EGU22-12016
https://doi.org/10.5194/egusphere-egu22-12016
EGU General Assembly 2022

Assessing social and ecological drivers of fire regimes in the Brazilian Amazon in the context of changing forest governance

Michel Valette[1,2], Morena Mills[1,2], Jem Woods[1,2], Yiannis Kountouris[1,2], and Minerva Singh[1]
[1]Centre for Environmental Policy, Imperial College of London, London, United Kingdom
[2]Leverhulme Centre for Wildfires, Environment and Society, London, United Kingdom

Whilst the deforestation rate of the Brazilian Amazon has decreased drastically over the 2005-2015 period, thanks to an ambitious program to fight deforestation, since then, forest degradation resulting from logging and wildfires became the major source of aboveground biomass losses and the Brazilian Amazon turned into a net carbon source. This could be partially explained by a decoupling of fire occurrence and deforestation, historically one of the key drivers of the fire regime in the region. Moreover, since 2015, deforestation rates and associated fires are rising again, and new deforestation frontiers are opening in previously unaffected areas in the central and western Amazon.

Fires in the Brazilian Amazon are closely related to climate and agriculture: fires are used to transform forests into pastures or cropland, and subsequent burns are used to maintain grass productivity. When nearby rainforests are sufficiently dry, deforestation and agricultural fires escape and can cause large wildfires. Local communities' fire management practices impact greatly the likelihood of these escaping fires, but also bear a cost. High mortality rates after even low-intensity fires lead to fuel accumulation and canopy damage, increasing the vulnerability of forests to subsequent burnings. Coupled with a regional reduction of precipitations due to climate change and deforestation, the Amazon forest could be threatened by a cycle of massive dieback and increased fire activity. Thus, it is crucial to understand the drivers of different types of fires in the region and how to prevent them. Of particular interest is the role played by the policies deployed after 2004 to reduce deforestation rates in the region and their recent weakening.

Building on previously published literature on the drivers of fire regimes and deforestation in the region, data were collected on potential drivers of fire regimes related to climate, agricultural expansion, ecosystem integrity, infrastructure, populations, environmental policies and land conflict. MODIS Active-Fire dataset was used as a response variable, and also classified into deforestation fires, agricultural fires and forest fires thanks to deforestation and land use data in a second step of the study. A spatiotemporal modelling approach, relying on the Log Gaussian Cox process and R-INLA package, has been adopted to assess the relative influence of different drivers of fire regimes in the Brazilian Amazon for the 2006-2020 period. Preliminary results on the drivers of fire regime in the state of Para for the last four years show a powerful influence of drivers related to agricultural expansion (especially ranching), integrity of the forest cover, presence of

rural settlements and environmental policies. Different protection regimes have varying influences on the fire regime, with sustainable use areas being the less efficient. Law enforcement efforts seem to have an inhibitory effect on fire occurrence and protected area downgrading, downsizing and degazettement favour them.