

## **Abstract**

This study applies Principal Component Analysis (PCA) and the Entropy Method to objectively assign weights to variables in measuring the Social Performance Index (SPI) and Ecological Damage Index (EDI) of 34 Indonesian provinces, based on the Doughnut Economy framework. PCA produced more varied weights, with unmanageable waste (45.21%) and education (22.90%) receiving the highest influence in EDI and SPI, respectively. In contrast, entropy weights were more uniform, suggesting balanced but less discriminative results. Using PCA-based weights, all provinces exceeded ecological limits, while only two—East Nusa Tenggara and West Sulawesi—fell below the social foundation. The study concludes that PCA offers greater responsiveness to data variance, making it a preferred method for sustainability assessments.

**Keywords:** Doughnut Economy, Principal Component Analysis (PCA), Entropy Method, Variable Weighting, Social Performance Index (SPI), Ecological Damage Index (EDI), Sustainability Assessment, Indonesia