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Thematic map types and Earth observation data sources for achieving for United Nations Sustainable Development Goal 15 Life on Land

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Abstract:

The pursuit of meeting the United Nations Sustainable Development Goals (SDGs) demands innovative solutions to challenges both locally and globally. Maps of SDG indicators could help pinpoint where to focus efforts (Kraak et al, 2020; Kraak et al, 2018; Ricker et al, 2020). Different types of thematic maps help answer different types of spatial questions. Picking appropriate data source, spatial scale and thematic map type for decision making is one significant challenge of making maps of the SDGs. Missing data is also a significant barrier for mapping the SDGs.

Forests provide critical ecosystem services, including carbon sequestration, biodiversity preservation, water regulation, and soil protection, while also supporting the livelihoods of millions of people worldwide. SDG 15: Life on Land is the goal to protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, land degradation and biodiversity loss. Maps could help focus on the conservation and sustainable management of these valuable ecosystems. Cartographers are challenged with research questions such as: How can SDG indicators be mapped in a way that will help decision makers preserve their existing forests?

Forests are often large and remote making them difficult to monitor regularly. Earth Observation (EO) data offer an opportunity to collect up-to-date information about forests, remotely, which can be valuable for understanding and preserving them. EO data is being used to help augment missing SDG data, by covering areas that are difficult to reach, and by offering modifiable data collection and analysis practices associated with SDG efforts (Ferreira et al, 2020; Mariathasan et al., 2019; Kussul et al, 2020). The use of Remote Sensing (RS) has long been recognized for their ability to capture the relationship between spectral reflectance and biophysical and structural properties of vegetation which is valuable for vegetation monitoring (Hesketh et al, 2013). This could be particularly useful for forest monitoring and reaching SDG 15.

Using raw satellite imagery is sometimes too great of a challenge. Processed datasets that already calculate variables such as forest cover at the global scale could be useful for these countries to monitor their own forests more easily. These data can then be used to make different types of thematic maps, and aggregated data at different administrative units. Choropleth maps are common for mapping the SDGs, but they are not always useful for helping identify where a phenomena occur specifically. Dasymetric maps, conversely, show precisely where the phenomena occur, but may not be easy to compare rates across administrative units. Here we describe how earth observation data and aggregating it at different spatial scales with different thematic map types influences the interpretation and reporting of forest area, with a focus on SDG 15.1.1: proportion of forests to total land area as an example (See figure 1). Each of these datasets has their benefits and drawbacks. Each of thematic map types help answer different types of questions related to meeting the SDG.

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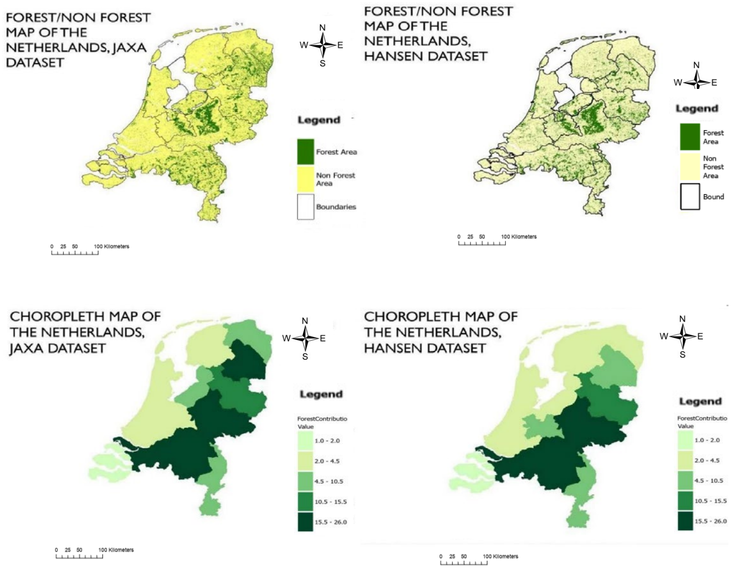

Figure 1. Comparing results from two different EO datasets and thematic map types for SDG 15.1.1 Proportion of Forested Land in the Netherlands.

Through this research, we aim to offer considerations and recommendations for mapping forest area as a percentage of total land area (SDG indicator 15.1.1). To meet this aim, we compare two distinctive processed EO datasets related to forests, one using cloud penetrating radar data and the other a processed dataset offering Global Forest Change processed from multispectral optical satellite imagery. We consider decision making implications related to the selection of the EO data, the thematic map types. Here we share examples from four case study countries: Netherlands, Zimbabwe, Paraguay, and Aruba. We discuss multi-scale and multi-dataset perspectives for data selection and processing to enhance missing data for the SDG indicators. We consider forest area measurements at different administrative scales and how data aggregation and boundary delineations influence the spatial patterns and statistical outcomes of forest cover estimates known as the Modifiable Aerial Unit Problem (MAUP). We hope these mapping efforts will promote and foster opportunities for targeted conservation in hotspots of deforestation and a replicable workflow.

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