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Quantification of the Area of Land Burned and Habitats Affected by Wildfires in Ireland, 2015–2021, and the Resulting Emissions

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Identifying pressures

Information on wildfires in Ireland is currently collated from fire services, media, social media reports and satellite-based programmes that record elevated heat signals of fires active under clear skies at the time of the satellite overpass. However, these sources are incomplete and inconsistent, with the omission of many small fires, bias towards population centres and limited data on the spatial extent of the fire and the type of land cover burned. In recent years, efforts have been made at the European scale to map burned areas greater than 30 ha by manual digitisation of satellite imagery. However, this still overlooks smaller fires and is subjective in its approach. Due to this lack of knowledge about wildfire events, it is not known to what extent changing climate and land management conditions are having an impact on the number of fires and their magnitude. Likewise, the estimated atmospheric emissions and loss of biodiversity arising from wildfires are poorly understood. This research aims to develop an automated methodology that allows the aftermath of a wildfire to be mapped and emissions estimated more accurately using factors determined specifically for Irish vegetation species.

Informing policy

Different measures have been implemented to reduce the incidence and impact of wildfires, for example periods when burning of growing vegetation is prohibited, forest fire danger ratings and notices, and fire breaks. However, with no reliable information on the timing and extent of a burn, or whether fires are repeatedly occurring in the same locations, the effectiveness of these measures cannot be evaluated. Likewise, to understand how climate changes may impact on the timing and extent of wildfire events, more information on where and when fires have occurred in the past is needed. Similarly to all EU countries, Ireland reports annual emissions of anthropogenic pollutants and greenhouse gases, but, at present, it is likely that those arising from wildfires are underestimated, given the paucity of information on events smaller than 30 ha. More detailed information on where and when a fire occurs, the nature of the vegetation that is burned, previous fires in a region, and the relationships between fires, weather and land management will enable the introduction of more targeted measures and policies to reduce the impact of wildfire events.

Developing solutions

To ensure the most comprehensive mapping of wildfire events, a fully automated method relying on identification of burn scars on medium-resolution optical satellite images was developed. Landsat and Sentinel-2 satellites carry sensors that record surface reflectance at a scale of 10–30 m, with new images acquired every few days under cloud-free conditions. These images permit the change in reflectance from live green vegetation to dead burned remains to be identified, and, through a filtering process, false alarms arising from agricultural activities or misclassification due to cloud shadows can be eliminated. Emission factors for three species of vegetation commonly associated with Irish wildfire events (gorse, heather and purple moor grass) were established using a dedicated combustion facility. The satellite-based methodology can be applied to historical images as well as those acquired by current and future sensors, and the atmospheric emissions more accurately calculated with a better knowledge of the vegetation that burned. Consequently, the contribution of wildfire emissions to the national total can be better estimated, and the efficacy of measures taken to reduce the incidence of fire events evaluated.

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