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A continental-scale multi-hazard analysis of economic recovery using nighttime light satellite data

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Risk assessments and disaster management are generally approached from a single-hazard perspective, ignoring the spatial and temporal connections and feedback loops that are involved when consecutive disasters occur. Not only can the total impact of a multi-hazard event differ from the sum of the impacts of the individual events, but the response and recovery process can also be more challenging for multi-hazard events when compared to a single-hazard disaster. Depletion of financial and human resources after a first hazard may for instance increase people's vulnerability at the time of a second event. This was demonstrated in northern Mozambique, where tropical cyclones Idai and Kenneth made landfall only six weeks apart, early 2019. Despite continued high needs and dependence on humanitarian aid after the second event, UN agencies and partners struggled to provide additional support, due to exhausted stocks and funds after their initial response efforts to Idai.

This study (that is part of the MYRIAD-EU project), focuses on post-disaster recovery, which is an often overlooked and misunderstood component of the disaster management cycle. A single-hazard approach to understanding recovery does not sufficiently reflect the complexity that is involved in multi-hazard events due to the potential feedbacks and interactions between hazards and their effects. While several recent studies have made efforts to improve our understanding of the relationships between single natural hazards and the recovery thereafter, recovery dynamics after multi-hazard events are still poorly understood. Additionally, the studies that have looked into recovery after natural disasters are often focussed on a single hazard type or limited set of extreme events in a specific region. To address this knowledge gap, this study sets out to compare economic recovery after multi-hazard events and single-hazard events on a continental scale.

Visible Infrared Imaging Radiometer Suite Nighttime Light (VIIRS NTL) data (2013-2022) are used as a proxy for economic recovery. To characterize recovery after different single- and consecutive events, accounting for geological, meteorological, and hydrological hazards, monthly changes in night light intensity are computed. A comparison of the recovery profiles of single- and multi-hazard events will then result in an improved understanding of the different trends and dynamics that are involved with economic recovery after multi-hazard events. The results of this study can be used by policy-makers and aid organizations to improve their disaster management strategies. Moreover, the resulting characterisation of economic recovery after single- and multi-hazard events will support future research into the identification of socio-economic factors that affect the

recovery in a multi-hazard context.