

## MAPPING BURNED AREAS USING SENTINEL-2 IMAGES

*An operational semi-automated burned area mapping service was developed within the context of the NOFFi project in Greece.*

### The challenge

Wildfires constitute an important environmental pressure in Mediterranean countries, with significant consequent impacts both in forested ecosystems and urban areas (e.g., increased risk of floods due to loss of vegetation cover in the wildland-urban interface). Timely burned area mapping is essential in post-fire management. However, the high number of fires, the extensiveness of the areas affected and—in many cases—the difficulty in approaching steep or remote areas render the official fire perimeter delineation, typically performed through fieldwork, a very challenging task.

Operational high-resolution satellite images constitute a cost-effective alternative in mapping wildfires, also offering much higher accuracy and timeliness than fieldwork.

### The space based solution

Within the National Observatory of Forest Fires (NOFFi – <http://epadap.web.auth.gr>), we developed a semi-automated burned area mapping service (so-called NOFFi-OBAM), exploiting Copernicus Sentinel-2 satellite data for mapping burned areas shortly after the fire and with the highest possible accuracy. NOFFi-OBAM has been deployed and operationally used in Greece, on a national level. The service (implemented as a plugin in the free and open-source GIS software QGIS), was first employed on a pre-operational basis during the 2016 fire season, mapping 30 large wildfires in Greece (25,683.72 ha in total), two in Cyprus and one between Greece and FYROM.

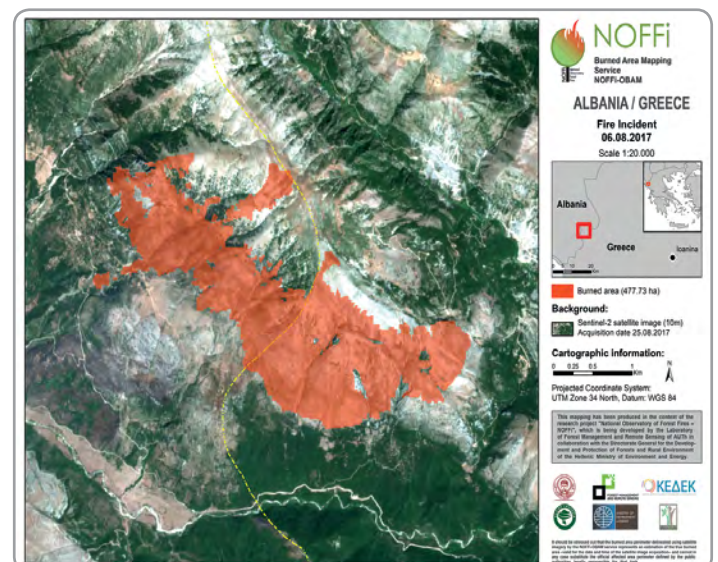
During the 2017 fire season the service was employed systematically, mapping burned areas from 97 wildfires in Greece (20,709.67 ha in total) and two between Albania and Greece. In addition, a network with representatives from all local forestry offices was created,

in order to establish a direct line of communication between the providers of the service and the primary stakeholders. As a result, in certain cases even burned areas less than a hectare were mapped, if the local forestry office believed it was important.

Although the methodology allows the use of other high-resolution satellite data, we almost only used Sentinel-2 images in both fire seasons, because they have an almost optimal spatial resolution for burned area mapping and – most importantly – high image acquisition frequency. In 2017 in particular, when Sentinel-2B had also been delivering images, the average time to produce a mapping was 6 to 7 days after the start of the fire.

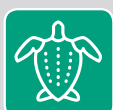
### Benefits to Citizens

Accurate and timely burned area mapping is essential for designing both short-term ecosystem restoration measures and direct pre-emptive measures that can mitigate the possible impacts of the fire/heavy rainfall combination (soil erosion, increased debris flow,



Burned area mapping performed using Sentinel-2 imagery for a transboundary wildfire between Albania and Greece in 2017.

Thematic Area



**BIODIVERSITY AND ENVIRONMENTAL PROTECTION**

Region of Application



**GREECE**

Sentinel mission used



**S2**

Copernicus Service used



**-**

Usage Maturity Level

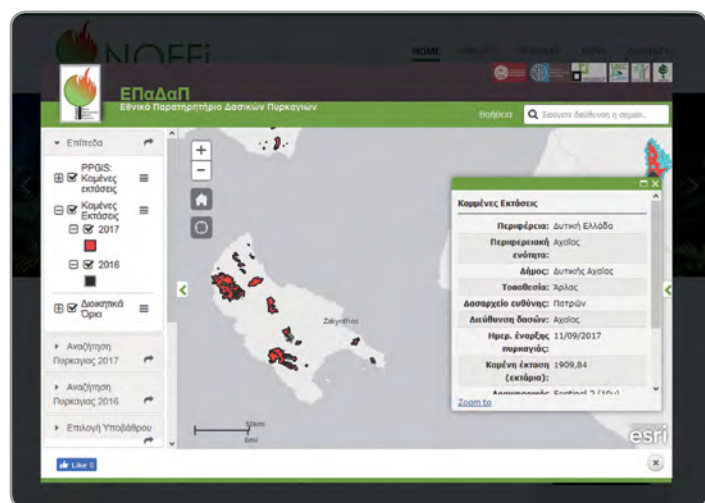


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floods, etc.). Hence, the results were also used by the General Secretariat for Civil Protection, as well as NGOs. Timely burned area mapping is also important for monitoring and safeguarding against illegal activities within the affected area. We also found a few cases where a Sentinel-2 image was acquired just after the start of the fire, highlighting the exact starting location. These cases were communicated to the authorities responsible for investigating the causes of the fire.

## Outlook to the future

NOFFi-OBAM has received very positive feedback from all stakeholders that used the service. The service will be further developed through a follow-up project due to begin shortly, which will also evaluate the possibility of exploiting the active fire products of Sentinel-3 for automatically initiating the mapping process. Moreover, additional funding is currently being pursued for securing the observatory's uninterrupted operation. NOFFi also includes two other services related to fire prevention and risk assessment (a fuel type mapping service and a midterm fire danger index), which are also plans to exploit Copernicus Sentinel data in the future.



WebGIS platform developed to disseminate the results of the project, which also incorporates a burned area viewing service, open to the public (<http://epadap.web.auth.gr/?lang=en>).

“The Sentinel-2 based NOFFi-OBAM service constitutes a new invaluable tool in post-fire management.”

*Antonios Kapetanios, Directorate General of Forests and Forest Environment, Hellenic Ministry of Environment and Energy*

## Acknowledgements

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D. Stavrakoudis<sup>1</sup>, A. Stefanidou<sup>1</sup>, C. Minakou<sup>1</sup>, I. Gitas<sup>1</sup> and A. Kapetanios<sup>2</sup>

1. Laboratory of Forest Management and Remote Sensing, Aristotle University of Thessaloniki, Greece
2. Directorate General of Forests and Forest Environment, Ministry of Environment and Energy, GREECE  
Email: [jstavrak@auth.gr](mailto:jstavrak@auth.gr)

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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. The views expressed in the Copernicus User Stories are those of the Authors and can in no way be taken to reflect the official opinion of the European Space Agency or of the European Commission.

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