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Agricultural land-use changes and they relationships to selected landscape parameters

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Study area

Trebic and Znojmo districts

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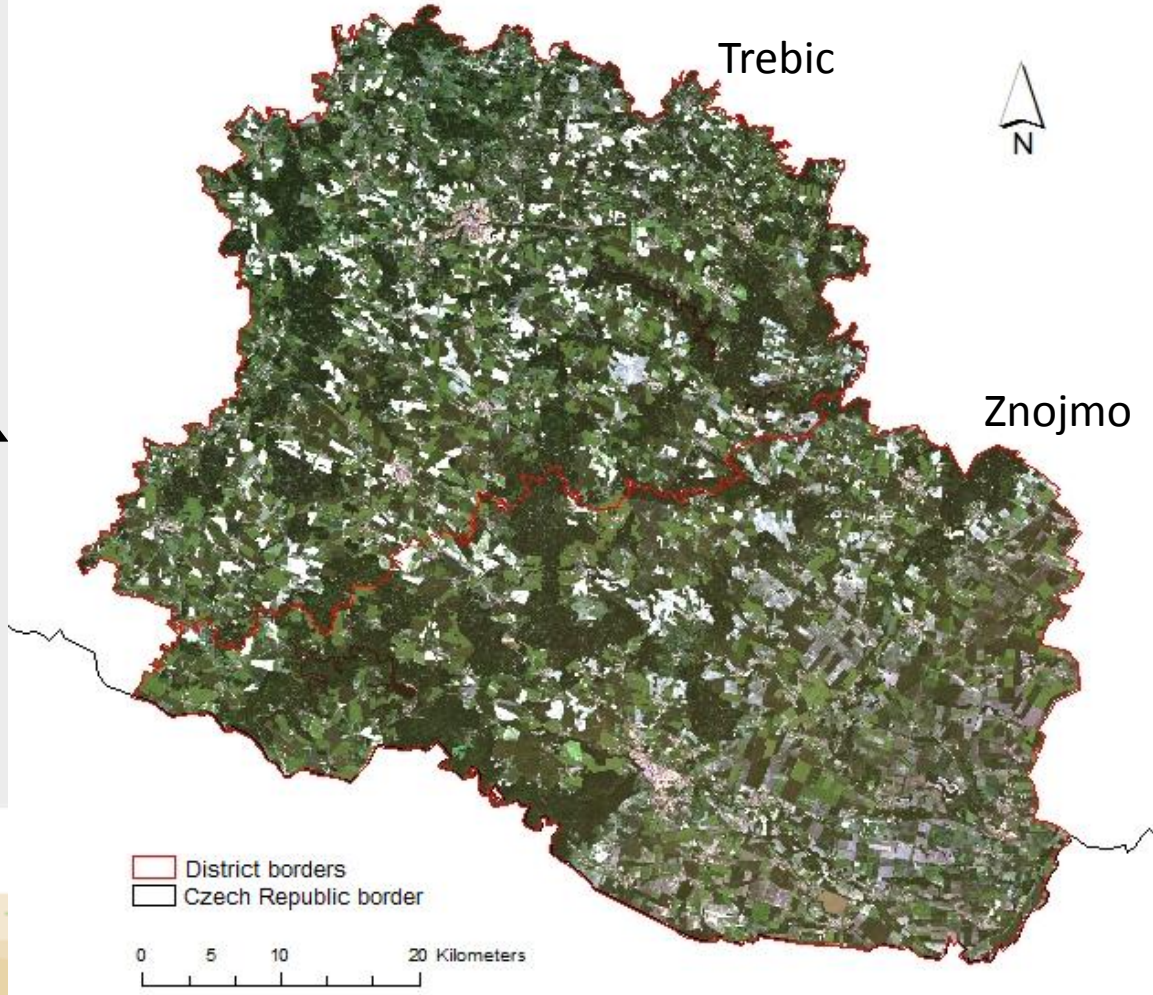
Study area



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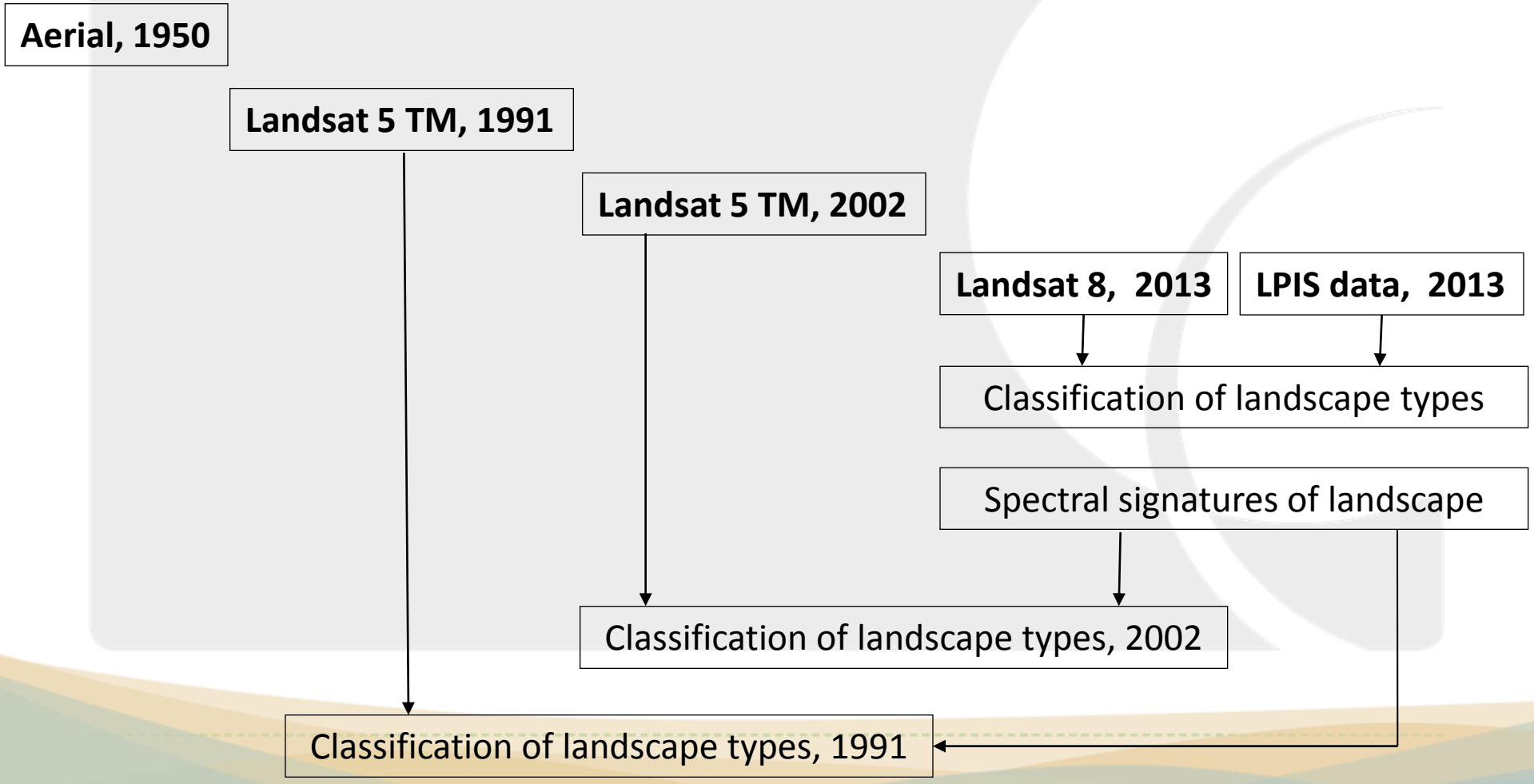
Objectives

- To characterise the land-use/land cover changes in Znojmo and Trebic districts;
- To explore distribution and changes in LULC along the slope gradient and topographic wetness index (TWI) classes.

Data for LULC change analysis



Description of LULC classes used for change study

LULC types	Description
Arable lands	Areas of land prepared for growing agricultural crops. This category includes areas currently under crop, and land under preparation
Grasslands	All areas covered with natural grass and small shrubs dominated by grass
Forest broadleaved	Areas dominated by forest which are broadleaves, coniferous and mixed
Forest coniferous	
Forest mixed	
Water bodies	Permanent lakes and other intermittent ponds
Settlements	Build-ups (houses) in both urban and rural parts

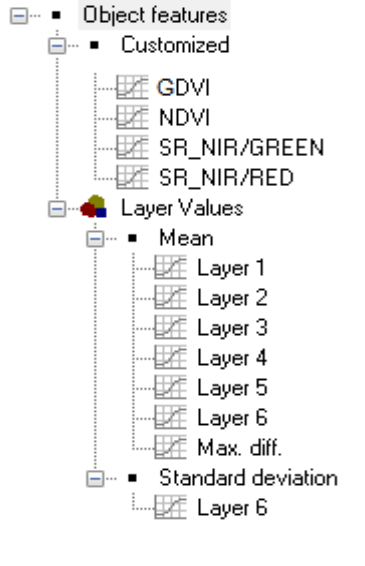
Object-based image analysis

1. Segmentation

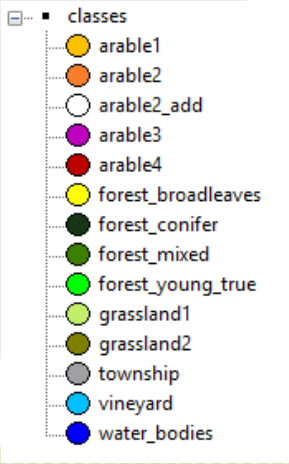
2. Nearest neighbour classification

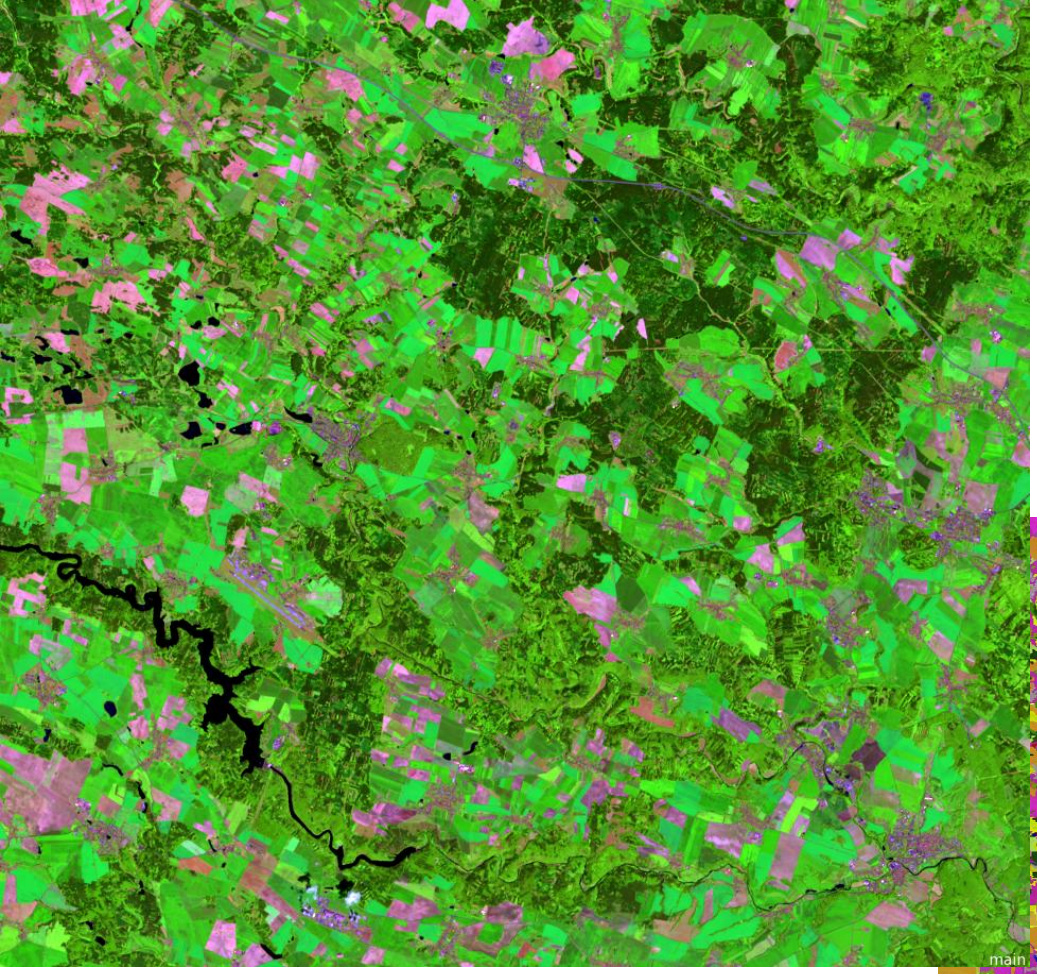
3. “Assign class” classification

Object features



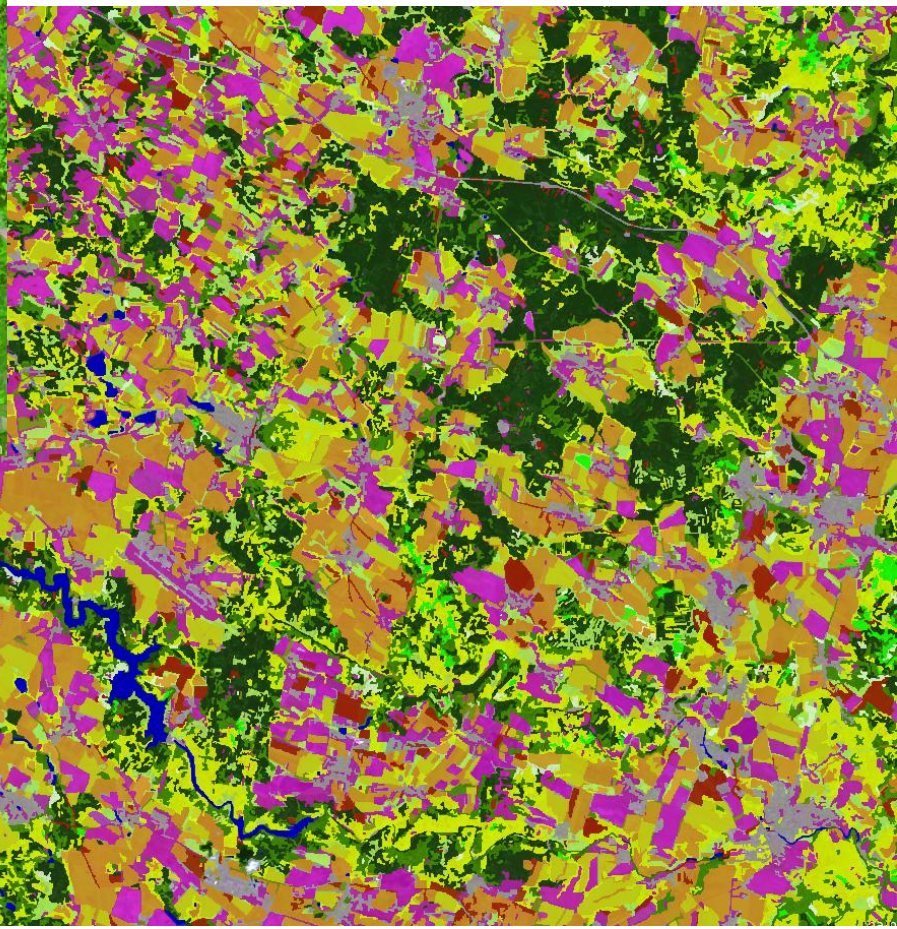
Class hierarchy





Synthesis of 2, 7, 9 bands of Landsat 8 image

Example of classification results



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Classified land use/ land covers (%) for the reference years

LULC types	1991	2002	2013
arable	73.7	72.4	65.4
grassland	4.5	5	6
f_broadleved	5.2	4.8	7.7
f_coniferous	5.2	3.7	4.8
f_mixed	7.4	10.6	10.4
water	1	1	1
settlement	2.9	3.2	4.1

Znojmo

Trebic

LULC types	1991	2002	2013
arable	65.9	63.6	55.1
grassland	4.0	4.7	9.6
f_broadleved	5.1	4.3	6.1
f_coniferous	14.1	13.8	14.7
f_mixed	7.3	9.7	10.2
water	1	1	1
settlement	2.4	2.8	3.13

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Summary of LULC change matrix from 1991 to 2013

(in %, proportion of each value to total area)

Znojmo

	arable	grassland	f_broadl	f_conif	f_mixed	water	settlement	Total 2013
arable	**57.8**	1.2	2.0	0.9	3.2	0.004	0.3	65.4
grassland	2.7	**2.7**	0.5	0.1	0.5	0.01	0.1	6.6
f_broadl	4.7	0.2	**2.5**	0.2	0.0	0.1	0.04	7.7
f_conif	1.6	0.1	0.3	**1.3**	1.5	0.0	0.0	4.8
f_mixed	5.3	0.2	0.02	2.5	**2.2**	0.0	0.3	10.5
water	0.09	0.0	0.01	0.0	0.0	**0.9**	0.0	1.0
settlement	1.7	0.1	0.0	0.2	0.0	0.0	**2.1**	4.1
Total 1991	73.7	4.5	5.3	5.2	7.4	1.0	2.9	100.0

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Summary of LULC change matrix from 1991 to 2013

(in %, proportion of each value to total area)

Trebic

	arable	grassland	f_broadl	f_conif	f_mixed	water	settlement	Total 2013
arable	**50.2**	0.4	0.3	3.1	0.9	0.2	0.1	55.2
grassland	4.8	**3.2**	0.9	0.7	0.0	0.0	0.0	9.6
f_broadl	3.4	0.2	**2.2**	0.2	0.1	0.0	0.01	6.1
f_conif	4.3	0.3	0.8	**8.0**	1.4	0.0	0.0	14.8
f_mixed	2.0	0.0	1.0	2.2	**4.8**	0.02	0.3	10.3
water	0.1	0.0	0.0	0.0	0.2	**0.7**	0.0	1.0
settlement	1.1	0.003	0.0	0.0	0.0	0.0	**2.0**	3.1
Total 1991	65.9	4.0	5.2	14.2	7.4	1.0	2.4	100.0

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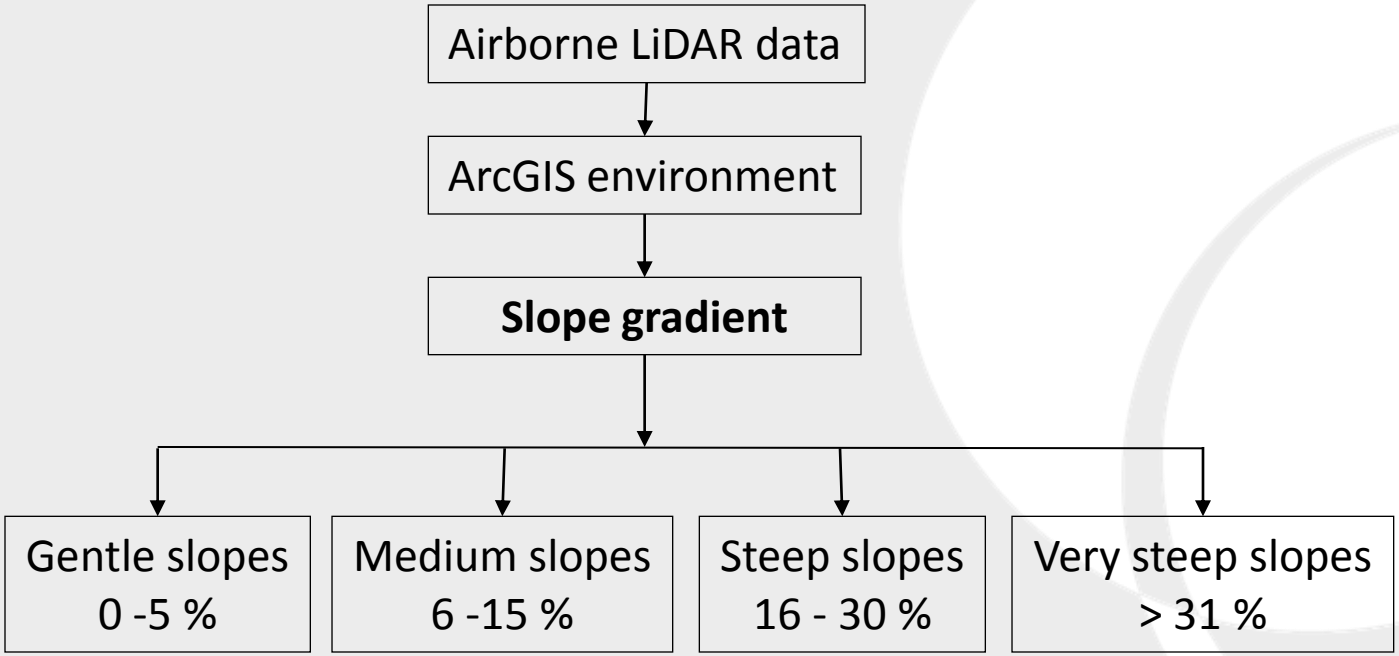
Slope gradient is conditional factor for LULC distributions*



Slope is the rate of maximum change in z-value from each cell.

*Hietel, E.; Waldhardt, R.; Otte, A. Analysing land-cover changes in relation to environmental variables in Hesse, Germany. Landscape Ecol. 2004, 19, 473-489.

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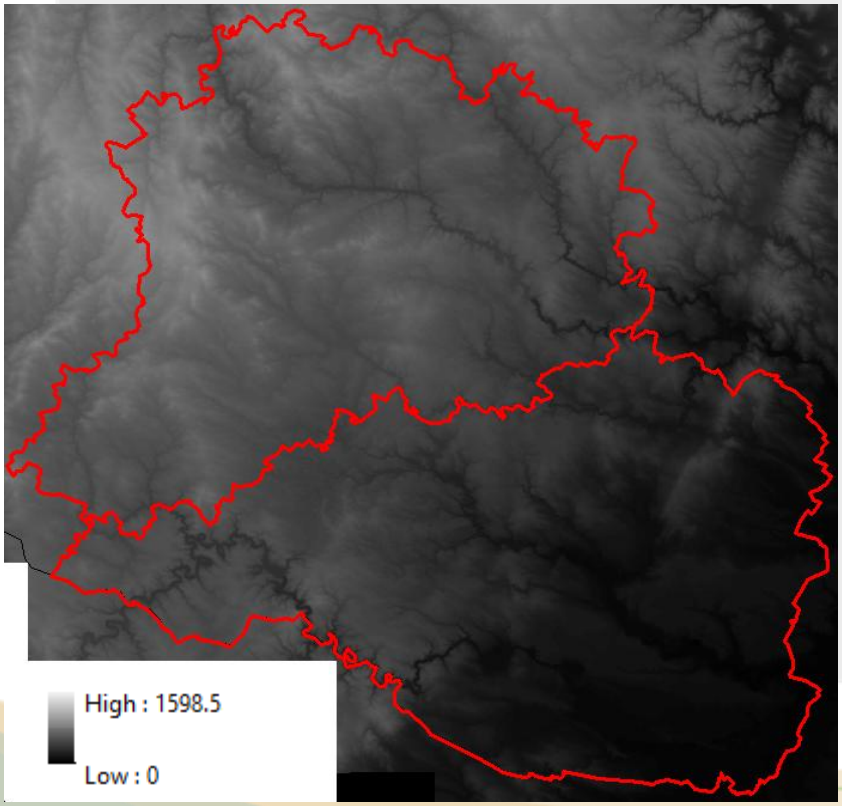

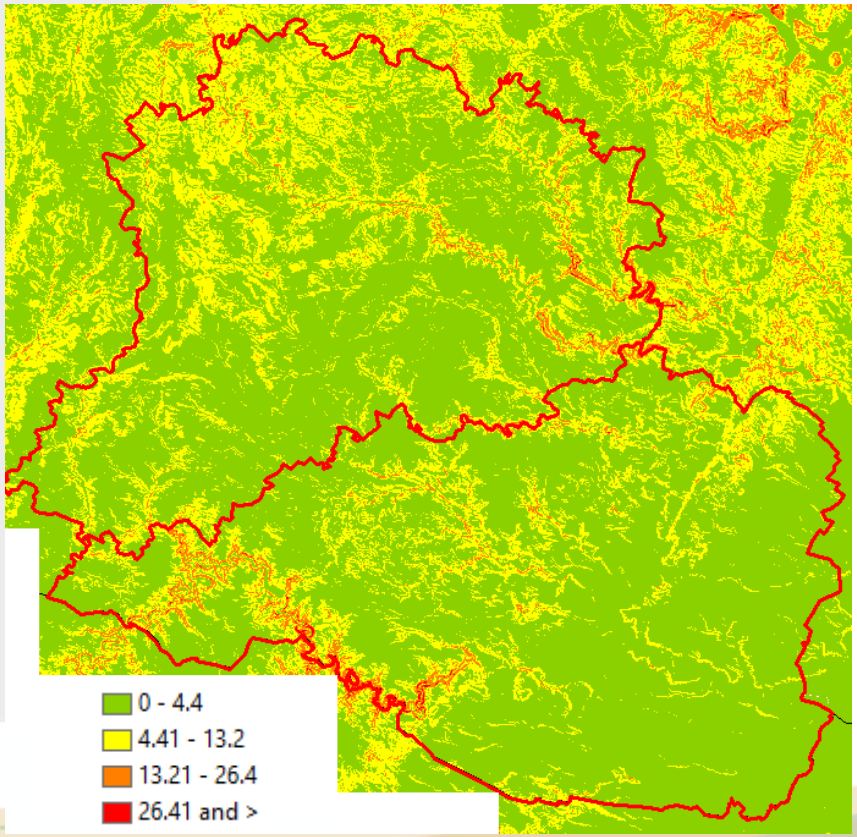

Digital Elevation Model

Example of the slope map

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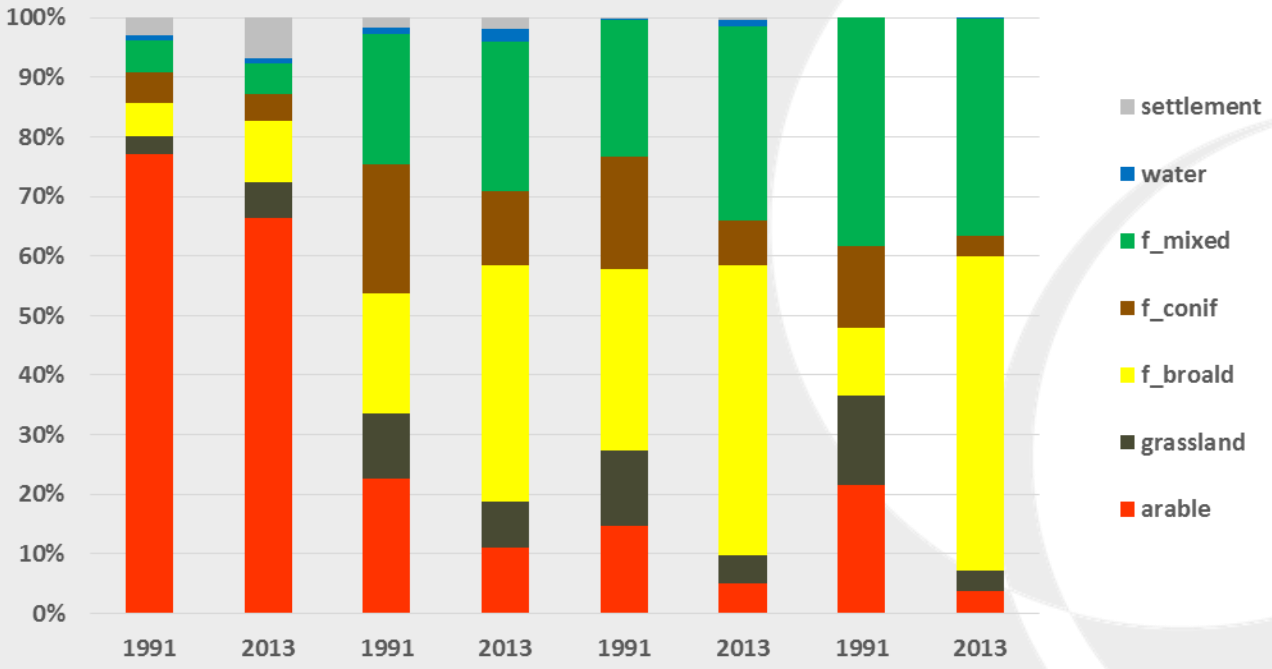
Proportion of land cover types in reference years along slope gradient

Znojmo



Slope gradient:	0-4.4%	4.5-13%	13.1-26.4%	> 26.5%
Percent of the area:	94.6%	4.4%	0.9%	0.1%

By overlaying the classified maps of each reference year on the slope map thematic information show relationship between LULC distribution and changes in each category

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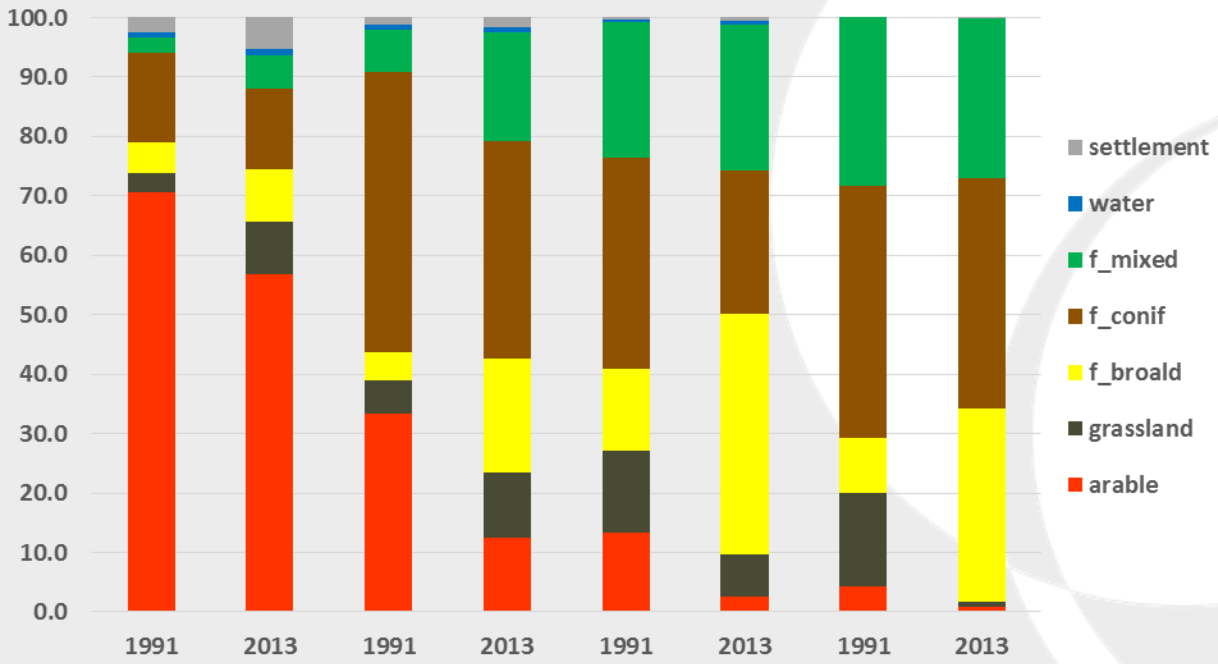
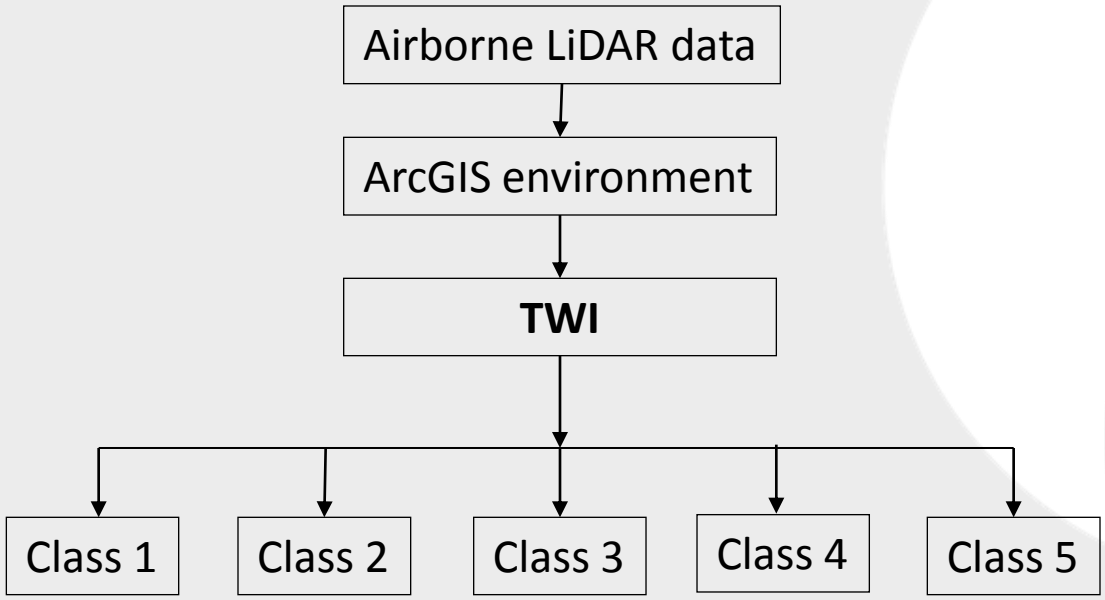
Proportion of land cover types in reference years along slope gradient

Trebic



Slope gradient:	0-4.4%	4.5-13%	13.1-26.4%	>26.5%
Percent of the area:	74%	20.5%	5.4%	0.1%

TWI is predicting factor for LULC distributions



http://www.springer.com/gp/book/9781402056475?token=gbgen&wt_mc=GoogleBooks.GoogleBooks.3.EN#otherversion=9781402064845

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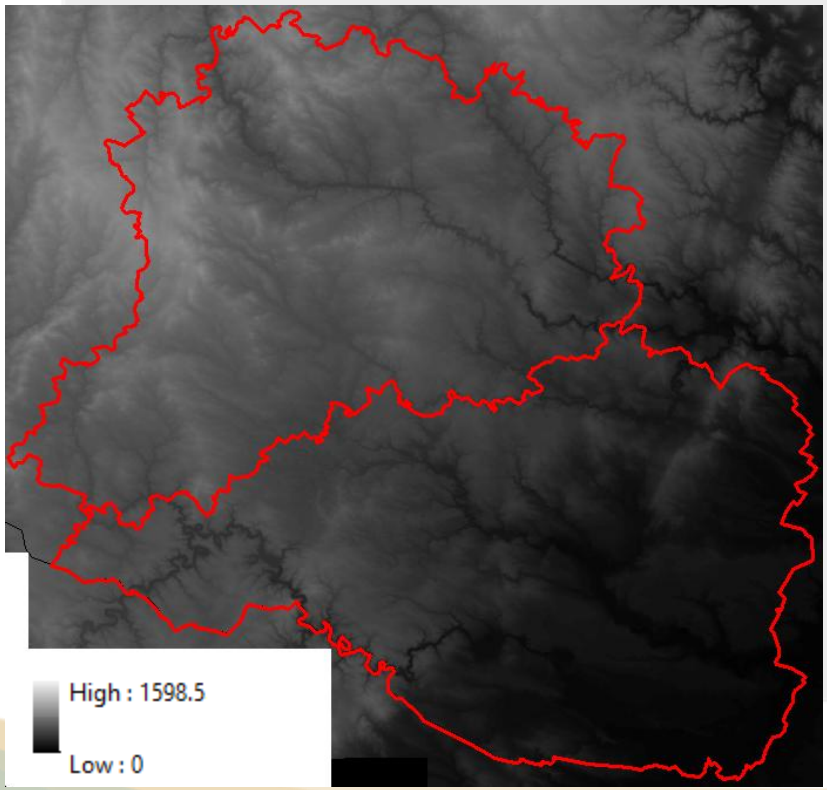
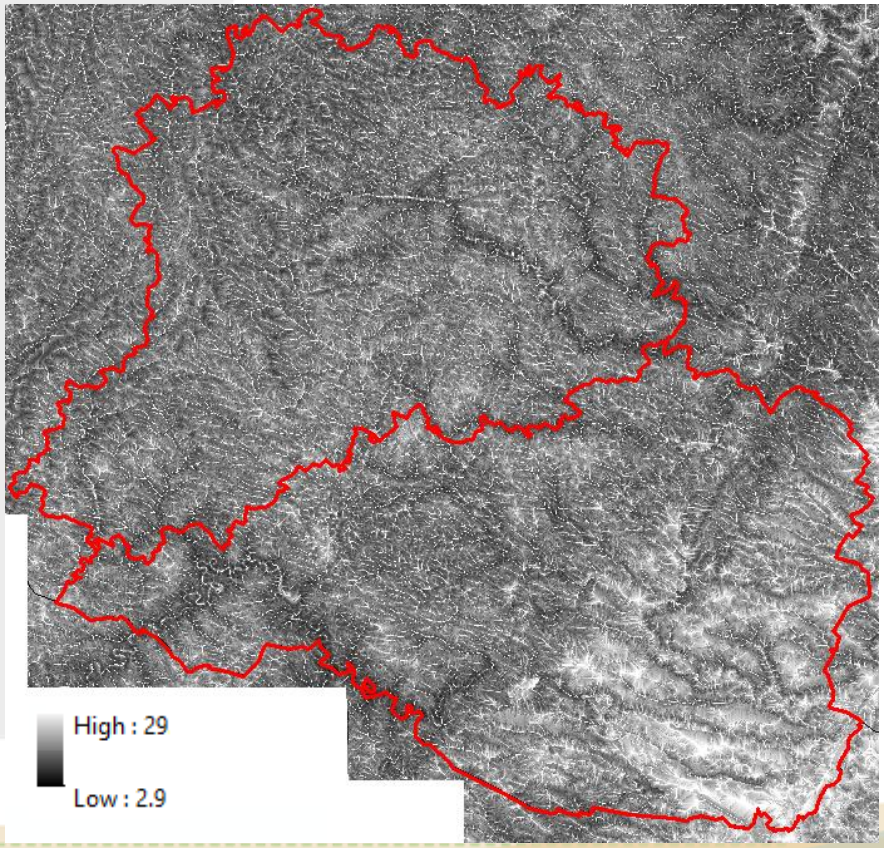
TWI is predicting factor for LULC distributions





Digital Elevation Model

Example of TWI map

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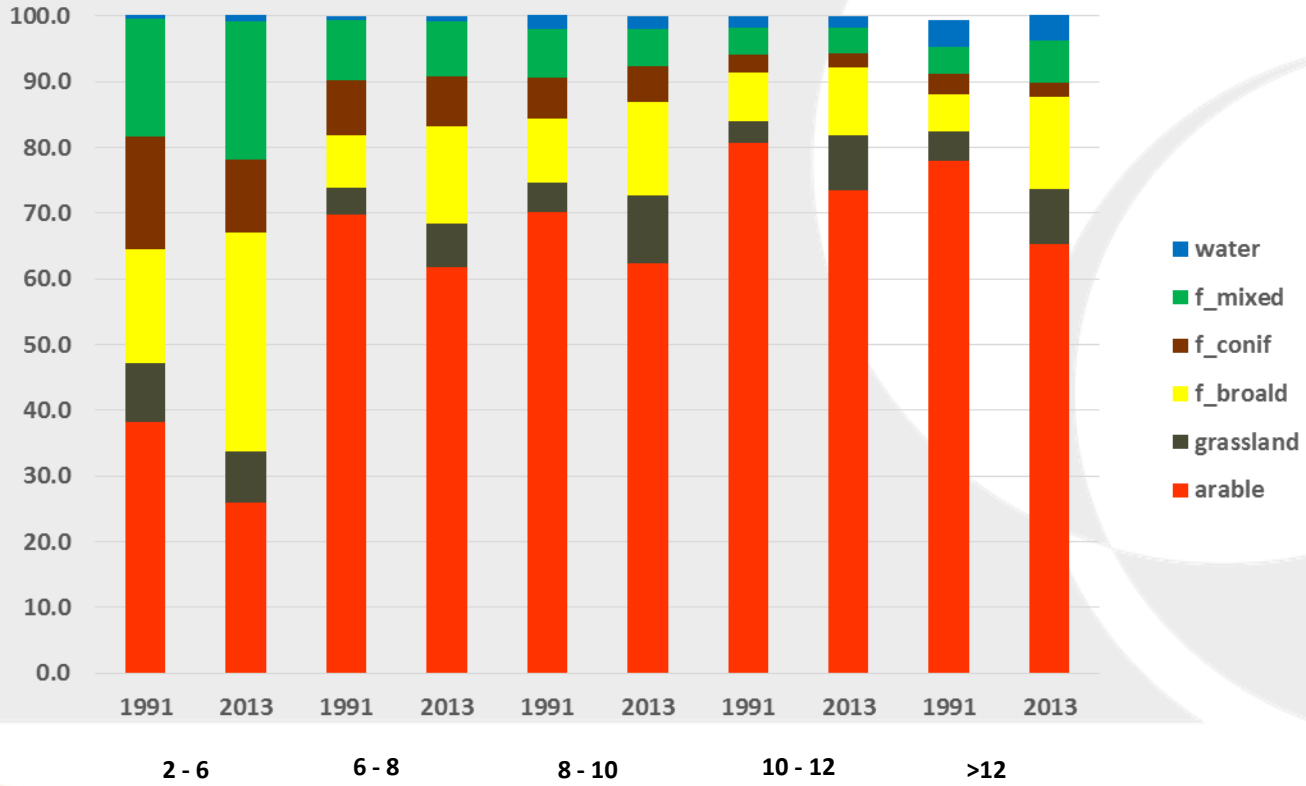
Proportion of land cover types in reference years along TWI classes

Znojmo



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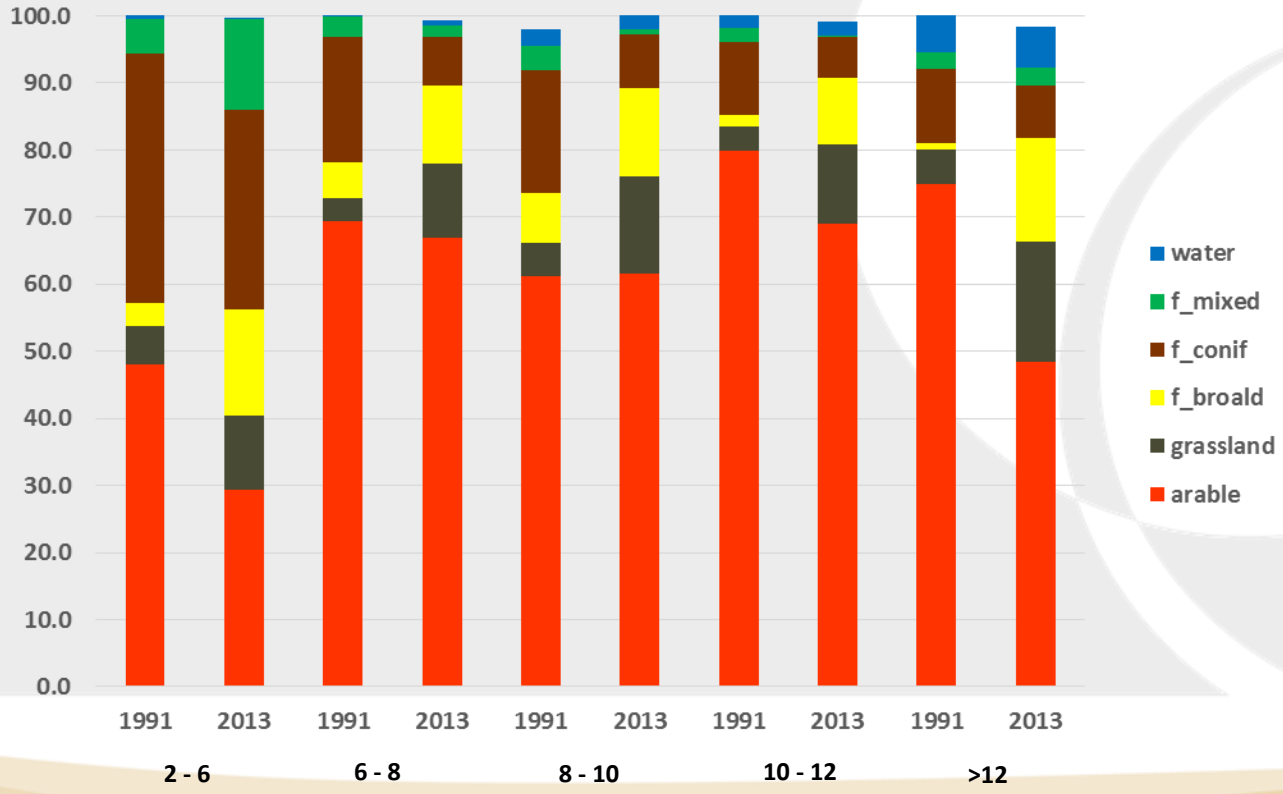
Proportion of land cover types in reference years along TWI classes

Trebic



Conclusions

1. Slope gradient is a predicting factor for LULC changes.

2. There is the slightly capacity of TWI to explain the processes of landscape changes.

3. Socio-economic driving forces can have an influence on land-cover changes and have to be considered in the study area.

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Thank you for attention!