Building resilience to floods in India: human development, income, inequality and forest cover

Chandra Sekhar Bahinipati[1,*], Unmesh Patnaik[2] and Asis Kumar Senapati[3]

[1]Department of Humanities and Social Sciences, Indian Institute of Technology Tirupati, Yerpedu 517 619, India
[2]Centre for Climate Change and Sustainability Studies, School of Habitat Studies, Tata Institute of Social Sciences, Mumbai 400 088, India
[3]PG Department of Economics, Ravenshaw University, Cuttack 753 003, India

Enhancing the resilience of disaster-affected communities is always a prime concern for policymakers. Empirical evidence reveals that many socio-economic indicators determine the resilience capacity of an entity. Although several studies in India have investigated the role of socio-economic and generic adaptation measures in reducing impact, there is a lack of studies concerning human development, inequality, and forest cover in reducing vulnerability to extreme events like floods. By considering data related to state-wise losses and damages from floods between 1980 and 2011, we study them in enhancing the resilience capacity of Indian states. Employing Poisson fixed effects with a clustered standard error model, we find: First, human development matters for reducing mortality, but it enhances people affected and houses damaged, and the relationship is expected to have an inverted-*U* shape for later outcomes. Second, in contrast to the anticipation, variables like inequality are negatively associated with houses damaged and human fatalities, i.e. the latter declines with increasing former. Third, the confounder, like forest cover, is found to be negative for all loss and damage indicators. Fourth, most of these variables are found to be statistically insignificant. Given that developing resilient infrastructure is the need of the hour, this study suggests the inclusion of climate risks in development planning to address the adaptation deficit and avoid possible maladaptation.

Keywords: Floods, forest cover, human development, income, Indian states, inequality, resilience.

et al.[4] enumerate the extreme events that occurred between 1970 and 2009, i.e. 192 floods, 69 droughts, and 113 cyclones. Around 12% of total land (i.e. 40 million ha) is prone to floods regarding exposure[5]. Patankar[6] reports that around 278 floods occurred in India from 1980 to 2017 and incurred economic losses and damages (L&Ds) of around US$ 58.7 billion, and 750 million people were impacted. Overall, an increasing trend exists for reported L&Ds regarding people affected, crop damage, infrastructure damage, etc. from natural disasters, specifically for floods[2,5,7].

Natural disasters affect human well-being in different ways. As long as we are not mitigating the expected adverse impacts from natural disasters, it will be challenging to achieve sustainable development goals[5,7]. In particular, nations with lower performance in socio-economic indicators, primarily developing and under-developed countries, are more likely to be affected by natural disasters. Although reported economic L&Ds would be less than in other developed countries, the impacts in terms of people affected, impact on livelihoods, and non-economic L&Ds are likely to be higher[5,7]. For instance, according to United Nations Development Programme (UNDP)[8], more than 50% of human casualties from the nations belong to the low human development index (HDI). Nations with better human development scores would easily pursue post-disaster mitigation activities than nations with low human development levels[9]. Further, Bahinipati and Patnaik[7] report a positive correlation between poverty and vulnerability scores among the districts in Odisha. According to the World Bank