

Widespread Subsidence and Carbon Emissions across Southeast Asian Peatlands

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Over the last three decades, most of the 25 million hectares of tropical peatlands in Southeast Asia have been deforested and drained. This has exposed their carbon-rich peat soils to oxygen, resulting in emissions of carbon dioxide. Here, we quantify the widespread subsidence that results from this large soil carbon loss. Using InSAR remote sensing, we map, for the first time, subsidence at 30m resolution across $\sim 3,000$ km² of peatlands, vastly improving the spatial resolution and coverage of subsidence measurements. Over 90% of the surveyed area is subsiding, with a mean of 2.2 cm/yr. The region now faces increased flooding risk and loss of productive land, as most peatlands are at or just above sea level. Our measurements also reveal that smallholder agricultural areas and degraded peatlands are subsiding at rates comparable to plantations, and that subsidence rates increase away from rivers and decrease over time after drainage. Because of its detailed spatial resolution, InSAR provides a new and valuable tool to identify emissions by land-use and geography and to target hotspots for better management. Finally, we use remotely sensed maps to update IPCC emissions factors and calculate regional CO₂ emissions from peat oxidation of 143 ± 28 MtC/yr.