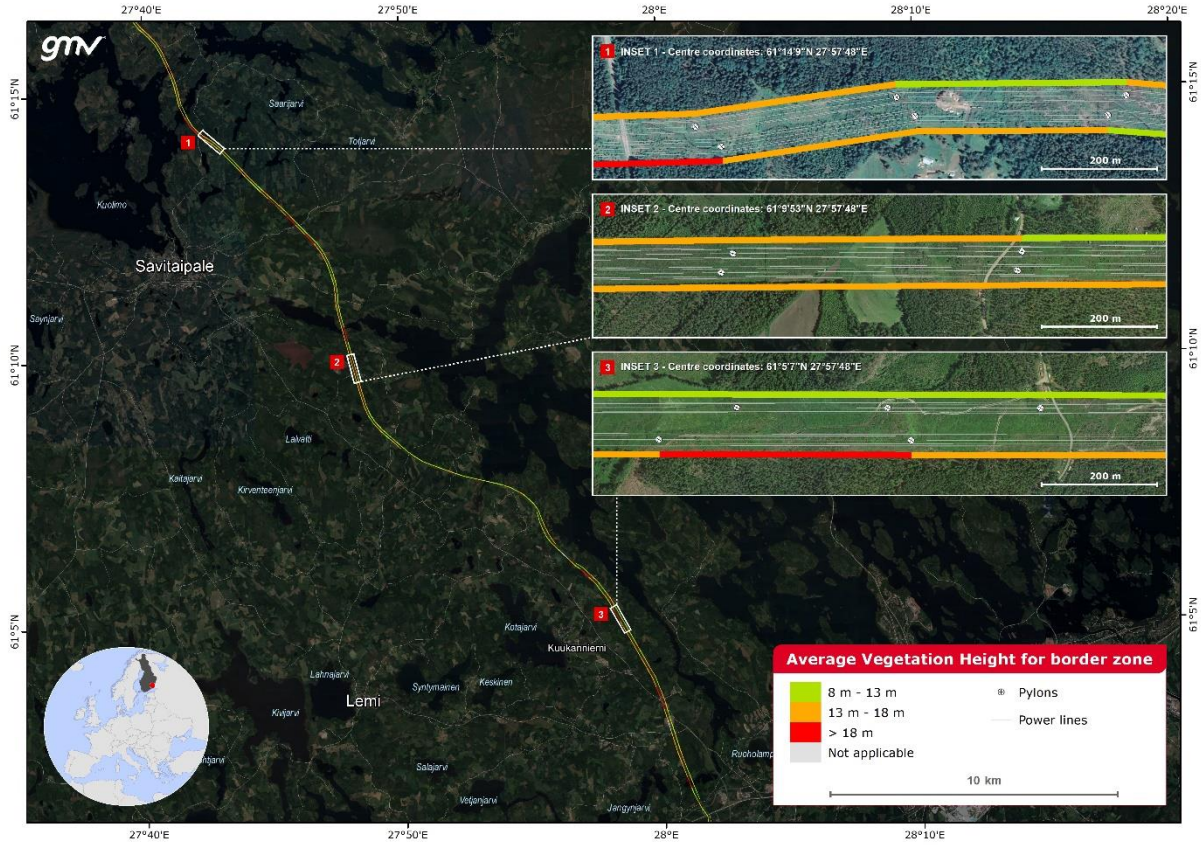
EO-FIN

Vegetation Height Estimation



Average vegetation height for border zone of electrical power lines in Finland using Worldview-2&3 (0.5m) (Source: GMV)

Product Category

☐ Land Use	☐ Natural Disaster	☐ Coast Management	☐ Earth's Surface Motion
■ Land Cover	☐ Climate Change	☐ Marine	

Financial Domain(s)

☐ **Investment management** ■ **Risk analysis** ☐ **Insurance management** ☐ **Green finance**

User requirements

UN37: Projection of risk to portfolio assets into future

Description

Vegetation height estimation is important for many aspects of the financial management sector. In sectors like construction and infrastructure development, accurate vegetation height estimation is vital for assessing potential risks related to buildings, power lines, and transportation projects. Overgrown vegetation near critical infrastructure can lead to safety hazards and increased maintenance costs. For industries focusing on renewable energy, such as solar and wind farms, knowing vegetation height is crucial. Tall vegetation around these facilities can obstruct sunlight and wind flow, affecting energy production and efficiency. In forestry and natural resource management, understanding vegetation height aids in estimating timber volume, planning harvest rotations, and assessing forest health. These factors directly influence revenue generation and sustainable resource utilization. Vegetation height can be estimated using VHR satellite images and machine learning models. To train these models, it is essential to have ground truth data such as in-situ or LIDAR data.

Spatial Coverage Target

Asset level

Data Throughput

Rapid tasking	☐ High	■ Low
Data availability	■ High	☐ Low

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Product specifications	
Main processing steps	The vegetation height machine learning model can be a regression-based deep learning approach that utilizes a Convolutional Neural Network (CNN), particularly an auto-encoder architecture such as DenseNet, ResNet, and SENet. Its primary objective is to predict the height of vegetation in a high-resolution satellite image that contains RGB channels. The model aims to create a canopy height map based on this single input image. When the ground truth data is LIDAR, the initial steps involve converting LIDAR point clouds into canopy height models. Then, the vegetation in the VHR satellite image is masked using vegetation indices and supervised machine learning models. The deep learning model is subsequently trained using VHR images timely aligned with the LIDAR data (ground truth data). After successful training and validation, the model can be deployed to estimate vegetation height in any desired image.
Input data sources	Optical: VHR based on the availability like Pleiades 1A/1B & NEO, WorldView2&3, and SPOT6/7 Radar: N.A Satellite-based products: N.A Supporting data: Ground truth data such as LIDAR
Accessibility	Optical VHR imagery: commercially available on demand from EO service providers.
Spatial resolution	≤ 1m
Frequency (Temporal resolution)	Daily
Latency	Daily
Geographical scale coverage	Globally
Delivery/ output format	Data type: Raster File format: GeoTIFF
Accuracies	Thematic accuracy: 80-85% Spatial accuracy: 1.5-2 pixels of input data
Constraints and limitations	■ Lack of ground truth data (LIDAR) ■ The cost of the VHR satellite images ■ Cloud presence ■ The machine learning model is limited to regions with similar vegetation characteristics where it was trained.
User's level of knowledge and skills to extract information and perform further analysis on the EO products.	Skills: Essential Knowledge: Essential