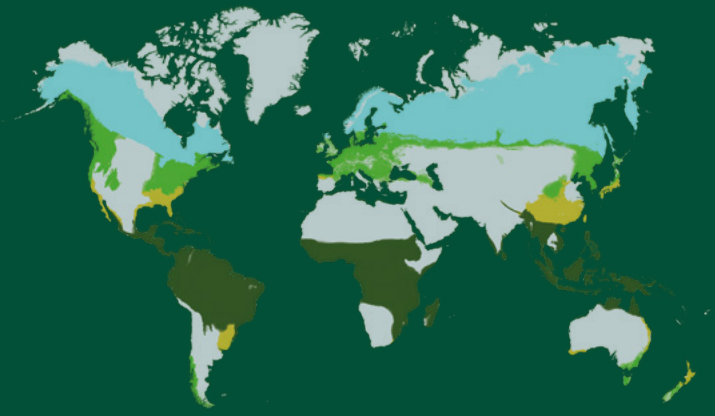


# Forests and fire

Wildfires and deforestation are not only environmental problems – they are shaped by economic systems, policy decisions and global consumption. LSE research examines these forces to understand why forests are under pressure and how better policies can protect them.

## What do forests do for the Earth?

Research by the **Centre for Economic Transition Expertise (CETEx)** sets out the critical role of forest ecosystems, from underpinning food systems to supporting livelihoods and providing a buffer for communities against environmental shocks. These benefits are known as ecosystem services. Often, they only become visible when they are disrupted.



Distribution of forests globally by climatic domain, 2020. Source: FAO (2020)



When forests are lost, these benefits decline. Air pollution and disease increase. Infrastructure becomes more vulnerable to floods and landslides. Economic systems become more exposed to climate hazards. These risks can transmit through financial systems via falling asset values, disrupted supply chains and rising insurance losses.

## What drives deforestation?

Today, most large-scale forest loss is due to agricultural expansion, timber extraction, mining, infrastructure and urban growth, driven by global consumption patterns.



2001-2020: approximately 1.48 million km<sup>2</sup> of forest were lost globally

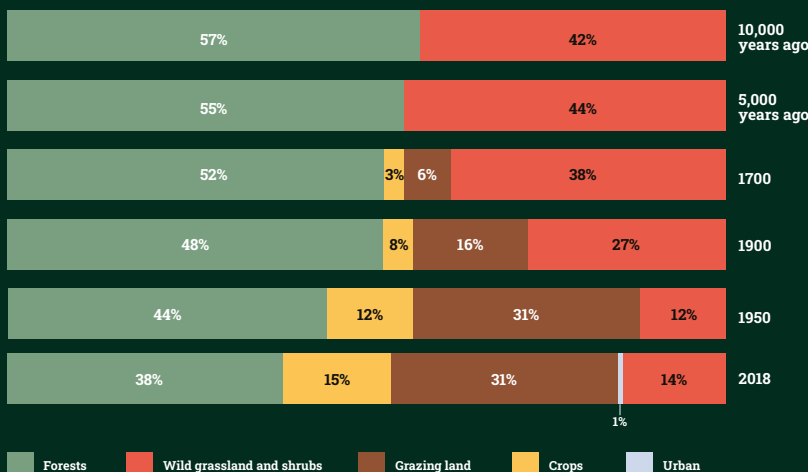


62% of tropical forest loss is linked to commodities such as beef, soy and palm oil



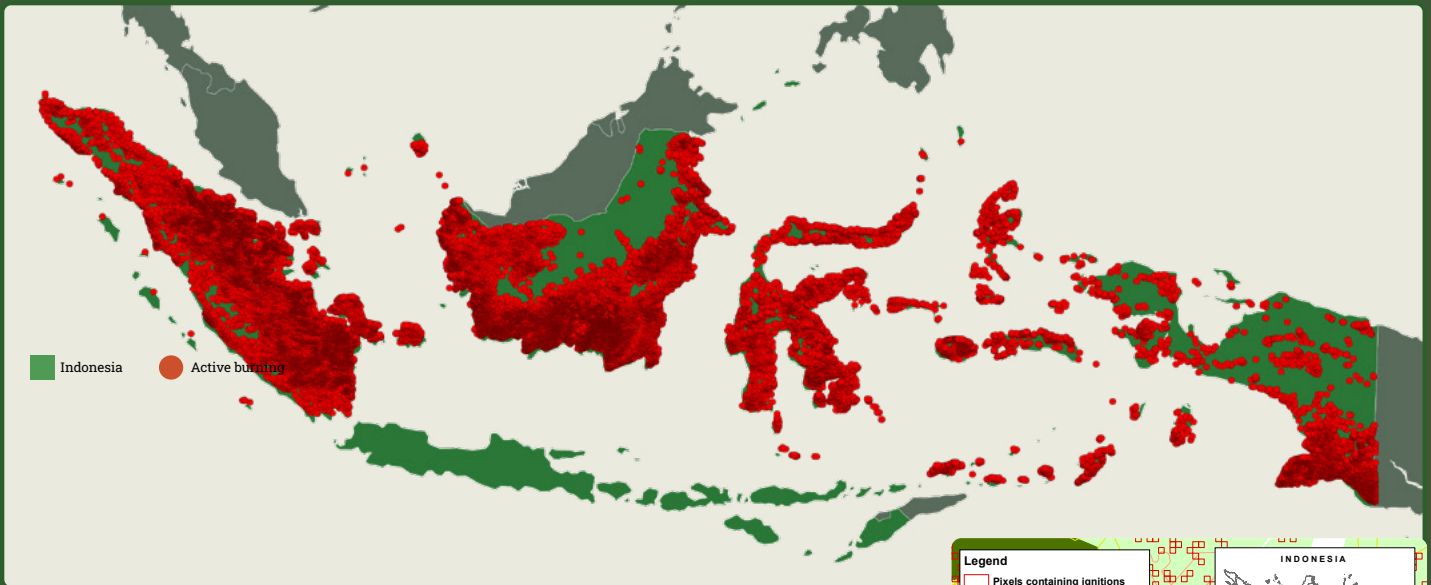
25% of tropical forest loss is associated with exports

### Change in global land use over the ages



This graph shows the accelerating decline in forested area as agricultural needs increase. Source: Ritchie (2021)





Hotspots of active burning in Indonesia tracked over 15 years using NASA's MODIS system

## Case study: Indonesia

Indonesia provides one of the clearest examples of how land-use policy, commercial incentives and fire risk intersect. **Dr Clare Balboni and Professor Robin Burgess** (STICERD) analysed 15 years of daily satellite data using NASA's MODIS system, which detects thermal anomalies at roughly one square kilometre resolution. Each "hotspot" indicates active burning.

These data were combined with land-use maps identifying oil palm concessions, wood fibre plantations, logging areas and protected forests. By overlaying fire detections with concession boundaries and forest loss records, researchers identified where fires ignited, how long they burned and whether they followed recent deforestation.

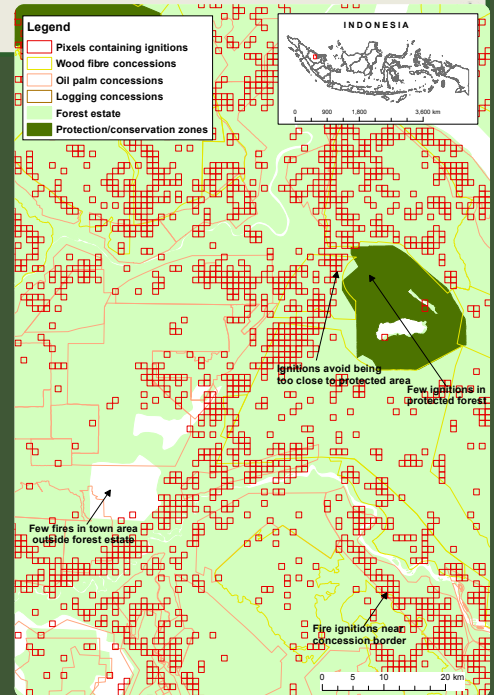
The patterns were clear:



Fire probability per hectare 8x higher in oil palm and wood fibre concessions than in other land categories. Nearly 1/2 of all concession fires occurred in oil palm areas.



Areas deforested in the previous year were approximately 275% more likely to experience fire, suggesting a strong link between land clearing and burning.



The figure shows a map of the Riau region in Indonesia. Using remote sensing (satellite) data from 2000-2016, each 1km<sup>2</sup> red grid cell represents at least one detected ignition within different concessions zones (wood fibre, oil palm or logging). A concession gives private companies the rights to establish plantations on public lands.



During the 2015 fire crisis, Indonesian fires released an estimated 400 megatonnes of CO<sub>2</sub> equivalent at their peak.



The largest single fire burned 656 km<sup>2</sup> – about the size of Singapore.



On some days, emissions exceeded the daily emissions from all US economic activity.



The resulting haze affected Indonesia, Malaysia and Singapore and was linked to significant public health impacts.

## Why are wildfires getting harder to fight?

Wildfires are becoming more intense, unpredictable and harder to control – but are they actually getting worse? And if global burned areas are falling overall, why are extreme “monster fires” still causing devastation?

In [this video](#), Dr Tom Smith (Associate Professor in Environmental Geography) explains the science behind modern wildfires and how climate change, land use and decades of fire suppression have made today’s fires harder to fight.



## Policies protecting forests and

### reducing fire and forest loss

**Satellite monitoring has reshaped accountability** as fire activity can now be detected, dated and geographically attributed with increasing precision. This allows regulators to identify repeated burning patterns and assess compliance.

**Reducing forest loss requires addressing its drivers** which include land-use planning, enforcement, incentives for sustainable agriculture and clearer international standards for deforestation-free supply chains. Financial institutions are increasingly assessing exposure to deforestation-related risk.

At the global level, **proposals for long-term funding mechanisms aim to tie economic incentives with forest protection**, particularly in lower-income, forest-rich countries.

**The challenge is not to halt development, but to shape it** in ways that preserve the ecological systems on which both local and global stability depend.

The evidence shows the right policies can reduce forest fires, but further action is needed to match the scale of the problem.

