Bushfire emissions: evaluating the impact on air quality and human health in the Northern Territory

Abstract

The Northern Territory (NT) of Australia experiences frequent bushfire events, particularly during the dry season (May-October). The region's climatic conditions promote rapid vegetation growth during the wet season, contributing to high fuel loads in the dry season. Early dry season burns are often implemented to reduce the risk of more intense wildfires later in the season. However, both early and late dry season fires release substantial amounts of smoke, including fine particulate matter ($PM_{2.5}$ and PM_{10}), which can significantly degrade air quality and pose serious public health risks. This study investigates the emissions from bushfire smoke and evaluates their impact on air quality and respiratory health outcomes across the NT. Using data from 2021 to 2024, the research integrates satellite-derived fire data, ground-based air quality monitoring records, meteorological datasets, and hospital admissions data. The methodology includes spatial analysis of fire hotspots, temporal assessments of particulate matter, and statistical correlations with hospital admission records for respiratory conditions. Although data analysis is ongoing, early observations suggest a likely link between intense fire activity and elevated particulate pollution, might exceeding national air quality standards. These pollution events appear to align with spikes in hospital admissions for respiratory issues, particularly among remote and Indigenous communities, who are disproportionally exposed due to both proximity and the use of cultural burning practices. The outcomes of this research are expected to inform more effective air quality management, public health responses, and policy frameworks aimed at reducing the health burden of bushfire smoke exposure in the NT.