?

Email info@earsc.org

More Information on Sentinels Benefits Studies:

www.earsc.org/sebs



“Based on the available satellite data, we are able to implement actions to protect society and infrastructure, based on two of the main pillars of our Strategic Planning: Effective Governance and Active Environmental Management.”

Ermioni Gialiti - Special Consultant of Crete's Regional Governor and authorized satellite data manager for the Region of Crete



The Sentinels Benefits Study is funded by the EU and ESA.
The views expressed in this study cannot be taken to reflect the official position of the EU or of ESA.