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Has peat rewetting reduced and prevented fires in West and Central Kalimantan?

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Introduction

After the devastating fires in 2015 in Kalimantan, fueled by having around 70% of peatlands degraded, the government, private sector and international organizations have invested significant resources and time to restore over 2.5 Mha of peat since 2016 (Miettinen et al, 2016; Carrasco et al, 2022). Thus, it is strategic to evaluate the impact and effectiveness of peat restoration via rewetting on fire occurrence and intensity in West and Central Kalimantan.

Previous works in Indonesia have assessed the impact of behavioral change interventions such as incentives, performance-based payments, in-kind support for fire-free agriculture, awareness raising, trainings on fire prevention, and deterrents on reducing fire occurrence (Carmenta et al, 2021; Falcon et al, 2022). Rather, our key contribution is to evaluate the effectiveness of peat restoration via canal blocking on fire occurrence and intensity from 2016 to 2021 using a counterfactual scenario based on impact evaluation methodologies.

Methods

We assess the reduction in fire occurrence and intensity in rewetted areas with canal blockings (treatment) with respect to untreated or control areas based on the blockings built between 2016-2019 in West and Central Kalimantan and registered in the PRIMS database. We define the treated areas as the 250m radius semicircles in the upstream of the blocked canal and the control areas as the remaining area within a 2 km buffer. We determine the impact by using regression adjustment on a matched sample that allows us to create a credible counterfactual of what would have happened had the blockings never been built (Gertler et al, 2016; Wooldridge, 2010).

We use a combination of satellite and administrative records from 2015-2021: fire brightness and radiative power from VIIRS-NASA, fire occurrence from the Indonesian Ministry of Forestry (MoEF), the Indonesian PRIMS data on canal blockings, peat canals and administrative units, and Google Earth Engine data on oil palm concessions, climate, intensity of night lights and terrain. Our panel data, generated from rasters, has 4.8 million observations for 15 variables.

Results and conclusions

We find strong heterogeneity of the effectiveness of rewetting: canal blockings reduced fires in certain districts up to two years after their construction. Moreover, the concrete blockings built in 2017 reduced the fire intensity (VIIRS data) by more than half, on average, for 28% of the rewetted area during the dry 2019 El Niño year.

Based on the binary (fire/no fire) MoEF data, the concrete blockings built in 2018 prevented the fires in the rewetted areas from becoming 18 and 2.6 times larger in 2018 and 2019 respectively. Also, the concrete blockings built in 2017 completely avoided fires in the rewetted zone during 2019. On the other hand, the wood blockings increased fires up to 24% in the treated sector. For the fire intensity VIIRS data, the wood structures show no significant impact, highlighting the importance of appropriate building materials. A simple comparison without a counterfactual (matching and regression) would lead to a wrong attribution of reductions and increases in fires.