

OPERATIONAL AFFORESTATION MONITORING

An operational afforestation monitoring system has been developed in the Free State of Thuringia in Germany using Copernicus and auxiliary GIS data.

The challenge

In Germany the federal states are responsible for the monitoring, controlling and planning of local forest areas. Depending on the state's regulations, the relevant authorities are in charge of the recognition and the designation of new potential areas covered by trees as the land use type "forest".

Without precise knowledge of the position and extent of new forest areas, the local forestry authorities are facing difficulties. Since cost-effective methods are favourable, a procedure for monitoring afforestation using open access Copernicus data has been developed. The procedure does not cover the regular deforestation, as clear-cutting requires authorisation. Therefore its position and extent are well known.

The space based solution

The monitoring of afforestation is conducted with the help of Copernicus High Resolution Layers (HRLs) Forests i.e. Tree Cover Density and Forest Type as well as a priori information.

Remote sensing products, such as Copernicus, depict all types of land use dominated by trees. This also means surfaces covered by short-time rotation plantations, fruit trees and parks which do not represent "forest" according to the Thuringian forest law. In order to eliminate those areas and to improve the accuracy of the final product, the Copernicus HRLs are combined with auxiliary data. For this purpose, additional Thuringian GIS information provided by the Agency for Surveying and Geodata (Federal State Thuringia) and the Thuringian Agriculture Administration representing land use and land cover classes as well as a normalised Digital Surface Model (nDOM) have been implemented. In the first step, the spatial accuracy is improved by combining the Copernicus HRLs with the nDom. Only areas classified as "forest" and those with

vegetation higher than two metres are considered for further work. Afterwards, the areas covered by trees but not representing "forest" are eliminated using the GIS information.

As a result, an accurate forest afforestation map is generated. The map together with a work card listing all potential afforested areas is made available to the local forestry officers, who are responsible for the verification and classification of the new forest areas.

Benefits to Citizens

Forests play an important role in the regulation of ecosystems. In addition to multi-faceted range of services, forests are important for the well-being of the human population. Forests fulfill many functions such as the protection of groundwater, against floods, noise protection, provide places for recreation and etc. These are reasons why forest areas are particularly protected by law. In Germany, forests cannot be transferred to other forms of use such as for building development.



Monitoring of afforestation for a test site in the forest district Hainich-Werratal (from the left to the right): forest mask in green, areas already recognised as forest in light green, new forest areas in orange, orthophotos in the background.

Thematic Area



AGRICULTURE,
FOOD, FORESTRY
AND FISHERIES

Region of Application



FREE STATE
OF THURINGIA

Sentinel mission used



S2

Copernicus Service used



CLMS

Usage Maturity Level

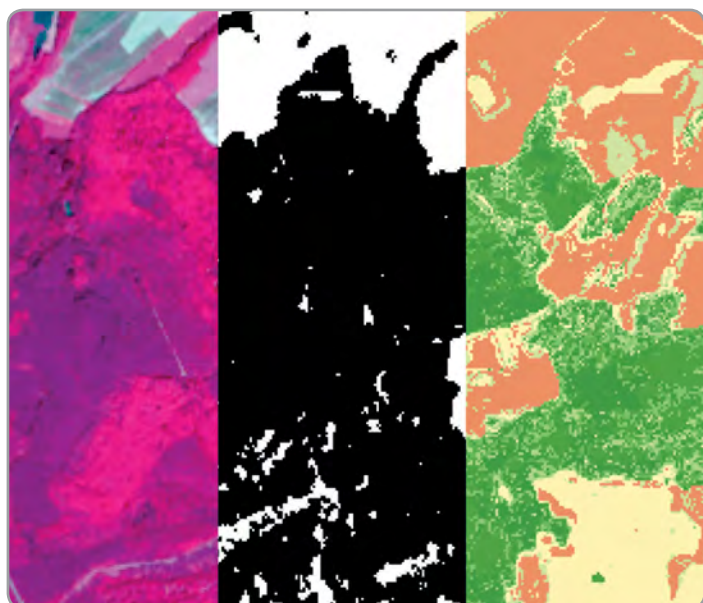


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The proposed monitoring system significantly improves the ability of efficiently detecting afforestation areas and thus supporting public forestry authorities in forest inventory and planning.

Outlook to the future

ThüringenForst will continue to implement this method to monitor and verify afforestation areas in a ten-year inventory and planning cycle, which is the normal practice in Germany. This means that the afforestation product is delivered annually for one tenth of the federal state. In the future, the Copernicus High Resolution Layers will be replaced by a forest mask and tree density generated layers using up-to-date Sentinel data (as shown in the image on the bottom left of this page) because of their higher spatial and temporal resolution. Moreover, new monitoring services using Sentinel data are being developed. These services particularly focus on rapid mapping of biotic and abiotic changes in forests as well as the classification of tree species.



Forest mask and tree density generated for a test site in the forest district Heldburg with the use of up-to-date Sentinel data (from the left to the right): Sentinel-2 (false color composite), forest mask and tree density. Copernicus Sentinel Data 2016 / FFK Gotha

“The successfully implemented afforestation monitoring system is a timesaving tool for foresters.”

*Sergej Chmara,
ThüringenForst Institute under Public Law*

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ABOUT COPERNICUS4REGIONS

This Copernicus User Story is extracted from the publication “**The Ever Growing use of Copernicus across Europe's Regions: a selection of 99 user stories by local and regional authorities**”, 2018, Edited by NEREUS, the European Space Agency and the European Commission.

The model cases focus on local and regional authorities who successfully applied Copernicus data in 8 major public policy domains. The views expressed in the Copernicus User Stories are those of the Authors and can in no way be taken to reflect the official opinion of the European Space Agency or of the European Commission.

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