

Land-use change in forest-frontier contexts under telecoupling: addressing methodological mapping challenges in Laos, Myanmar, and Madagascar

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Forest-frontier landscapes in the humid tropics show specific and distinct land-use change (LUC) dynamics compared to other world regions, while offering insightful examples of current global environmental and development challenges. Social-ecological systems (SES) in these contexts not only have to meet the livelihood needs and development aspirations of local populations, but are also expected to ensure ecosystem service flows to provide worldwide benefits to humans, to the point that global factors have outweighed local determinants of LUC in many such landscapes. Driven by demands for commercial agricultural production, carbon sequestration or biodiversity conservation among others, distant socio-economic and environmental influences are becoming increasingly entangled, triggering not only rapid LUC processes at the local scale, but also unchaining multi-directional spill-over and feedback effects affecting other SES. These phenomena are what the land system science community has recently tagged as telecoupled situations.

To reveal the implications of such dynamics for the resilience of SES, a first and key step is to apprehend the LUC trajectories occurring at the local level. However, methodological challenges arise when conducting spatially-explicit change assessments in these regions, given the high temporal variability at the plot level, compounded by the paucity of good quality satellite imagery. This paper presents the methodology developed to overcome this problematic in our comparative cross-country research, relying on a participatory approach to complement the available remote sensing data. This allows to co-produce together with local land users the knowledge needed to illuminate the LUC trends over the past 20 years in our six research sites in Laos, Myanmar and Madagascar. The resulting LUC maps in turn serve as the basis to assess changes in ecosystem service supply and their implications for human well-being, constituting the stepping stone to understand how telecoupling affects the resilience of SES in forest-frontier contexts in the humid tropics.