Abstract

The structure and function the forest ecosystem are continuously degrading due to overexploitation of ecosystem services supplemented with anthropogenic and climate alterations at a much higher rate than would cause by the natural processes only. The differential impact of anthropogenic activities and climate alteration in assessing the forest cover resilience is understudied, especially in consideration with the role of precipitation in defining forest cover resilience. This thesis (i) assessed the impact of climate and anthropogenic alternations on forest cover distribution, (ii) estimated climate dependent forest cover resilience using empirical modelling, (iii) projected forest cover resilience using empirical and dynamic vegetation modelling (DVM), and (iv) prescribed PAs planning prescriptions based on forest cover resilience protocol in India. This study was performed in two different landscapes as (a) India, where the forest cover are more dependent of anthropogenic disturbances than climate, compared to the (b) Hindu Kush Himalayan (HKH) mountainous region, characterized by less anthropogenic than climate drivers. The Dyna-CLUE model well captured the past trends as well as the spatial heterogeneity for the study sites and projected the future probable LUFC distribution. At river basin scale, the role of anthropogenic disturbances in forest degradation was prominent than climate. In the HKH mountainous region, the impact of anthropogenic activity follows the negative logarithmic trend indicating higher disturbances at the lower altitudes. The life form map derived using 'percentage of tree canopy cover' data overestimated the scrub and grassland and underestimated forest cover spread in India, it provided first-hand data for forest cover monitoring at medium scale. The forest covers in drier regions exhibit lower resilience; whereas, the majority of forest covers in India estimated highly resilient owing to the precipitation limits of 1400 mm. The higher resilience capacity of forest cover indicates that it can withstand minor climate disturbances, followed by scrub and grassland. Majority of the scrubs and grasslands in wet precipitation regime may experience regime shift to forest and scrubs, respectively, if the anthropogenic disturbances are called off. The identified precipitation regimes and thresholds (tipping points) is expected to have conservation implications. The MC2 DVM well performed in life form simulation and productivity estimation, where the biases in global climate data would induce the majority of the observed differences. The MC2 simulated and projected results exhibits, the forest cover in wet climate regimes were highly resilient; however, the lower resilience in the seasonal dry tropical forests (SDTF) in Deccan Peninsular region; could be indicating the moisture limitation in this region. The protected areas conservation prioritization was done based on the current, and future resilience state for the forest dominated. The future scope of the study may include the components as plant dispersal, life form co-existence and anthropogenic contributions in the MC2 DVM to better simulate the vegetation distribution. The identified forest cover resilience maps and precipitation thresholds have potential implications in ecological research, forest management and conservation of South Asian countries including the HKH region.