Potential and Accuracy of Digital Landscape Analysis based on high resolution remote sensing data

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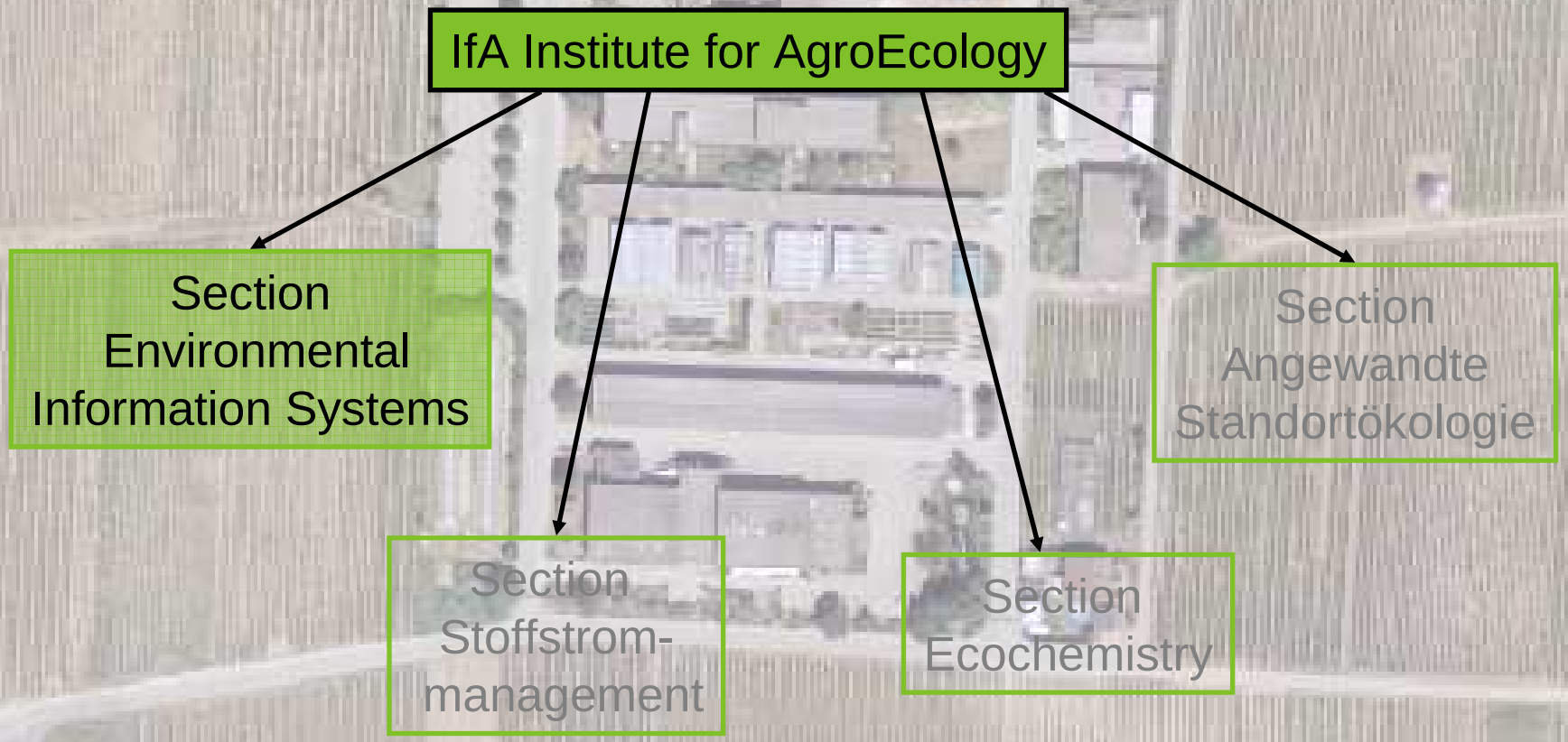
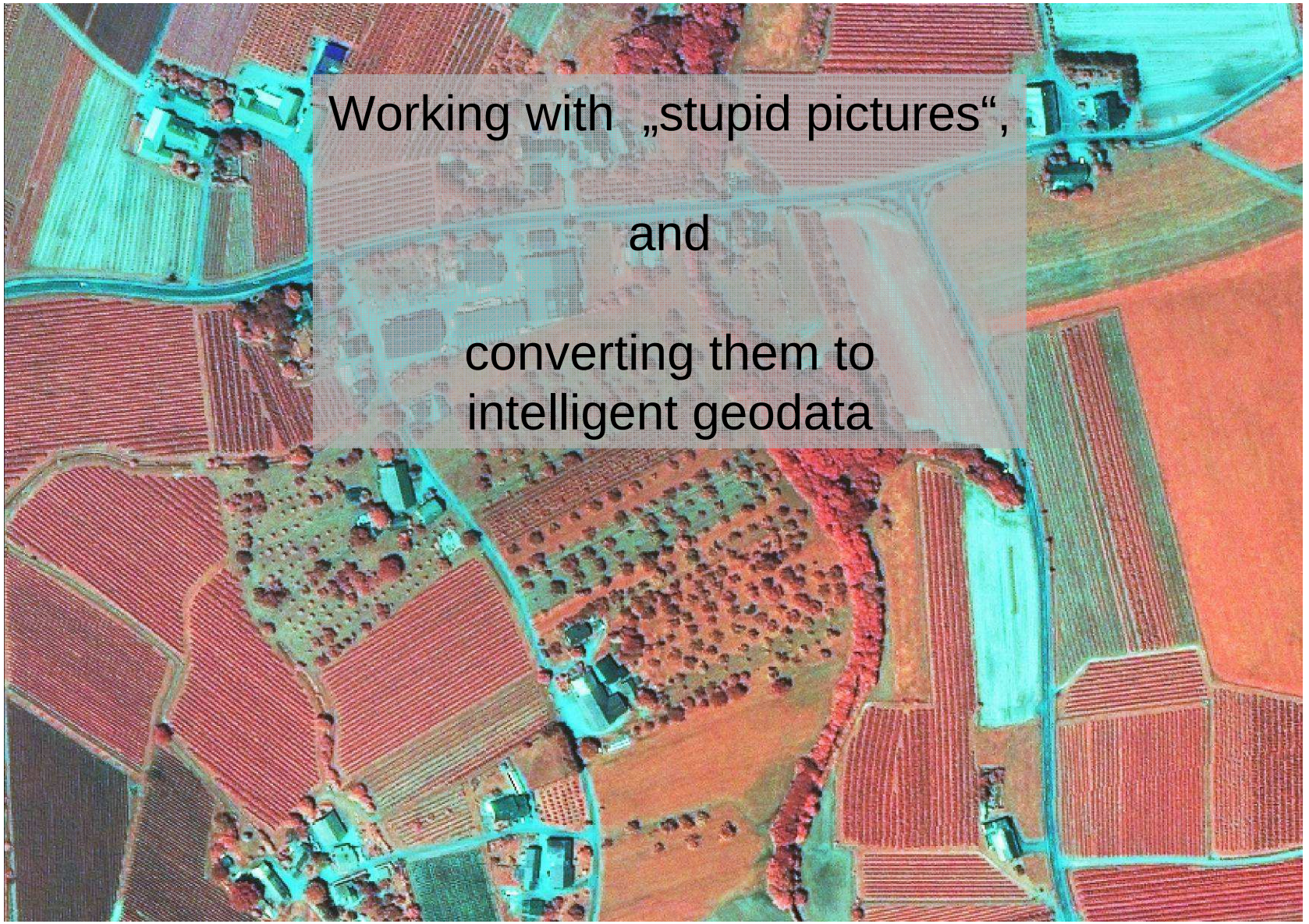
Rhineland-Palatinate AgroScience GmbH

non profit research institute

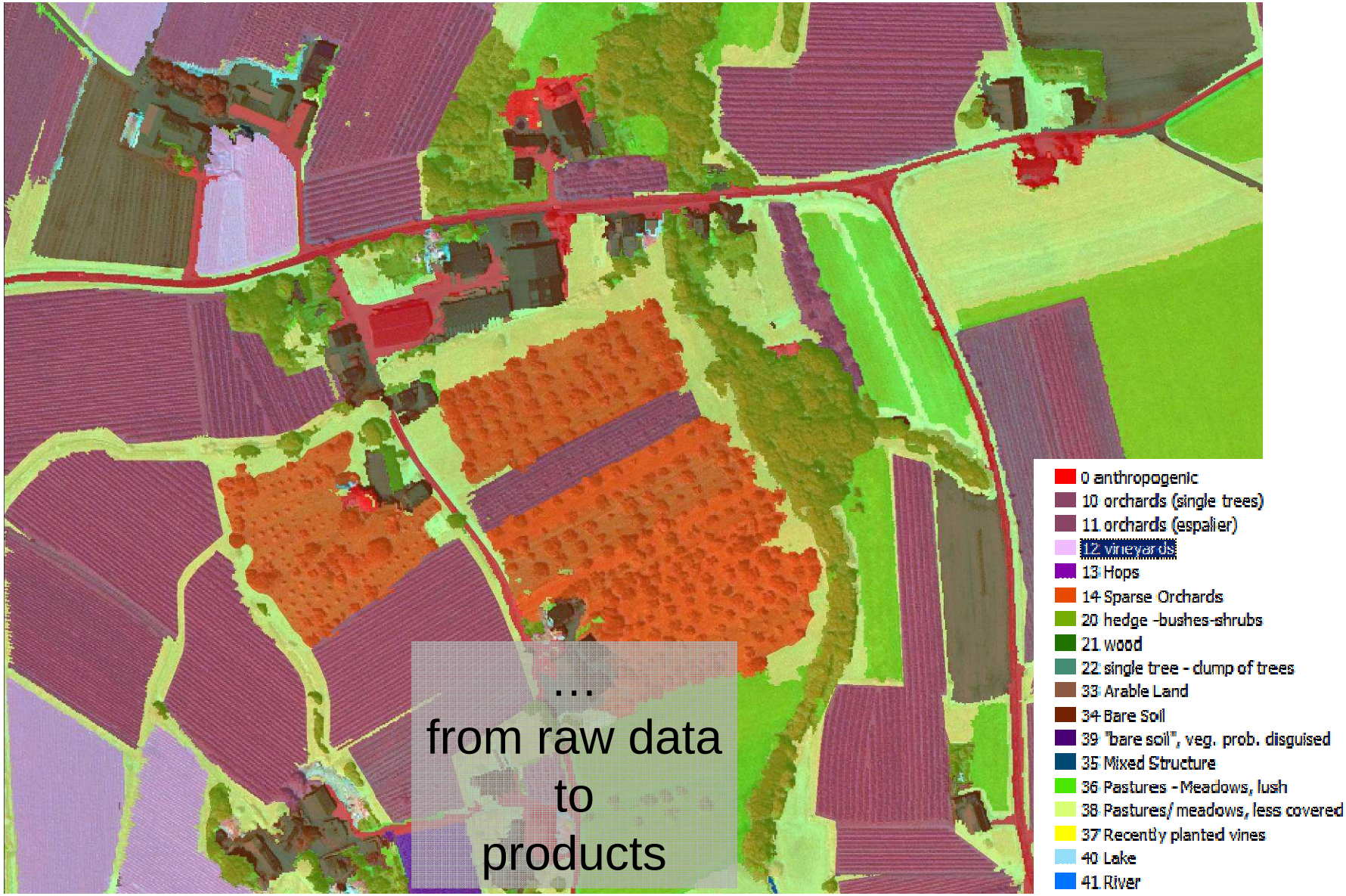
100 % daughter of Ministry



Our main objectives



Our main objectives



Contents

Remote sensing data with different spatial and temporal resolution are today available (nearly) for the whole world.

In Past: Coarse resolution (Land-SAT...)
Today: new generation of high resolution remote sensing data useful for realistic landscape classification (arable land or vegetation, structures and forests)

<u>Presented today:</u>

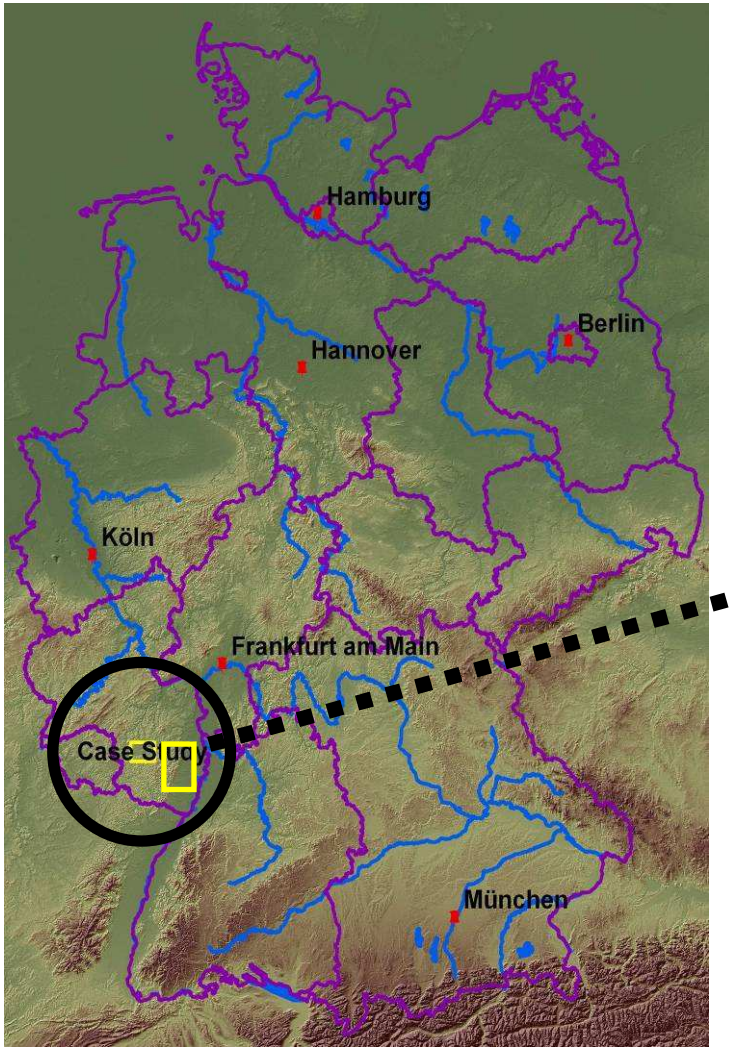
- **Optical and multispectral sensors (orthoimages, (IKONOS-2) and Quickbird): land cover classification**

- **High resolution radar satellite TerraSAR-X (Infoterra GmbH, Germany): topographical mapping roads, railways, settlements, industrial buildings, etc...**

First analysis of the TerraSAR-X will be shown as Case studys (Germany and Tunesia)

Case Study (Germany): hr multispectral images and geodata

Classification and mapping of arable land and vegetation as basis for the calculation of biogas and biomass potential for an up-to-date biotope cadastre



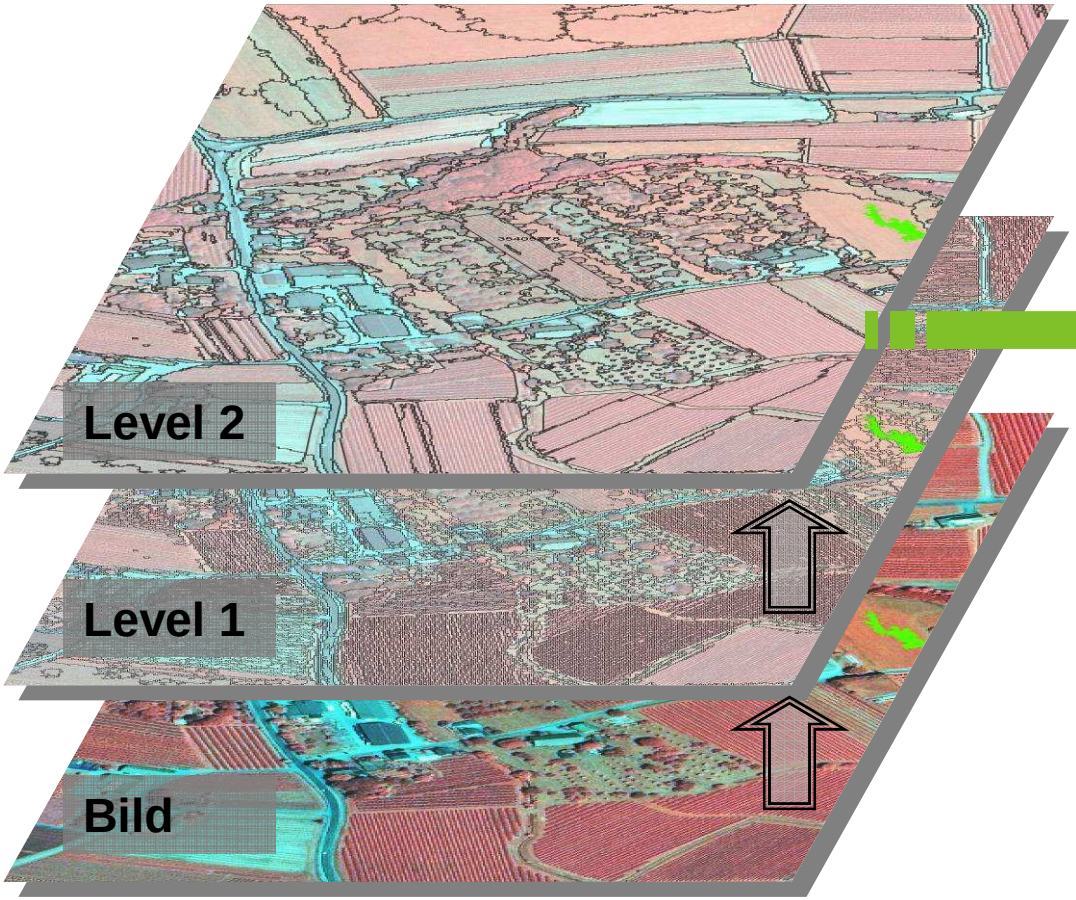
Source: raw data

high resolution aerial photos

high resolution satellite images

false color presentation:
near infrared, blue, green

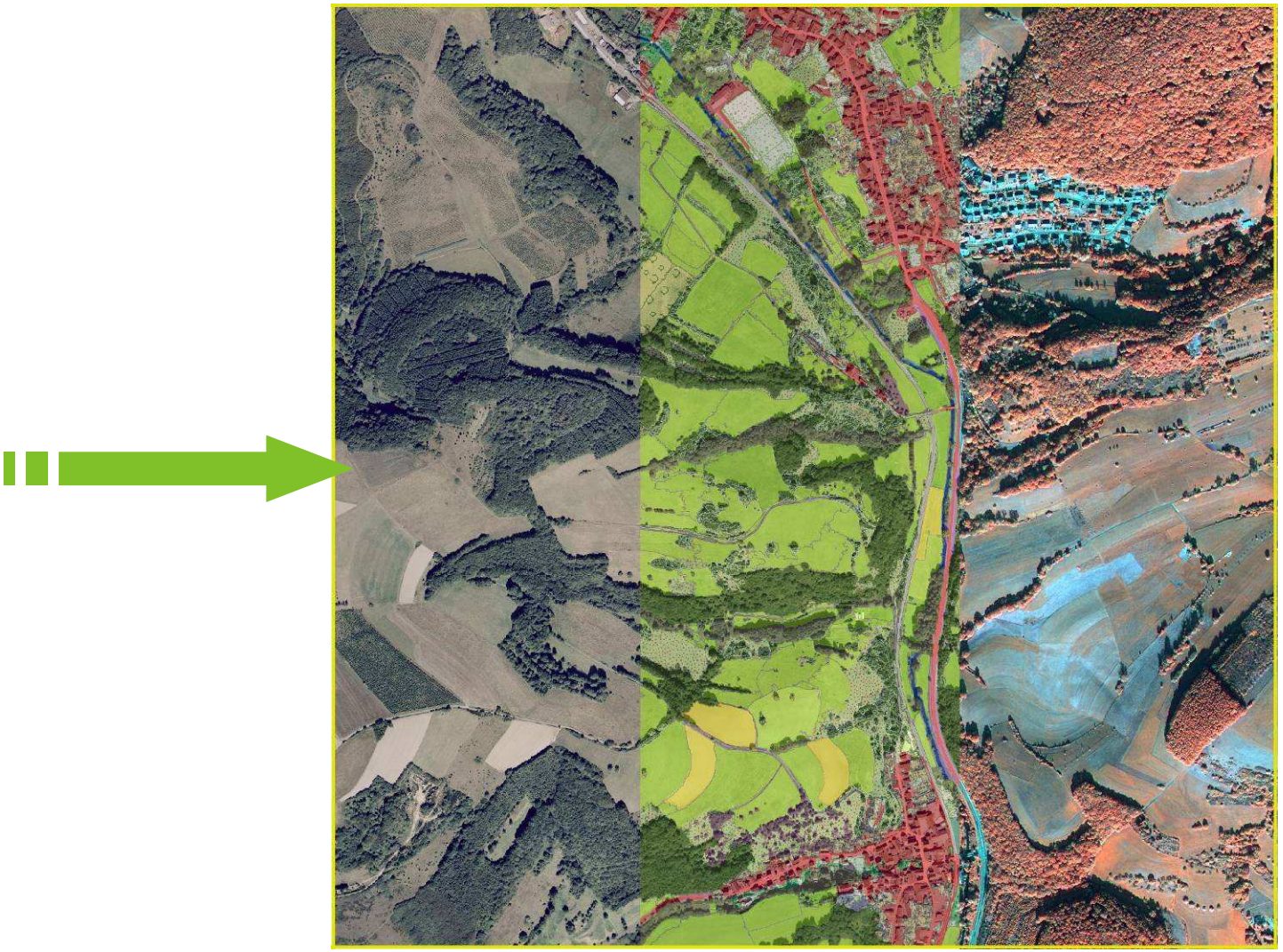
knowledge-based
semi-automated classification process
(with Definiens)



knowledge-based
semi-automated classification process
(with Definiens)

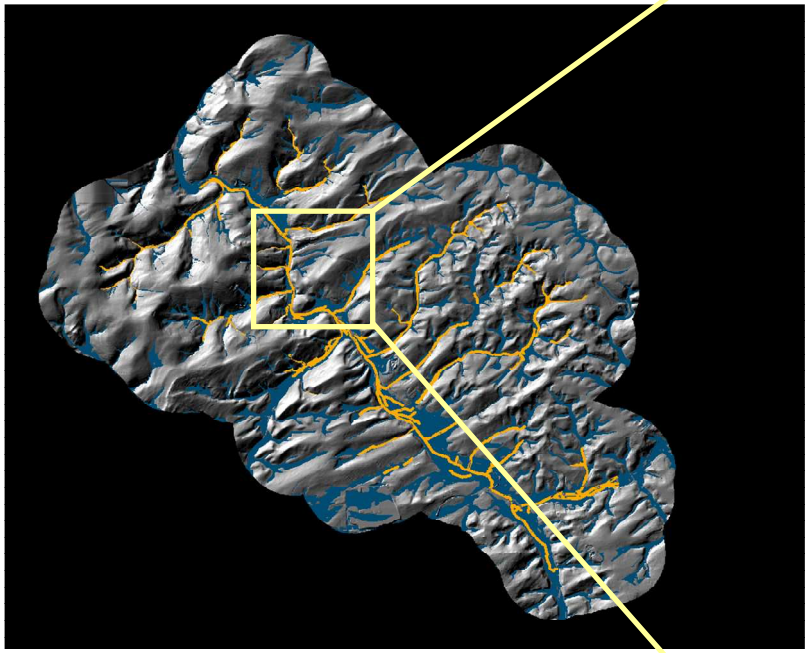
	photo documentation	aerial image	classification
orchard single tree			
orchard espalier			

Result:
landscape classification

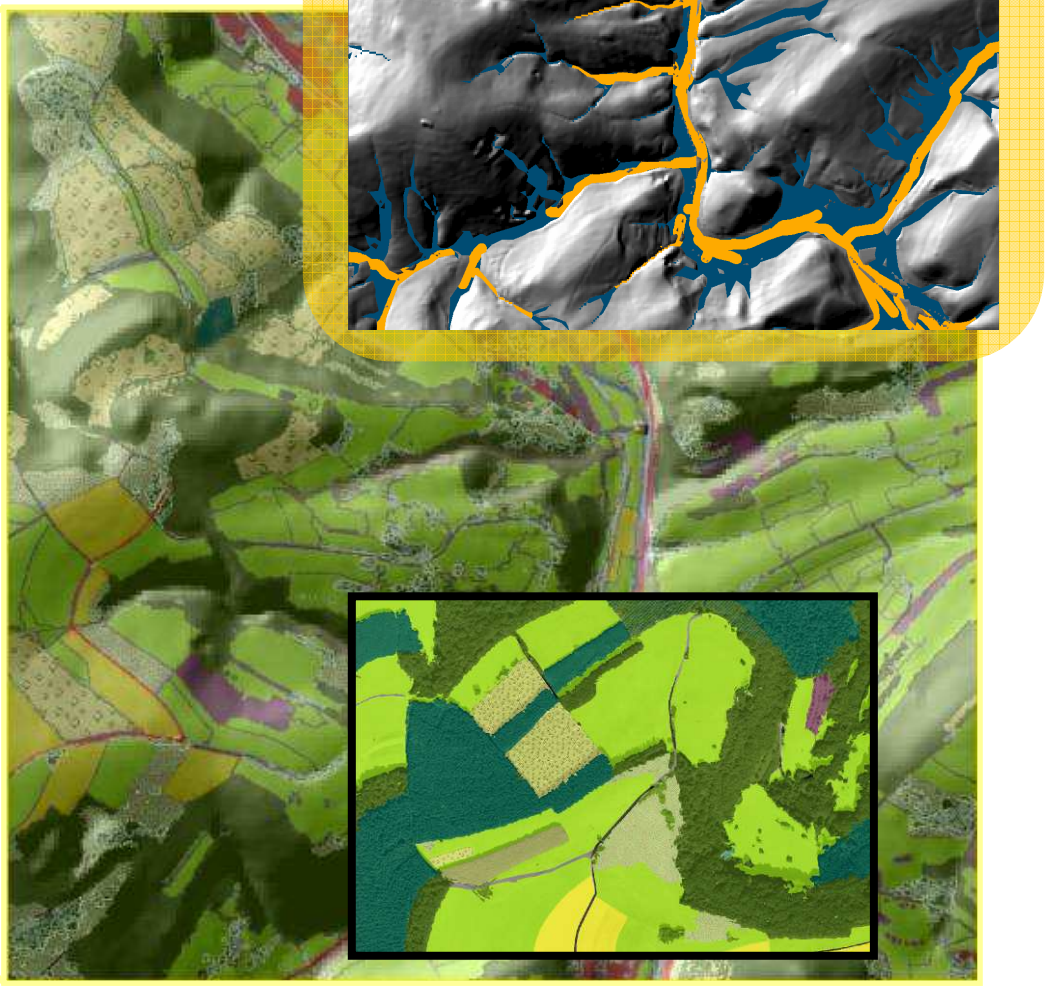


Digital Terrain Model overlapped with classification results

Result:
landscape classification



...
flood areas from DTM



Accuracy: hr-classification and cadastrial information (ALK)

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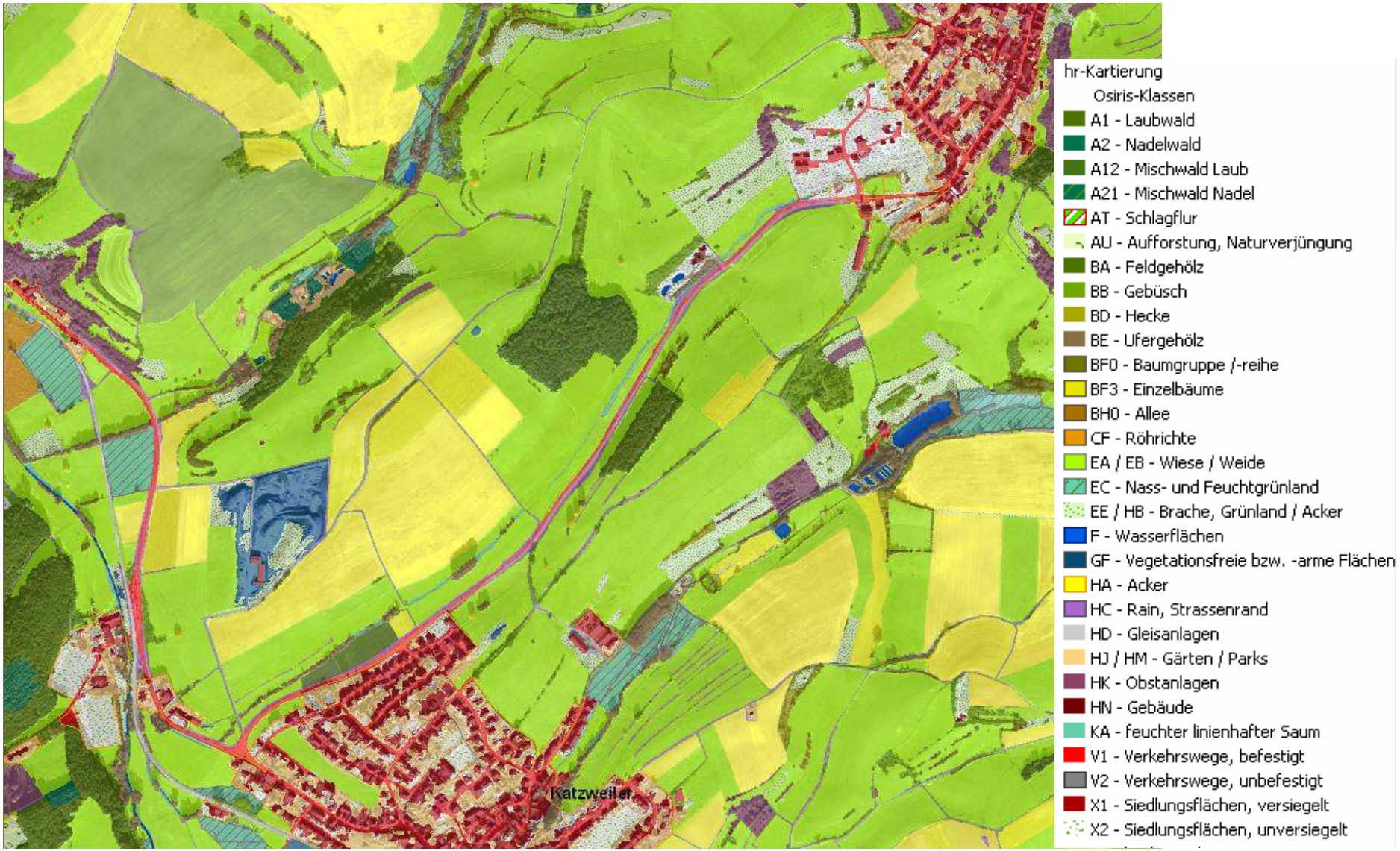

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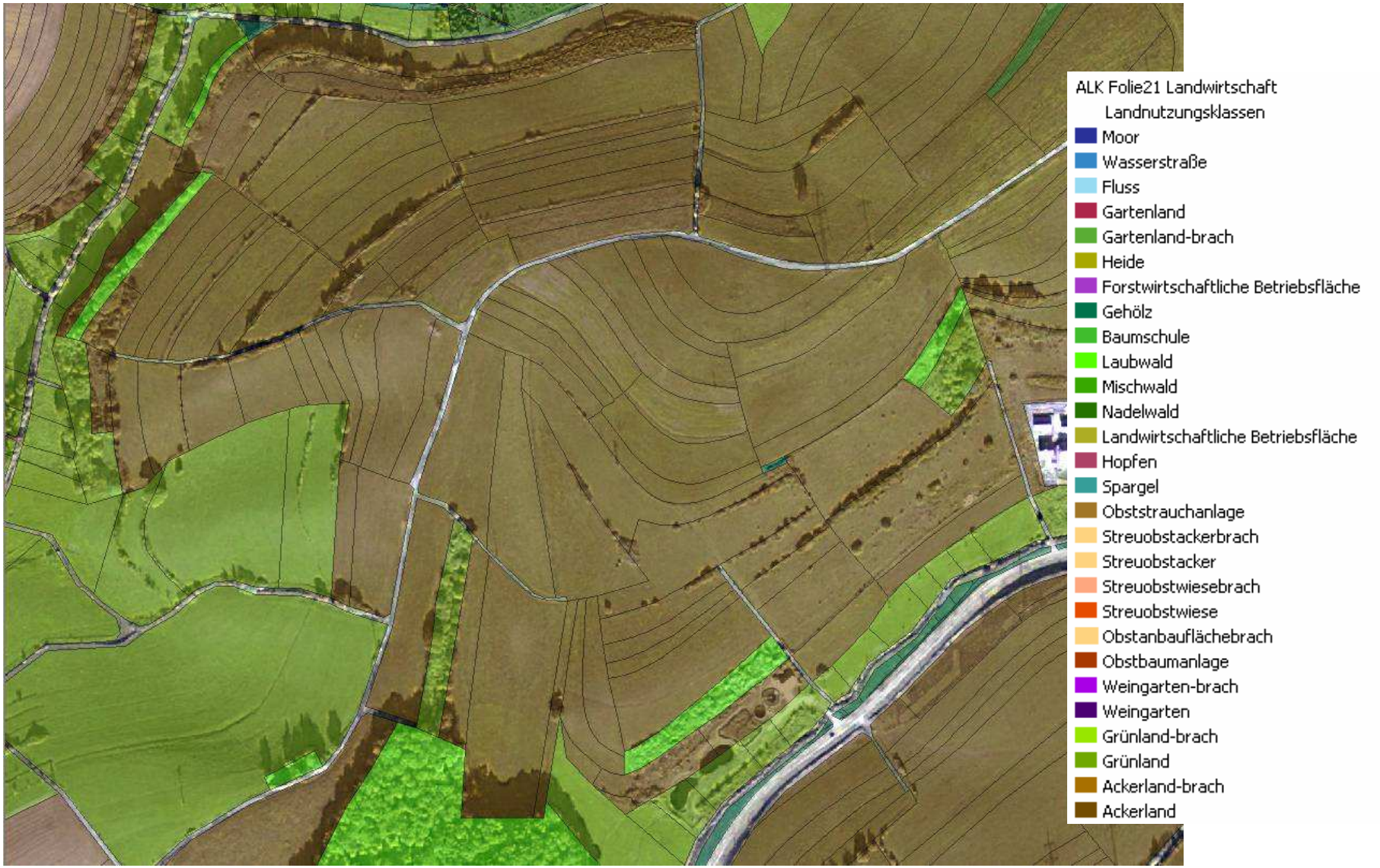

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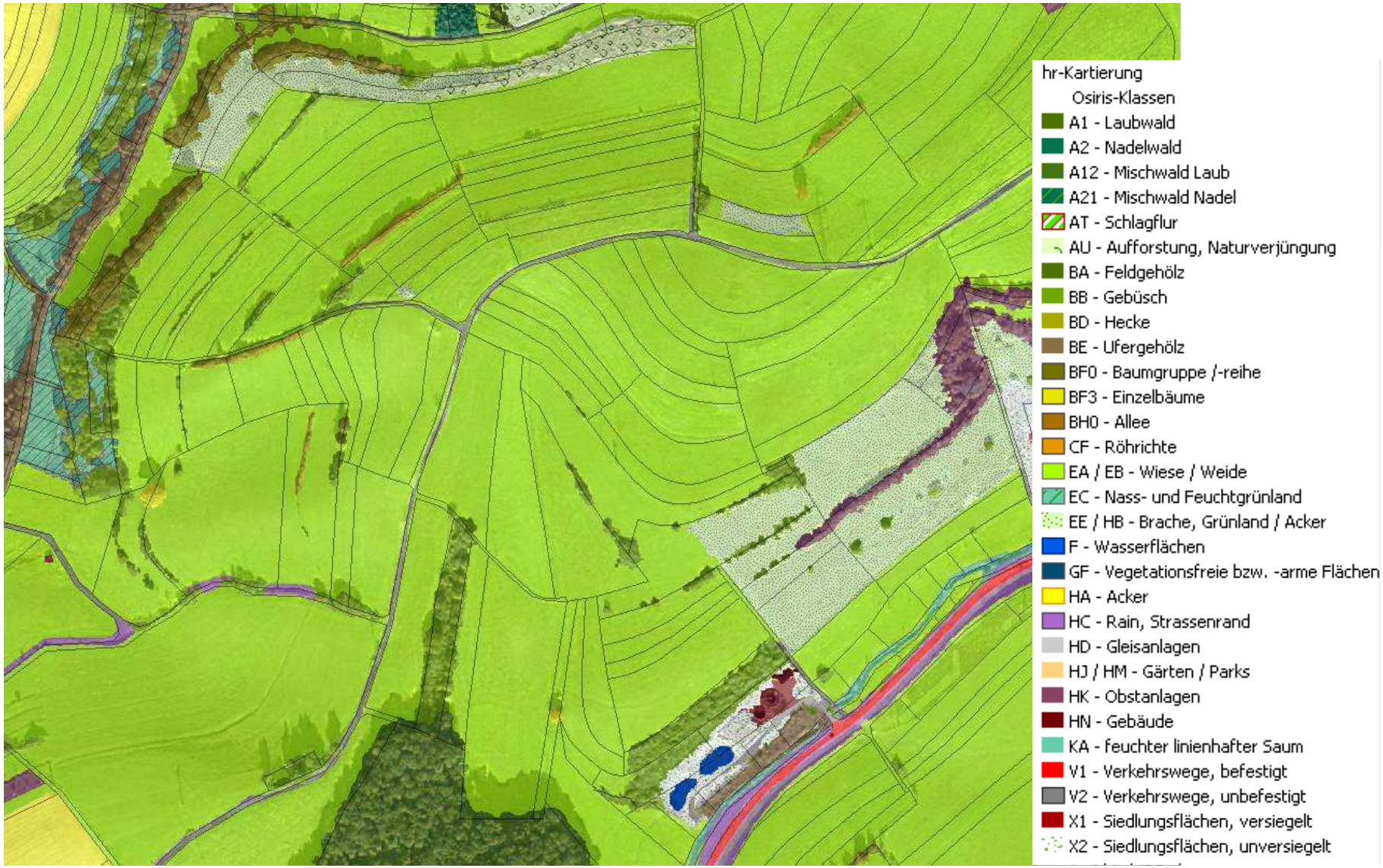
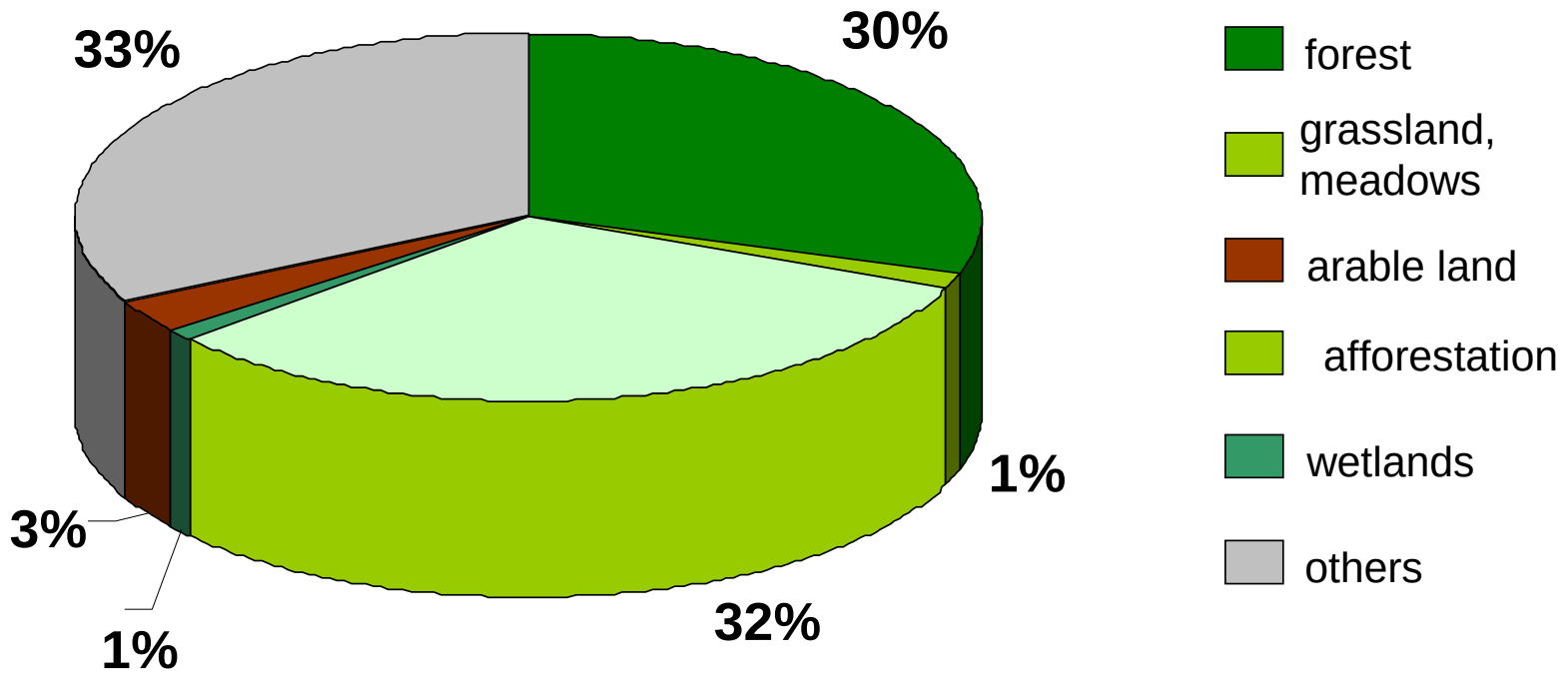


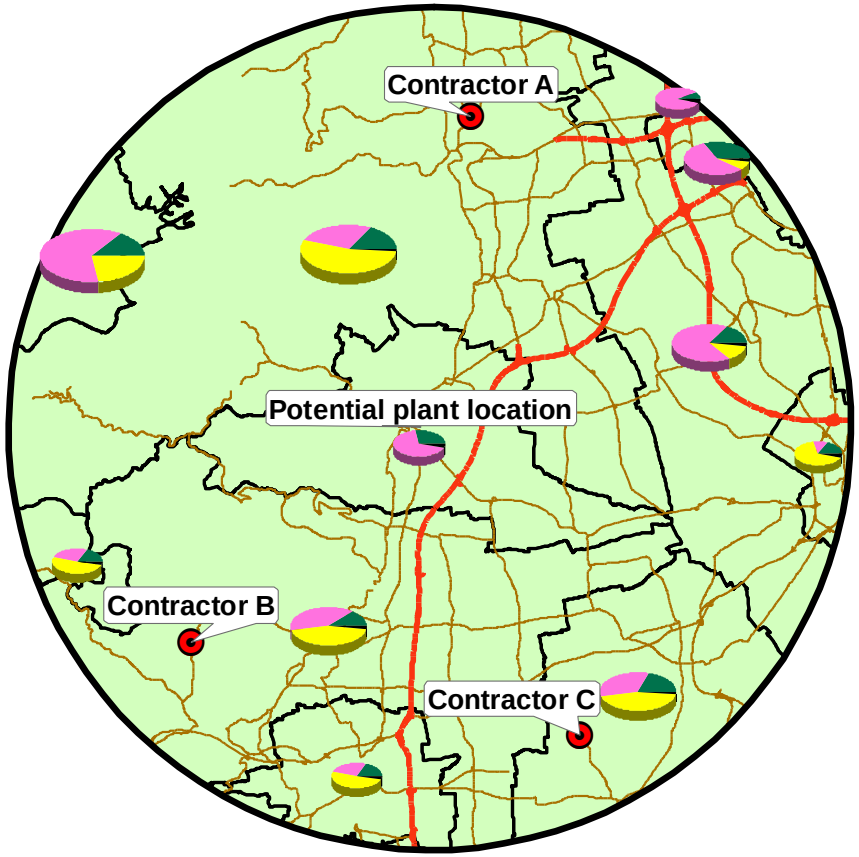
Result:
landscape classification and analysis:

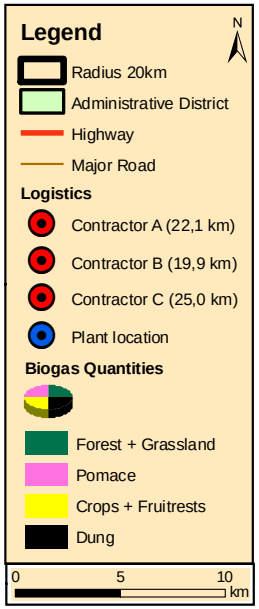
mapping, statistics, analysis

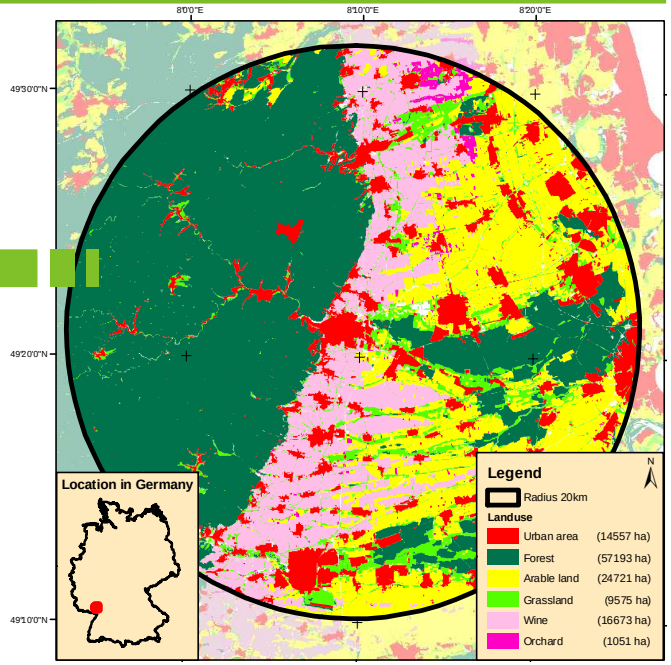


Ground truthing showed an accuracy of 95 % - 98 %

Applications: GIS-based Feasibility Study for Biogas Plants





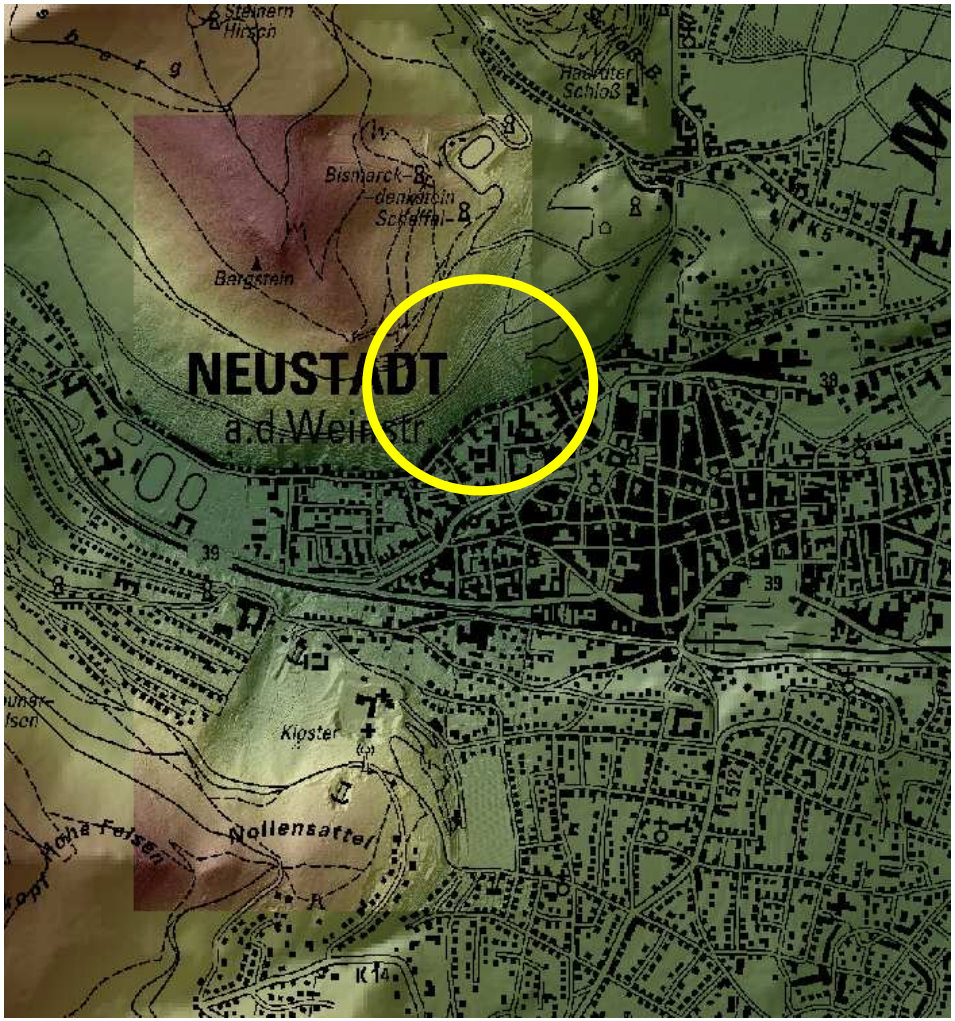


Summary

➔ Visualisation and identification of substrate- and biogaspotentials

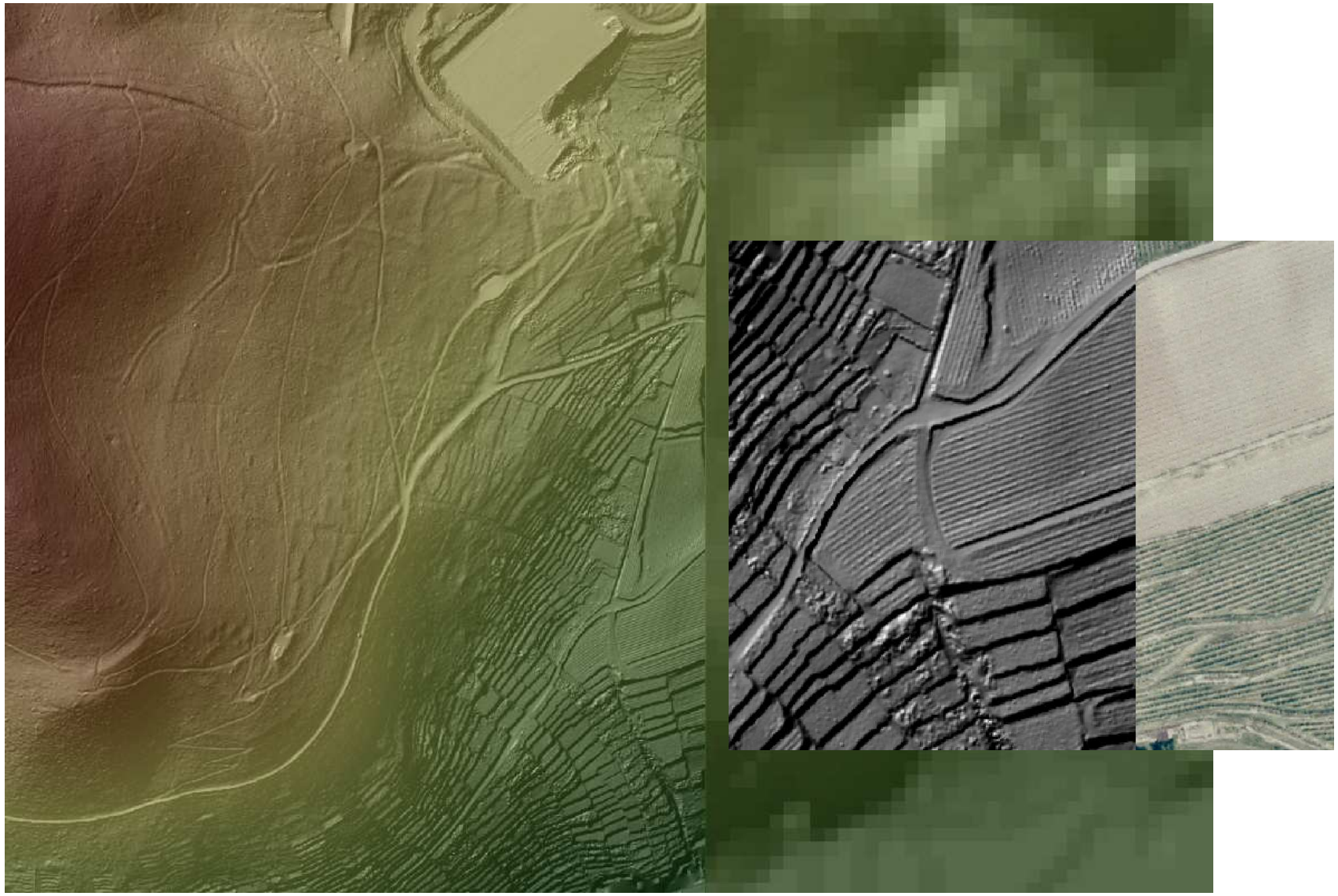
➔ Location Evaluations to maintain Cost-Effectiveness (e.g. shortest paths)

Perspectives: Applications based on LIDAR DTM and DSM

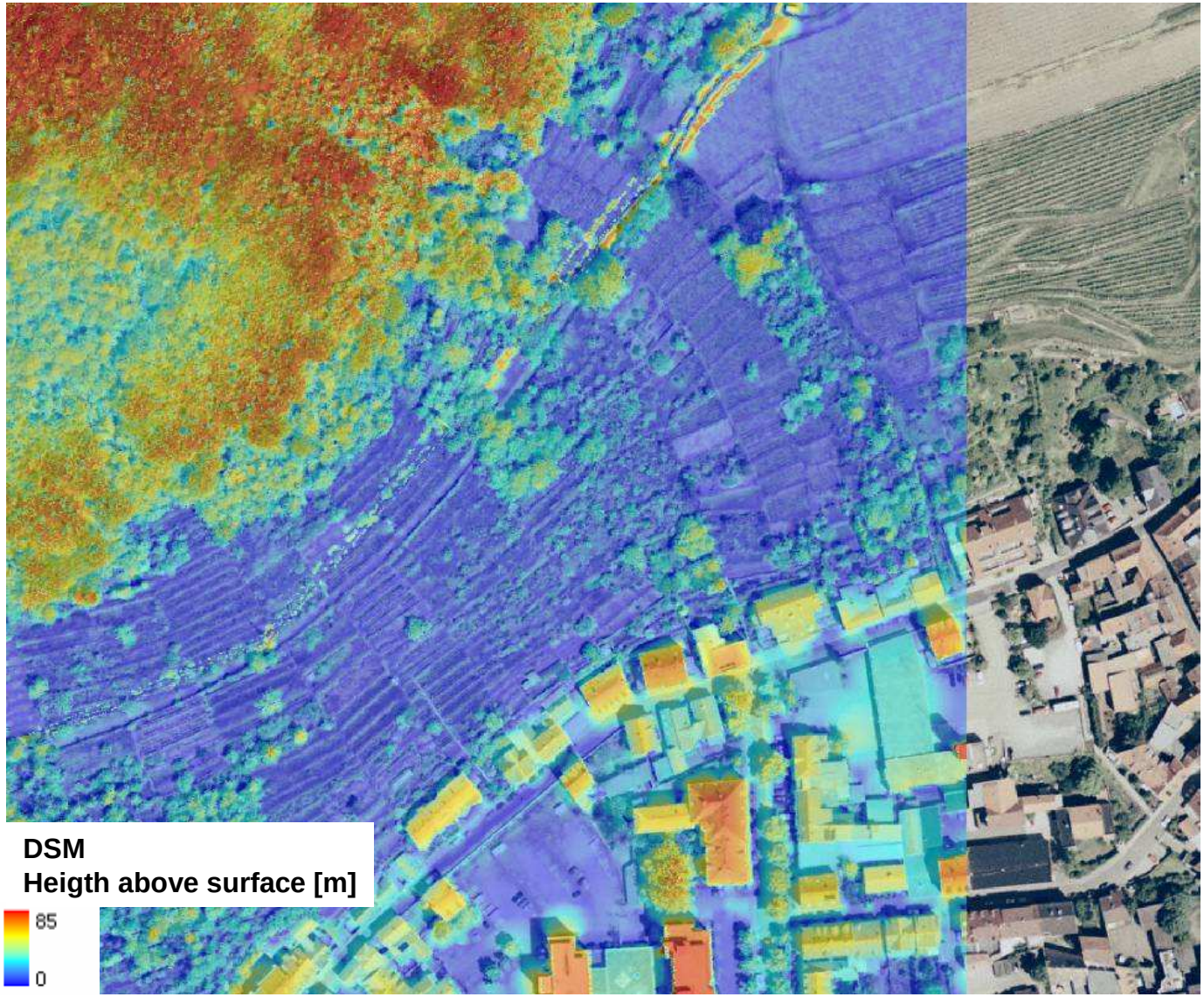


LIDAR: Light Detection And Ranging“
DTM: Digital Terain Model
DSM: Digital Surface Model

Perspectives: Applications based on LIDAR DTM (3 Points per sqm)



Perspectives: Applications based on LIDAR DSM



Meaningful applications:

Mapping of buildings, roads...

Calculation of terrain models:

- slope
- aspect
- potential solar radiation
- ...

but,

available only for small areas

expensive...

Especially for countries with a lack of small scaled geodata

(this means high resolution)

the generating of basic geodata like

topographical maps combined with the classification of land cover

delivers important georeferenced information for

organising, planning and managing

ecological and even economical issues

Case Study: TerraSAR-X[1]

Combination of multispectral sensor data and Terra-SAR-X data

Terra-SAR-X: Advantages

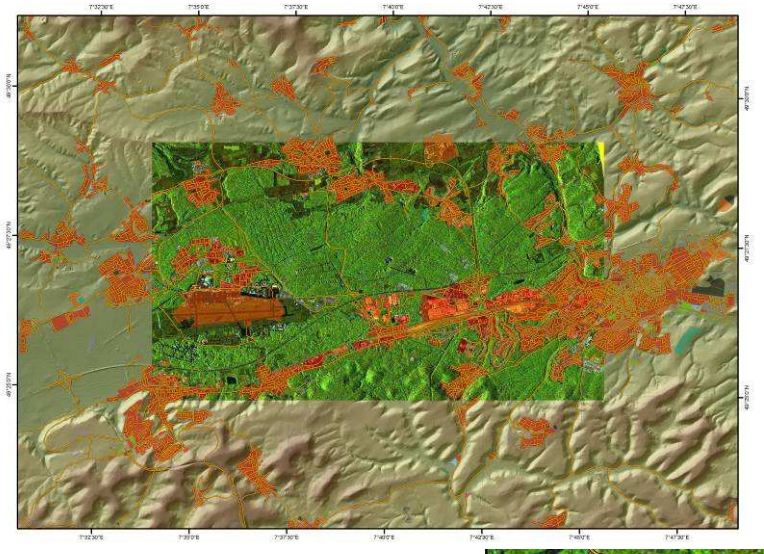
- weather (clouds...) and daylight independent
- reflexion of sealing areas like streets, building, surface waters

➔ semi-automated mapping and analysing of anthropogenic land cover

- topographical information
- settlements, buildings
- streets...

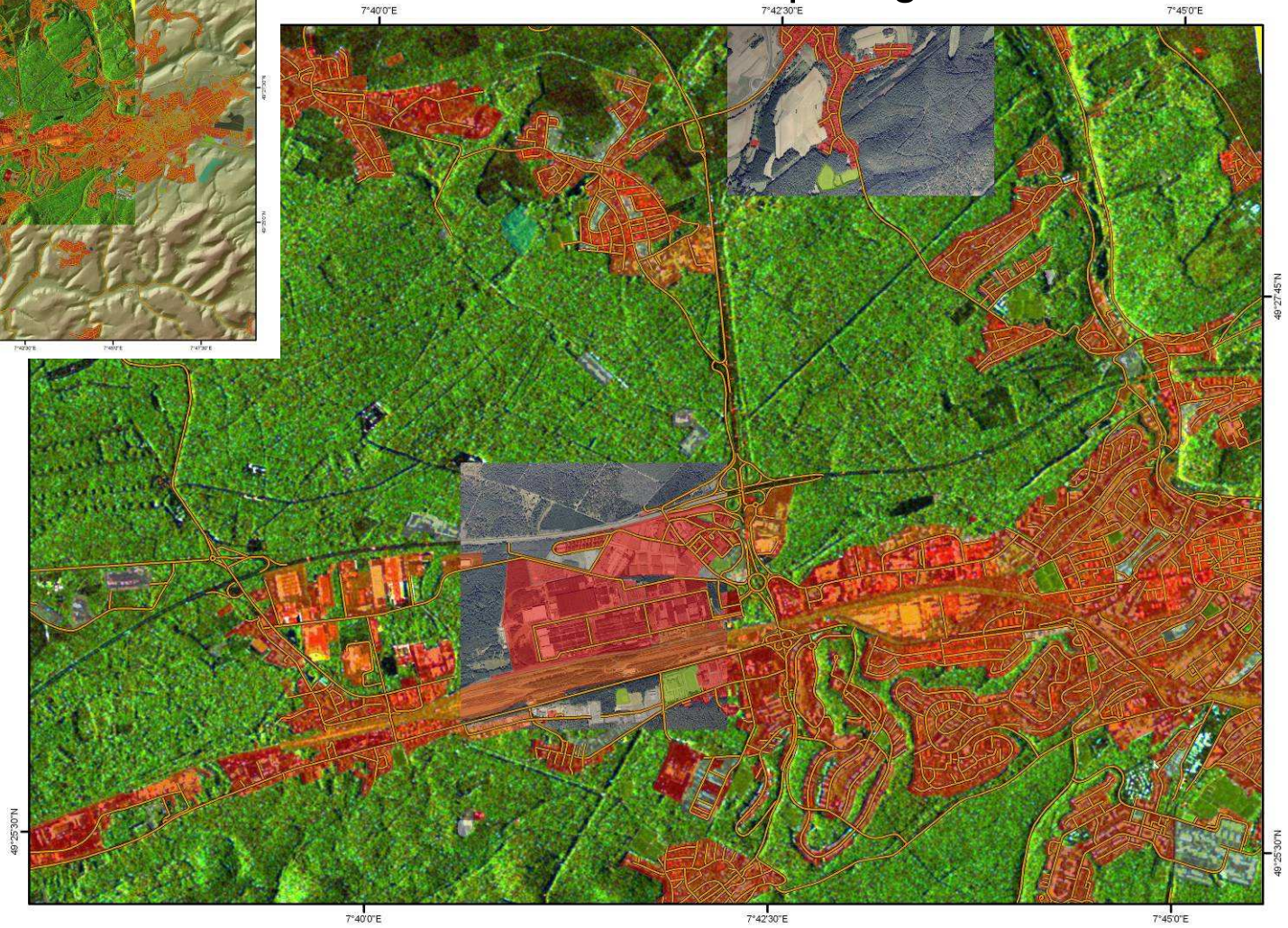
SpotLight:	up to	1 m	resolution, scene size 10 km	(width) x	5 km	(length)
StripMap:	up to	3 m	resolution, scene size 30 km	(width) x	50 km	(length)
ScanSAR:	up to	18 m	resolution, scene size 100 km	(width) x	150 km	(length)

[1]: **TerraSAR-X**: Infoterra GmbH, Germany



Germany, region Kaiserslautern

TerraSAR-X, SpotLight Data



Anthropogenic features derived from German ATKIS (vector-based, medium scaled)

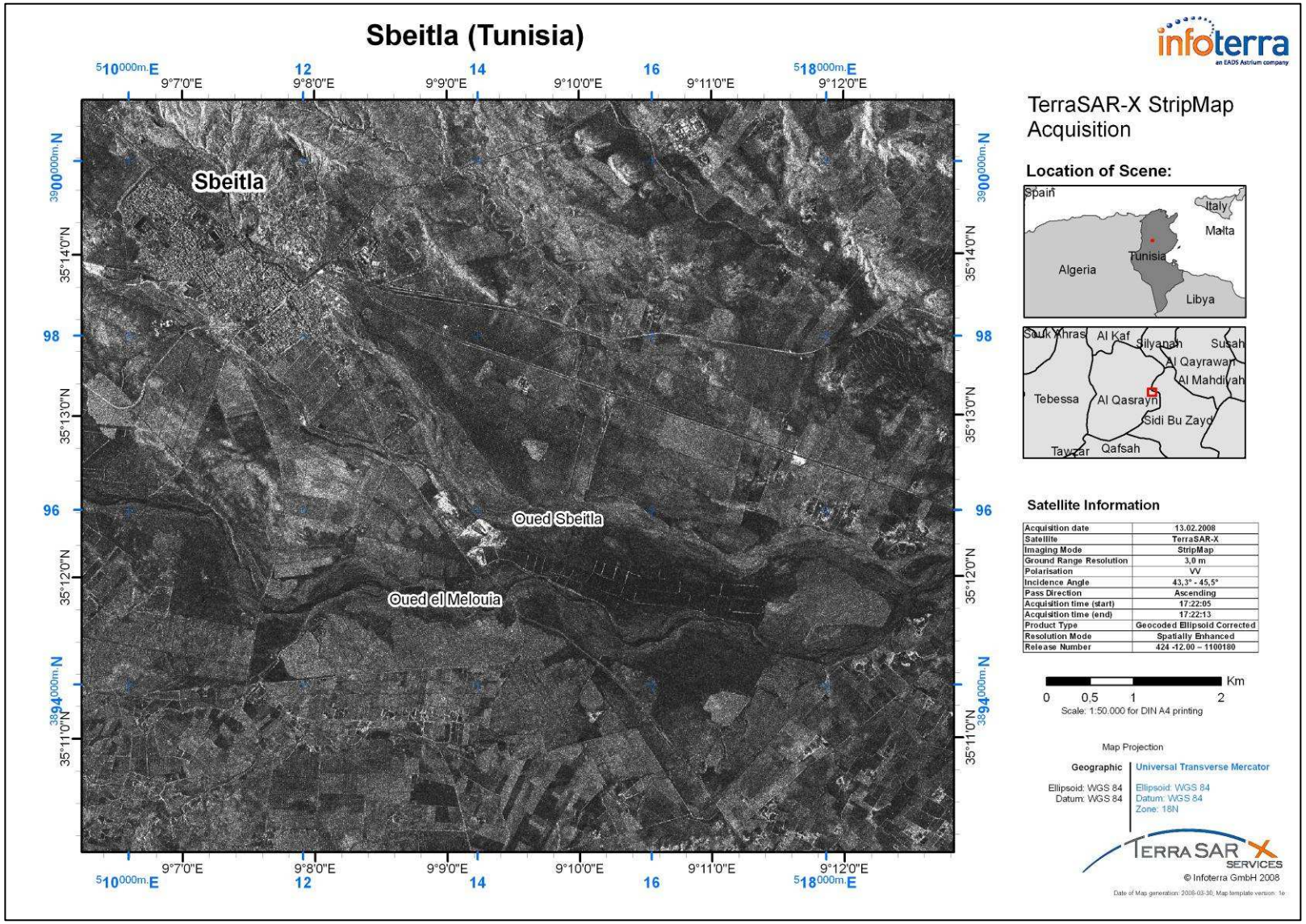
First evaluations of this new sensor showed a high potential
especially in combination with multispectral images
for a semi-automated classification of land cover and anthropogenic land use.

The extraction of sealed objects from Terra-SAR-X
was compared with anthropogenic features from the German ATKIS data
and we found in a first study a high accuracy in a medium scaled resolution
(1:10.000 – 1:25.000)

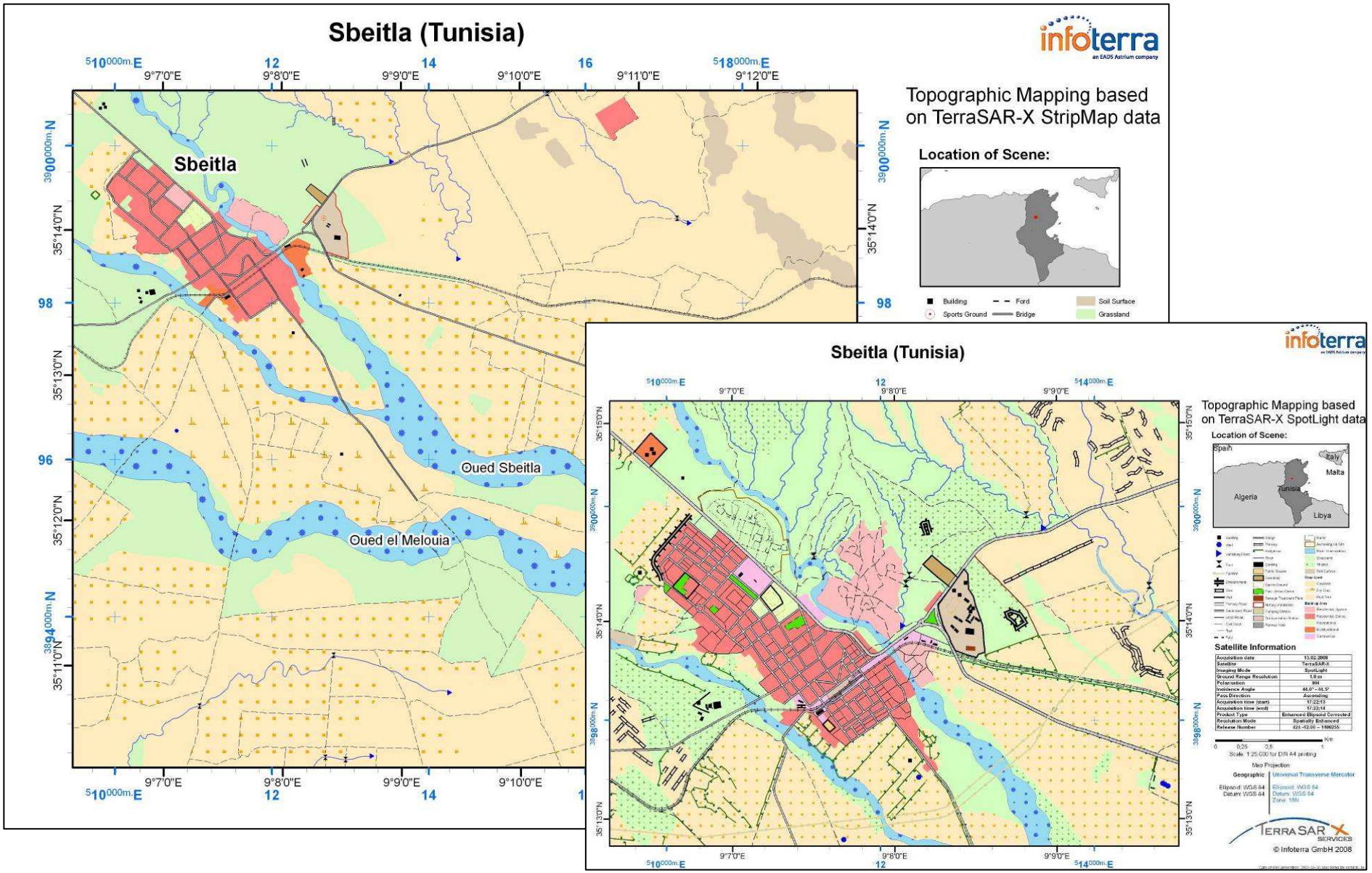
...
had to be continued
...

Now first results from InfoTerra GmbH, Germany ,
Case Study Tunesia: Topographical Mapping

Topomap based on StripMap data



Topomap based on StripMap data



Conclusions and "Take Home Messages"

✓ **Optical and mulitspectral images in high resolution are available world-wide and can be classified by using object oriented image classifcation software semi-automated**

Applications:
land cover, topographical mapping, assessment of biomass/biogas potential

✓ **New radar images like TerraSAR-X (and Terra-SAR-X Tandem) are available world-wide in different scale levels: from high to medium resolution: overview mapping to detailed infrustructure analysis**

Applications:
topographical mapping, infrastructure and anthropogenic features (sealed surfaces!)
generating DTM (10m resolution)

✓ **Very high resolution DTM and DSM data can be used for better planning and visualising in small scaled regions**

Thank you for your kind attention!