PANDEMIC IMPACTS

Lockdowns and fire in Madagascar's parks

COVID-19 lockdowns stalled protected area management in many countries. New research examines how fire and on-site protected area management are interlinked, demonstrating the novel use of satellite data and statistical modelling.

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As we grapple with the long-lasting societal and economic consequences of the COVID-19 pandemic, our interdependence with nature has never been more apparent. Recovery efforts now focus on sustainable pathways and are envisioned as opportunities to combat climate change, biodiversity loss and other environmental crises. The identification of COVID-19 as a zoonotic disease has emphasized the link between infectious disease risks and biodiversity loss. Yet the lockdowns and reduction in economic activities also affected protected areas worldwide and made field studies challenging. New studies (for example, see refs. [1,2]) are starting to examine how protected areas have been impacted by the pandemic, including a recent one that assessed the impact of the lockdown on forest fires[3]. In this issue of *Nature Sustainability*, Eklund et al. report on the combination of satellite-derived data on forest fires and precipitation with statistical models to evaluate the impact of the COVID-induced lockdown on protected area management in Madagascar[4].

Fig. 1 | Forest fires. Flames burn vegetation in a forest fire event in Betafo, central Madagascar. Credit: Jean-Frédéric Hansssens/EyeEm/EyeEm/Getty.

Satellite-detected, freely available fire data have long been used to monitor and help manage fire activity within protected areas[5]. However, only a few studies have used this type of fire data to assess the efficacy of protected area management[6]. Going a step further, Eklund and colleagues combined statistical modelling with satellite-derived forest fire data and weather data to examine how fire activity changed given COVID-induced lockdowns inside protected areas in Madagascar, a well-known biodiversity hotspot. Most on-site park management activities, such as ranger patrols, community engagement and income-generating activities such as tourism were suspended during the lockdowns.

To predict future fire events, the authors utilized historical and contemporary fire and weather data for all protected areas in Madagascar for every month from 2012 to 2020. Model predictions were then compared with the observed fire activities before and after the pandemic to look for anomalies (differences between predicted and observed). As fires in protected areas occur due to complex anthropogenic, weather and other factors, such as forest type[7,8], the authors used rainfall as the control for weather — to make sure that it was not affecting the results of the statistical model.

Eklund and colleagues found that during pre-pandemic years, striking differences between observed and predicted fires occurred only during two periods: October–November 2013 and September 2018. Both periods were associated with political unrest linked to Madagascar's presidential elections. In 2019, just before the COVID pandemic, the observed fire activity was comparable to that predicted based on historical data. However, the authors found an unprecedented increase in fires between March and July 2020, when site management activities were suspended. As on-site management activities resumed after July 2020, fire activity quickly dropped to levels predicted by the model. This important finding illustrates how fire activity and on-site protected area management are directly linked, with critical implications for biodiversity conservation.

Eklund et al. illustrate an innovative methodology using freely available satellite data to rapidly assess the effect of lockdowns on protected areas and the implications for biodiversity conservation when field research is not possible. The authors also looked at the link between protected area governance and excess fires during the lockdown. They found no significant difference in fire activity across the various park governance types, as activities were stopped across all protected areas. The greater concentration of excess fires in the parks of western Madagascar reflected the timing of the lockdown, as the parks in the moist forest biome in the central and eastern parts were too wet at the time. Important findings aside, follow-up interviews with the park staff and community members could be done to shed light on excess fire events during the lockdown. Future studies could also examine the influence of contextual factors, such as socioeconomic conditions, political events and behavioural aspects of fire activity and management both inside and outside of parks.

Eklund and colleagues used rainfall data as a proxy for weather. The statistical model could also include site-specific topographic and atmospheric factors, such as wind, to explain the spatial differences in fire anomalies. Future studies using a similar methodological approach could also quantify the extent of habitat damage and degradation in protected areas due to excess fire activity during COVID-19 lockdowns.

Finally, for other sites where fire is a driver of habitat loss and degradation, Eklund et al. demonstrate a method for replicating this assessment and potentially combining it with complementary and relevant data to enhance our understanding of fire and land management. The study could be further scaled up to include other habitat loss and degradation drivers to guide protected area authorities to adapt their strategies and actions to better manage and monitor fires (Fig. 1). ❐

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Competing interests

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