

**(ID 104)****Investigating a Methodological Framework to Develop Forest Resilience Index using Multisource Remote Sensing Satellite Data****Priyadarshani, G.G.H.<sup>1\*</sup>, Welikanna, D.R<sup>2</sup>**

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**Abstract**

Sri Lanka is considered rich in forests, as they cover 29.9% of the total land area of the country. However, most of the forests in Sri Lanka are under threat due to climate and land use changes. Therefore, possibilities to investigate the temporal resilience of the forests using satellite imagery could be advantageous. Forest resilience is the capacity of forests to recover from disturbances, resulting in undesired shifts from their original state to alternative stable states. This study aimed to analyze the resilience of Wilpattu National Park and Kanneliya Rain Forest using a time series of Landsat 8/9 and Sentinel 1 satellite imagery from 2017 to 2022. The study proposes a Forest Resilience Index (FRI), generated using three existing indices, the NDVI (Normalized Difference Vegetation Index), LAI (Leaf Area Index), and RVI (Radar Vegetation Index). NDVI employs reflection of light in visible and near-infrared (NIR) wavelengths, LAI is one-sided green leaf area of a canopy or plant community per unit ground area and the RVI is microwave metric use to evaluate vegetation cover. Polynomial curve fitting was associated in order to develop the FRI index using NDVI and RVI. Fundamentally the FRI is believed to be proportional to the physical vegetation properties revealed by NDVI, LAI and RVI. First order polynomials were resulted in the regression models. Specifically, the resulting FRI for Wilpattu National Park is  $0.7827 \text{ NDVI} + 0.2173 \text{ RVI}$ , while for Kanneliya Rain Forest, it is  $0.7853 \text{ NDVI} + 0.2147 \text{ RVI}$ . The resilient level using the proposed FRI ranges from 0 to 1 indicating low to high resilience. Validation was successfully conducted using the generated FRI for the Upper Wilpattu area. The forest resilience index values, indicating the resilient dynamics from the year 2017 to 2022, ranging from 0 to 0.56 for Wilpattu National Park and from 0 to 0.63 for Kanneliya Rain Forest. Probability density of the resulting NDVI, RVI, LAI and FRI suggest the occurrence of a particular vegetation status is more or less the same. Though the LAI index in the proposed study is not fully incorporated to the FRI, the study discusses the possibilities. Multisource remote sensing data integration can help to develop and improve the monitoring of the forest status. In conclusion, this analysis has contributed to a more comprehensive understanding of the temporal variability and resilience dynamics observed in the forests of Sri Lanka.

**Keywords:** Forest Resilience Index, LAI, NDVI, RVI, Time Series Analysis