

International LCLUC Regional Science Meeting in Central Europe

Sopron, Hungary 16-22nd October 2014



Land-Cover and Land-Use Change Program



LCLUC RELATED ACTIVITIES OF THE UNIVERSITY OF WEST HUNGARY



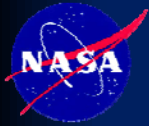
Prof. Éva Konkoly-Gyuró

Ass. Prof. Géza Király

Ass. Prof. Borbála Gálos

Pál Balázs





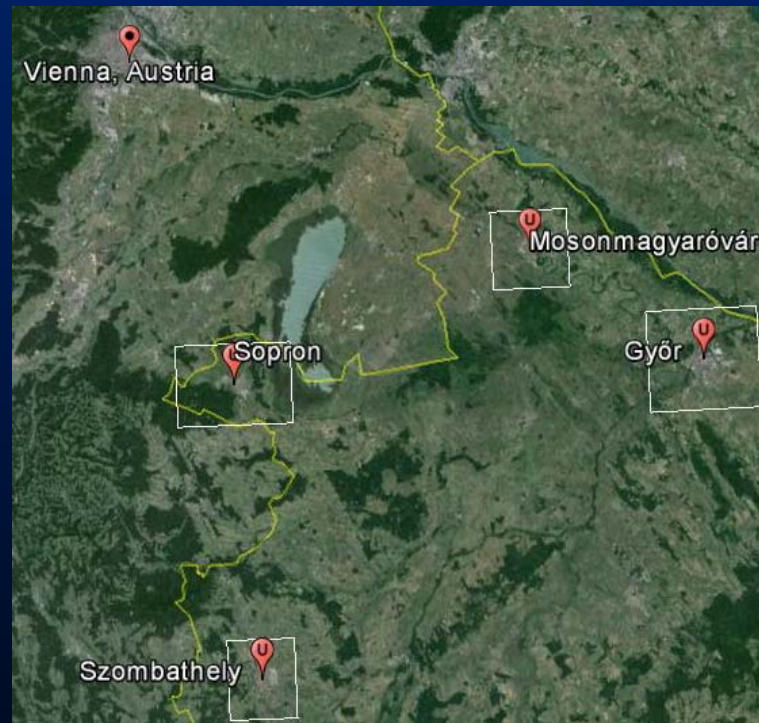
UNIVERSITY OF WEST HUNGARY



FOUR CITIES/CAMPUS – 6 FACULTIES – 9300 STUDENTS

SOPRON

- ◀ Forestry
- ◀ Wood Sciences
- ◀ Economics
- ◀ Pedagogy



MOSOMMAGYARÓVÁR

- ◀ Agriculture and Food Sciences

GYŐR

- ◀ Apáczai Csere János Teacher Training College

SZOMBATHELY

- ◀ Natural and Technical Sciences
- ◀ Arts ; Artistic, Pedagogy and Sports Sciences



MAIN LCLUC RELATED RESEARCH AREAS OF THE FACULTY OF FORESTRY

Institutes – Research Centres

- Institute of Geomatics and Civil Engineering
 - Chair of Surveying and Remote Sensing
 - Institute of Environment and Earth Sciences
 - NEESPI Focus Research Center for Nonboreal Eastern Europe, University of West Hungary
 - Institute of Forest Resource Management and Rural Development
 - Chair of Landscape Sciences and Rural Development
- 

Topics

- Basic research
 - Remote sensing, Surveying
- Applied research
 - GIS applications of forest changes, measurements, ICLUC changes, DEM-s
- LCLUC for forest-climate interaction and climate change impact modelling
- LCLUC
 - for landscape history /character change
 - ecological network changes
 - correlation of LCLUC with social/human factors



LCLUC ASSESEMENT IN EUROPE

IP EU 6th Research
framework Program



2004-2008

Coordinator ZALF

+ 30 participant institutes



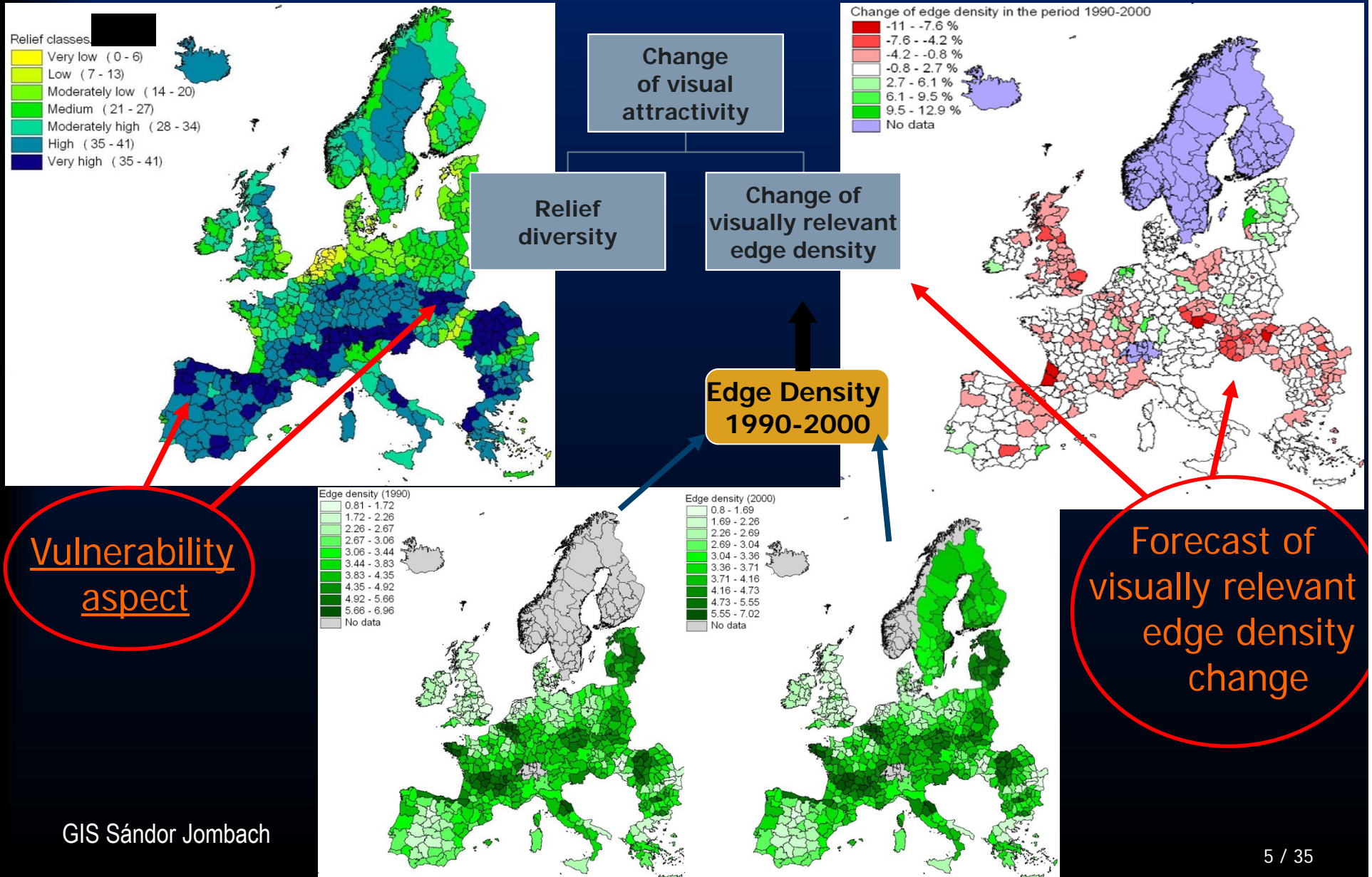
SENSOR Project

Tool for **ex-ante Sustainability Impact Assessment** of Environmental, Social and Economic Effects of **Multifunctional Land Use** in European Regions (EU27+2)

- **UWH: Development of land use relevant landscape indicators**
- Define threshold for them
 - **Continuity of land use**
 - **Visual attractivity – edge density**



INDICATOR METHODOLOGY AND DATA PROCESSING

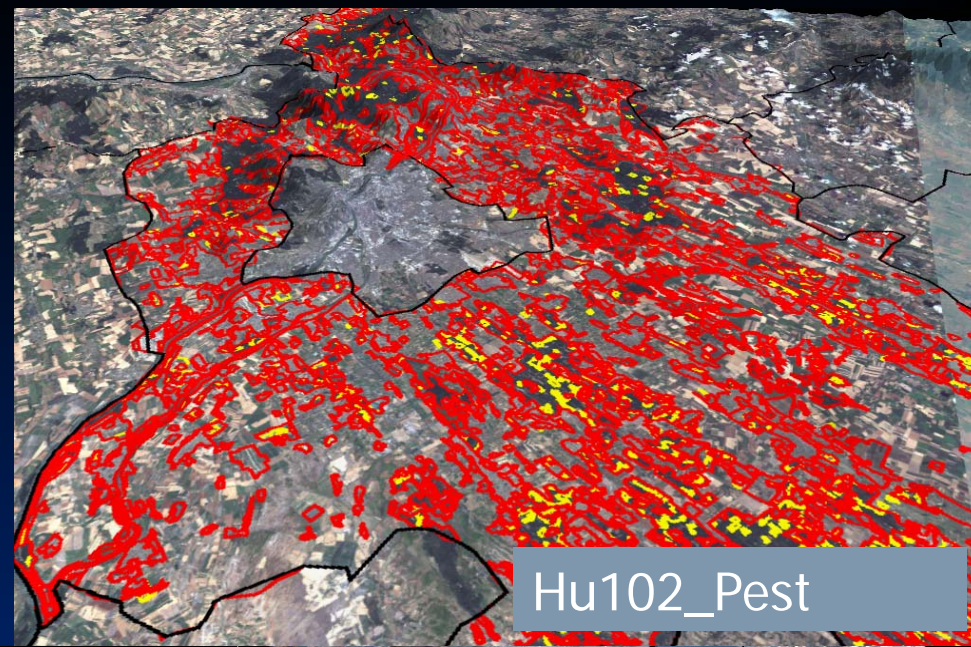


How to define thresholds?

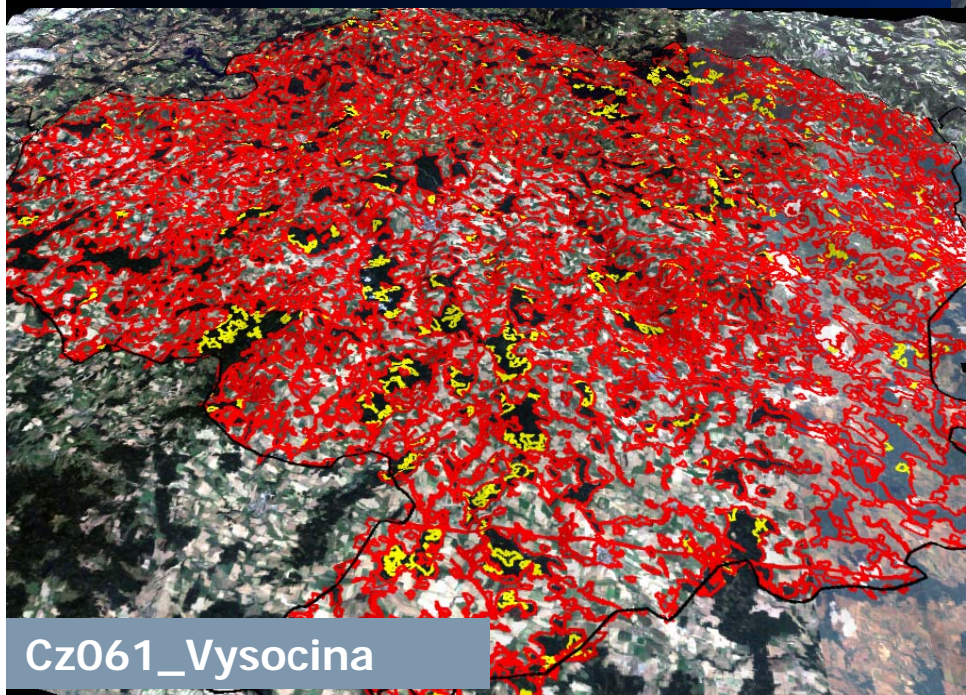
Examples of edge density change

Used dataset: IMAGE2000, CLC1990 and 2000,
Used software: ERDAS Imagine 8.6, ArcView 3.2

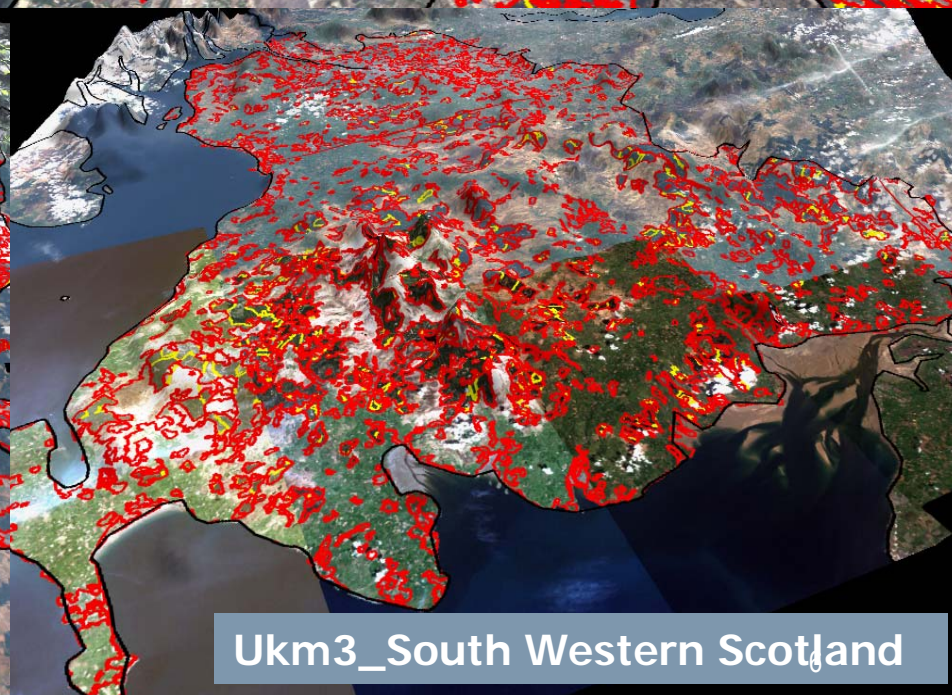
<http://www.eea.europa.eu/publications/COR0-landcover>
<http://image2000.jrc.ec.europa.eu/>



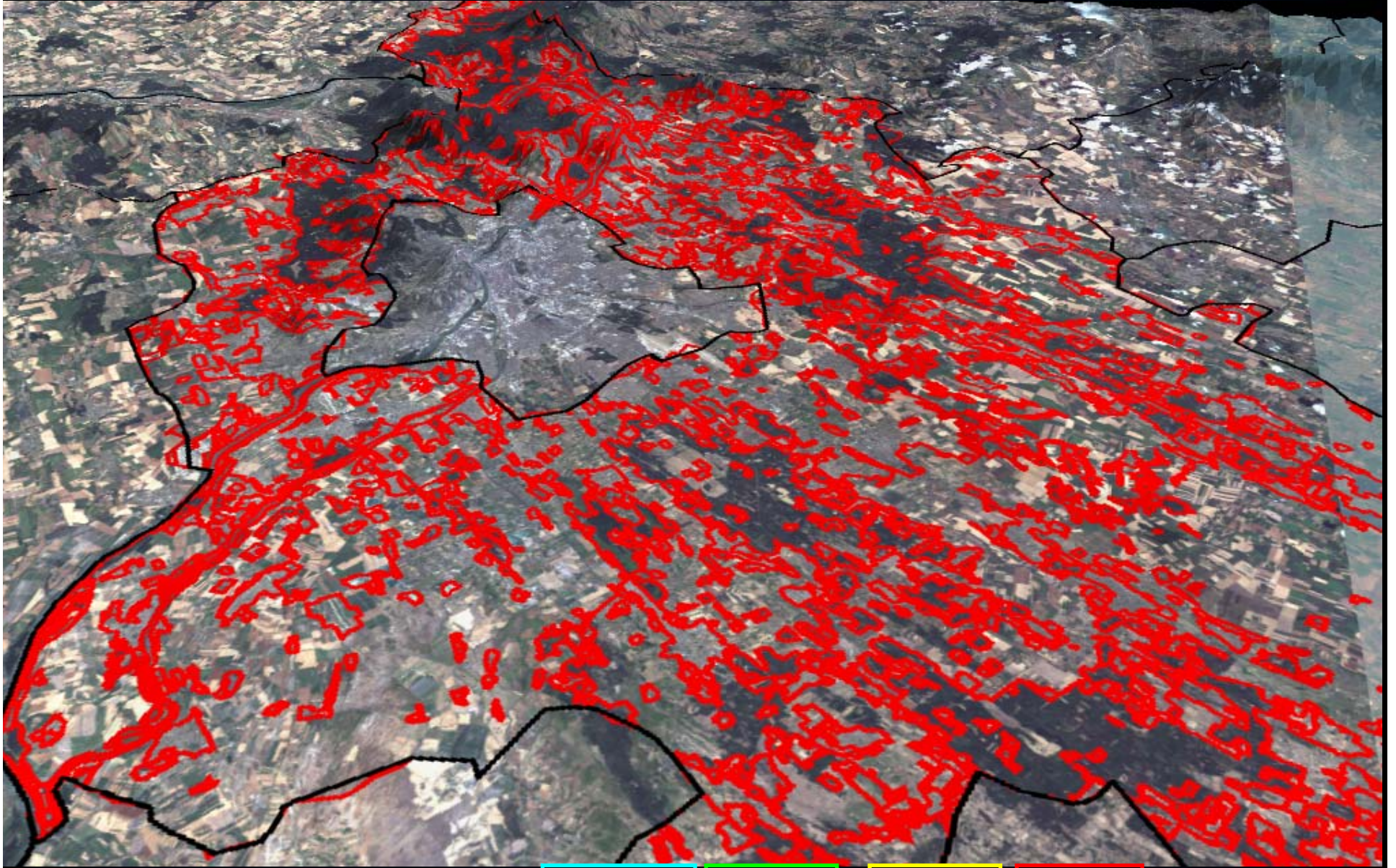
Hu102_Pest



Cz061_Vysocina



Ukm3_South Western Scotland



100%

-5%

-10%

-15%



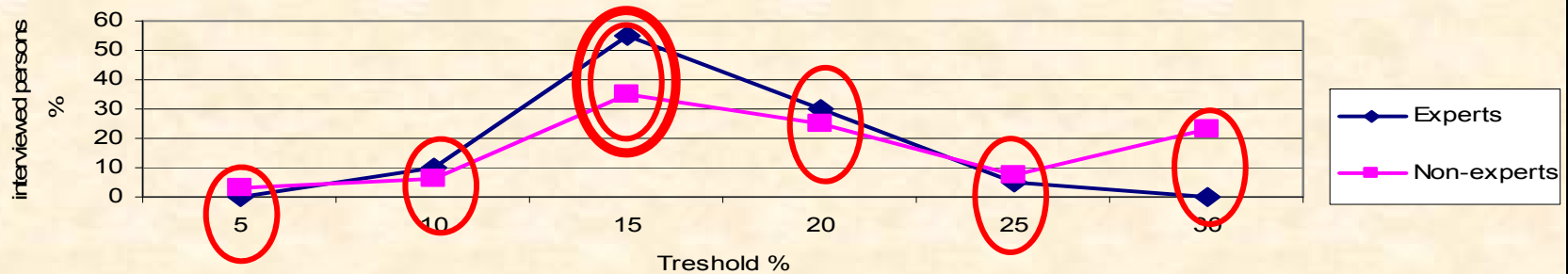
VISUALLY ATTRACTIVE EDGE DENSITY FROM CLC AND FROM CLUE OUTPUT FOR 2000.



INCREASE OF BUILT UP AREAS ON AGRICULTURAL LAND

LOWLAND

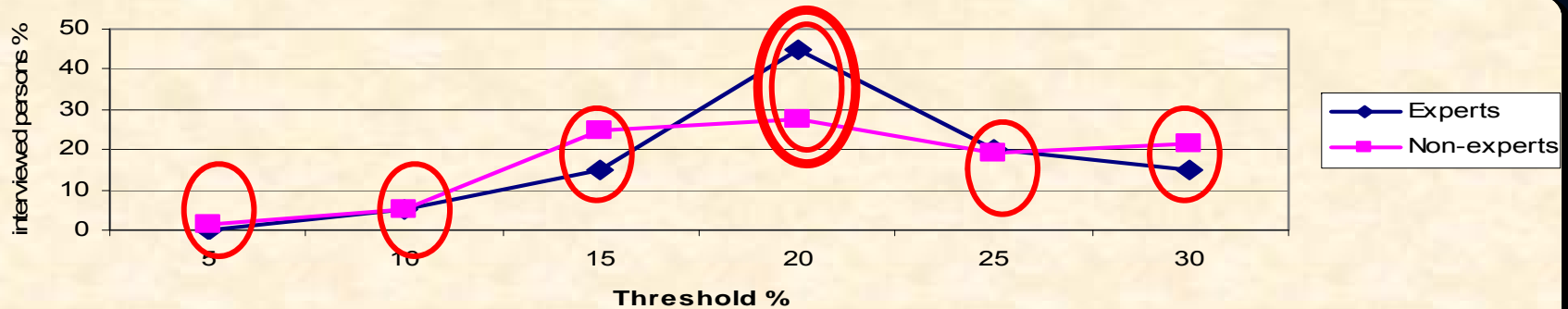
Threshold definition



INCREASE OF FOREST ON AGRICULTURAL AREAS

MOUNTAIN VALLEY

Threshold, the change % chosen by the significant majority of the answerers

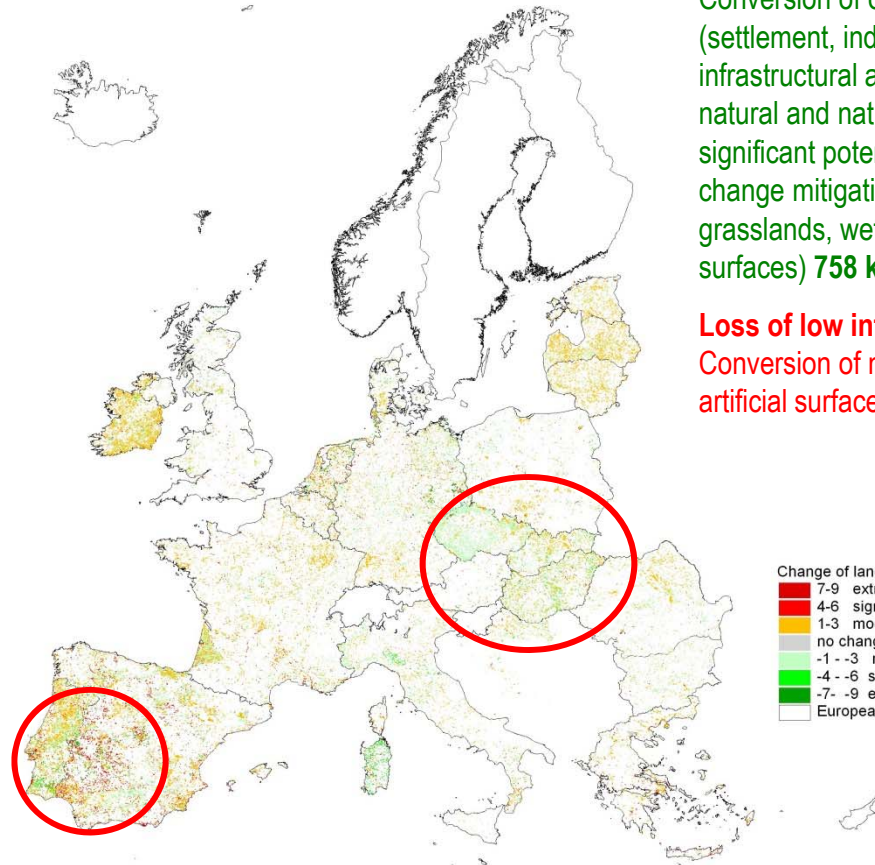


CLIMATE CHANGE MITIGATION POTENCIAL OF THE LAND-COVER INTENSITY IN EUROPE 1990-2000

BASED on CLC 100 dataset

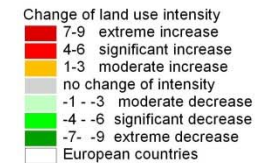
Corine Land Cover Code	Description Corine Land Cover Category	Land use intensity*
111	Continuous urban fabric	9
112	Discontinuous urban fabric	8
121	Industrial and commercial units	9
122	Road and rail networks	9
123	Port areas	9
124	Airports	10
131	Mineral extraction sites	10
132	Dump sites	10
133	Construction sites	10
141	Green urban areas	6
142	Sport and leisure facilities	8
211	Non-irrigated arable land	8
212	Permanently irrigated land	9
213	Rise fields	9
221	Vineyards	8
222	Fruit trees and berry plantations	8
223	Olive groves	5
231	Pastures	5
241	Annual crops with permanent crops	7
242	Complex cultivation patterns	7
243	Land principally occupied by agriculture	6
244	Agro forestry areas	6
311	Broad leaved forests	1
312	Coniferous forest	1
313	Mixed forest	1
321	Natural grassland	1
322	Moors and heathland	1
323	Sclerophyllous vegetation	1
324	Transitional woodland shrub	2
331	Beeches, dunes and sand plains	1
332	Bare rocks	1
333	Sparsely vegetated area	1
334	Burned area	3
411	Inland marches	1
412	Peatbogs	1
421	Salt marches	2
423	Salines	6
422	Intertidal flats	2
511	Water courses	2
512	Water bodies	2
521	Costal lagunes	3
522	Estuaries	3
523	Sea and ocean	3

* Defined by Konkoly-Gyuró É - Nagy D. 2006..



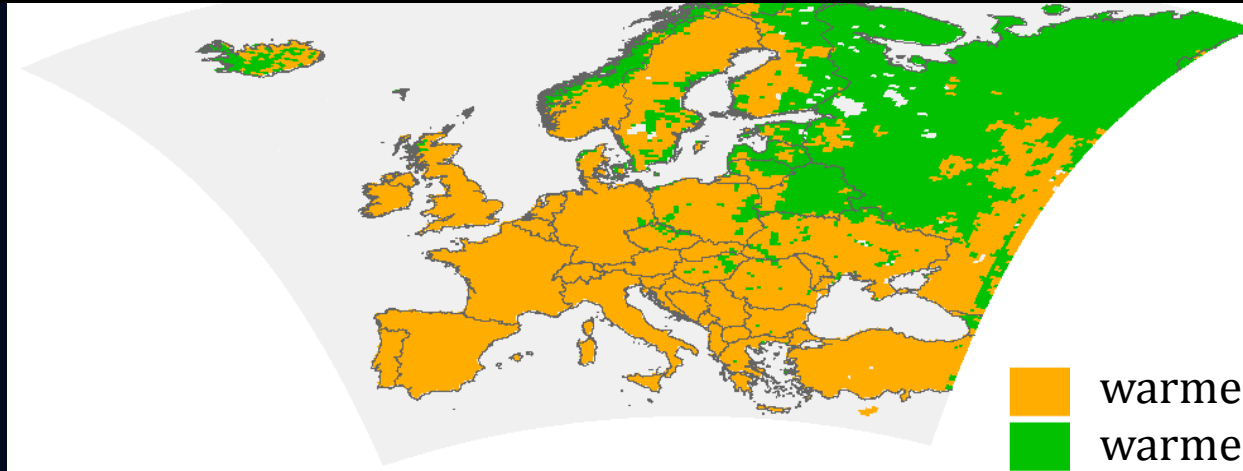
Gain in low intensity areas:
Conversion of of artificial surfaces (settlement, industrial and infrastructural areas) into semi natural and natural areas having a significant potencial of climate change mitigation (forest, grasslands, wetlands and water surfaces) **758 km2**

Loss of low intensity areas:
Conversion of natural areas into artificial surfaces **8828 km2**



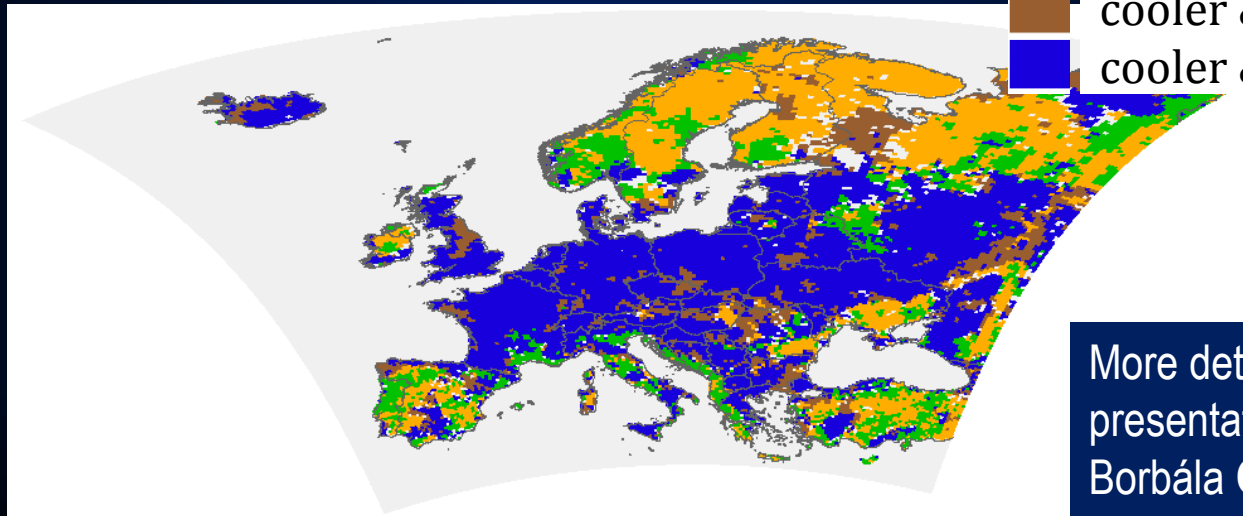
CLIMATE CHANGE MITIGATING POTENTIAL OF AFFORESTATION – CASE STUDIES (GÁLOS et al. 2013)

Effect of GHG concentration change 2071-2090 vs. 1971-1990



- warmer & dryer
- warmer & moister
- cooler & dryer
- cooler & moister

Effect of afforestation 2071-2090



More details in presentation of **Borbála Gálos**



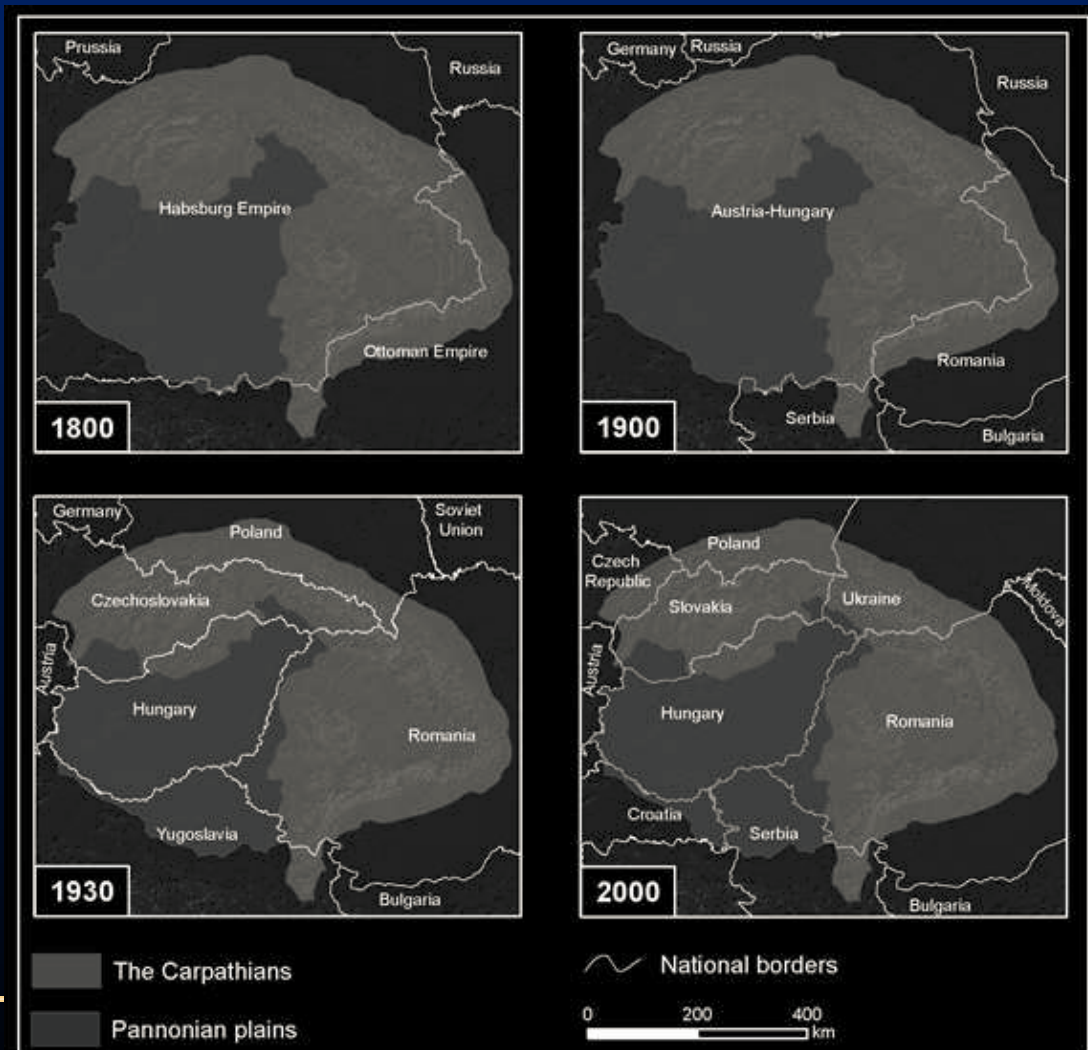
Method: regional climate modelling

LCLUC CASE STUDIES OF MACRO-REGIONS IN EUROPE

200 YEARS LAND USE CHANGE IN THE CARPATHIAN BASIN



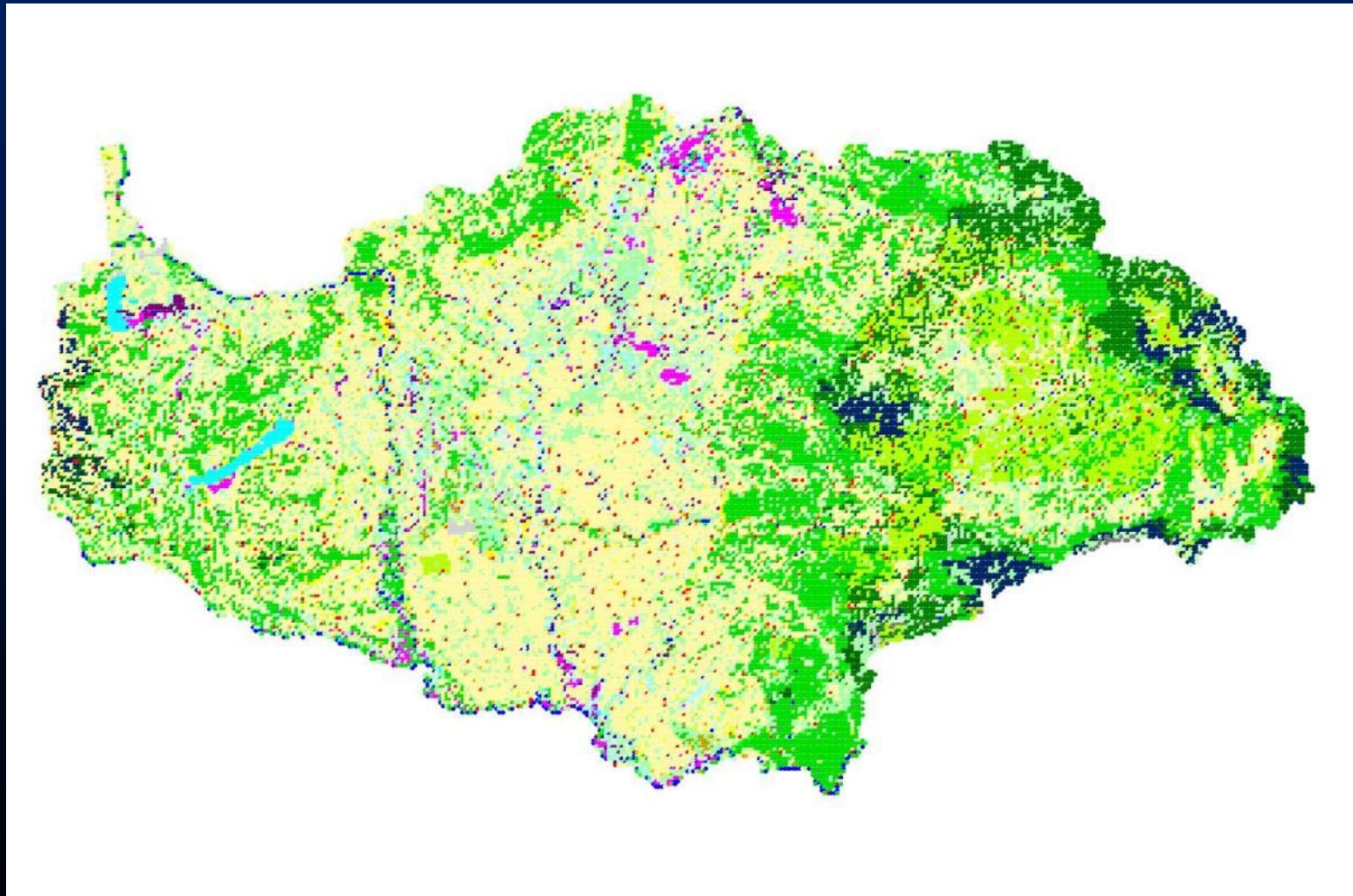
Related to the presentation of Catalina Munteanu



OVERVIEW FORESTRY MAP OF HUNGARY RELIEF, CREATED FOR THE WORLD EXPO, 1900 PARIS

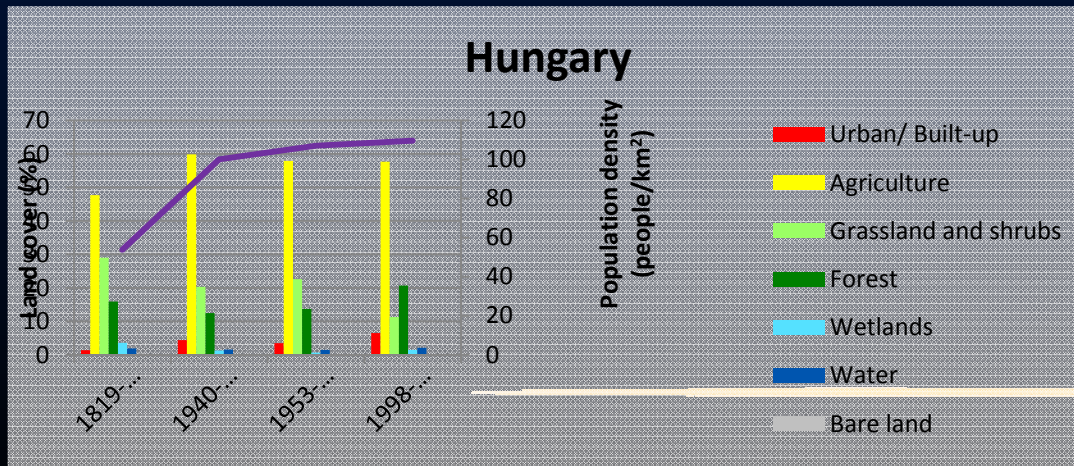
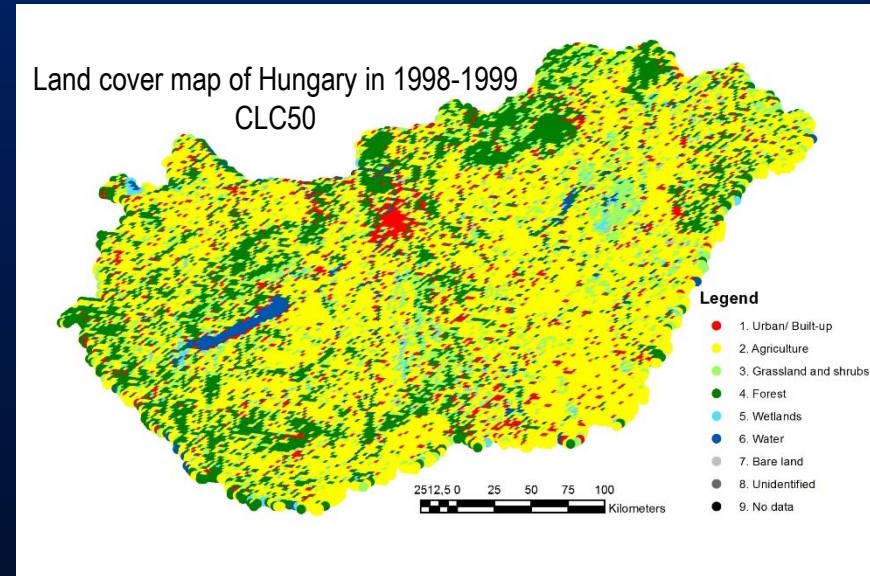
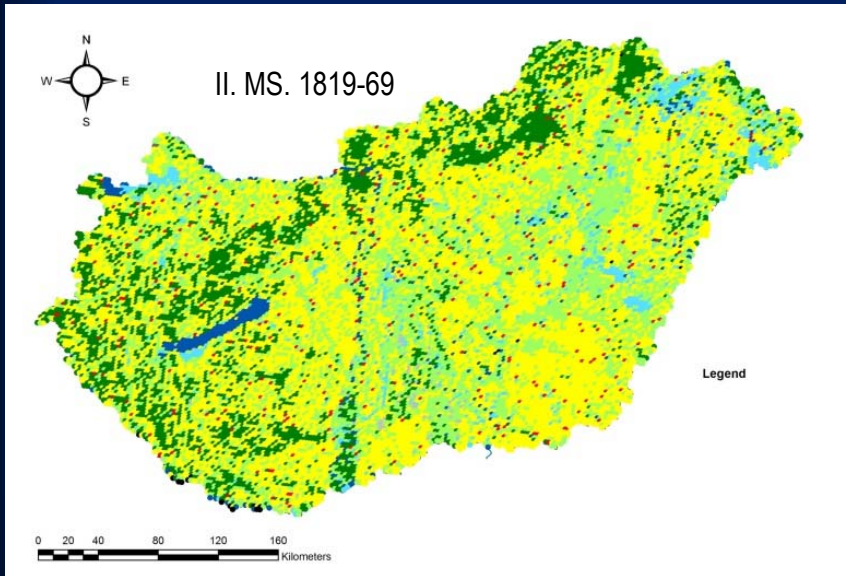


II. MILITARY SURVEY 1806-1869 HUNGARIAN KINGDOM AND TRANSYLVANIA

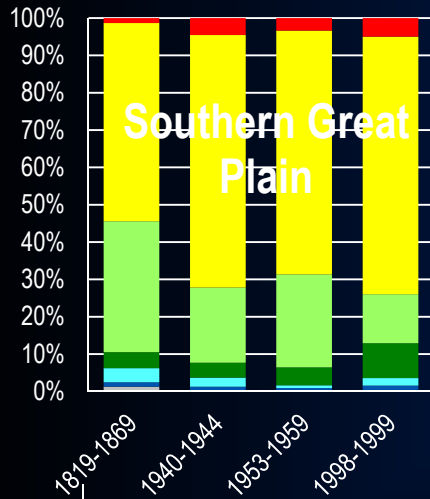
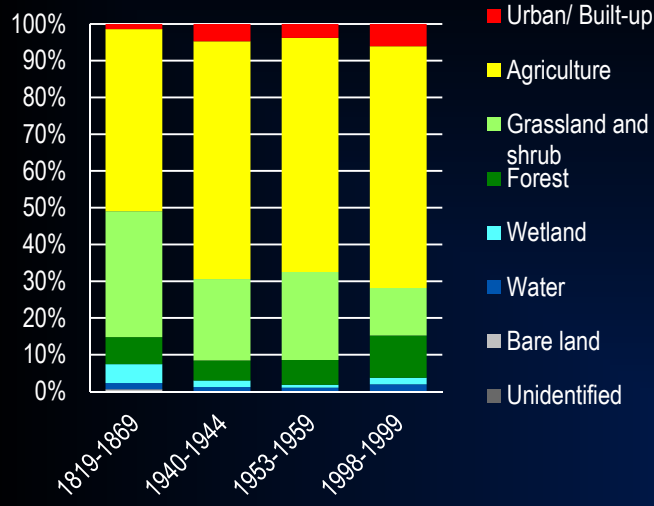


LCLUC CASE STUDIES OF HUNGARY

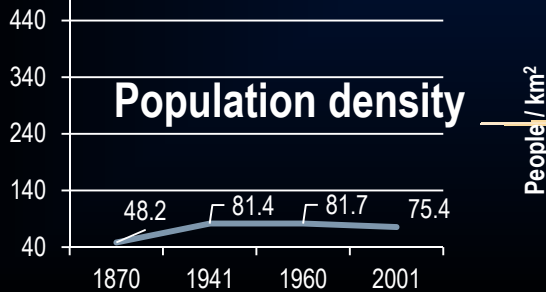
AS PART OF THE CARPATHIAN BASIN PROJECT



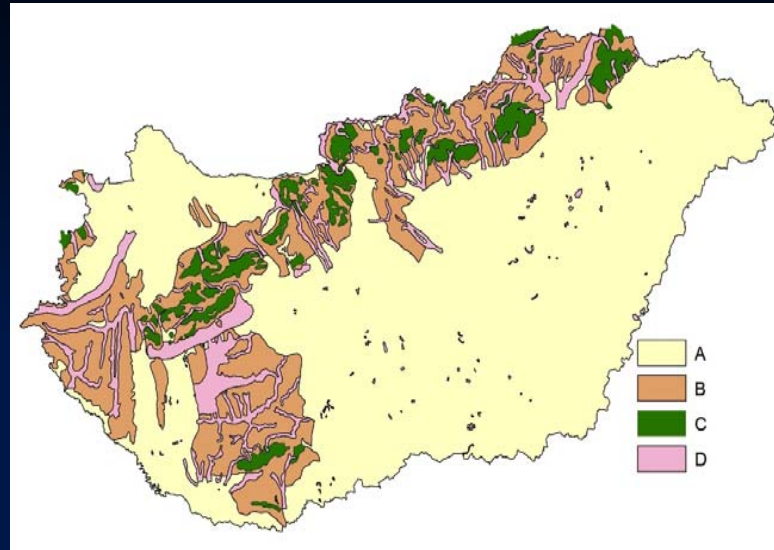
A - Plains



Population density



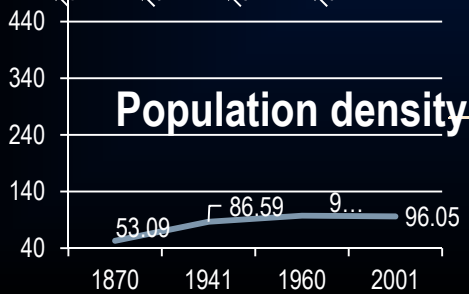
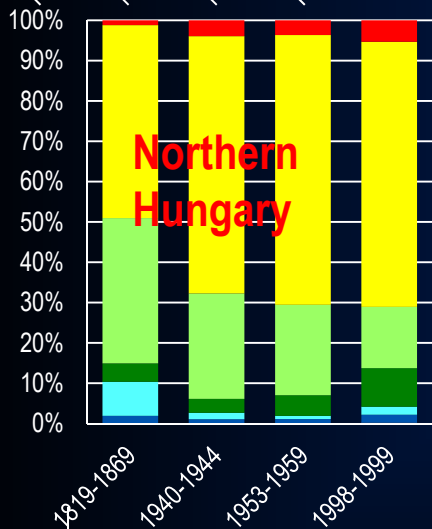
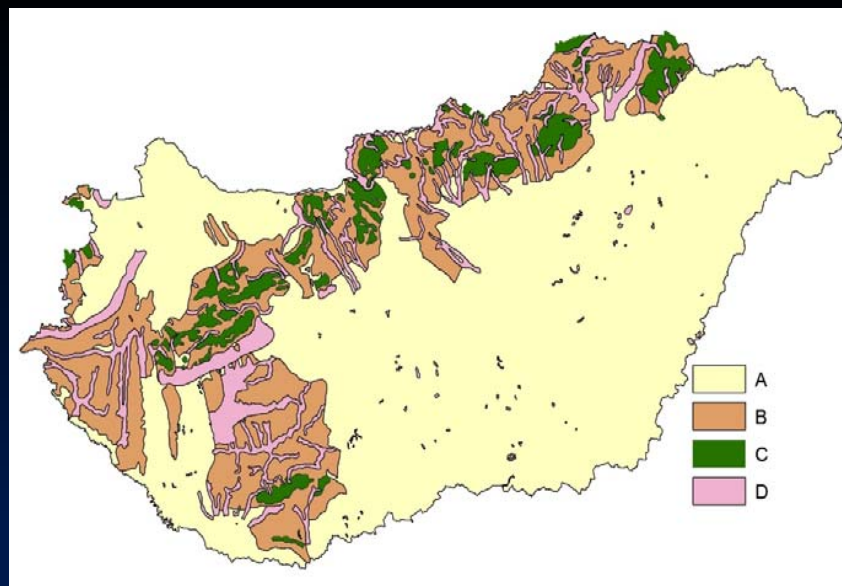
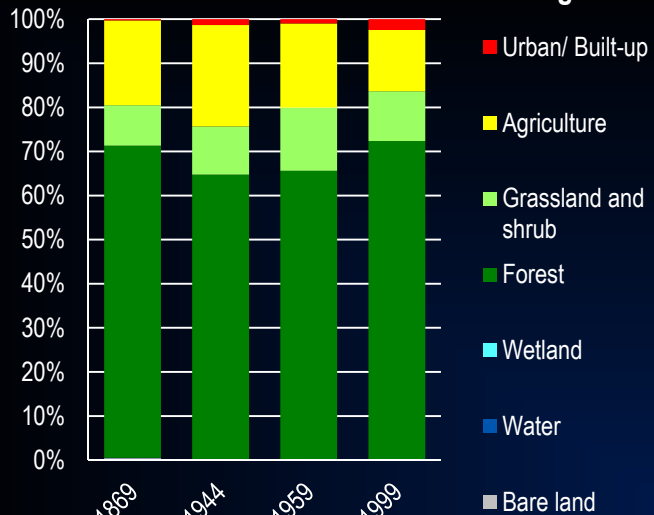
Main naturalgeographical landscape types of Hungary



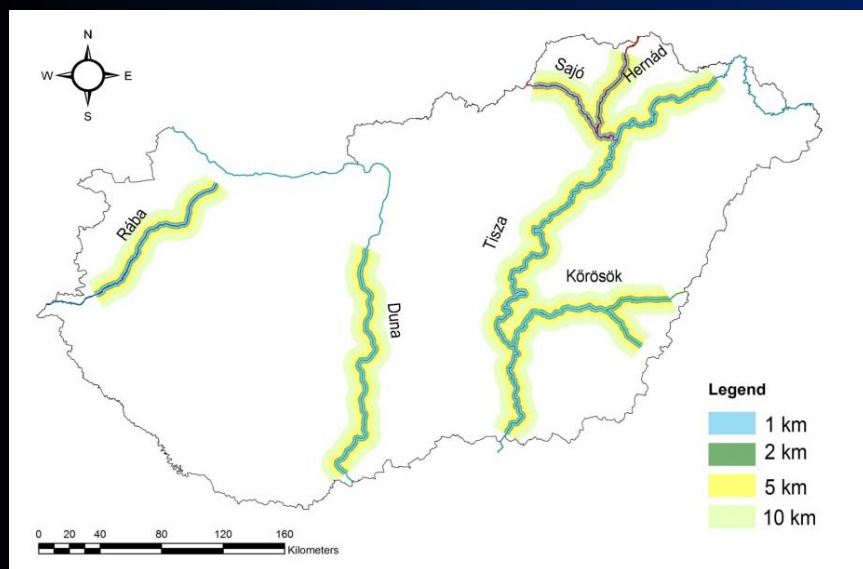
- A - Plain with moderately continental climate; dominantly used by agriculture**
- B - Erosion hills; dominantly used by agri- and silviculture and locally by industry**
- C - Forested mountains in of medium height**
- D - Some peculiar landscapes**



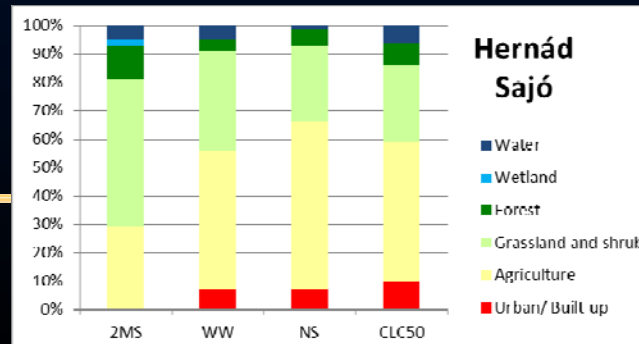
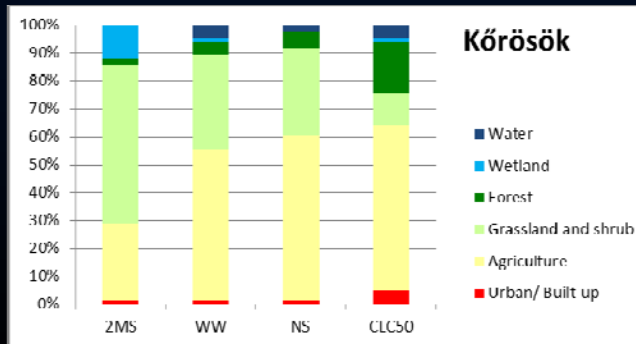
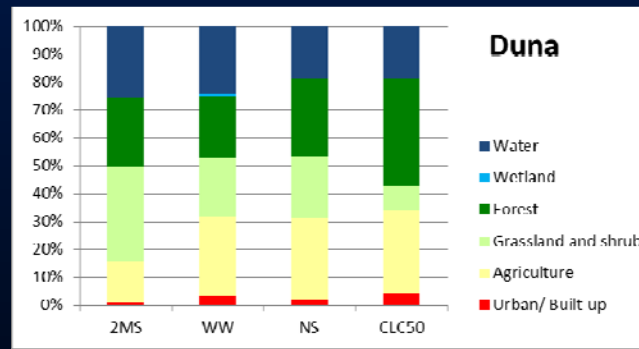
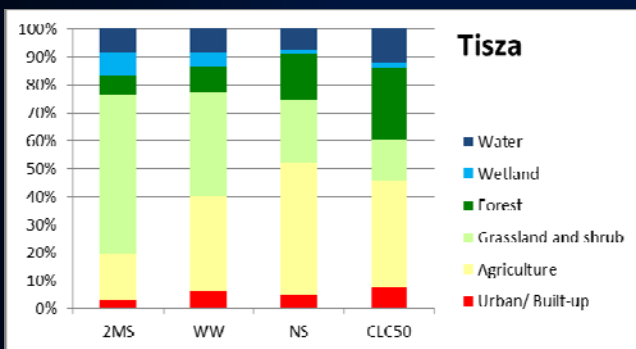
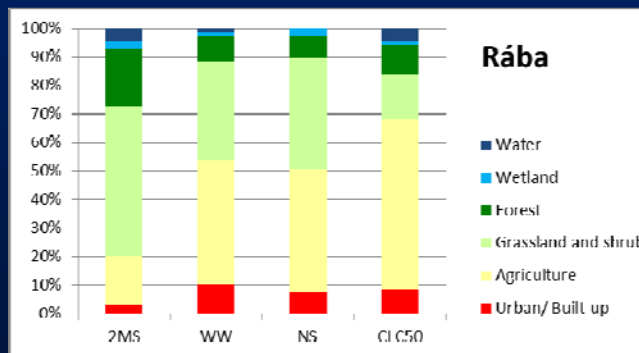
C - Forested mountains of medium height



LCLUC ALONG THE RIVERS OF HUNGARY 1869-2006



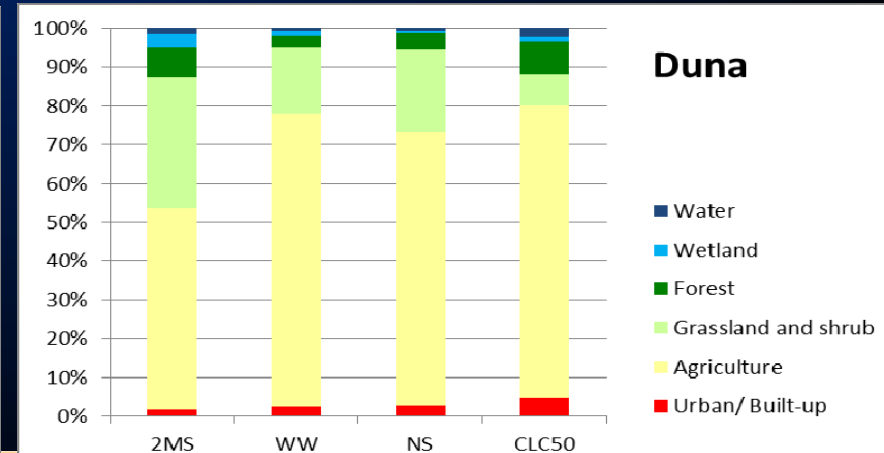
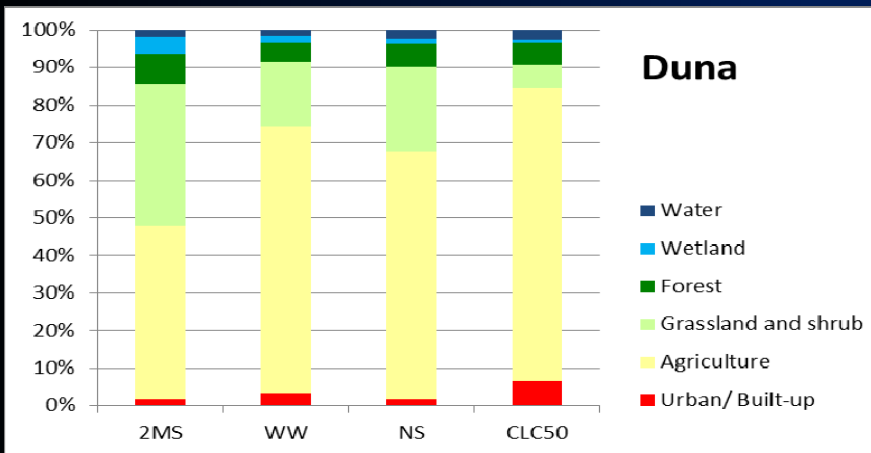
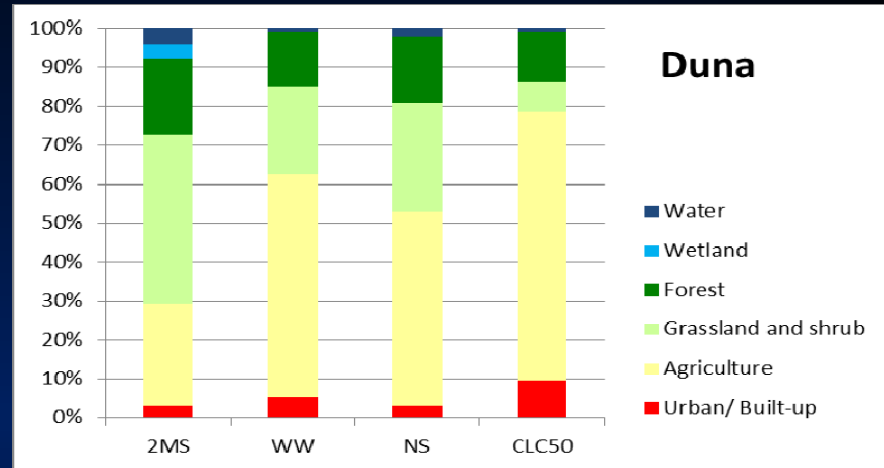
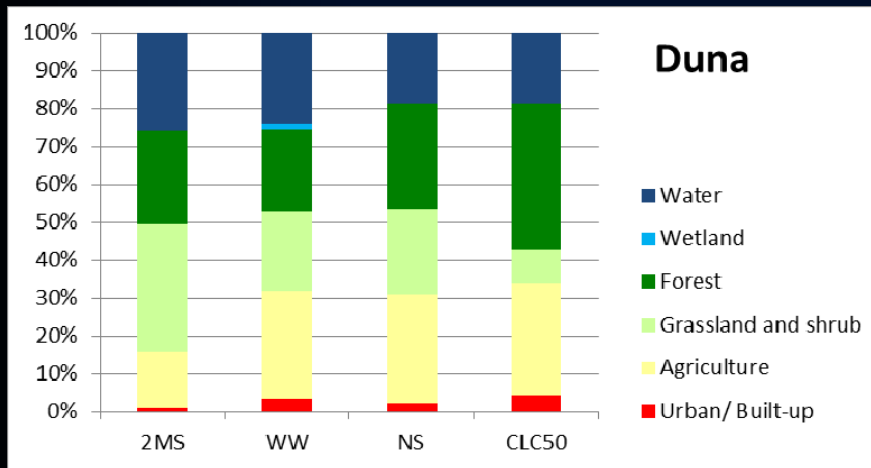
1 km
Buffer
zone



LCLUC ALONG THE DANUBE IN HUNGARY 1869-2006

1km

2km



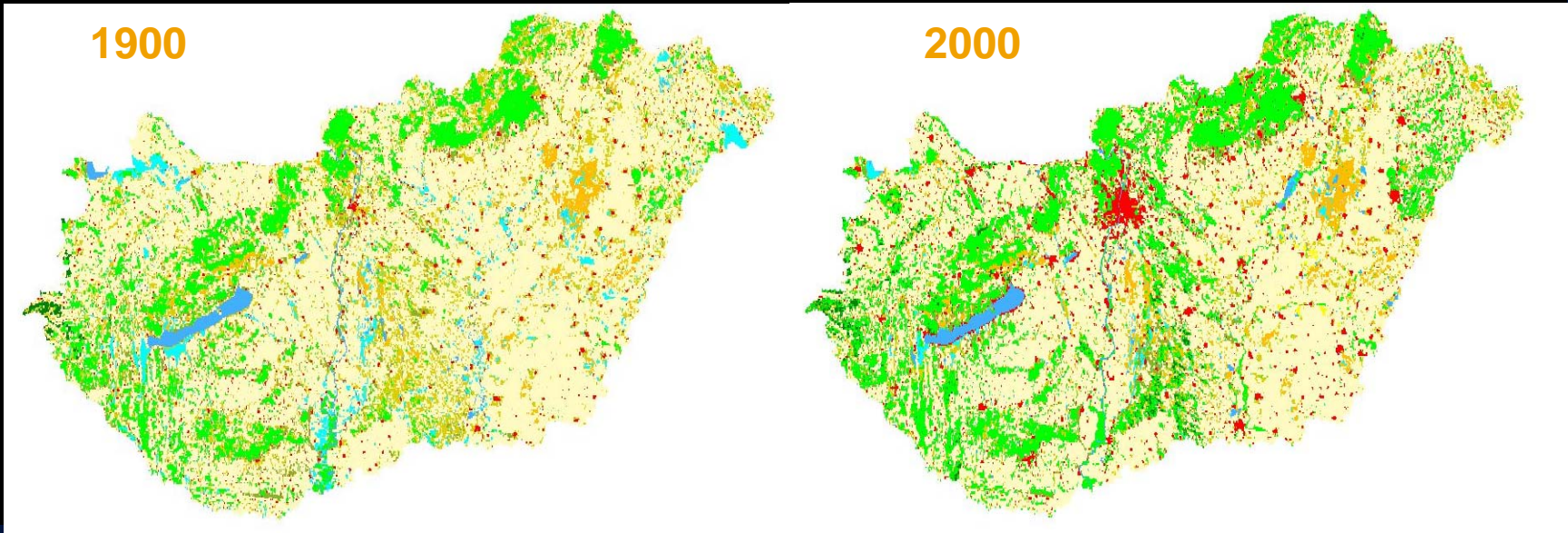
5km

10km

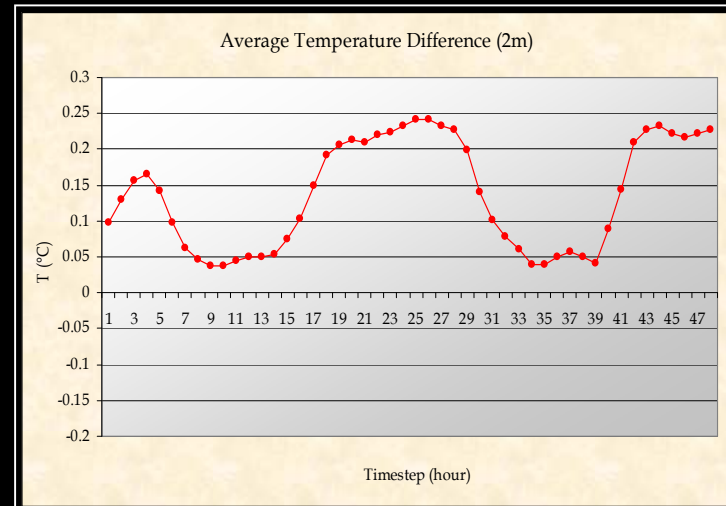
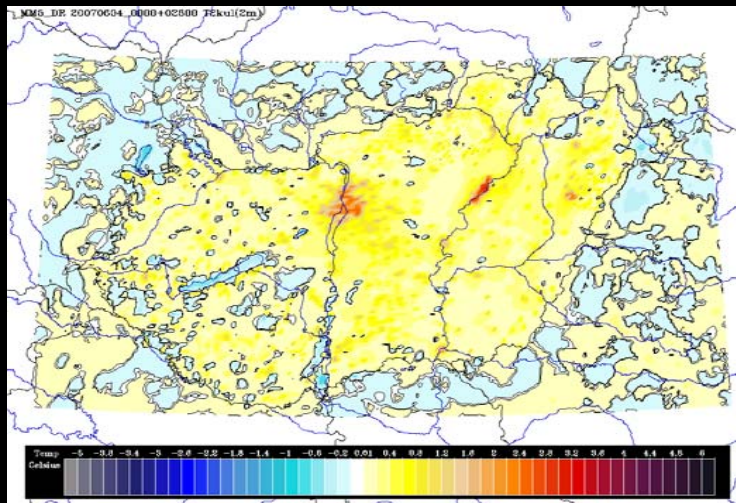


CLIMATIC EFFECTS OF LAND USE CHANGE IN HUNGARY

(Drüzler et al. 2010)



Urbanisation effect visible → increase of temperature



Temperature difference 2000 vs. 1900

A DECISION SUPPORT SYSTEM FOR CLIMATE CHANGE ADAPTATION IN RAINFED SECTORS OF AGRICULTURE FOR CENTRAL EUROPE

- **Aim:** information about **land use and management options** for adaptation and mitigation of the climate change impact – especially in the case of **threatened semi-natural forests and non-irrigated agriculture** in low-elevation regions in Southeast Europe
- **Expected result:** ~~GIS-supported information about the regional and local risks~~ regarding climate change until 2100:
 - e.g. land cover/use and expectable changes, potential production, water and carbon cycle, biodiversity and other ecosystem services, potential pests and diseases, etc.



See more at Poster : Mátyás et al. 2013



supported by the TÁMOP-4.2.2.A-11/1/KONV-2012-0013 („Agroclimate”)
joint EU-national research project

LCLUC CASE STUDIES OF MICRO-REGIONS



WP 1: Management and coordination
WP 2: Communication, knowledge management and dissemination

WP 3: Eco-topologies – Inventories of ecological networks

WP 4: Histories – History of ecological networks

WP 5: Ecologies – Ecosystem services and biodiversity

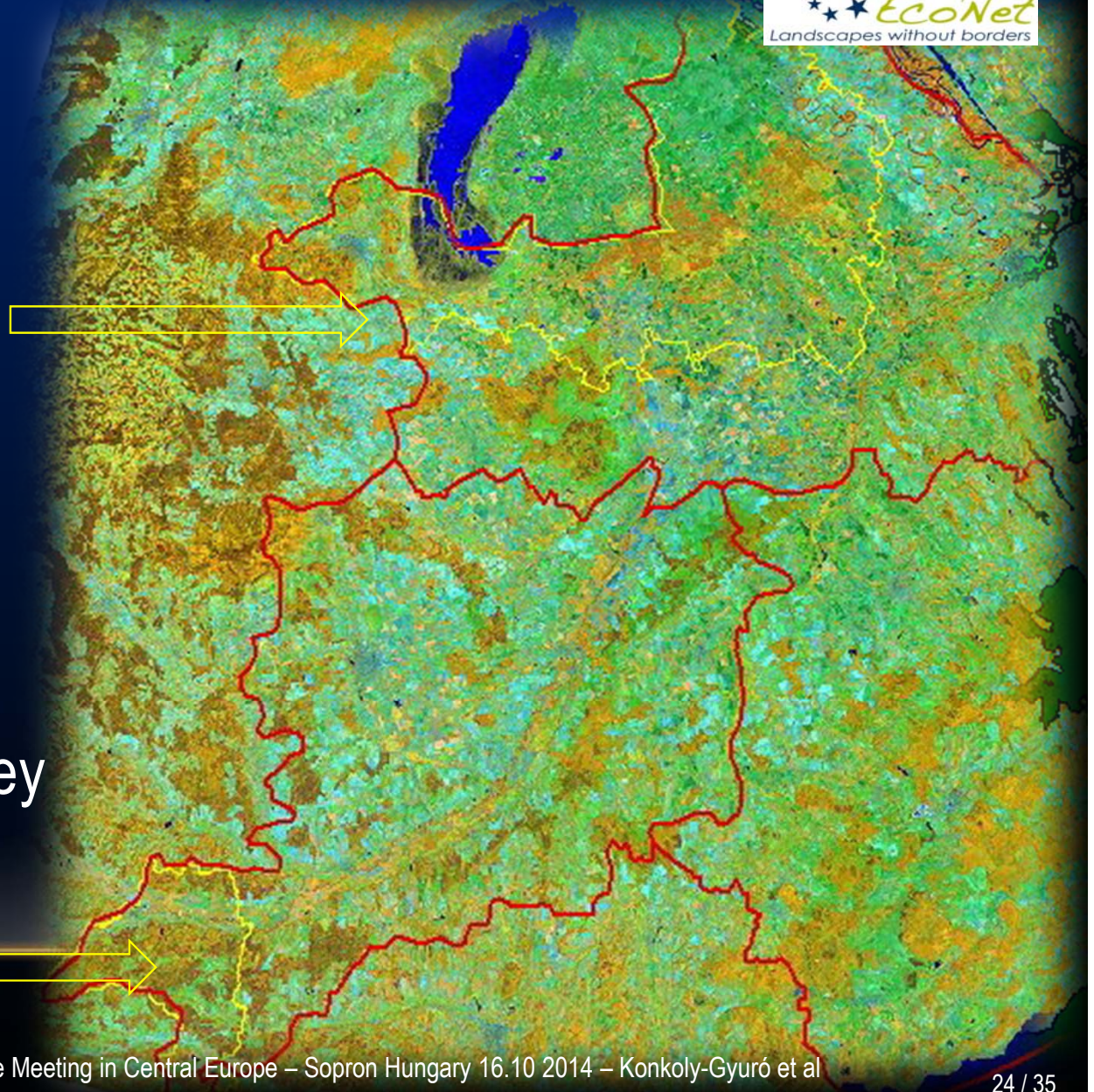
WP 6: Identities and strategies – Raising awareness



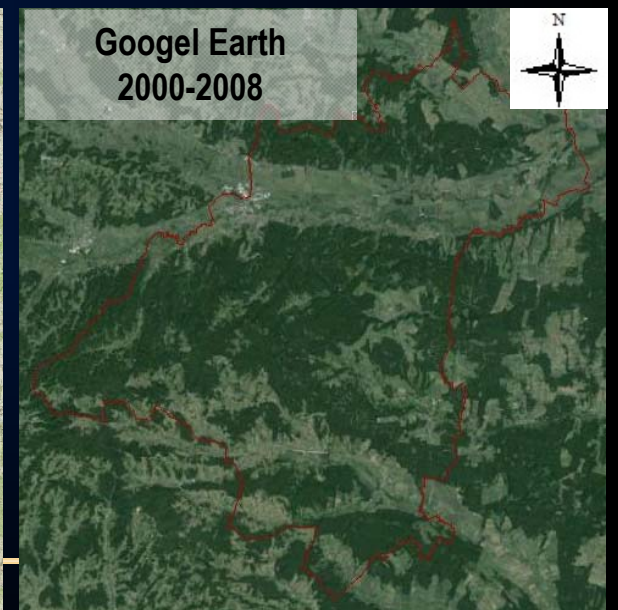
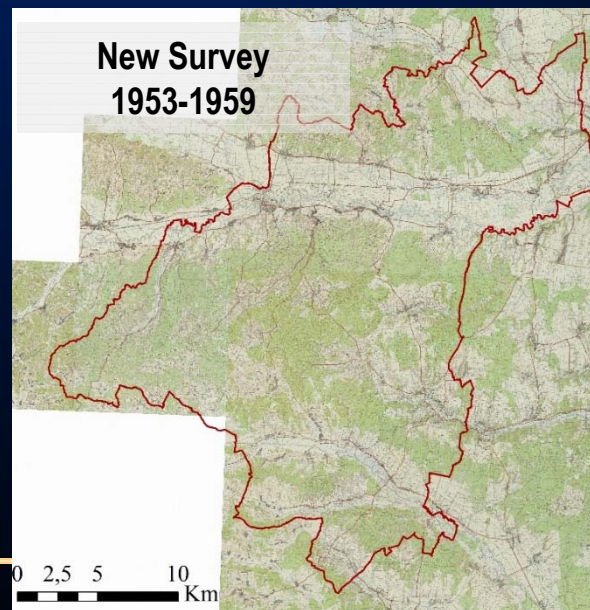
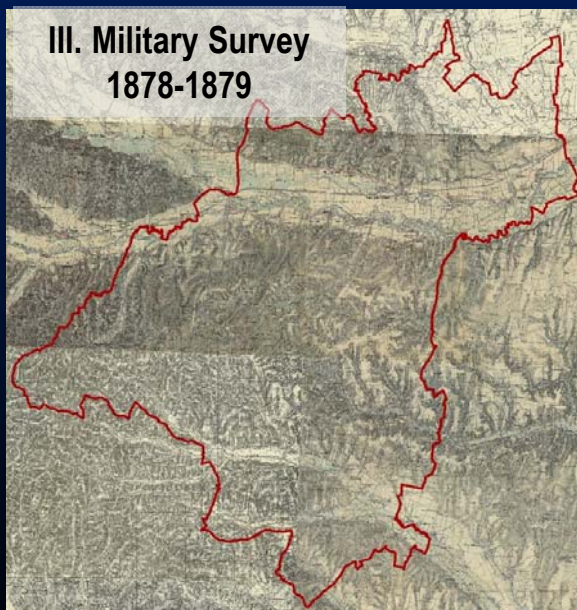
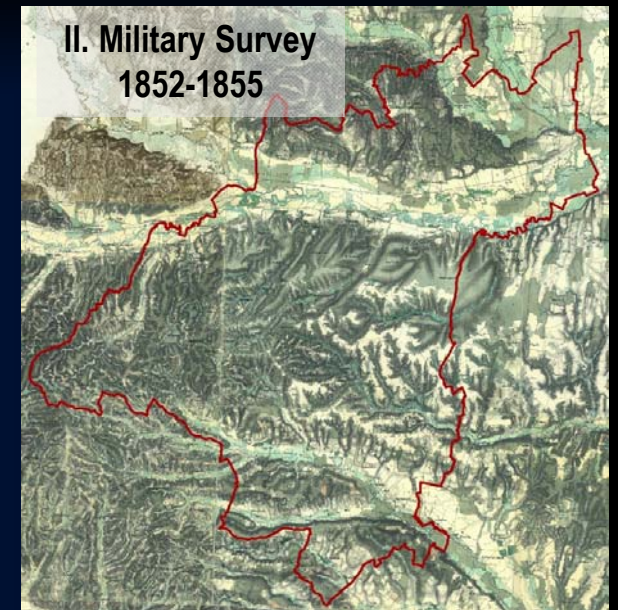
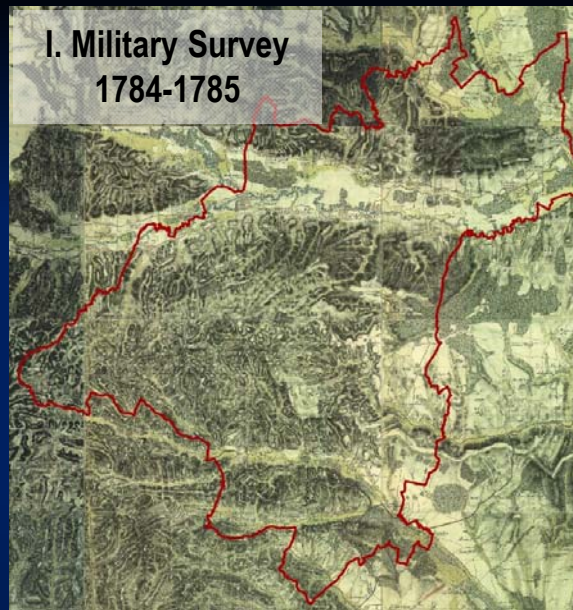
STUDY AREAS IN HUNGARY



- Sopron, Fertő-Hanság basin
- Őrség,
- Upper-Rába-valley



LCLUC IN ÖRSÉG TRANSBOUNDARY AREA 1784-2008

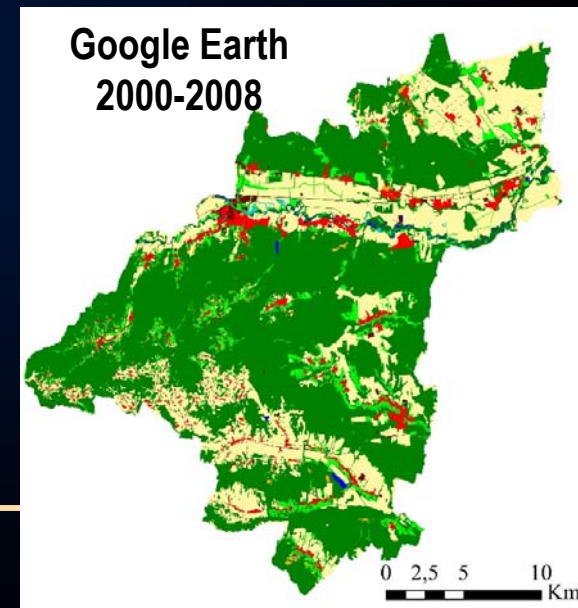
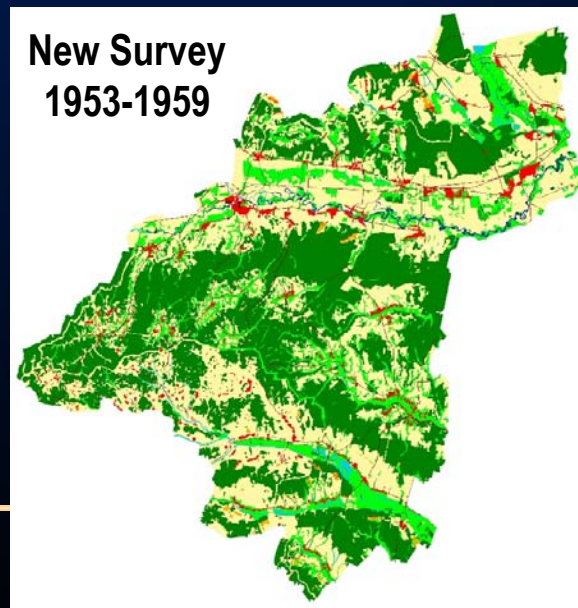
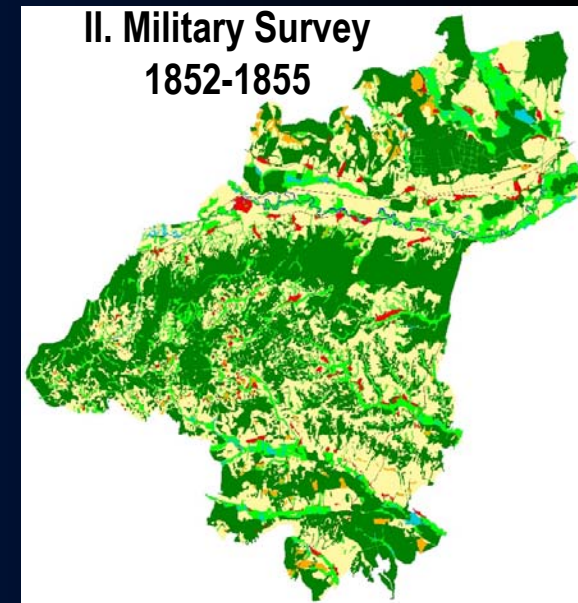
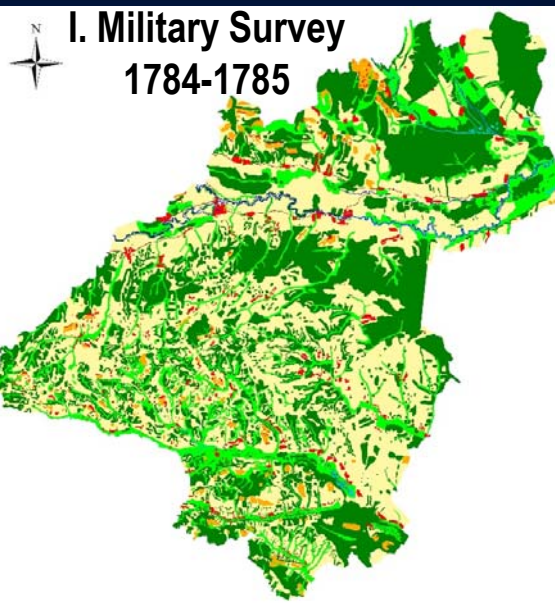


LCLUC IN ŐRSÉG TRANSBOUNDARY AREA 1784-2008



Legend

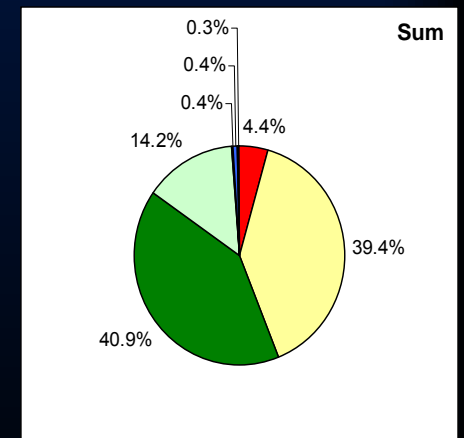
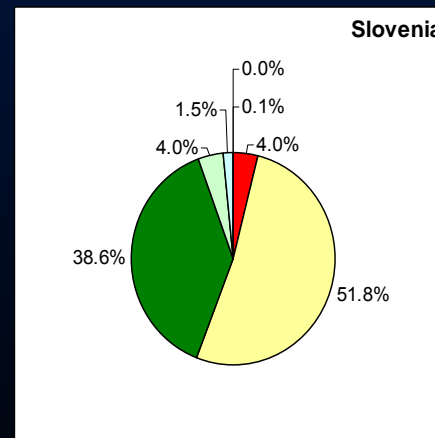
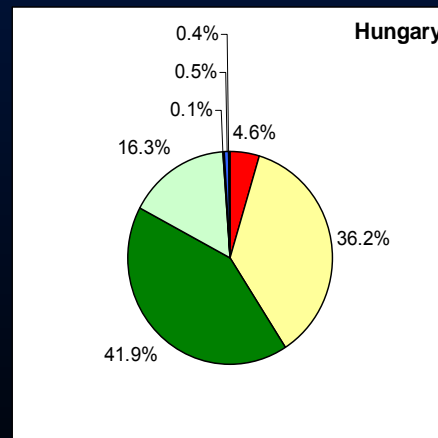
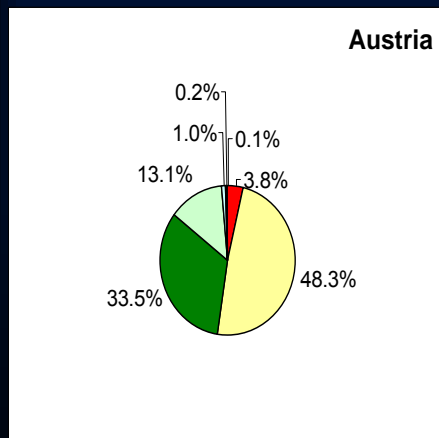
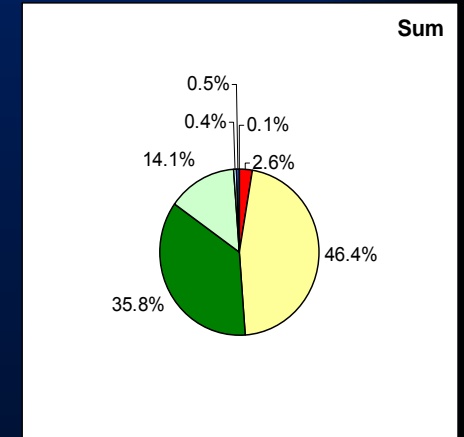
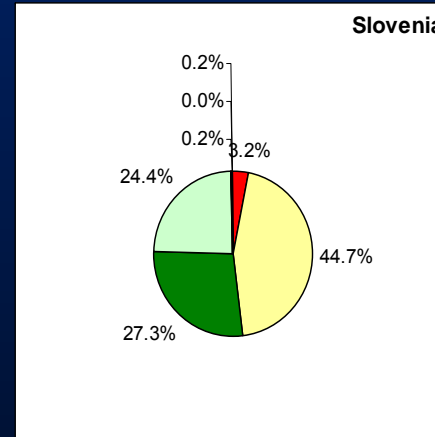
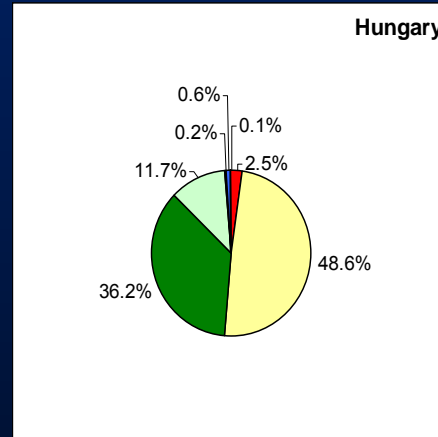
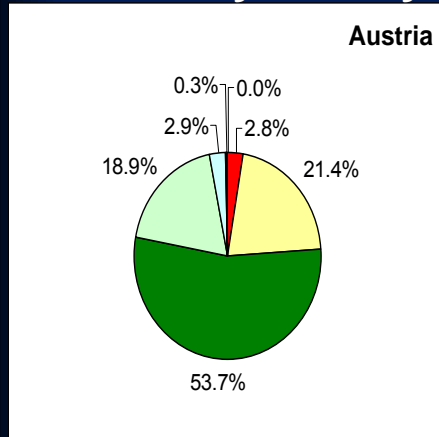
- Continuous urban area
- Discontinuous urban area
- Arable land
- Orchard, vineyard
- Forest
- Grassland
- Wetland
- Open water surface



AREAL CHANGES OF THE COUNTRIES



I. Military survey

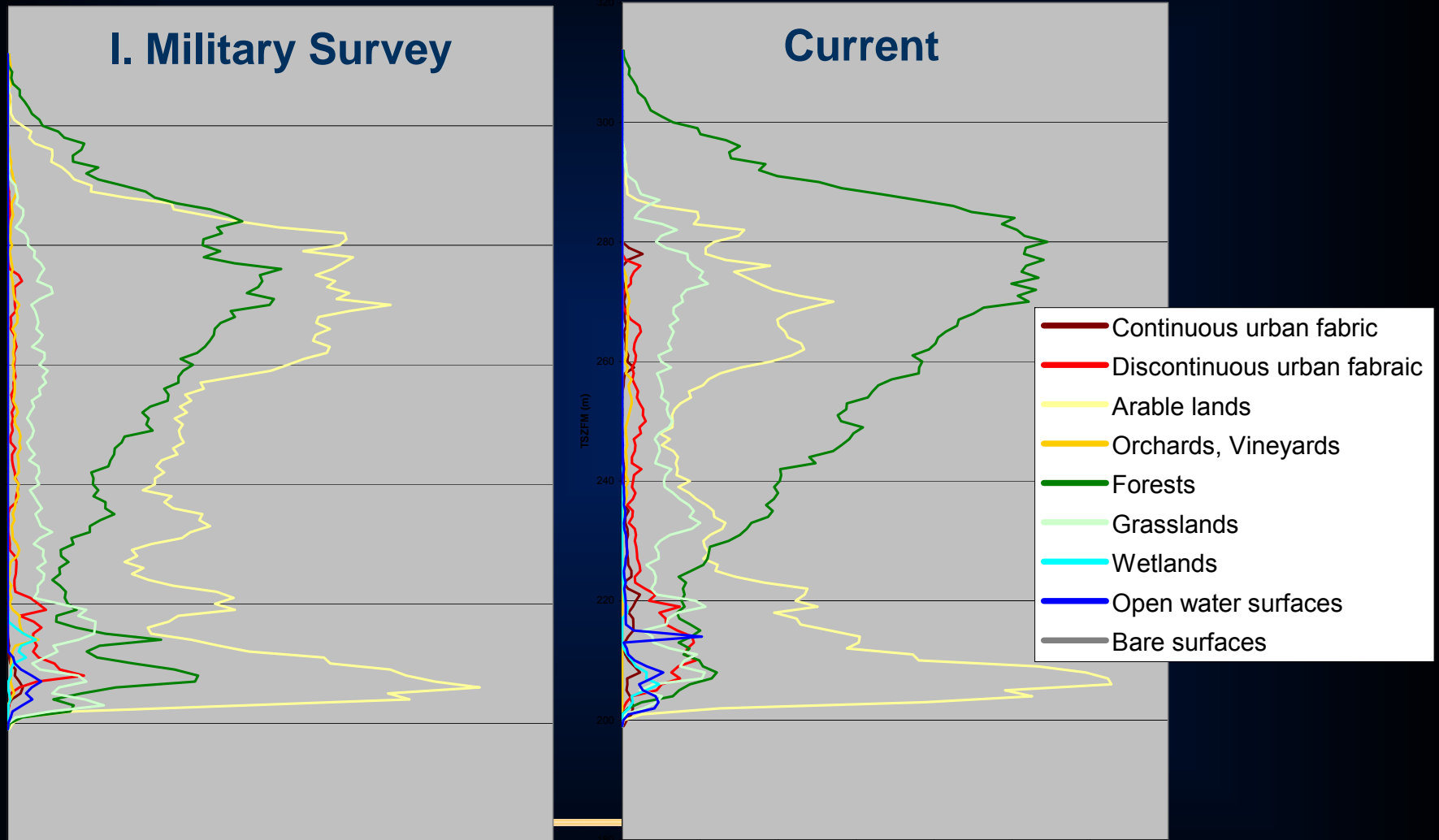


'New' survey



Complex analysis - Őrség

Vertical distributions of the land cover

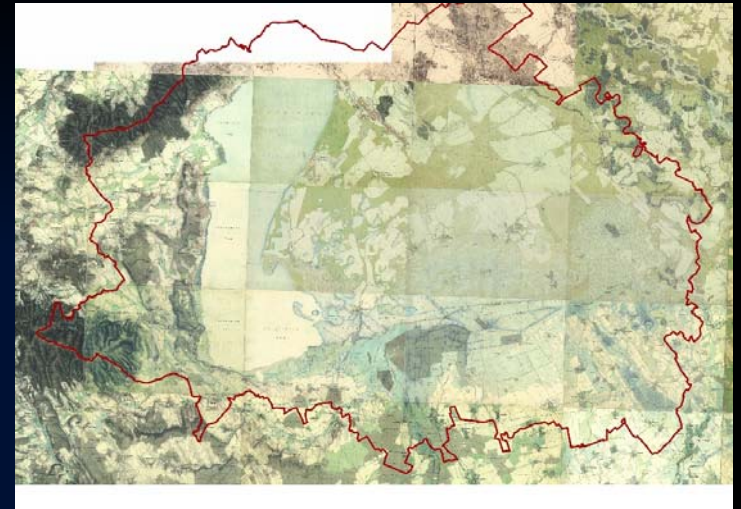


LCLUC
1784-2006
case study

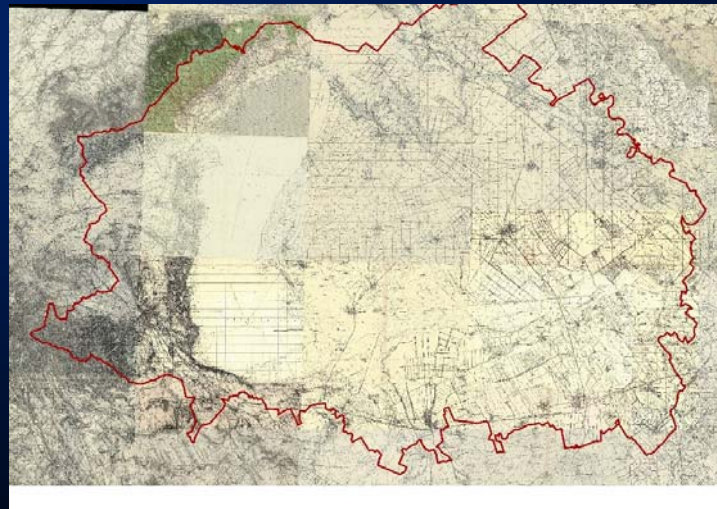
FERTŐ-
HANSÁG
transboundary
area



I. Military Survey 1784



II. Military Survey 1840-1847



III. Military Survey 1872-1880



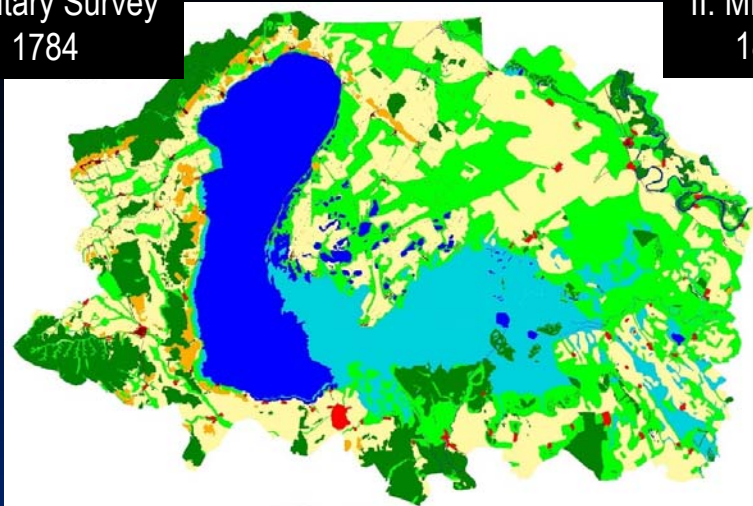
Rapid Eye 2009



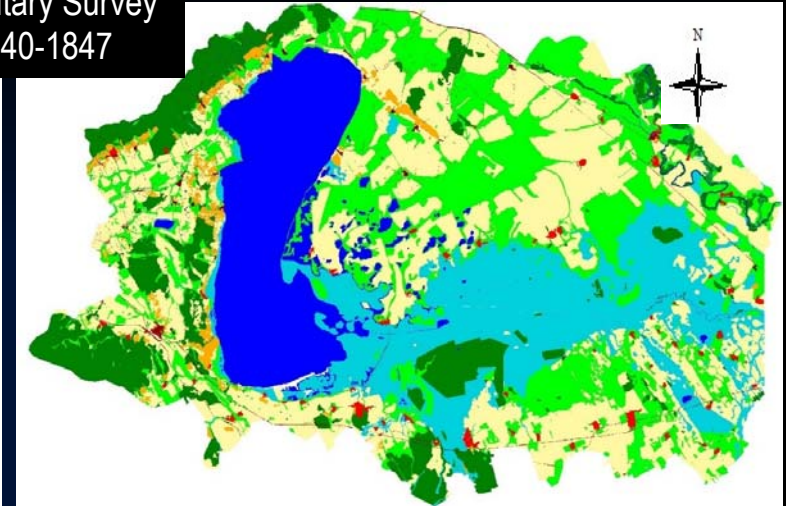
LCLUC
1784-2006
case study

FERTŐ-
HANSÁG
transboundary
area

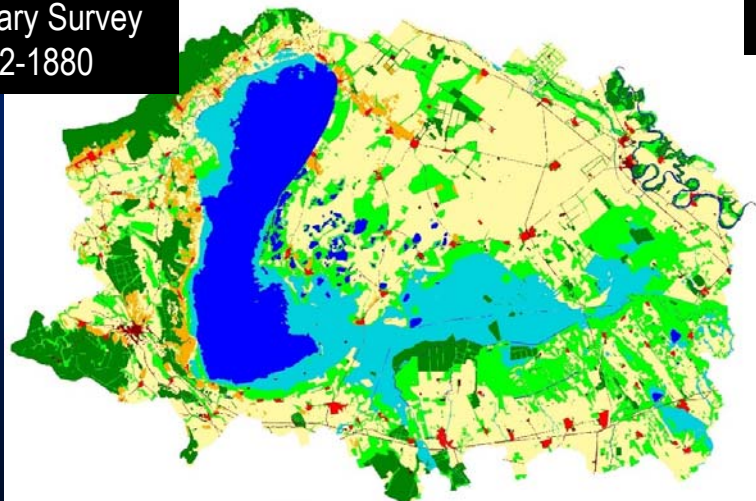
I. Military Survey
1784



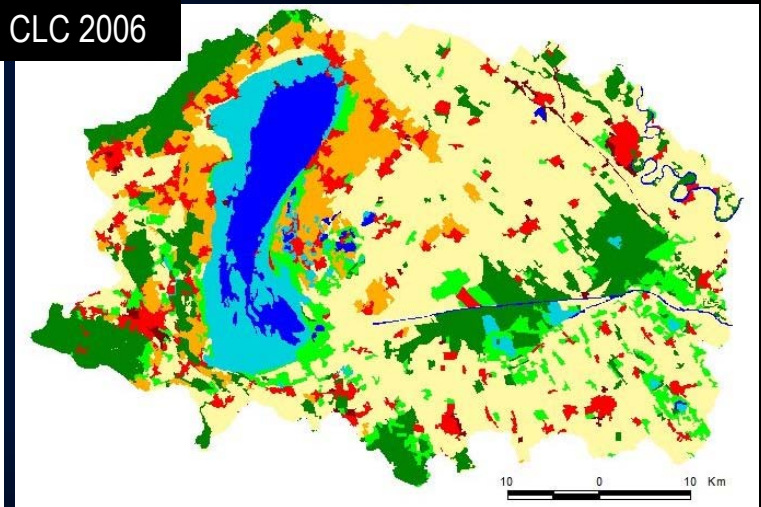
II. Military Survey
1840-1847



III. Military Survey
1872-1880



CLC 2006



Legend

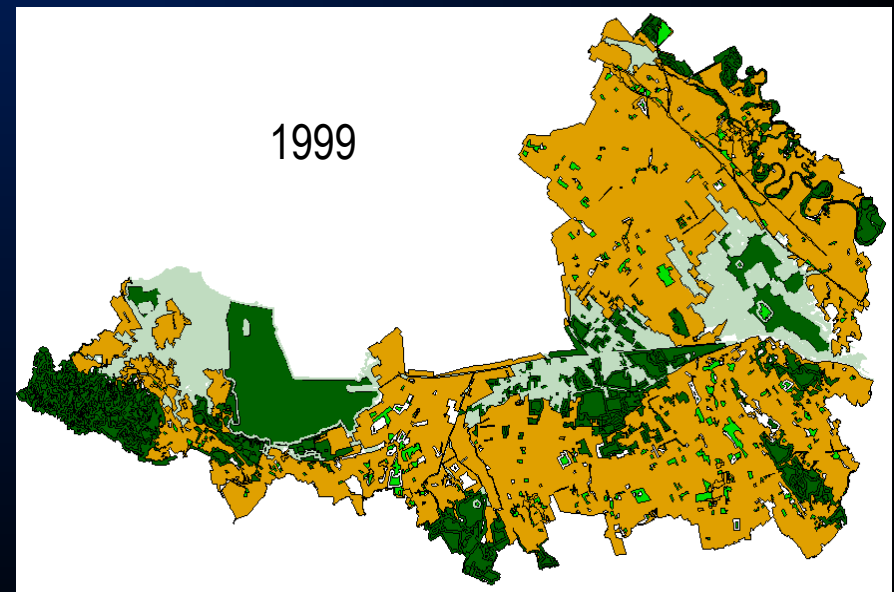
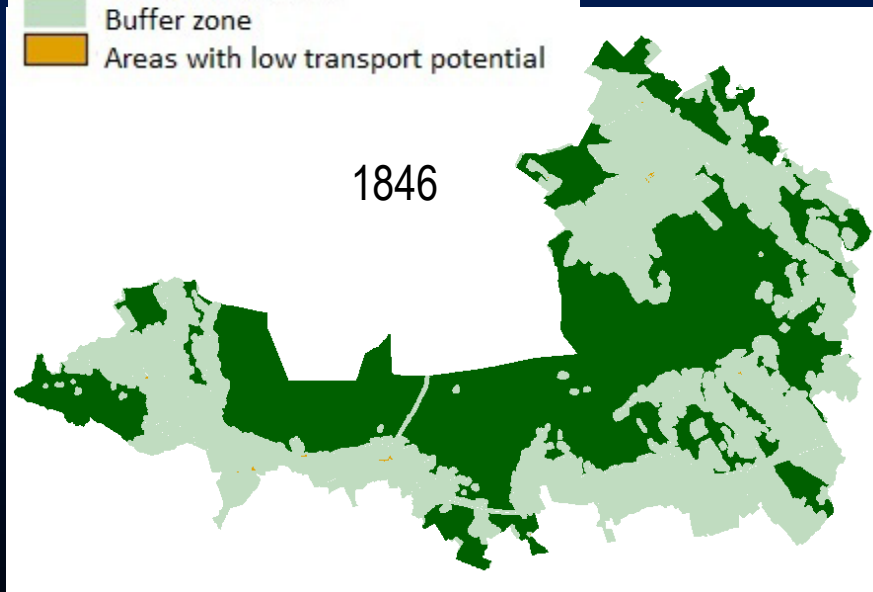
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- Forest
- Grassland
- Wetland
- Open water surface



FUNCTIONAL STRUCTURE OF THE ECOLOGICAL NETWORK IN FERTŐ-HANSÁG LANDSCAPE

	II. Military S. CLC 50	Present EN
Core	48,98%	23,93%
Corr	50,98%	4,09%
Buff	-	15,10%
ALTP	0,04%	57,59%

- Core area
- Ecological corridor
- Buffer zone
- Areas with low transport potential



II. MILITARY SURVEY - ~1820



III. MILITARY SURVEY - 1872

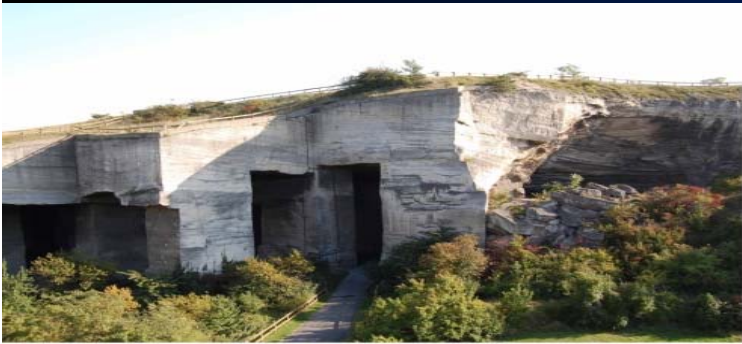


2006





FERTŐ/NEUSIEDLERSEE LANDSCAPE



THANK YOU FOR YOUR VALUABLE ATTENTION!

- Prof. Éva **Konkoly-Gyuró**
 - Ass. Prof. Géza **Király**
 - Ass. Prof. Borbála **Gálos**
 - Pál **Balázs**
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