

Development of a Forest Resilience Index by Combining Multispectral and Microwave Vegetation Indices

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Abstract

Sri Lanka is one of the few surviving countries in the world with an extensive natural forest cover, however, most of the existing forests have been impacted by changing environmental conditions and escalating disturbances. To preserve our forest environment, investigating its temporal resilience is important. Forest Resilience is the capacity of forests to recover from disturbances in which they experience undesired shifts from their original state to available alternative stable. This research study mainly focused to analyze the resilience of forests Wilpattu National Park and Kanneliya Rain Forest with a time series of the Landsat 8/9 and Sentinel 1 satellite imagery during the period of the year 2017 to 2022 by generating Forest Resilience Index (FRI). In this study, Landsat 8/9 and Sentinel 1 satellite images were used to create the NDVI, LAI and Radar Vegetation Index (RVI) layers. Then a time series analysis was conducted with values of NDVI, LAI and RVI. The final outcomes of Forest Resilience Indices were generated with NDVI and RVI. The FRI for Wilpattu National Park is $0.7827\text{NDVI} + 0.2173\text{RVI}$ and for Kanneliya Rain Forest is $0.7853\text{NDVI} + 0.2147\text{RVI}$. The validation was conducted with generated FRI for the Upper Wilpattu area, and it was succeeded. This analysis has helped to evaluate the temporal variability which indicates the resilient dynamics of the Sri Lankan forests.

Keywords: *FRI, LAI, NDVI, RVI, Time Series Analysis*