

Committee on the Challenges of Modern Society

Pilot Study

**„Use of Landscape Sciences
for Environmental Assessment“**

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Landscapes and Environmental Security

Environmental security, in an **objective sense**, measures the absence of environmental threats to acquired values, in a **subjective sense**, the absence of fear that such values will be attacked.

(after Brauch 2004)

Threats (examples)

- land degradation
- floods, droughts
- crop failures



Values (examples)

- ecosystem services
- ecosystem integrity
- sustainability

**A simple model
of human-
environmental
Interactions
in the face of
environmental
security**

Drivers

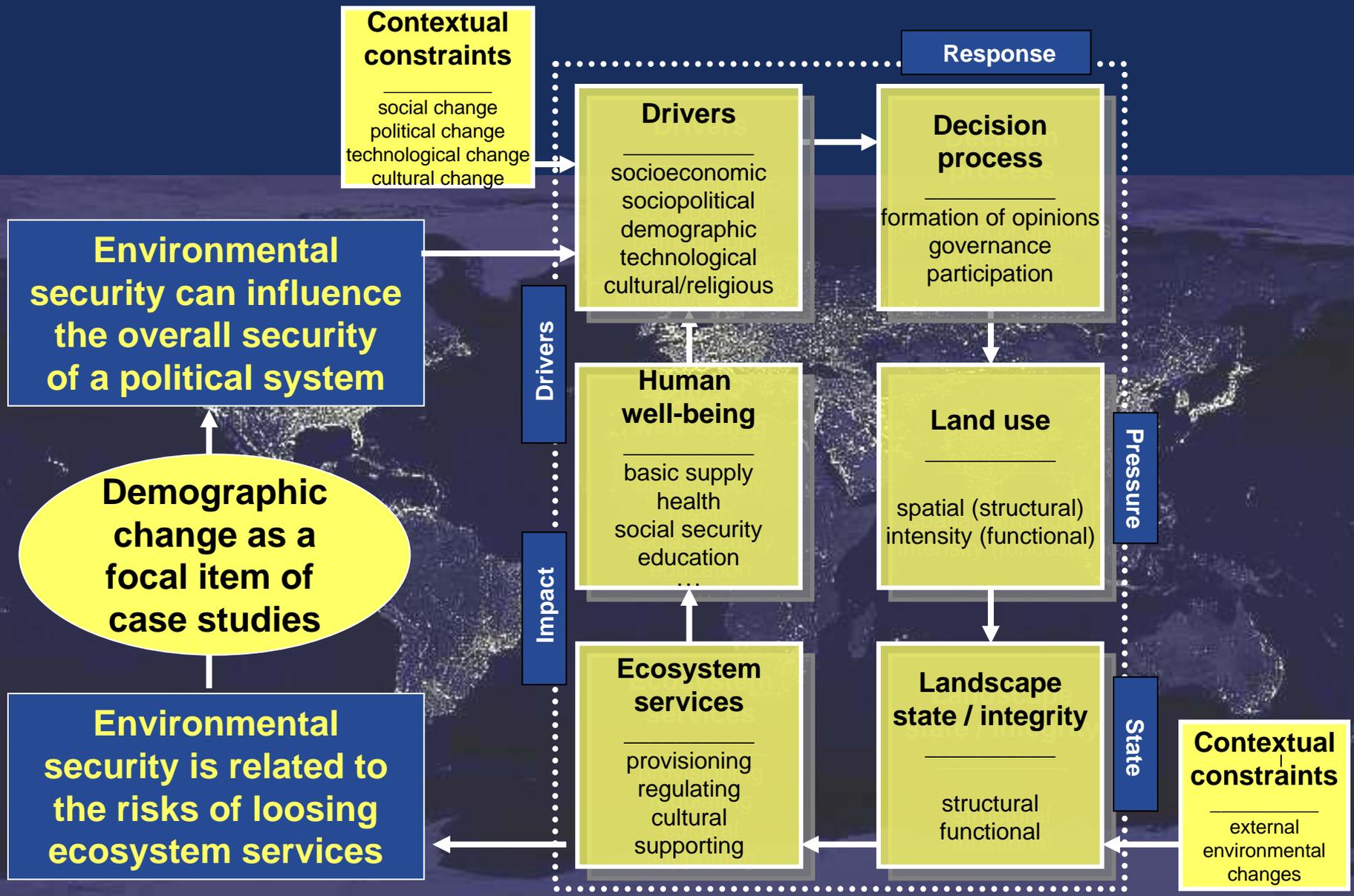
Impact

Response

Pressure

State

**D P S I R
indicator
system
(EEA 1998)**



Objectives of the Pilot Study

Objects: *Landscapes*

as human-environmental systems *in certain areas*

Methodology: *Landscape sciences*, the study of

- (i) *distribution patterns* in and between communities, ecosystems and human-environmental entities,**
- (ii) *ecological processes* that affect those patterns,**
- (iii) *change* of patterns and processes over time**

Objectives of the Pilot Study

...to explore the potential of quantifying and assessing environmental conditions, processes of land degradation, and subsequent impacts on natural and human resources,

by combining the advanced technologies of remote sensing, geographic information systems, spatial statistics, and process models with landscape ecology theory.

Objectives of the Pilot Study

**...to improve
the technologies and methodologies
of environmental assessment,**

**as a process by which scientific evidence
and technological information are used
to evaluate present conditions
or to forecast landscape developments
referring to alternative future courses of action.**

Conception of the Pilot Study

...to carry out landscape analyses in different case study regions,
...to exchange data and methodologies,
...to apply the techniques for risk assessments,

Steps of landscape analysis

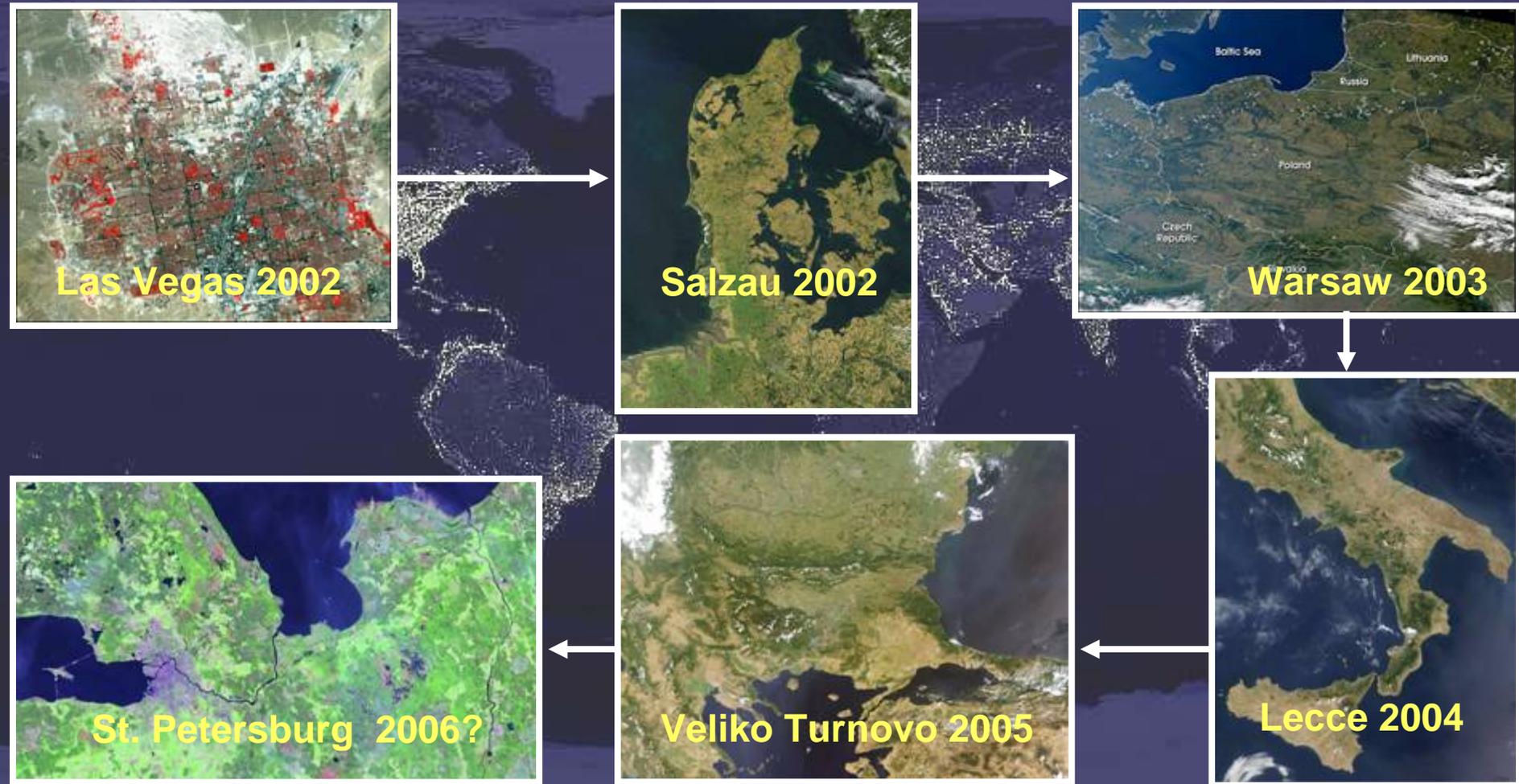
- Landscape characterization
- Land cover change detection
- Landscape indicators
- Landscape models
- Landscape scenarios
- Landscape theory
- Landscape assessment

...to interpret the results with reference to environmental security.

Participating Nations



History and Development



Products

EPA Report (2002)

Proceedings Las Vegas, US

→ Project start

EcoSys Vol. 10 (2003)

Proceedings Salzac, Germany

→ Methods

EcoSys Suppl. Vol. 42 (2004)

Proceedings Debe, Poland

→ Case studies

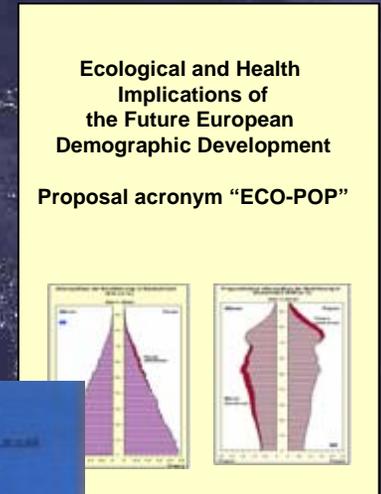
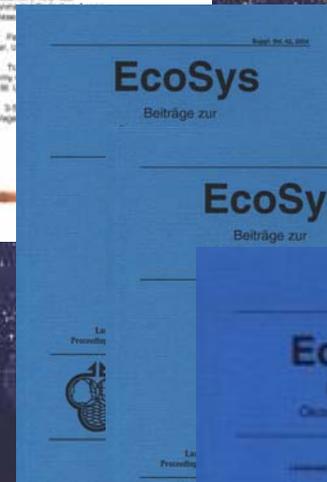
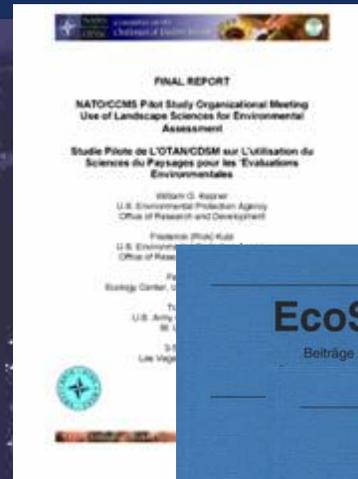
Eco-Pop EU Proposal (2004)

→ Demography

EcoSys Vol. 11 (2005)

Proceedings Lecce, Italy

→ Linkages

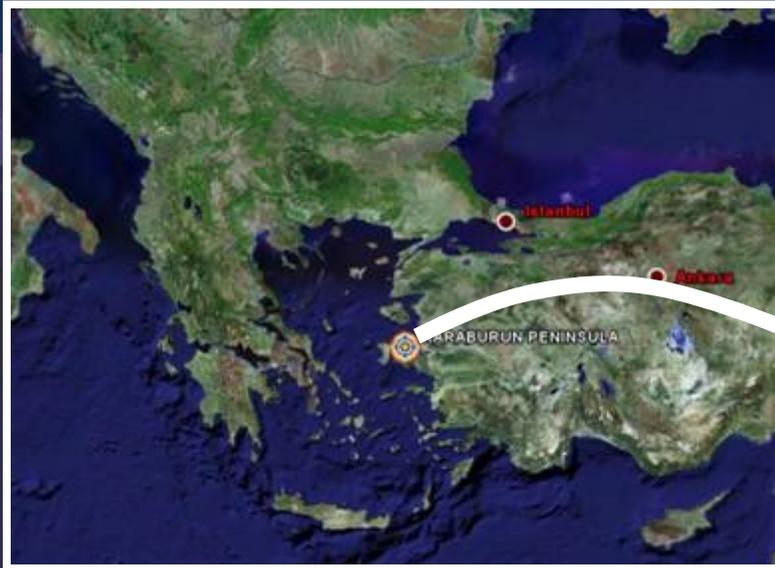


Some Results

Methodological steps

- Landscape characterization
- Land cover change detection
- Landscape indicators
- Landscape models
- Landscape scenarios
- Landscape theory
- Landscape assessment

- **Landscape characterization**



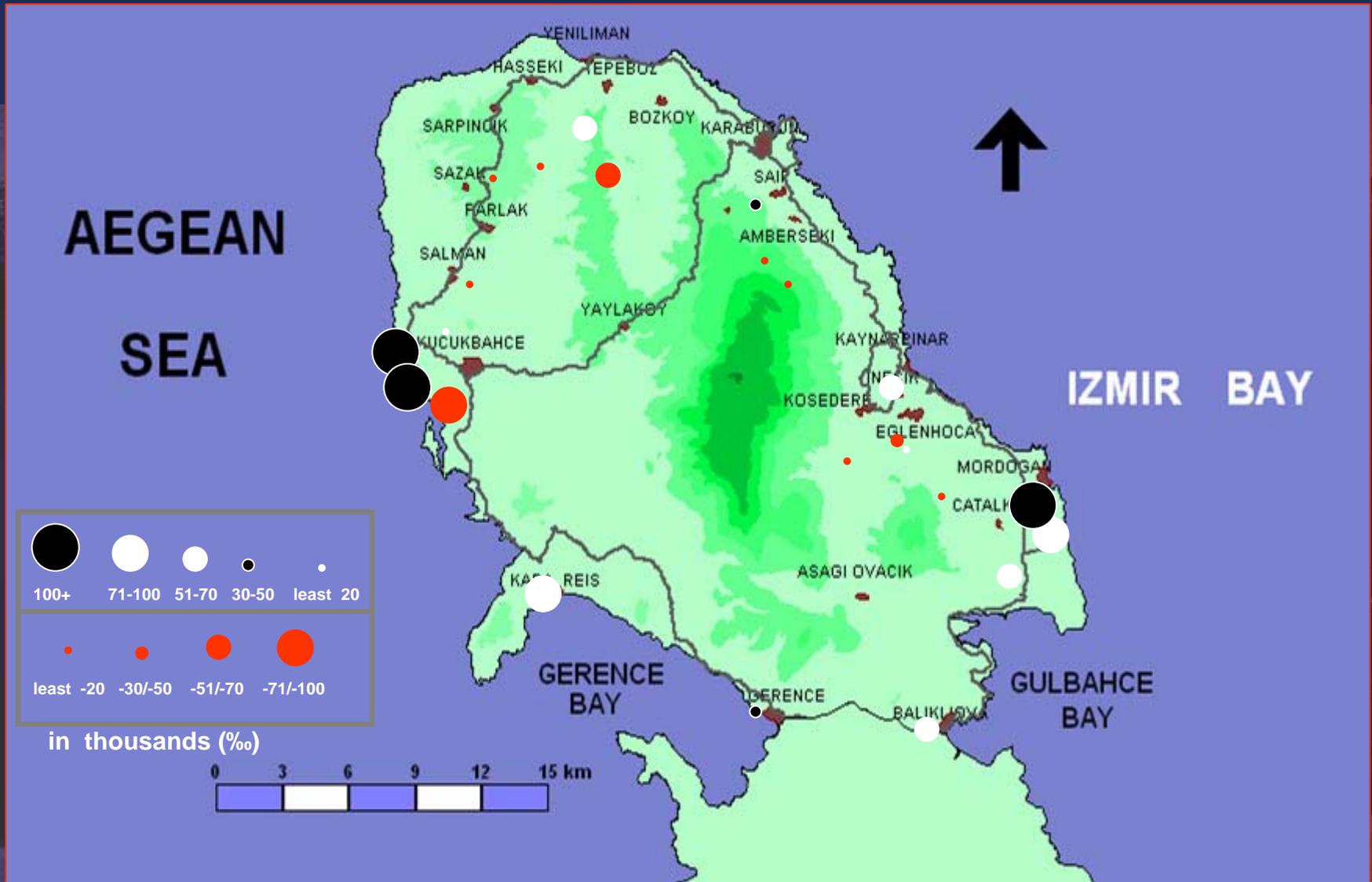
**Study area
Turkey**

E. Nurlu



Karaburun Peninsula

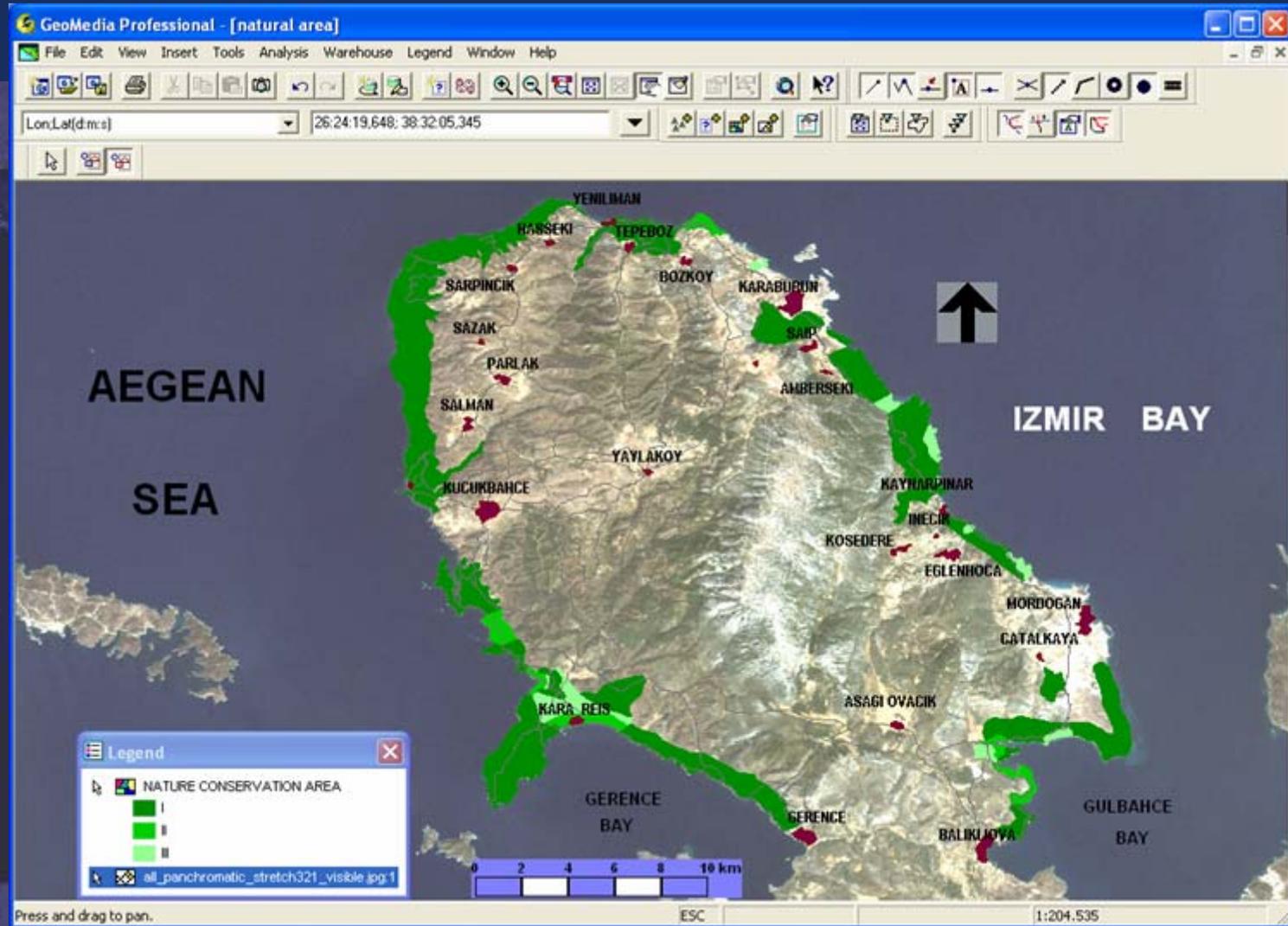
Demographic development



Land use



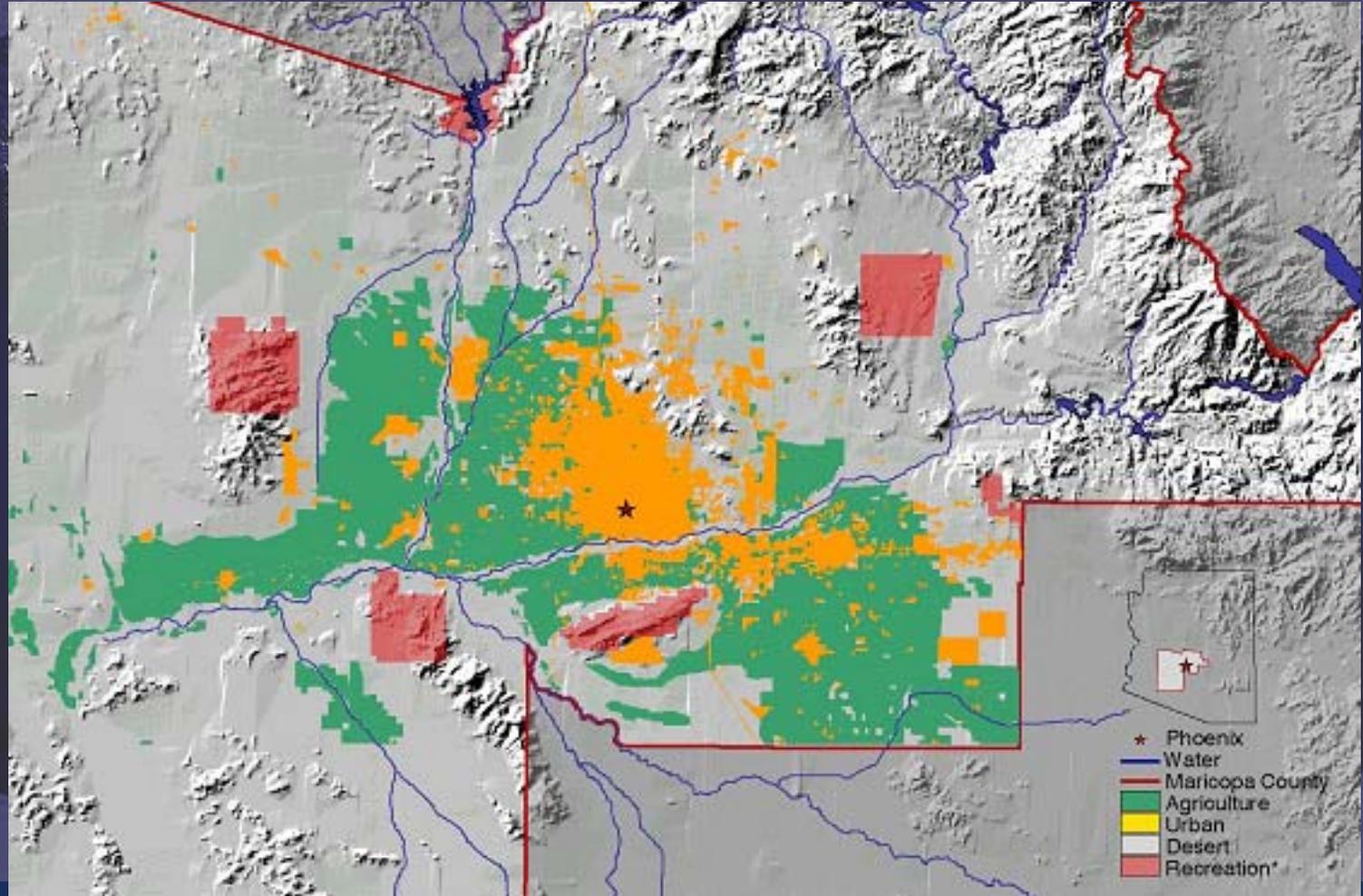
Biodiversity and nature conservation



**Central Arizona - Phoenix
land use 1975
T. Blaschke, Austria**

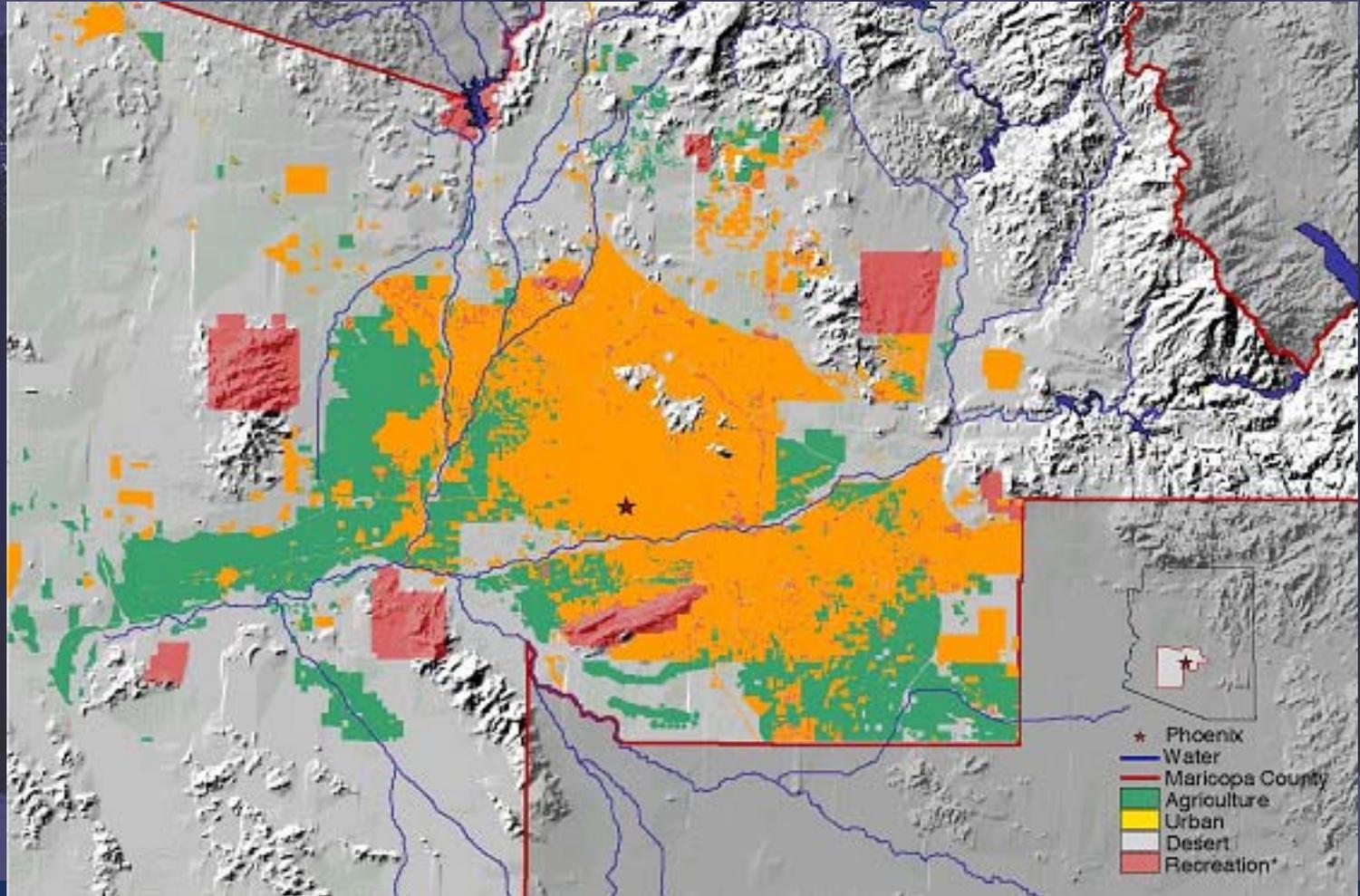
- Landscape characterization
- Land cover change detection

1975



**Central Arizona - Phoenix
land use 1995
T. Blaschke, Austria**

1975
↓
1995



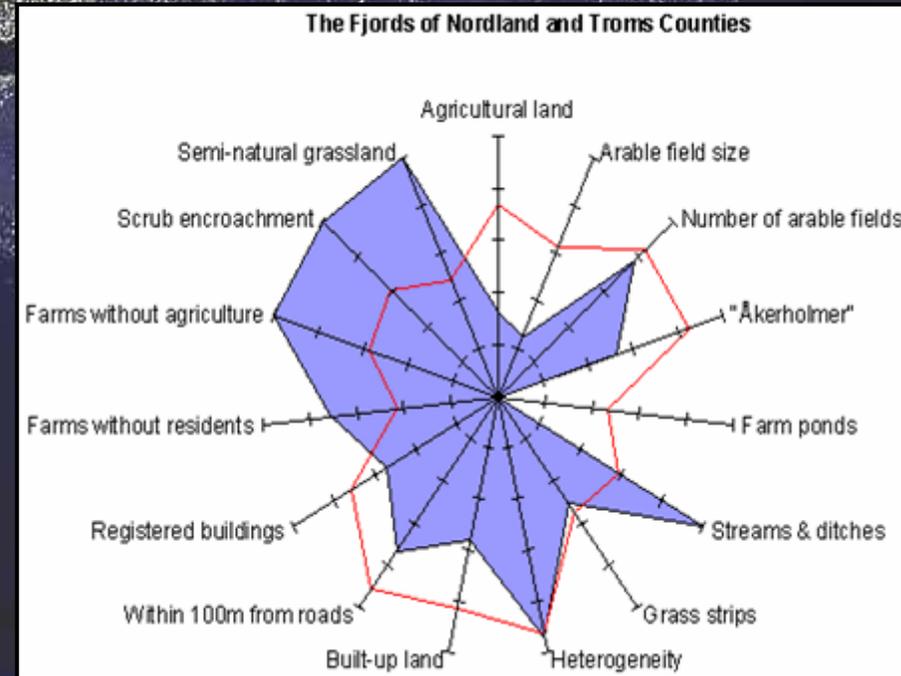
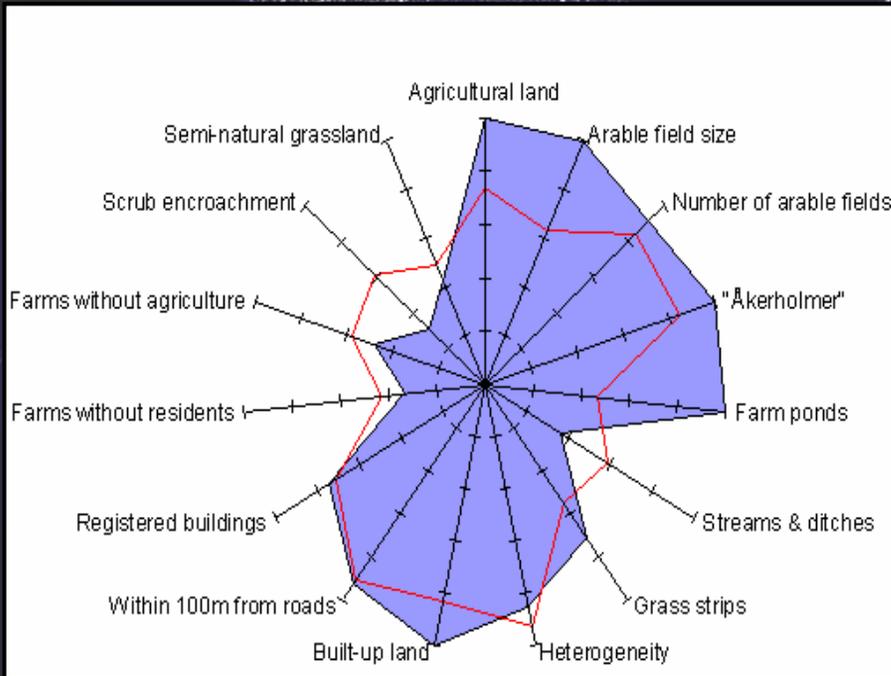
Landscape comparisons

W. Fjellstadt, Norway

- Landscape characterization
- Land cover change detection
- **Landscape indicators**

Lowland districts of Eastern Norway and Trøndelag

Fjord districts of Nordland and Troms



— = national average

Case study area
NW Oregon
W. Kepner et al., USA

- Landscape characterization
- Land cover change detection
- Landscape indicators
- **Landscape models**
- **Landscape scenarios**

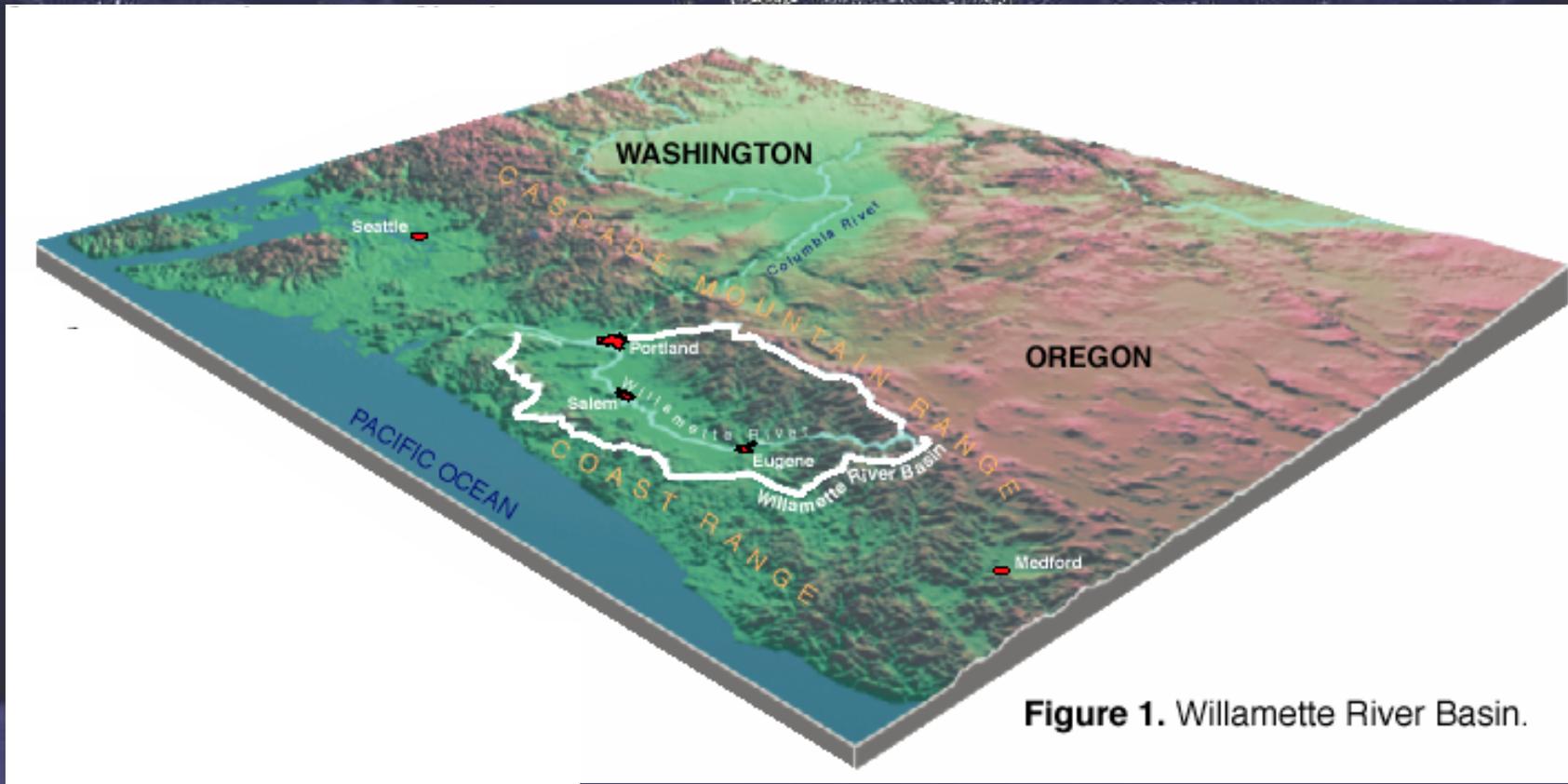
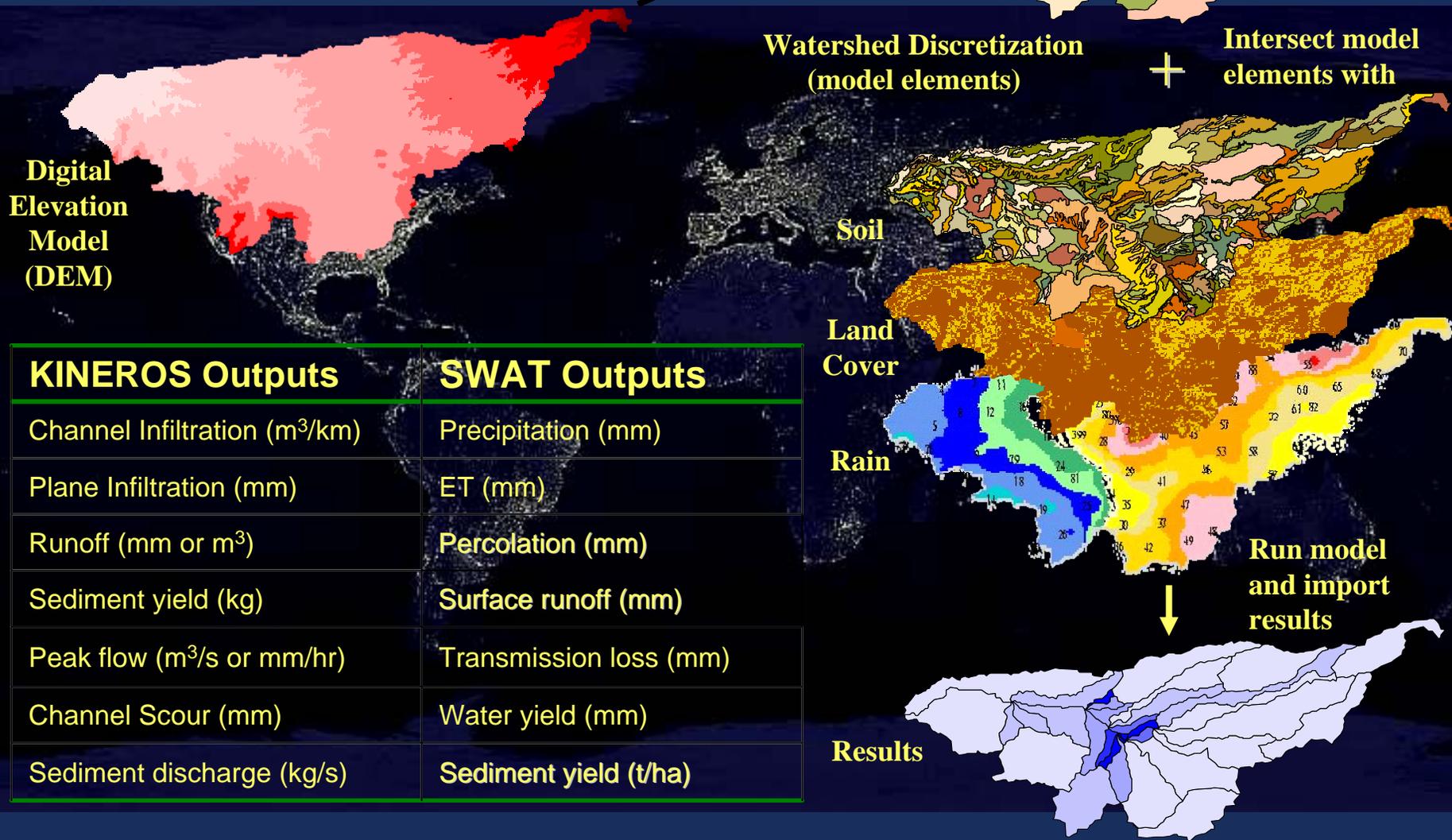


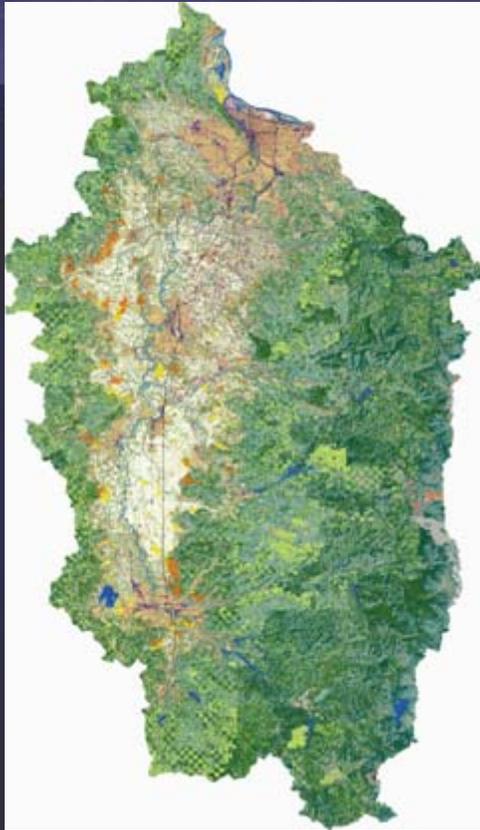
Figure 1. Willamette River Basin.

AGWA Inputs and Outputs



KINEROS Outputs	SWAT Outputs
Channel Infiltration (m ³ /km)	Precipitation (mm)
Plane Infiltration (mm)	ET (mm)
Runoff (mm or m ³)	Percolation (mm)
Sediment yield (kg)	Surface runoff (mm)
Peak flow (m ³ /s or mm/hr)	Transmission loss (mm)
Channel Scour (mm)	Water yield (mm)
Sediment discharge (kg/s)	Sediment yield (t/ha)

Future scenarios – land use



Conservation 2050

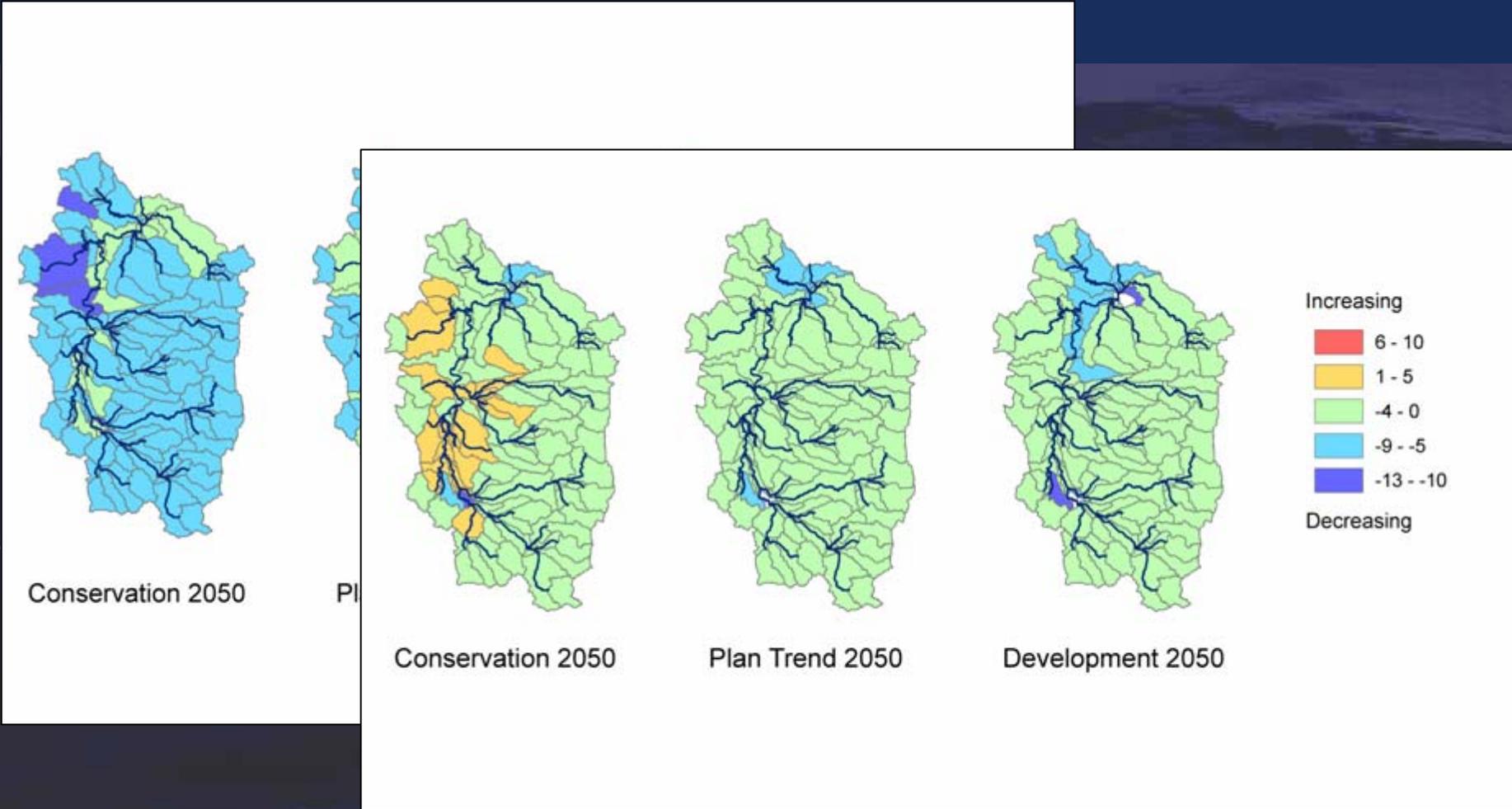


Plan trend 2050



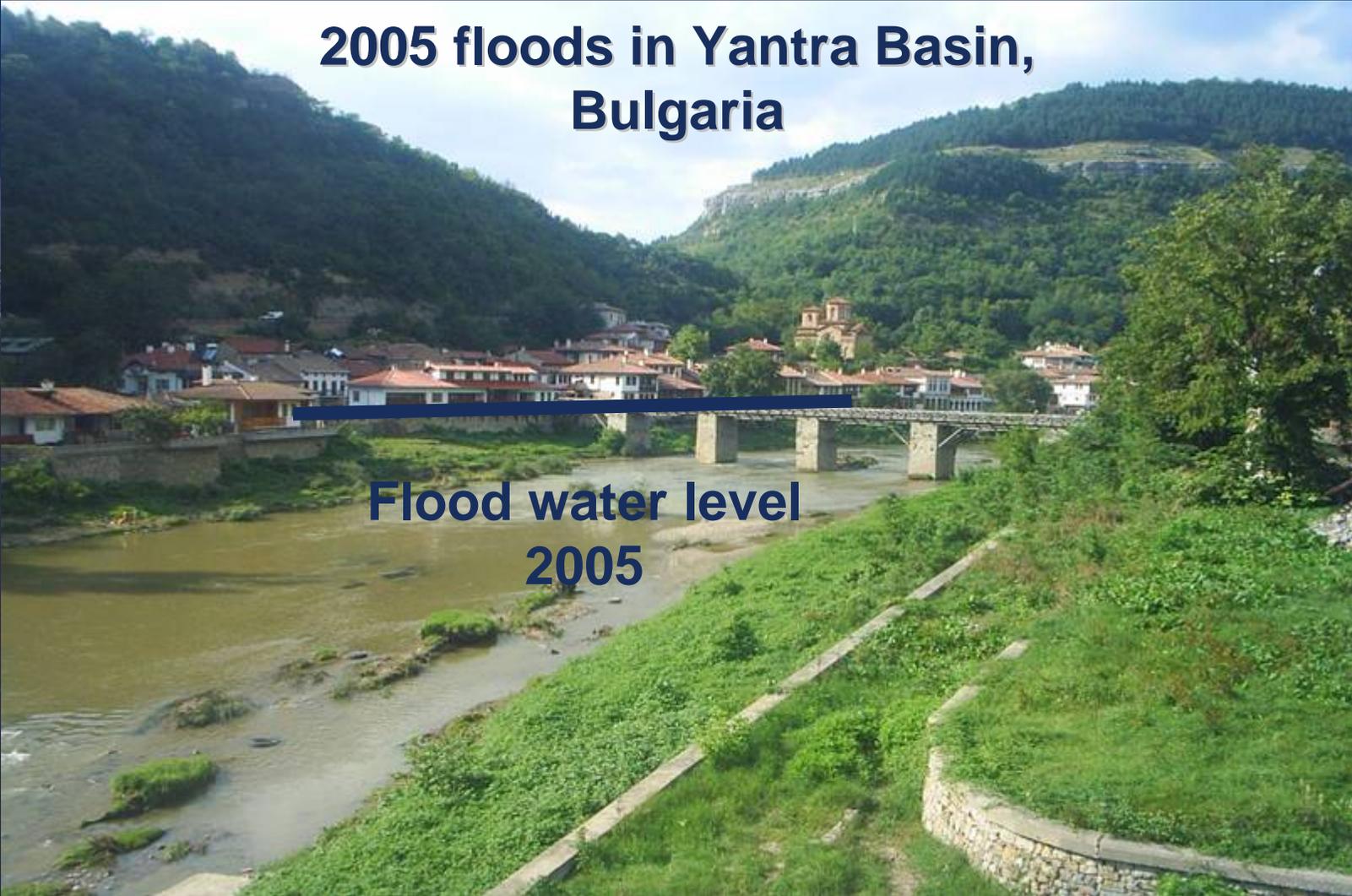
Development 2050

Percent change in surface runoff, 1990 - 2050



Percent change in percolation, 1990 - 2050

2005 floods in Yantra Basin, Bulgaria



Flood water level
2005

Model applications: M. Nikolova and S. Nedkov, Bulgaria

- Landscape characterization
- Land cover change detection
- Landscape indicators
- Landscape models
- Landscape scenarios
- Landscape theory
- **Landscape assessment**



Study area:
**Natural protected
area of Torre Guaceto**

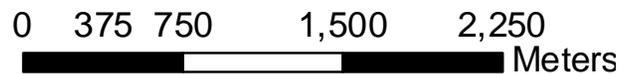
**I. Petrosillo et al.
Italy**

**→ Dynamics
of landscape change
and ecosystem services**

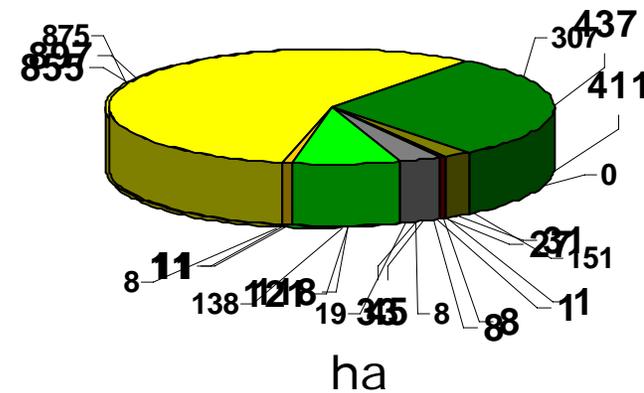
Classification of study area according to the most representative biomes



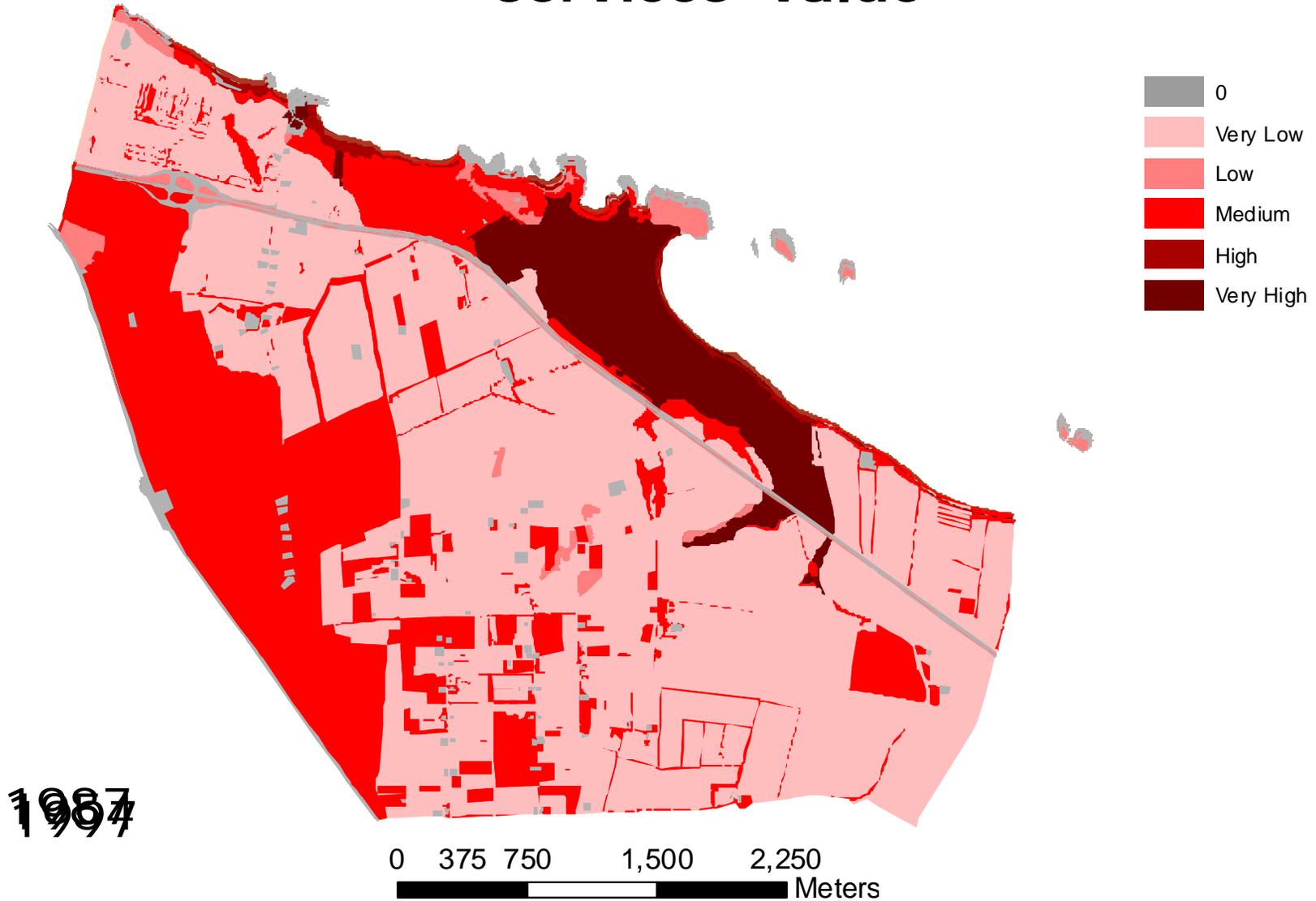
1987



- COASTAL BEACH
- CROPLAND
- FOREST
- GRASSLAND
- ROCK
- URBAN
- WETLANDS



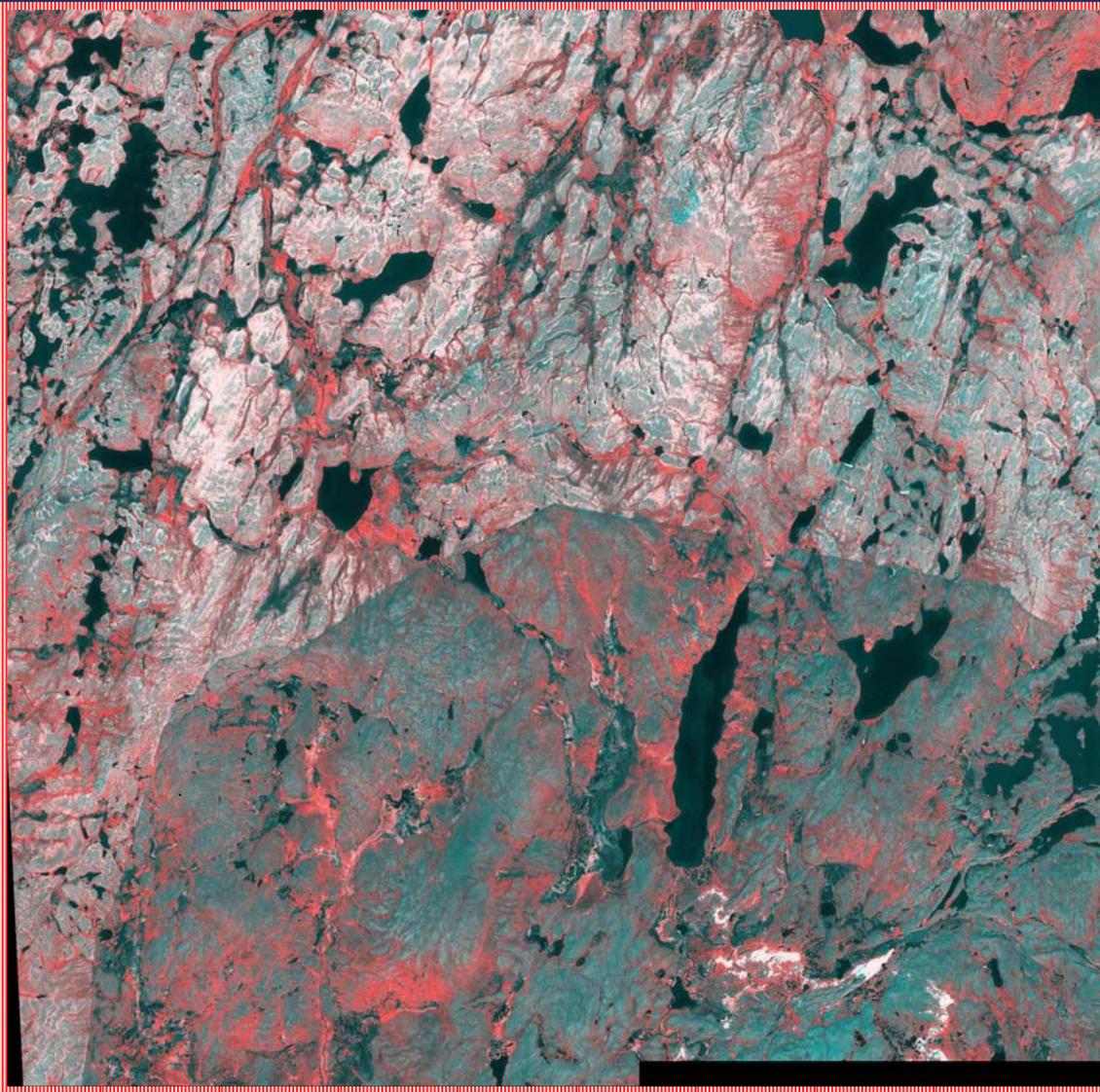
Spatially explicit distribution of ecosystem services' value



Land use competition in Northern Finland T. Kumpula et al., Finland and Germany

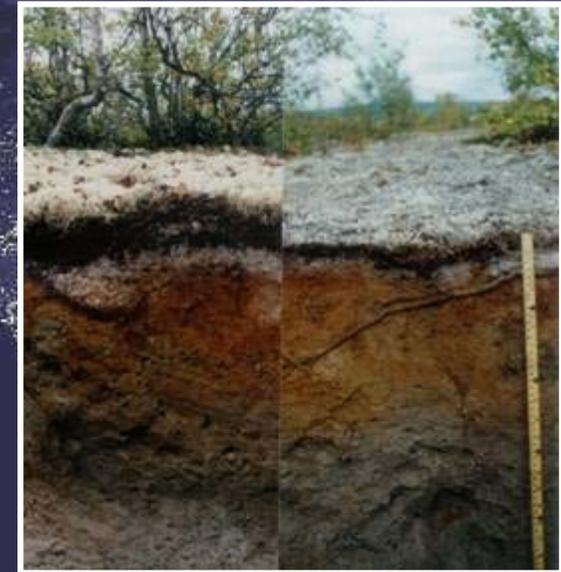


- Reindeer herding
- Agriculture
- Forestry
- Tourism
- Energy production

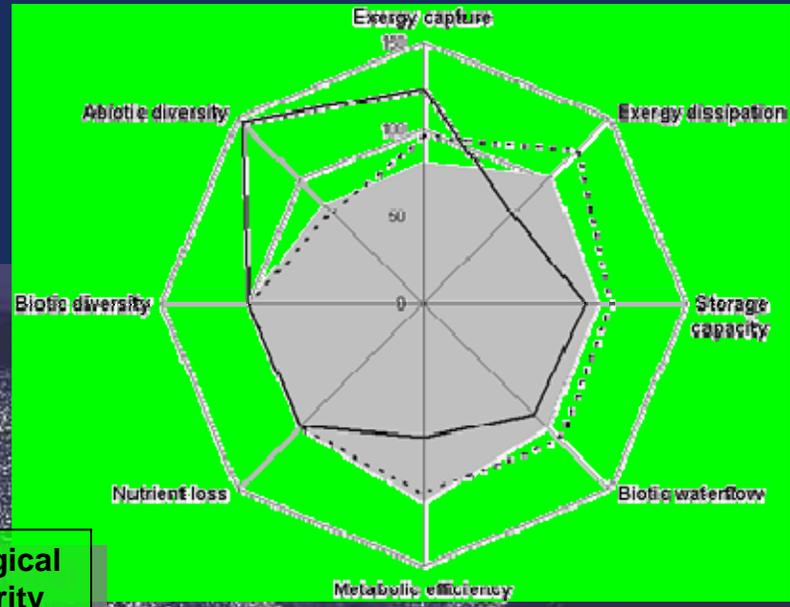
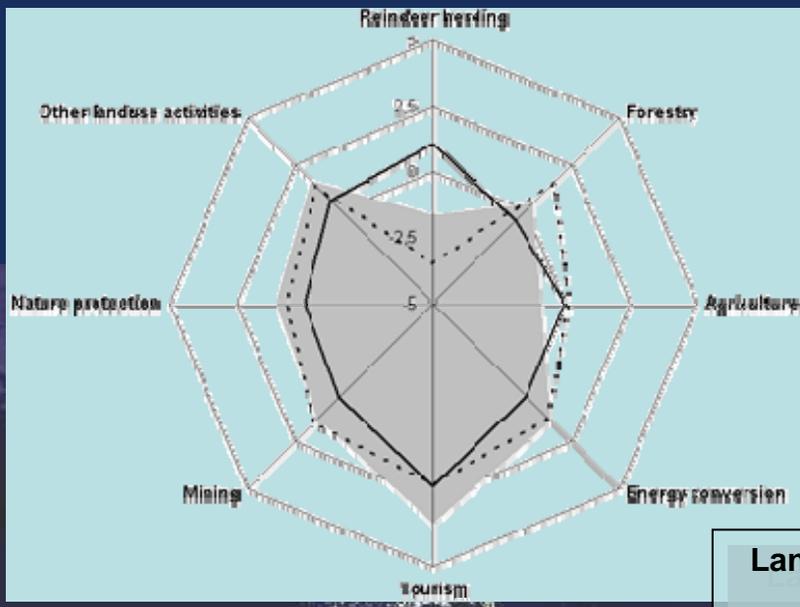


Ikonos picture

**Norway:
winter pasture**



**Finland:
Summer and
winter pasture**

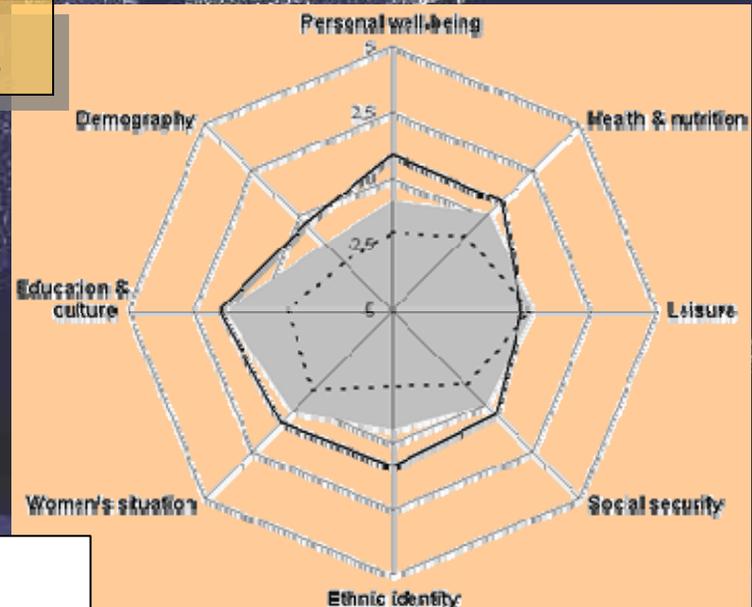
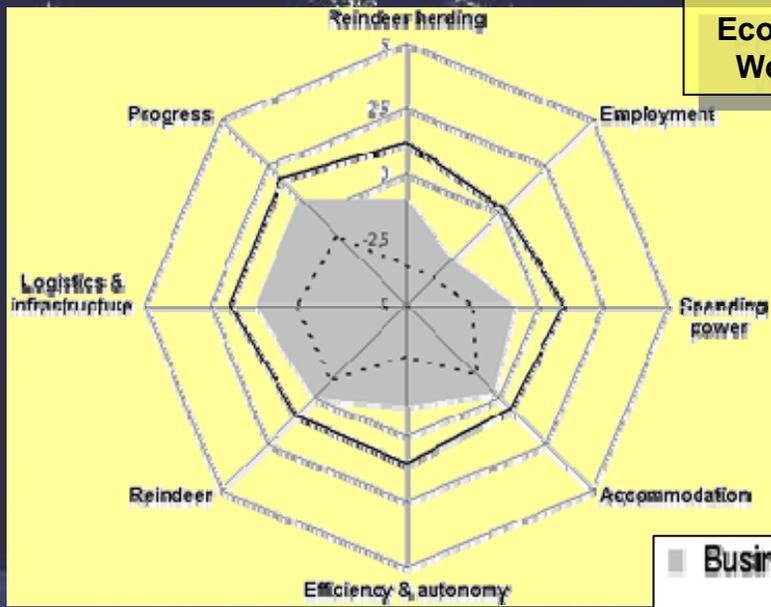


Land Use

Ecological Integrity

Economic Welfare

Social Welfare



■ Business as usual
 □ Intensification of reindeer husbandry
 ▤ Reduction of reindeer husbandry

More examples and information:

<http://www.nato.int/ccms/pilot-studies/lsea/lsea-index.htm>

or

<http://www.ecology.uni-kiel.de/~fmueller/ccms.html>

Final Report (full report)

„Use of Landscape Sciences for the Assessment of Environmental Security“

Elsevier Publishers

Editorial Board:

K. Krauze (Poland), I. Petrosillio (Italy),
F. Mueller (Germany), G. Zurlini (Italy),
S. Victorov (Russian Federation),
B. Jones (USA) W. Kepner (USA)

Final Report

I. Setting the framework

- organizational and scientific framework
- environmental (landscape) security

II. Individual contributions

- 15-20 papers describing the case studies
- focussing on security relevant topics
- demographic change as an important constraint

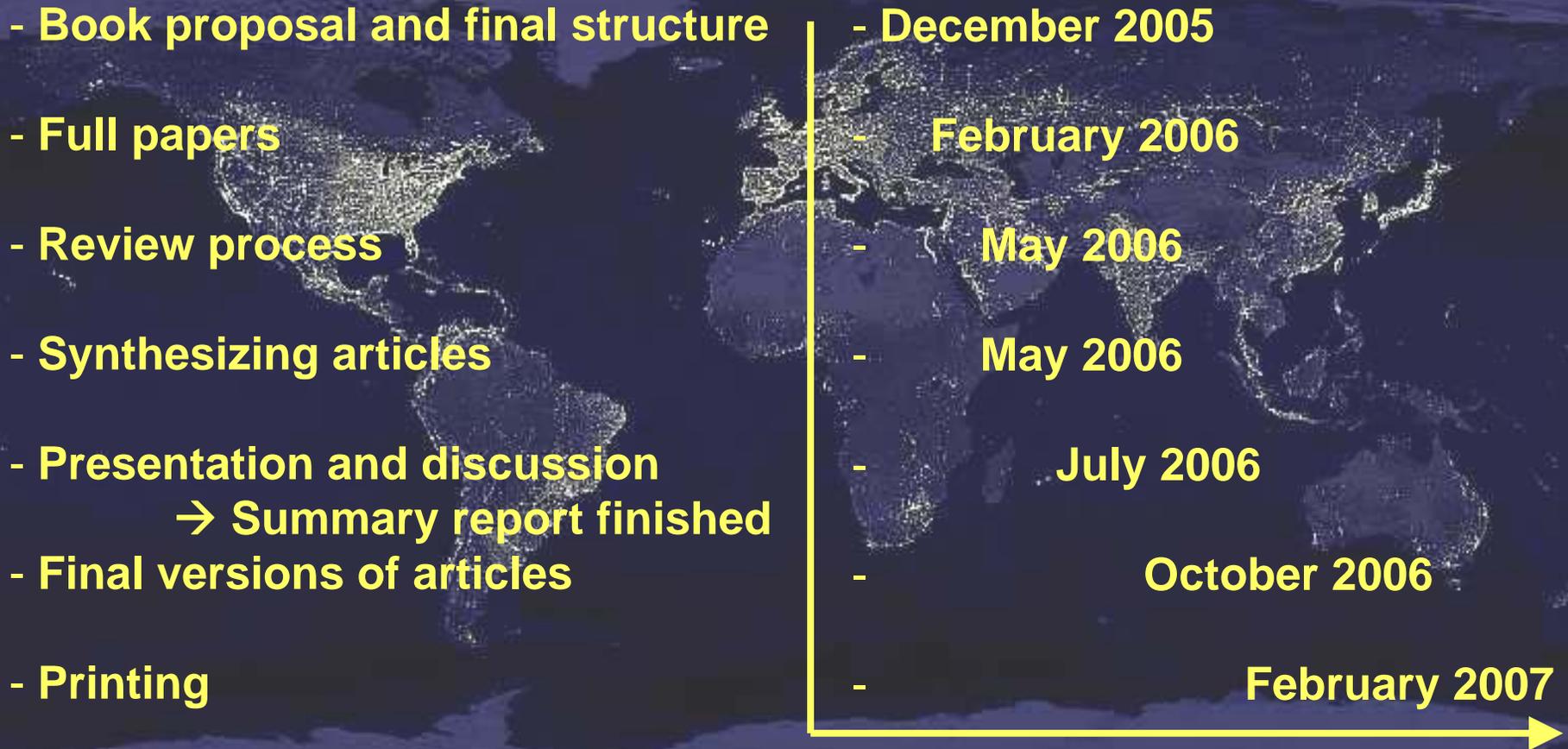
III. Outcomes – Integration – Perspectives

- for methodology, science, assessment, management
- for environmental security (integrating papers) and
- summarising recommendations

IV. Appendix

Final Report

Proposed time line:

- 
- Book proposal and final structure
 - Full papers
 - Review process
 - Synthesizing articles
 - Presentation and discussion
→ Summary report finished
 - Final versions of articles
 - Printing
- December 2005
 - February 2006
 - May 2006
 - May 2006
 - July 2006
 - October 2006
 - February 2007

Final Workshop in 2006

**Decision of the group:
St. Petersburg in summer 2006**

***Co-organizers:*
Sergey Viktorov, Sergey Kondratjev,
Yuri and Irina Pyhk (INENCO)**

**Meeting will be temporally linked with a conference on
„quality of life indicators“ from the
International Committee of Ecological Indicators**

***If organizational problems occur after fixed
deadlines (e.g. visa problems, missing support),
we will have to turn to Plans B (Turkey) or C (Ukraine)***

Final Workshop in 2006

Focal items:

**Presentations and discussions
of the final reports from all national groups**

Presentation of the summary report

Discussion of the integrating papers for the book (III)

Conception of future cooperation

Future Development

Land degradation

Quality of life

Value systems

Population growth

vs.

Population decrease

Aging

Migration

Fertility reduction

Singulatization

Spatial heterogenization

Urbaninzation vs. shrinkage in rural areas

Future Development

Land degradation

Quality of life

Value systems

Urbanization vs. shrinkage in rural areas

Social risks?

Environmental risks?

- (a) Integrate Med-Dialogue Countries
- (b) Include more social scientists
- (c) Apply landscape methodologies
- (d) Organize a workshop
- (e) Conceive another CCMS project (?)

Landscape based assessment of demographic change processes - Regional risks and potentials



Thank you for the attention

CCMS Pilot Study „Use of Landscape Sciences for Environmental Assessment“