

# Modeling of a climate-adapted tree species distribution for Germany based on National Forest Inventory and remote sensing data

## Tree Species Project

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### Climate change and future forests

The climate change has a strong impact on European forest ecosystems, reducing their resilience. It must be expected that climate change will alter the site conditions at a faster pace than forest systems can adapted.

A major concern in forestry is therefore the development of adaptation strategies that require accurate information on tree species and site conditions in high spatial and temporal resolution.

### Objectives and project goals

The focus of the Tree Species Project is on the development of nationwide maps of tree species distribution, which will then be intersected with further site data in order to formulate risk analyses and forestry recommendations for action.

### Data currently available / Data we want to obtain

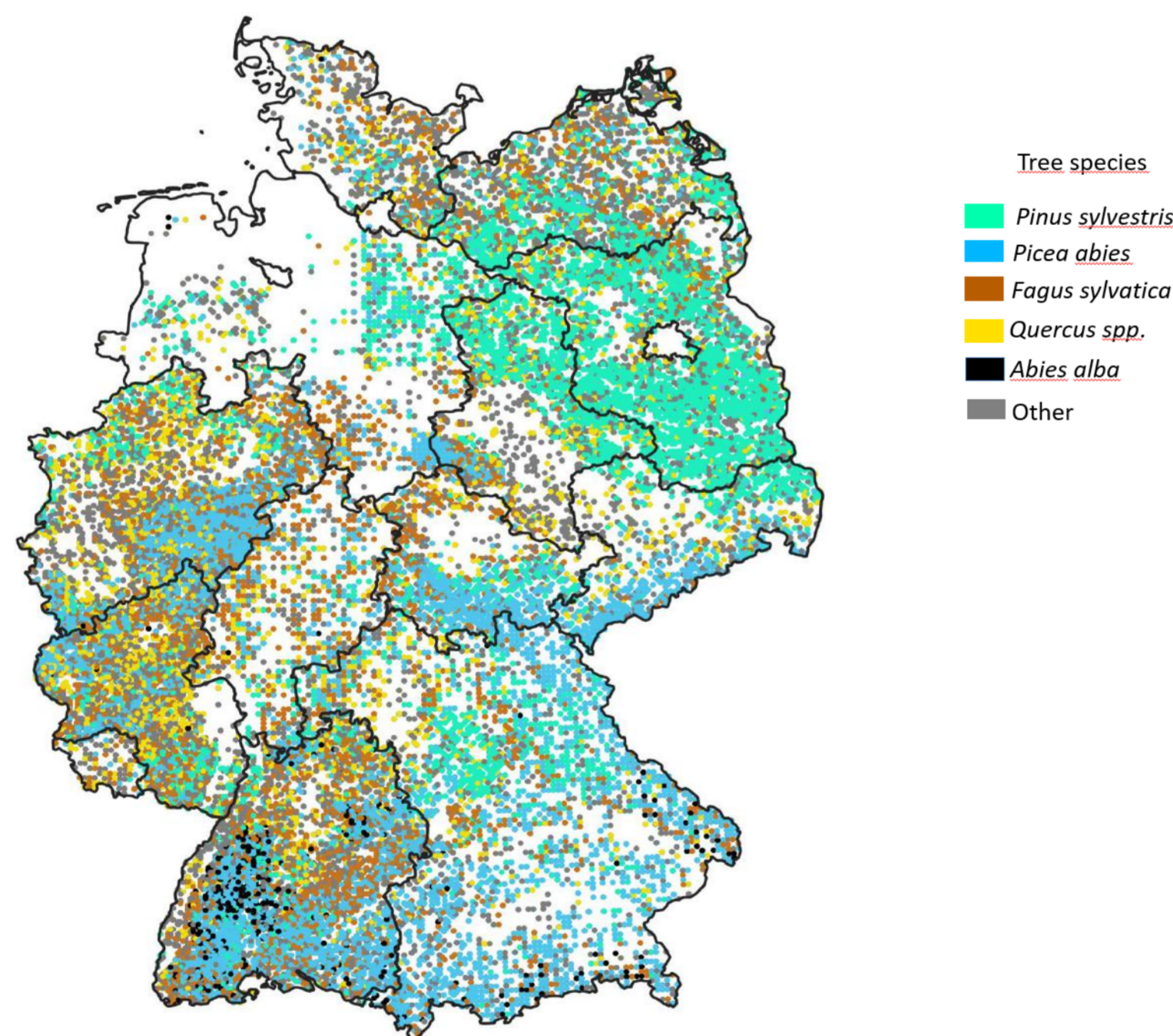


FIG 1: Tree species information from NFI plots (2012<sup>a</sup>)

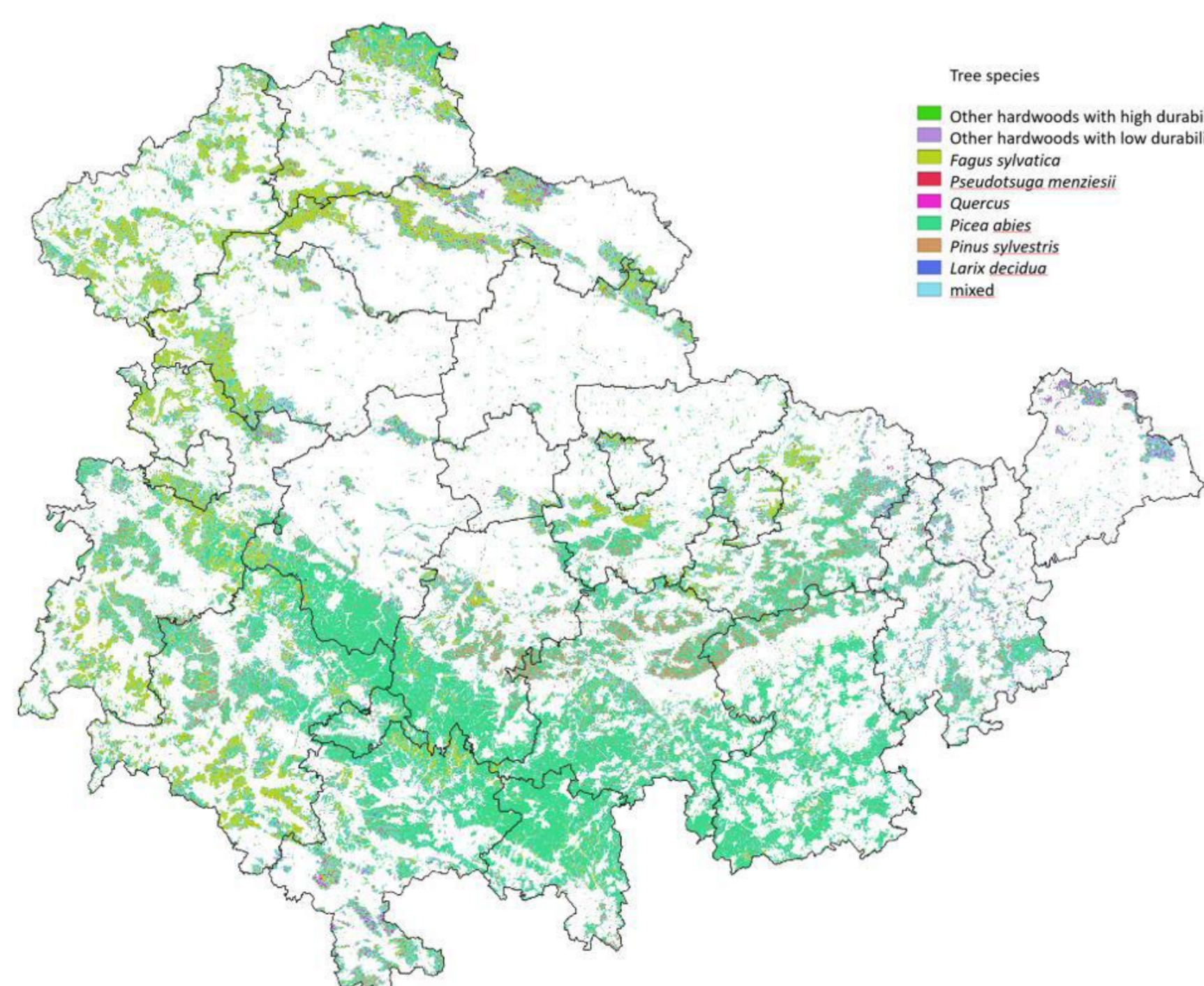
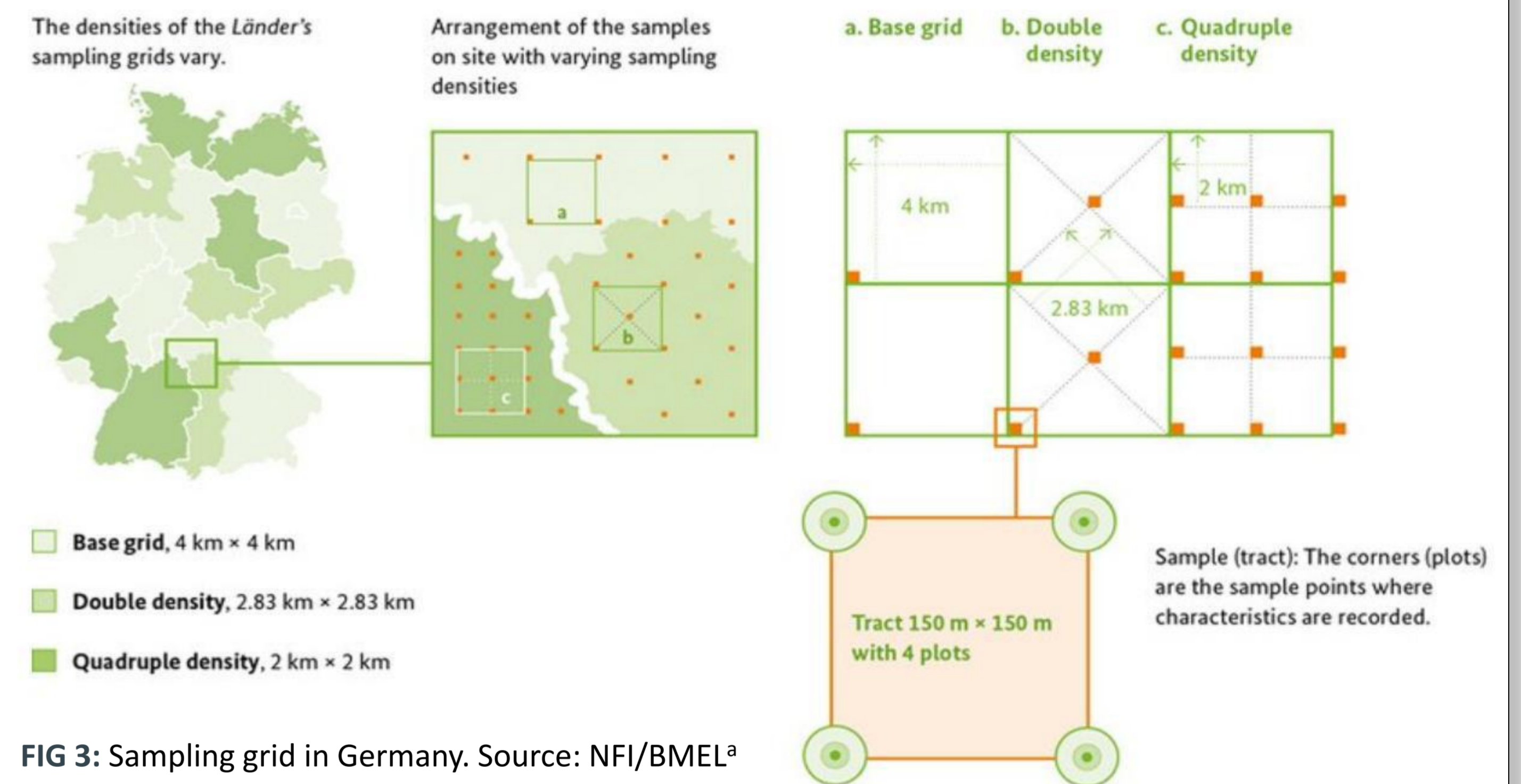
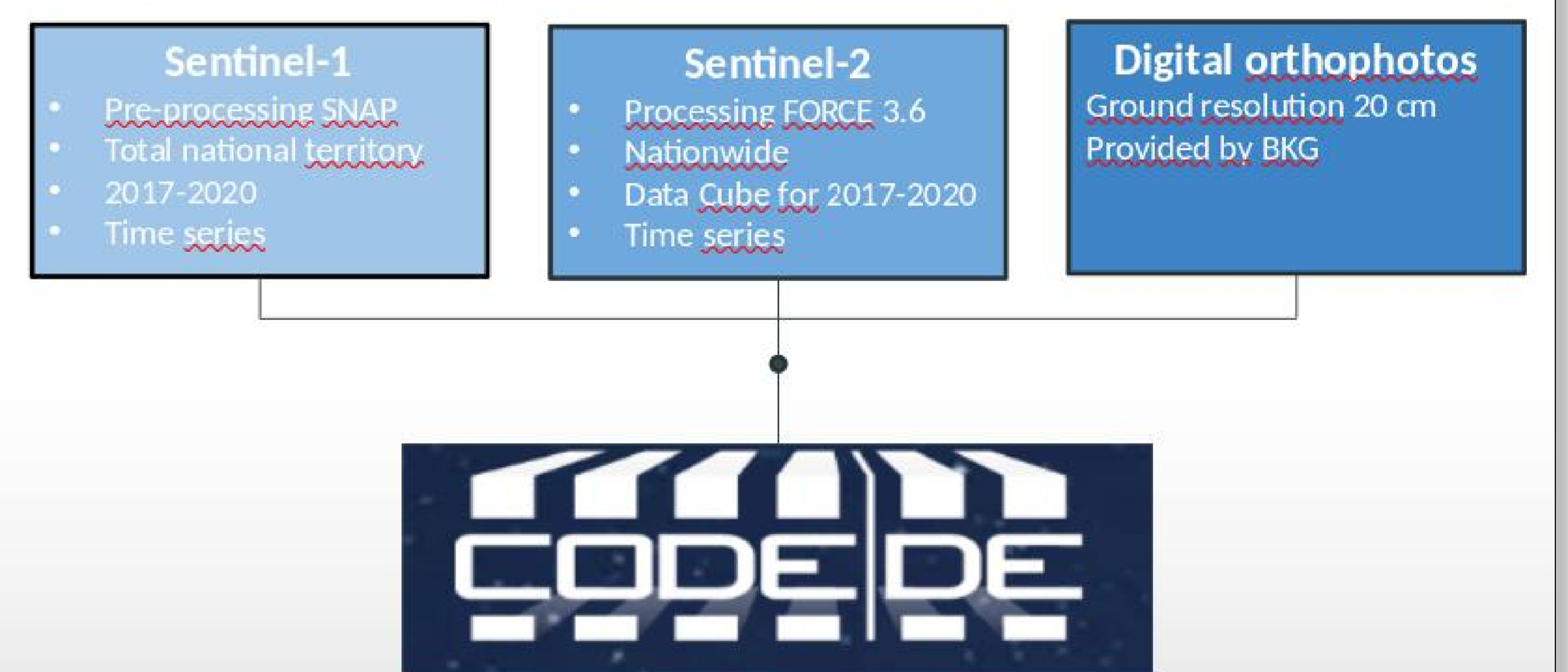


FIG 2: Tree species distribution as a wall-to-wall map<sup>b</sup>, exemplified for the state of Thuringia using Sentinel-2 data and Random Forest classification with NFI data for training. In the project neural networks and time series data will be used for classification.

### Database – National Forest Inventory (NFI)



### Databases – Remote Sensing



### Tree species information from NFI combined with Remote Sensing Data



### Expected results

- A tree species composition map for entire Germany, covering the most dominant species
- Open database for training and validation of deep learning models
- Pre-trained deep learning models
- Application to Copernicus data
- Resilience indicator map
- Map showing tree species distribution adapted to site conditions and future climate
- A set of forest management options that lead to the establishment of stable forest ecosystems