project title

The lost forests; a historical forest area inventory

project subtitle

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Research group: Environmental Sciences
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Project description

The largest uncertainty in the global carbon budget is in emissions from land-use, which has an uncertainty of approximately 60%. This is mainly because, until now, we have lacked the tools and data to quantify emissions from deforestation and degradation in the tropics with sufficient accuracy and temporal consistency, and to capture recent afforestation in many extratropical regions. The legacy of land-use decisions today will impact the remaining carbon budget required to achieve climate targets in the coming decades. As a society, we also rely on the land ecosystems to take up around one-third of all anthropogenic CO_2 emissions, i.e. the natural land carbon sink which is also highly uncertain at interannual to decadal timescales. Better quantification and understanding of the complex carbon flows involved in the land carbon cycle is therefore paramount. The Global Carbon Budget (GCB) is the most comprehensive source of data and information about regional-to-global scale carbon fluxes.

A recently funded project by Schmidt Sciences Virtual Institute for the Carbon Cycle (VICC) called Combining LAnd-use, modeling and Remote-sensing to Transform carbon budgets (CLARiTy) seeks to decrease the land use related uncertainties (emissions) to close the GCB by delivering and operationalizing a consistent data-driven framework for GCB updates and providing accurate estimates of the terrestrial CO2 sources and sinks. One important aim of CLARiTy is to use most recent and up-to-date Earth Observation-based innovations that will be incorporated into the HYDE, HILDA+ and finally the LUH (Land Use Harmonization) datasets. These land change datasets form the basis of all land related computations for the GCB.

HYDE is an internally consistent combination of historical population estimates and also an implementation of improved allocation algorithms with time-dependent weighting maps for cropland and grazing land, while the period covered is 10,000 BCE to the present. It is being developed and maintained at UU (landuse.sites.nl), while HILDA+ (HIstoric Land Dynamics Assessment+) is a global dataset on annual land use/cover change between 1960 and 2019 at 1 km spatial resolution, developed at KIT, Germany. It is based on a data-driven reconstruction approach and integrates multiple open data streams (from high-resolution remote sensing, long-term land use reconstructions and statistics). **Coupling** of HYDE with HILDA+ requires new land classes to be incorporated into HYDE, with forests as the most important new class. This requires a bold and challenging effort to quantify past global forest changes over time.

Therefore, this proposal seeks a master student who will start to develop a **global inventory of historical estimates of forest area change per country for the whole Holocene**. This will jumpstart the coupling of HYDE-HILDA.

Job requirements

No specific computer skills are necessary, Excel knowledge is recommended though.