

Land systems governance and vector-borne diseases.

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The effect of land use and land cover on vector-borne diseases has been conceptualised in various forms, ranging from Pavlovsky's nidity of diseases, pathogenic landscapes or more recently, in a different perspective, landscape immunity. In this context, land cover has been used widely as a proxy for vector and host habitat and as such often assumed to help monitor hazard (as abundance of infected vectors). Land use, which includes dimensions related to human activities and what land cover is effectively used as by human societies, has provided additional insight into exposure to infected vectors. The land system framework, as it has been elaborated in the field of land science, has added multiple layers to our understanding of what shapes landscapes. Prominent features of interest in the context of vector-borne as well as zoonotic diseases include land legacies, inequities, trade-offs, the role of institutions and distant causes. Very superficially, one could say that land systems examine more broadly the elements shaping landscapes at various spatial, temporal and institutional scales, accounting for the diverse priorities stakeholders may have. For instance, the land system framework acknowledges that landscapes reflect decisions made over decades, if not centuries and as such cannot be easily steered in other directions. Looking into distant causes allows to understand factors affecting land management beyond the "farm gate". The full potential of this framework has not been explored in the context of health, despite its attention for trade-offs in relation to e.g. conservation. Urbanisation

trajectories in the Western world have created extensive and complex ecological interfaces between human-inhabited built-up areas and natural or semi-natural habitats supporting wildlife, whose role in conservation is increasingly emphasised. This may create landscapes that support tick- and mosquito-borne diseases. Agricultural development trajectories in the tropics may have increased the susceptibility of livestock and human populations to vector-borne diseases. We argue that, if land is to be one of the levers into more proactive management of vector-borne and zoonotic disease risk, in a One Health spirit, the land systems framework offers a meaningful tool to understand how landscapes are shaped and may change in the future, and what drives decision and may constraint health risk management when land is concerned. Furthermore, unintended consequences should be assessed when decisions affecting land are taken. The potential reinforcement of integrating health in the land systems framework would thus be beneficial both for health risk management and for sustainable land use decision-making.