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Adaptation to climate change: Using nighttime lights satellite data to explore human response to flood events

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To better understand the impact of climate change, we need to uncover how (and to what extent) societies respond and adapt to it. Yet the dynamics resulting from two-way feedbacks between nature and society remain largely unknown. Here we present an interdisciplinary study aiming to uncover one of the least quantified aspects of human-nature interactions, the spatial-temporal distribution of demographic changes following the occurrence of extreme events. To this end, we use nighttime light satellite data in four contrasting case studies in both low- and high-income countries (Lower Limpopo River in Mozambique, Mekong River in Vietnam and Cambodia, Brisbane River in Australia and Mississippi River at St. Louis in USA), and explore the interplay between flooding events and changes in population distribution in the period 1992-2013. Our study shows the challenges and opportunities of nighttime lights in unraveling the way humans adapt to climate change. Specific results show that population distribution of societies that strongly rely on structural measures ("fighting floods" policies) is not significantly affected by the occurrence of flood events. Conversely, learning dynamics emerge in societies that mainly rely on non-structural measures ("living with floods" policies) in terms of relative population in floodplain areas, i.e. reduced human proximity to rivers. Lastly, we propose the development of a novel approach to exploit the growing availability of worldwide information, such as nighttime lights satellite data, to uncover human adaptation to climate change across scales and along gradients of social and natural conditions.