

# Estimating Ecosystem Services using 3D Remote Sensing Data

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## Abstract

Ecosystem Services are important concept to protect local forest. There is functionality provided by local forest to support our daily life. However, it is difficult to quantify and understand their functionality. In this study, physical parameters, such as forest structure is quantified by 3D laser scanner, Unmanned Aerial Vehicle (UAV), and satellite radar images to visualize and quantify the values of their functionality. The scale is diverse from single tree to landscape level to satisfy different purposes from ecosystem services. At landscape level, biomass mapping and watershed management are required to maintain their functionality. Forest level management requires monitoring local habitat for birds and wildlife animals. And single tree is a basic and inevitable component to support all of their functionality.

3D remote sensing technology allows us to quantify the mass of structure and the structural change from multi-temporal dataset. In early study, the accuracy to understand the total mass of forest was the main concern. In recent years, multi-temporal data is easily obtained to quantify the change. Therefore, the change is used to understand the ecosystem services from multi-temporal 3D data. The change is caused by the gain (tree growth) and the loss (logging and forest disaster).

In this research, we introduce several 3D remote sensing technology (hardware and software) for forest application and shows examples to estimate ecosystem services from multi-temporal 3D data.

**Keyword** Remote Sensing, GIS, Laser, 3D, Forest Structure

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