



Figure 1. Kalimantan Oil palm concessions. Non-certified concessions in yellow, RSPO-certified concessions in blue.

industrial oil palm plantations (Struebig *et al* 2015), we would expect a stasis or at least, a reduced rate of loss of orangutan population in RSPO certified concessions, attributable to RSPO status. We used a recently developed dynamic and spatially-explicit population distribution and density map, developed by Santika *et al* (2017), overlaid with concession boundary maps, to ascertain the presence and density of orangutans in palm oil concessions between 1999 and 2014. Santika *et al* predicted orangutan population estimates are based on Bayesian modelling that takes into consideration various input data (helicopter nest counts, transect nest counts, and interview data) and predictors. This mixed method approach provides a considerably more robust means of detecting population presence and density over the entire species range than prior estimates.

Number of fire hotspots detected

RSPO criteria aim to minimize the use of fire in plantation establishment and management through P&C 5.5 and 7.7, therefore we would expect a reduction in the amount of fire within RSPO concessions relative to the counterfactual. Fire is often used in palm oil concessions to clear land prior to planting, in between crop cycles and to clear existing crops of weeds and pests. However, when coupled with prolonged periods of drought and on high carbon peat soils, fires can have devastating environmental, human health and economic effects (Harrison *et al* 2009, Gaveau *et al* 2014b, Cattau *et al* 2016). To assess the effectiveness of RSPO certification in reducing fire outbreaks, we mapped fire

incidents in Kalimantan at a 1 km² resolution from the Moderate Resolution Imaging Spectroradiometer (MODIS) Active Fire Detections, extracted from MCD14ML Collection 5 and distributed by NASA FIRMS for the years 2011–2015. Fire data for the years 1999–2004 were obtained from the MODIS archived records and extracted from the MCD45 collection.

Social

Rates of poverty in villages neighbouring concessions

In addition to receiving compensation for the transfer of land tenure, sustainable oil palm concession development should deliver benefits to members of neighbouring villages through increased employment opportunities both in the concession and through supporting services and infrastructure (RSPO P&C 6.1 & 6.11). Subsequently, we would expect the overall level of poverty within a village should decline in response to the sustainable operation of concessions, both from the baseline and relative to the counterfactual. Poverty was measured using the issuing of statement letters of poverty (SKTM) at the village level as a proxy indicator. SKTM letters are issued to families falling below a series of absolute poverty indicators to facilitate increased access to hospitals, scholarships and legal aid (Fiarni *et al* 2013) and have been found to be a reliable indicator of poverty rates in Kalimantan (Priebe and Howell 2014). Data on the number of SKTM letters issued over the course of the studies focus years (2000–2014) was obtained from the Indonesian Village Potential Survey (PODES), distributed by the Indonesian Bureau of Statistics for the years 2000