



Modeling of agroforestry in Natura 2000 habitat site in Hungary

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Presentation objectives

- **Aim of the study**
- **Landuse changes in Hungary**
- **Forest areas in Hungary**
- **The model building:**
 - **the study area**
 - **data sources of the model**
 - **the LiDAR survey**
- **Results**
- **Conclusion**

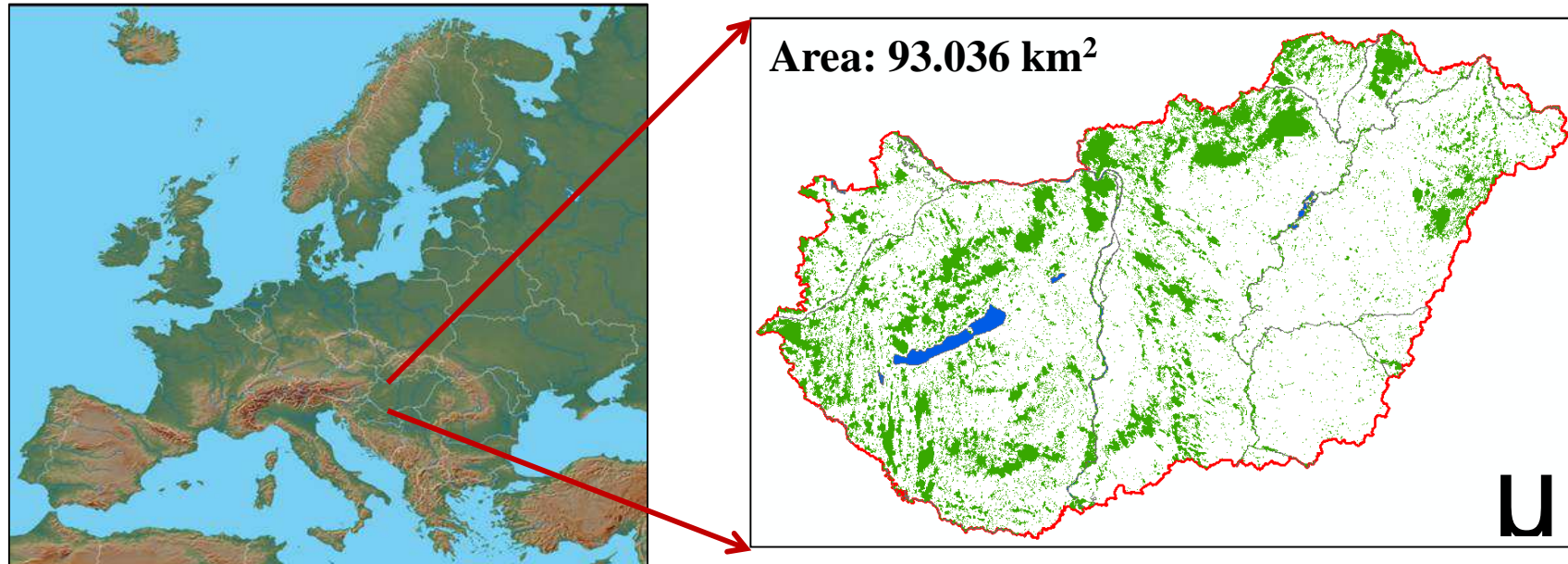
Aim of the study

...plan a site selection model for development of agroforestry landuse...

- **in a Hungarian study area with less favoured soil conditions** (salinization, extreme water management, soil structural degradation)
- **in a NATURA2000 habitat site** (increasing biodiversity, use native species, maintain the extensive farming, livestock, landuse utilization)
- **connect fragmented forests** to ensure the continuity of ecological green corridors



Landuse changes in Hungary



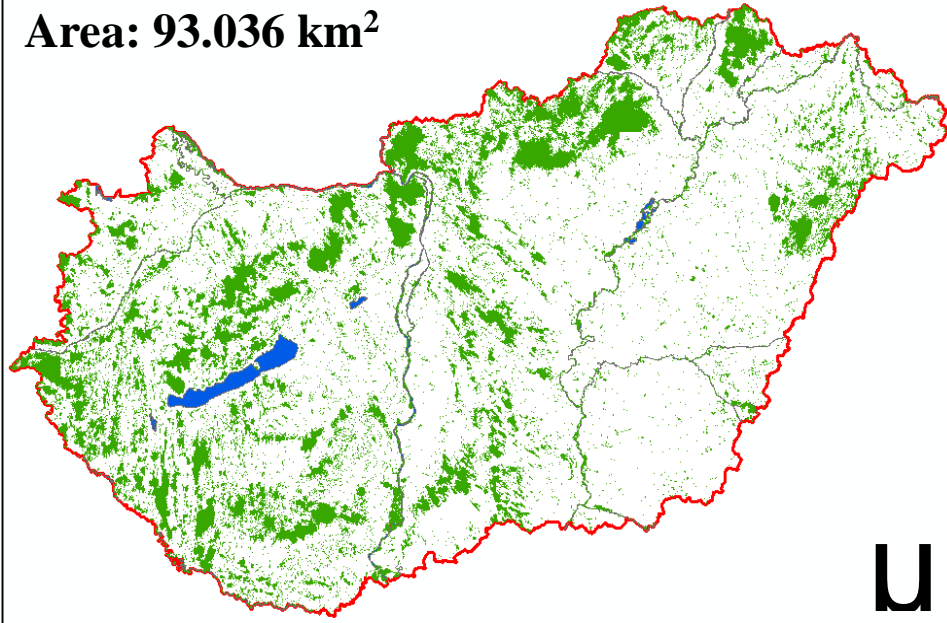
Changes of landuse utilization in 1990 and 2013

	Agricultural area (1000 ha)	Forest (1000 ha)	Arable land (1000 ha)	Area extracted from cultivated (1000 ha)
1990	6 473	1 695	8 235	1 068
2013	5 340	1 934	7 375	1 928
Change	1134 ↓	238 ↑	860 ↓	860 ↑

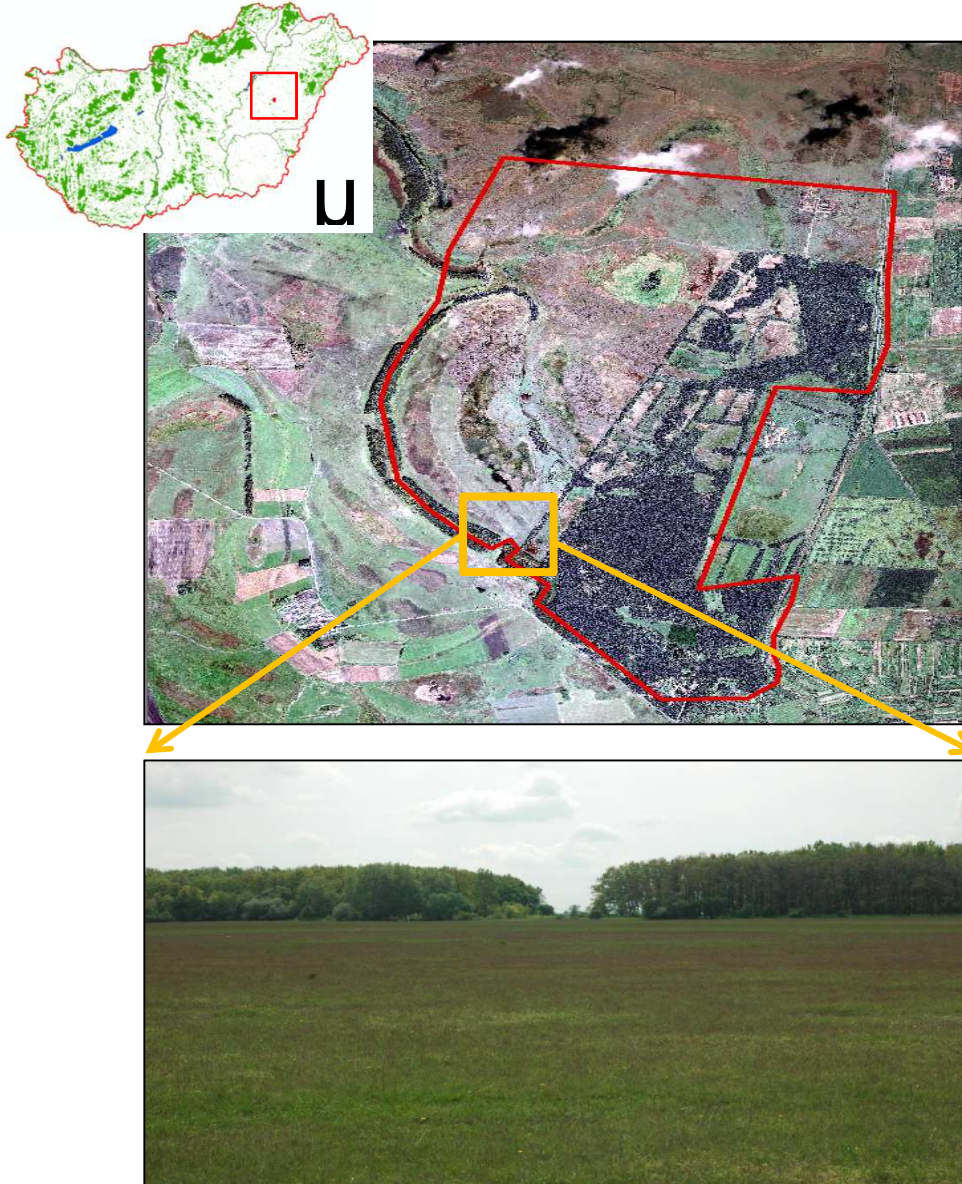
Source: Central Statistical Office database

Forest areas in Hungary

Area: 93.036 km²



The study area



- 830 ha
- Part of Hortobágyi National Park
- Part of NATURA2000 network
- Soil type: meadow solonchaks
- Land use utilizations:
 - Forest
 - Land wetland
 - Semi-natural grassland
- Dominant tree species:
 - *Quercus robur*
 - *Populus* sp.
 - *Robinia pseudoacacia*
 - *Pyrus pyraeaster*
 - *Acer* sp.
 - *Elaeagnus angustifolia*
- Saline plant associations:
 - *Festuca pseudovina* - *Achillea setacea* associations (inferior area)
 - *Lolium perenne*-*Cynodon dactylon* - *Poa angustifolia* association (higher quality area)

Data sources of the model I.

Spatial Decision Support System (SDSS)

- Criteria: constraints and factors
- Constraints (limit our analysis):
 - NATURA2000 habitat site (1) → NATURA2000 database
 - Semi-natural grasslands (1) → CORINE database (2006)
 - Land wetlands (0) → CORINE database (2006)
 - Channels (0) → DTA50 (Topological map of the Hungarian Republic in 1:50.000 scale)
 - Agricultural areas (0) → DTA50
 - Dirt roads (0) → DTA50
 - Forest (0) → DTA50



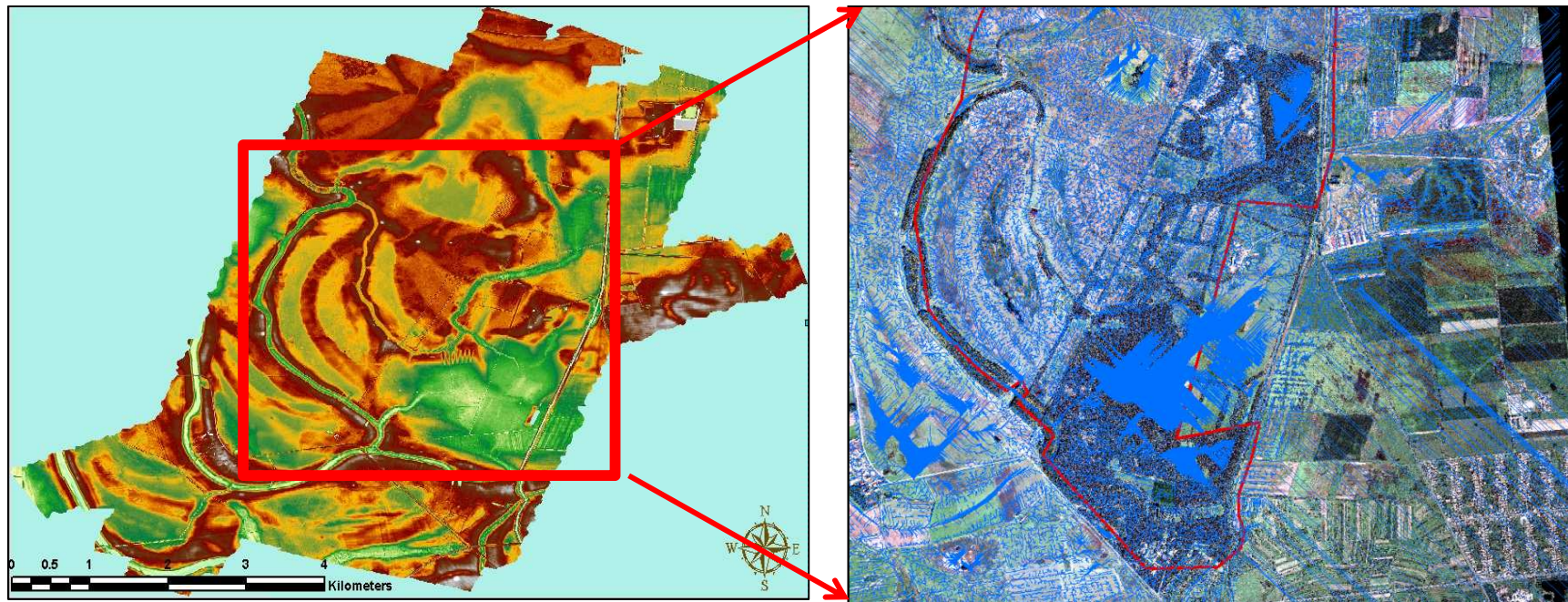
Data sources of the model II.

Factors :

define some degree of suitability for all geographic regions

Digital Elevation Model (DEM)

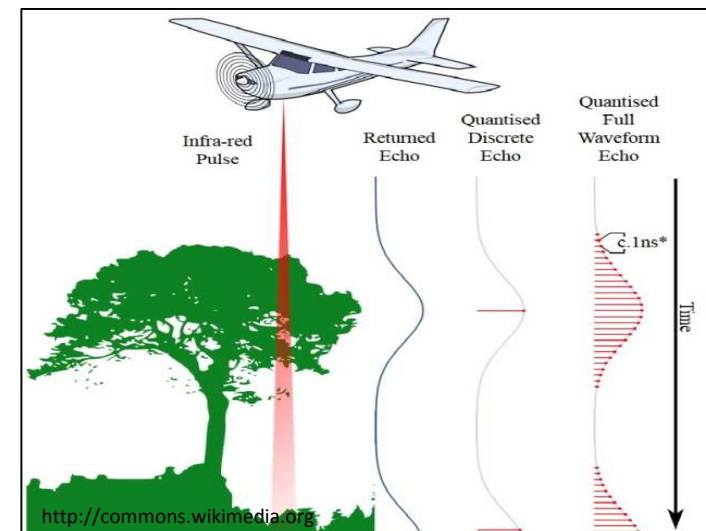
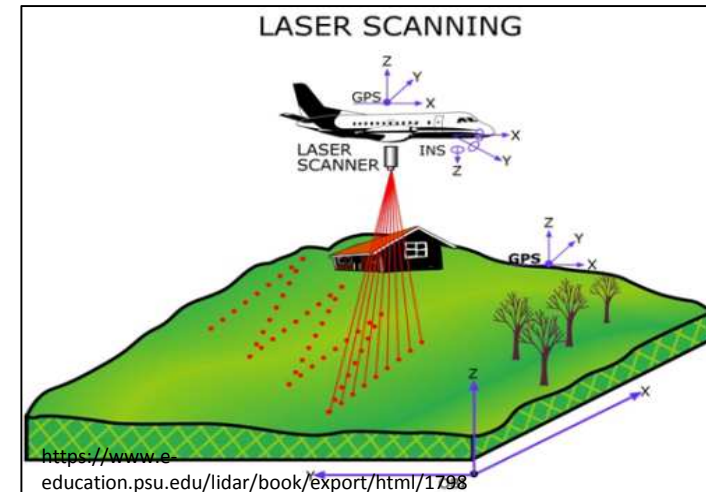
Runoff model



Use: airborne laser scanning (LiDAR) technology

The LiDAR survey

- **Use LiDAR technology:**
 - make Digital Terrain Model (DTM)
 - coastlines survey
 - city modeling
 - forestry use (height of trees, canopy size, density, biomass estimate)
- **Disadvantage of traditional leveling methods**
 - measure few points
 - detect small level differences
 - survey of unpermanent fluided area is less used for
- **Advantages of the LiDAR technology:**
 - active system (with its own power source), so it is completely independent of natural light and time of day
 - the laser energy is able to penetrate the vegetation. In addition to dense sampling, the processing of data is relatively easy to separate the crown and the surface reflection Use it e.g. topographic assessment of forest areas(DDM létrehozása)
 - the data more accurate vertical and horizontal directions
 - point cloud consisting of millions of points → detailed information about the land surface
 - measure the elevation of surface, the trees, in full waveform → generate 3D image

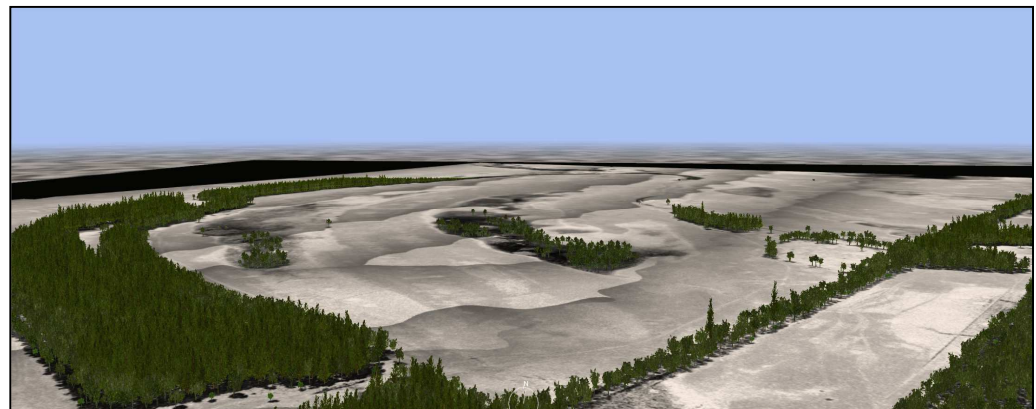
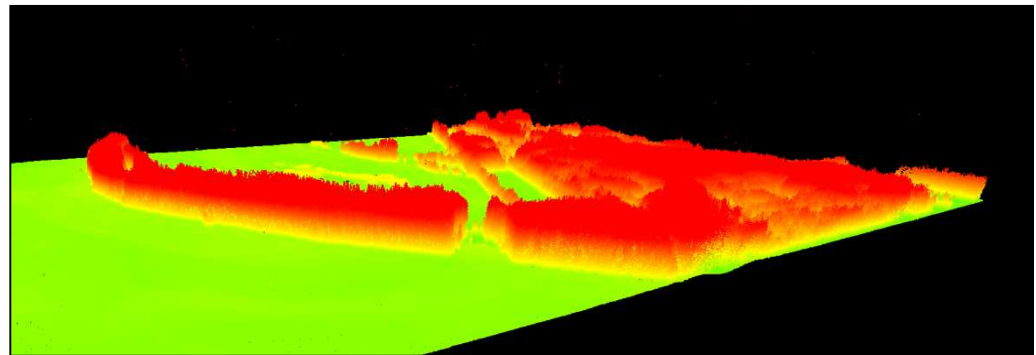
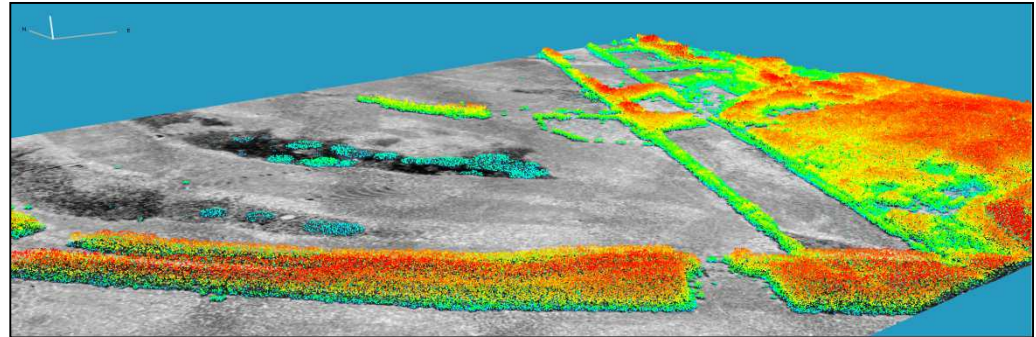




The LiDAR survey

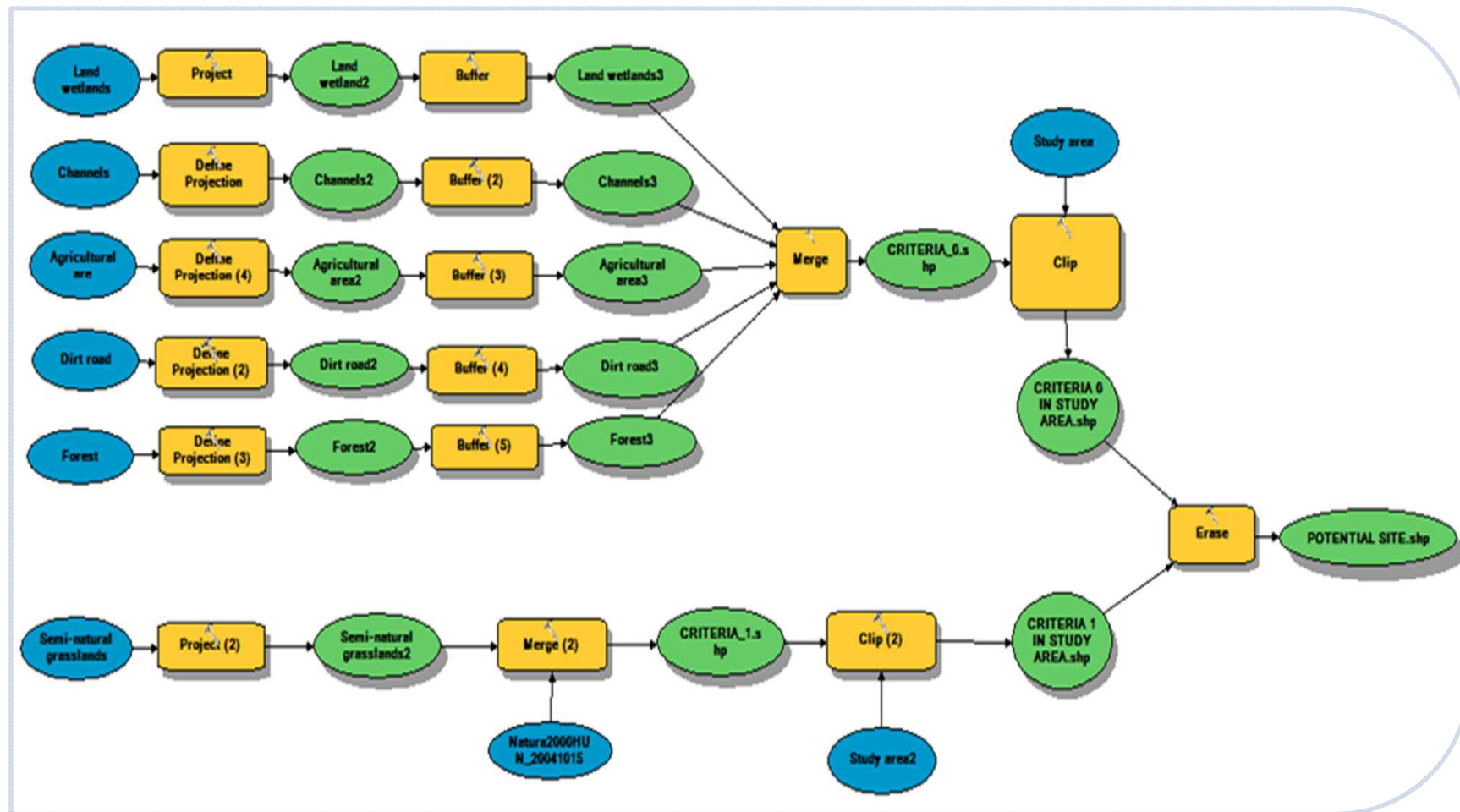


- Within the framework of ChangeHabitats2 project
- habitat mapping, biodiversity monitoring, environmental and natural conversation in NATURA2000 habitat sites
- Our survey contains:
 - 700 million laser points
 - 14 flight strips
 - 12.86 point/m² point density



Results

Define the constraints from database

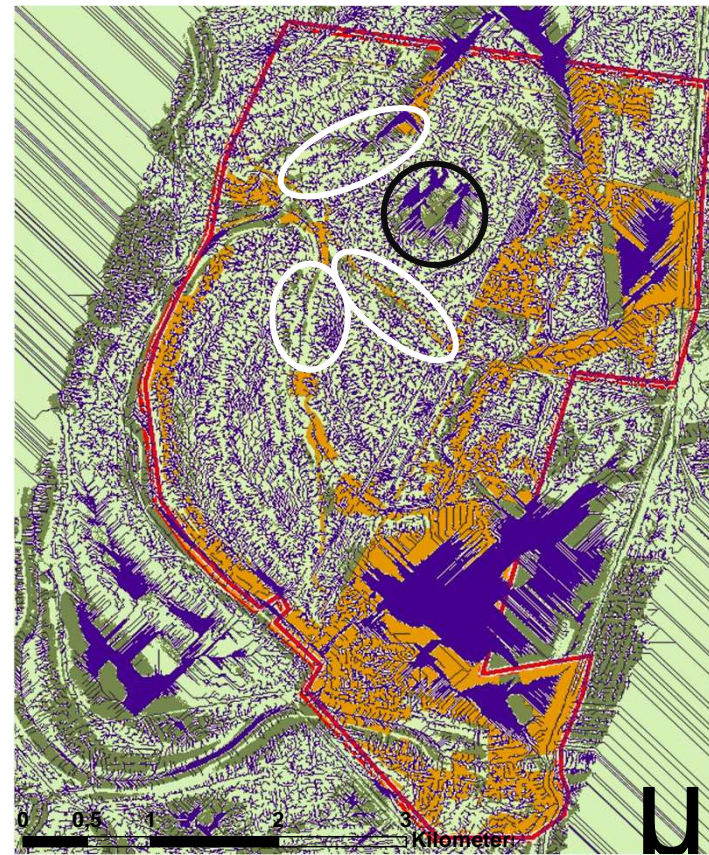
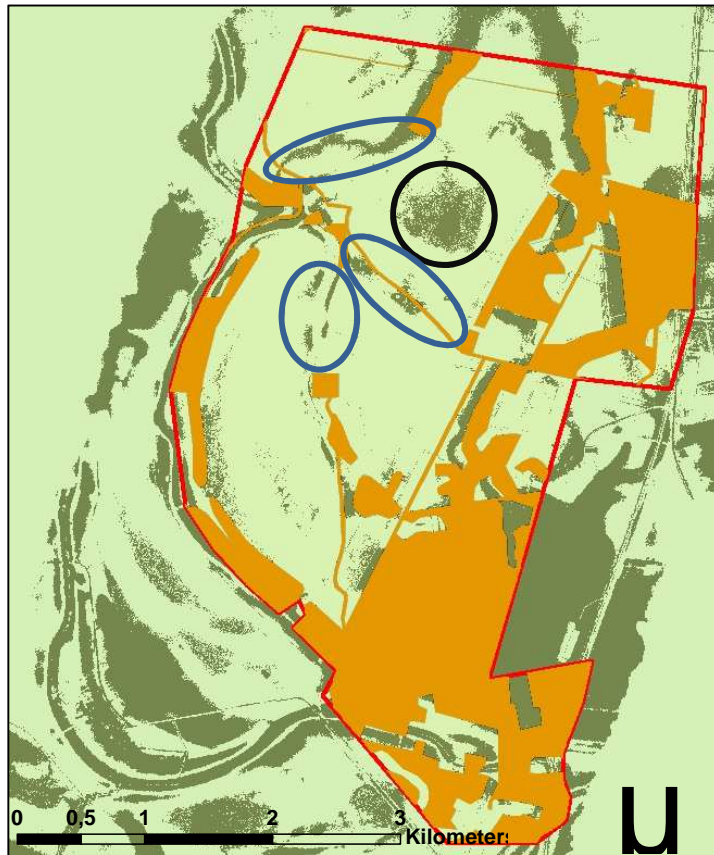


Results

Compared the features with the DEM and runoff model:

Unsuitable potential areas: in saline grasslands, land wetlands

Suitable potential areas: in continuity of the existing forests → connect the fragmented forest areas (123-137 mBf vertical ranges)



Conclusion

- **This site selection model can be used in generally** only the input databases must be changed, depending on the goal of the model building
- The airborne LiDAR data sources, which is a more widely used remote sensing technology in habitat mapping, environmental and nature conservation provides appropriate data sources for **plan a site selection model for development of agroforestry landuse**
- the remote sensing technology can be used verifiability for the agroforestry payment system (at least annual monitoring flight) → the control of the payment system is generally problem both in national and international levels



Acknowledgements

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Thank you for your attention!

