Territorial systems of ecological stability of the landscape

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The concept of territorial systems of ecological stability of the landscape

Territorial system of ecological stability of the landscape is interconnected set of natural and modified (but close to nature) ecosystems that maintain balance through direct and backward relationships.

From the system point of view, the concept TSES represent a significant innovation of the classic conservation concept. This new concept is based on supporting the development of ecological infrastructure as a flexible tool for enhancing the effectivity of natural heritage protection.

European ecological network EECONET

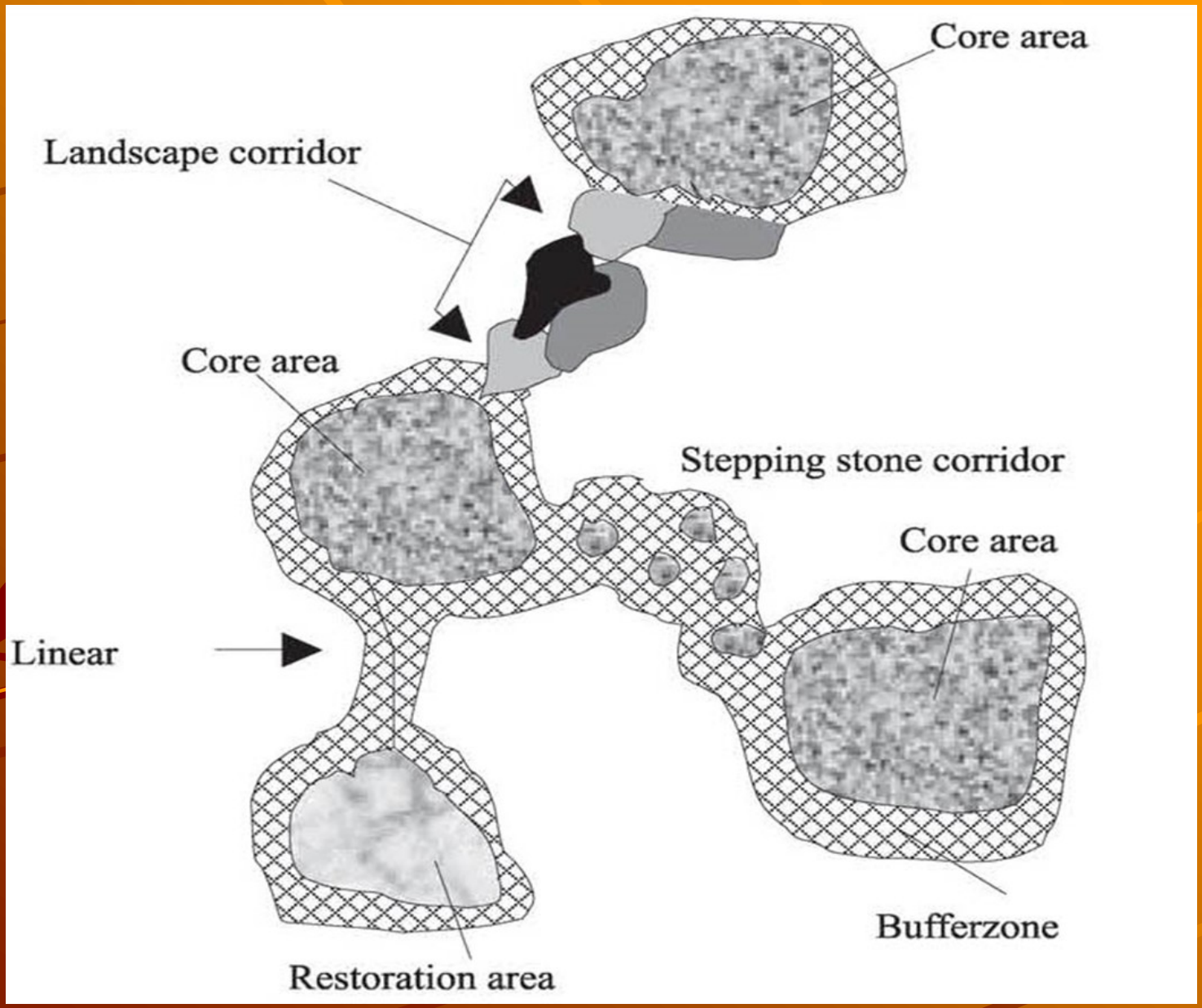
EECONET aims to establish a joint territorially interconnected network providing protection, restoration and development of ecosystems of European significance. The functional capability of this network is determined by relevant links across the Europe. Their basic components are:

Core areas which include representative demonstration of all types of ecosystems of Pan-European importance capable of permanent existence within individual countries (in a compatible Czech TSES are referred as biocentres).

Landscape corridors (biocorridors of supra-regional importance according to TSES) connect the core areas to allow spatial communication respective migration processes of animals and plants (e.g. by means of seeds dissemination).

Buffer zones (respectively interactive elements) are areas with increased landscape care that separate core areas from external negative influences and, on the other hand, promote the diffusion of positive effects.

Structure of EECONET (European ecological network)



Czech concept of territorial systems of ecological stability of the landscape (TSES)

Sustainability of production and biodiversity capacities generally depends on the ecological stability of landscape. This stability can be positively influenced by reducing of destabilizing phenomena (through environmental policy) and by creating of TSES systems (through spatial planning). The main objectives of these complex systems are to maintain of natural genofond and to induce favourable effects on ecologically less stable parts of the landscape.

The current set of ecologically important segments creates so-called skeleton of ecological stability (SES) that plays crucial role in maintaining of the landscape biodiversity. SES together with replenishment of missing part of system create the essence of TSES. The basis for defining of SES and designing of TSES is biogeographic differentiation of the landscape according to geobiocenological concept (geobiocenosis is a terrestrial community of plants and animals).

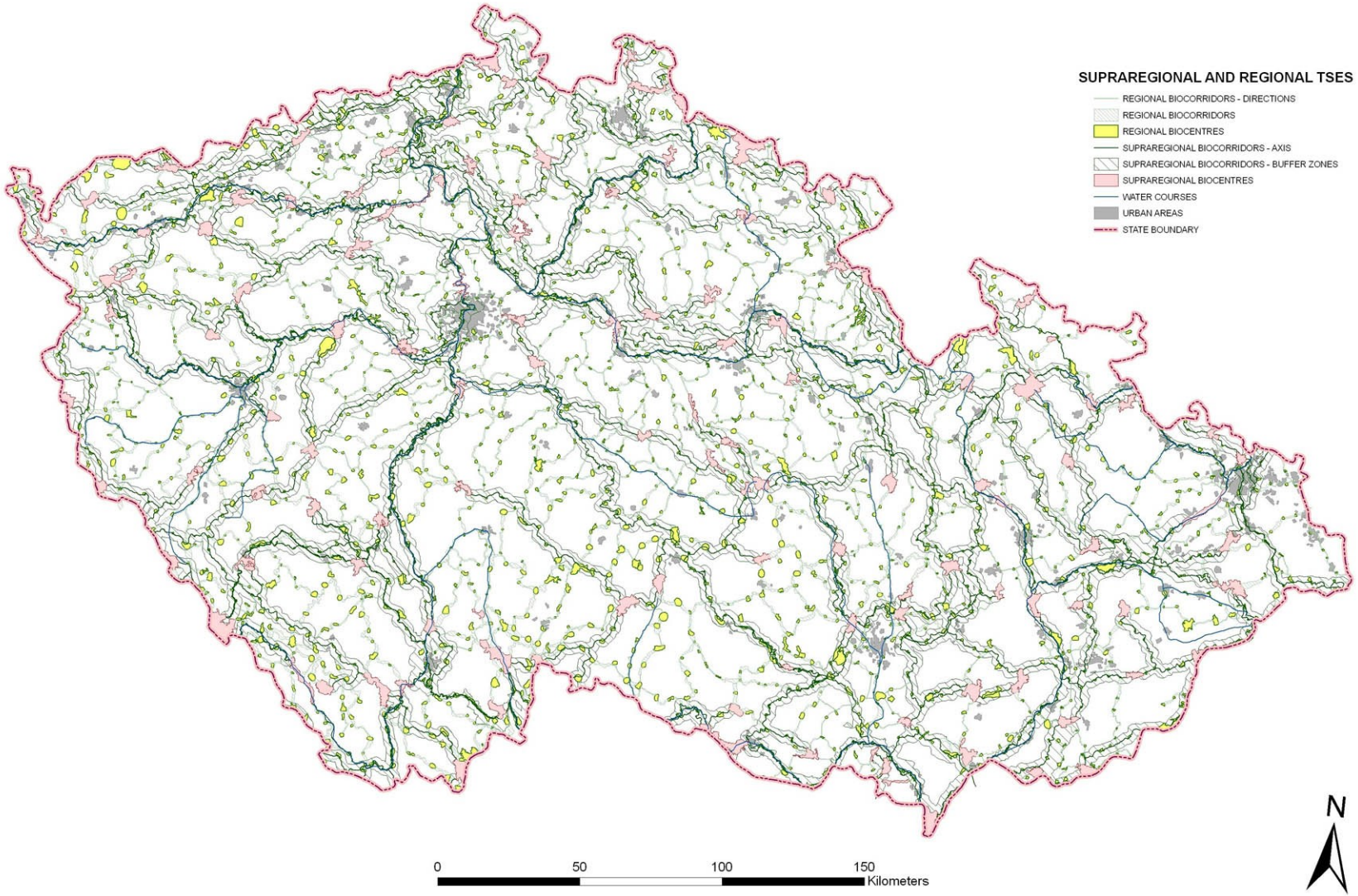
Categorization of TSES

- **Local TSES** with range from 1 to10 ha
  Regional TSES =10-50 ha
  Supraregional TSES = at least 1 000 ha
  Provincial TSES = more than 10 ths. ha – e.g. river Dyje valley (National park/NP Podyjí) and springs of river Úpa (NP Krkonoše).
- **Biospheric TSES** = more than 10 ths. ha – in the Czech Republic only natural monument Modrava wetlands (National Park Šumava) was designated. This TSES follow up on core area (Kerngebiet) of the Bavarian Forest National Park.
- The Czech TSES system include 25 basic biocentres of European significance and 10 relevant biocorridors of European significance which are represented by selected parts especially of the supraregional TSES.

Space parameters of TSES

The spatial parameters of biocentres and biocorridors			
minimal biocentres area	Type of bicenoses		area/ha
local	forest		3
	aqueous		1
	wetland		1
	meadow		3
	step ladder		1
	rocky		0,5
regional	forest according to the vertical		
	vegetation stages	beech and beech-oak	30
		oak-beech and beech	20
		fir-beech	25
		spruce-fir-beech	40
		spruce	40
		cage-alpine	30
		wetland alder	10
	aqueous		10
	wetland		10
	meadow		30
	step ladder		10
	rocky		5
supraregional	core area		10-50
	total area		1 000
provincial	core area		1 000
	total area		10 000
biospeheric	core area		10 000
lengths and widths of biocorridors			
local	maximal permissible length		0,4-1 km
	minimal required width		10-20 m
regional	maximal permissible length		1-2 km
	minimal required width		20-50 m

SUPRAREGIONAL AND REGIONAL TSES OF THE CZECH REPUBLIC



Levels of ecological stability within the TSES

Actual level of TSES is defined by 5-degree classification ranging from the highest level of 5th degree (especially forests with natural and nature-related composition of species, preserved wetlands, subalpine meadows), over 4th degree (semi-cultural forests, natural line biocenoses and natural meadows and pastures), 3rd degree (cultural forests, natural water areas and flows, small-scale gardens and orchards and semi-cultural meadows and pastures), 2nd degree (strongly devastated forests, ruderal biocenoses, small-scale vineyards), to the first degree (characterized especially by artificial water area and flows with strong polluted water, large-scale vineyards and arable land).

The built-up areas then have zero ecological stability.

How TSES Works

It can be generally state that TSES increase the share of stable ecosystems and reduce landscape fragmentation.

Ecological stability decreases with a declining share of ecologically stable and successively advanced ecosystems. In contemporary conditions ecological stability also decreasing with the growing fragmentation of the landscape. Human-affected ecosystems are environmentally unstable and therefore require additional energy input, which in the long run increases cost of maintaining them (costs of afforestation of spruce monocultures with little resistance to harmful abiotic and biotic factors makes around 3.5 thous. EURO/ha – for comparison costs of additional energy of fuel for deep ploughing makes almost 30 EURO/ha).

Ecologically stable original agricultural landscape

Intensified agricultural landscape

Forests devastated by bark beetle and their natural regeneration (Šumava mts.)

Loss of Landscape Connectivity = Loss of Biodiversity

This process is mainly conditioned by:

isolation of biocenoses *(a community of all organisms inhabiting a particular territory)*.

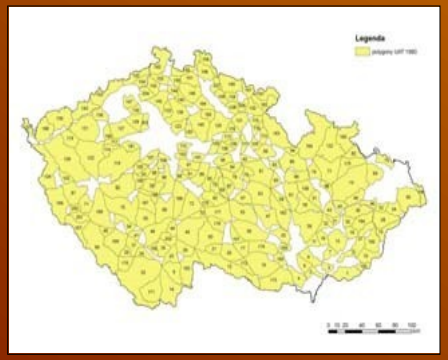
loss of genetic diversity *reducing long-term horizon resistance to adverse external influences*.

Conclusion:

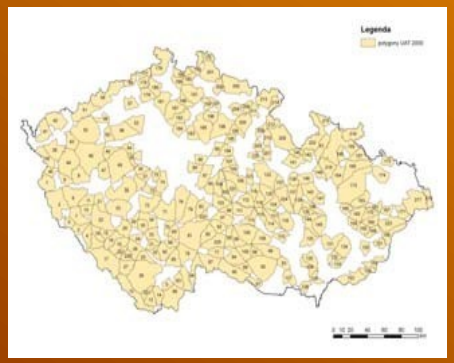
Small isolated biocenoses are not able to survive in the long-term under the unfavourable conditions generated especially by development of human civilization – see e.g. climate change, expansion of transport infrastructure and/or penetration of invasive alien species.

Increasing the scope of transport infrastructure = increasing of landscape fragmentation

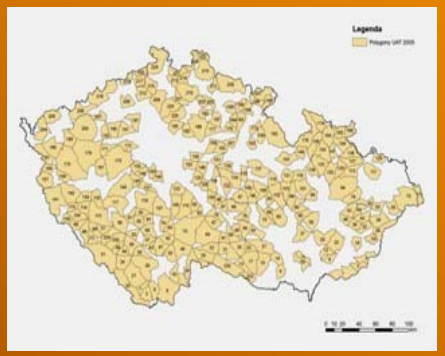
1980



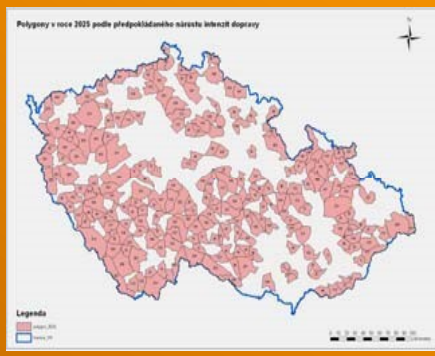
2000



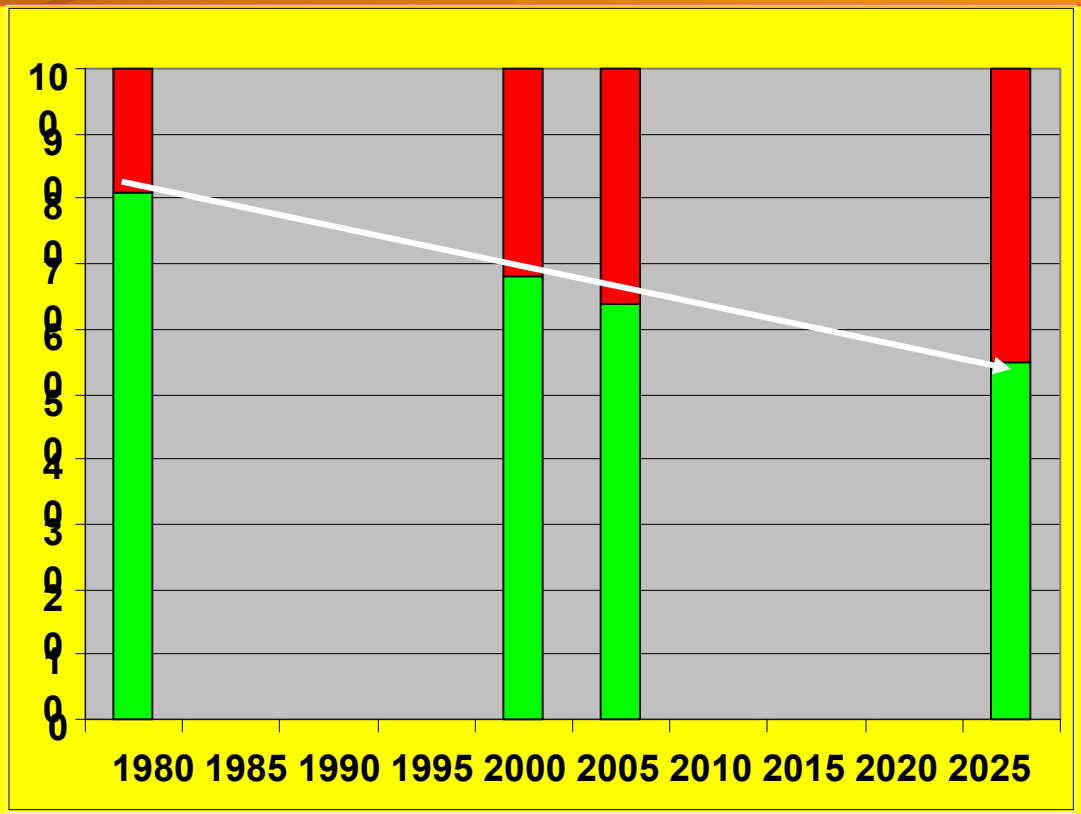
2005



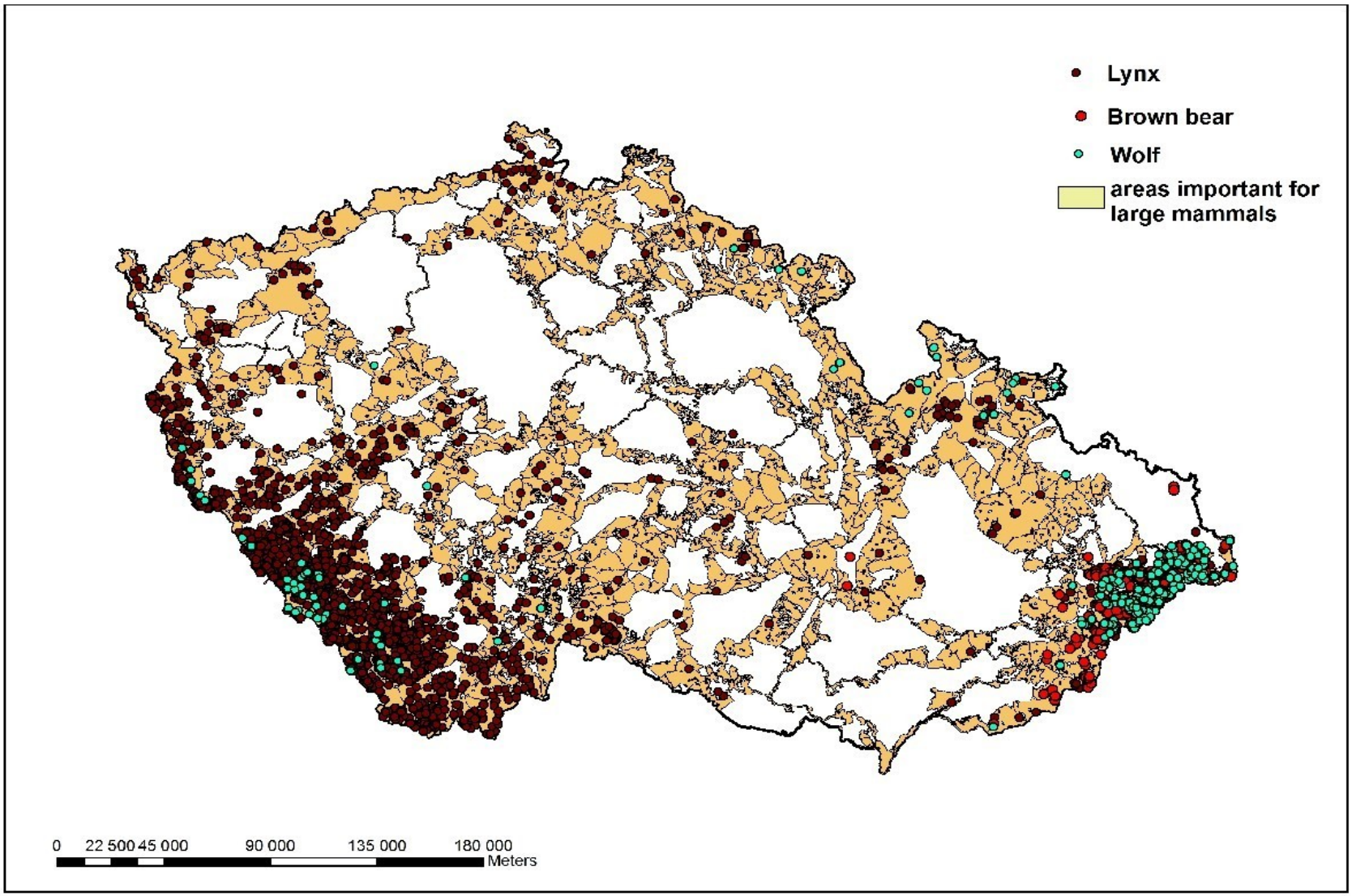
2025



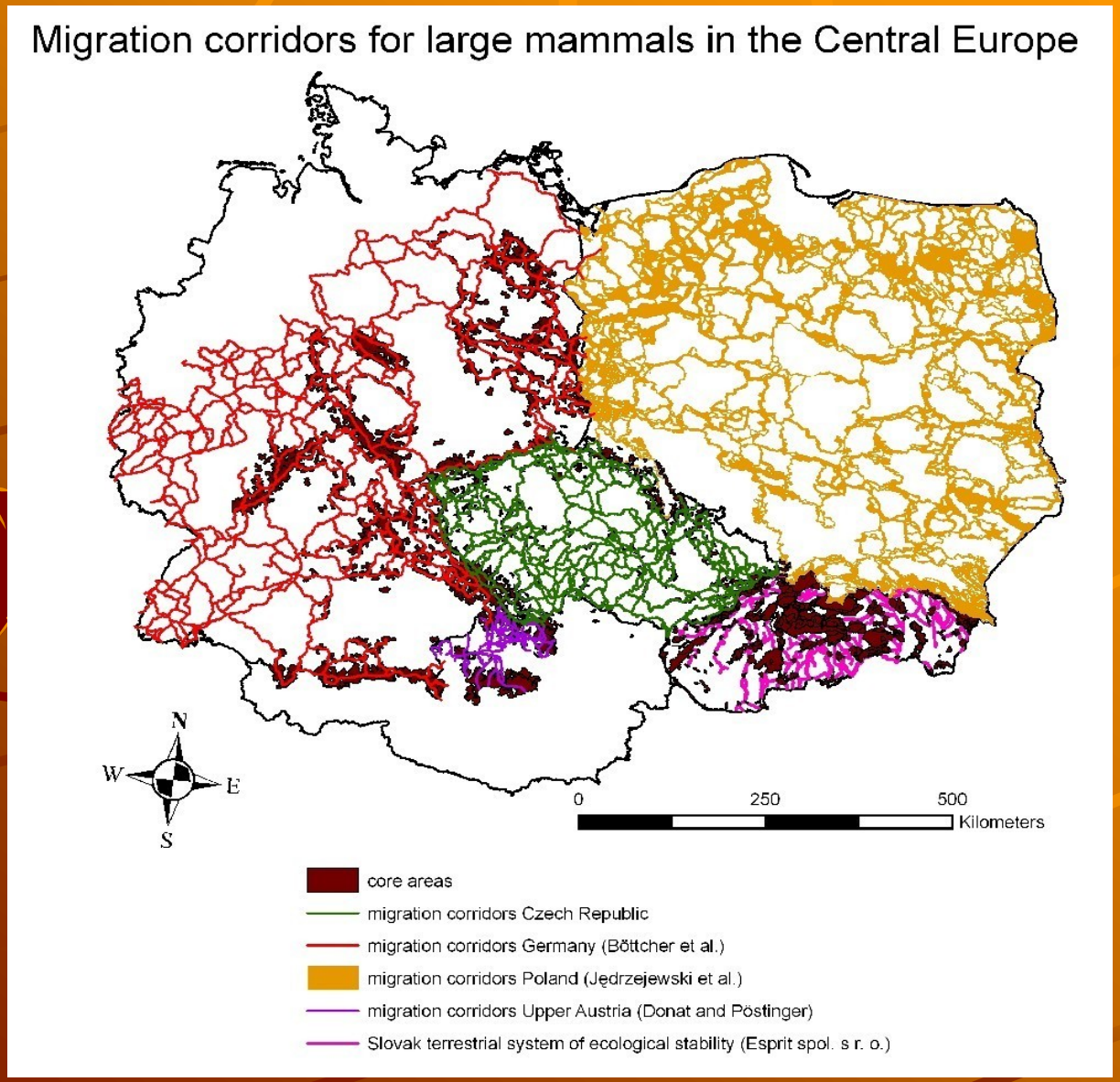
Number of the areas unfragmented by traffic is going to decline by 30% over the period 1980-2025!



Identifications of migration corridors



Identification of migration corridors in the Central Europe



Ecoduct on the Czech highway D 1 (Central Moravia)

TSES links to spatial planning

The aim of spatial planning is in general to formulate the basic economic, social and environmental objectives of the development of territorial units (with emphasis on the way and intensity of land-use) and next to identify the main activities influencing this development and to determine optimal management of these activities.

The incorporation of the systemic concept of ecological stability into spatial planning significantly extends the possibilities of practical implementation of environmental policy objectives.

Specification of TSES in spatial planning documentation

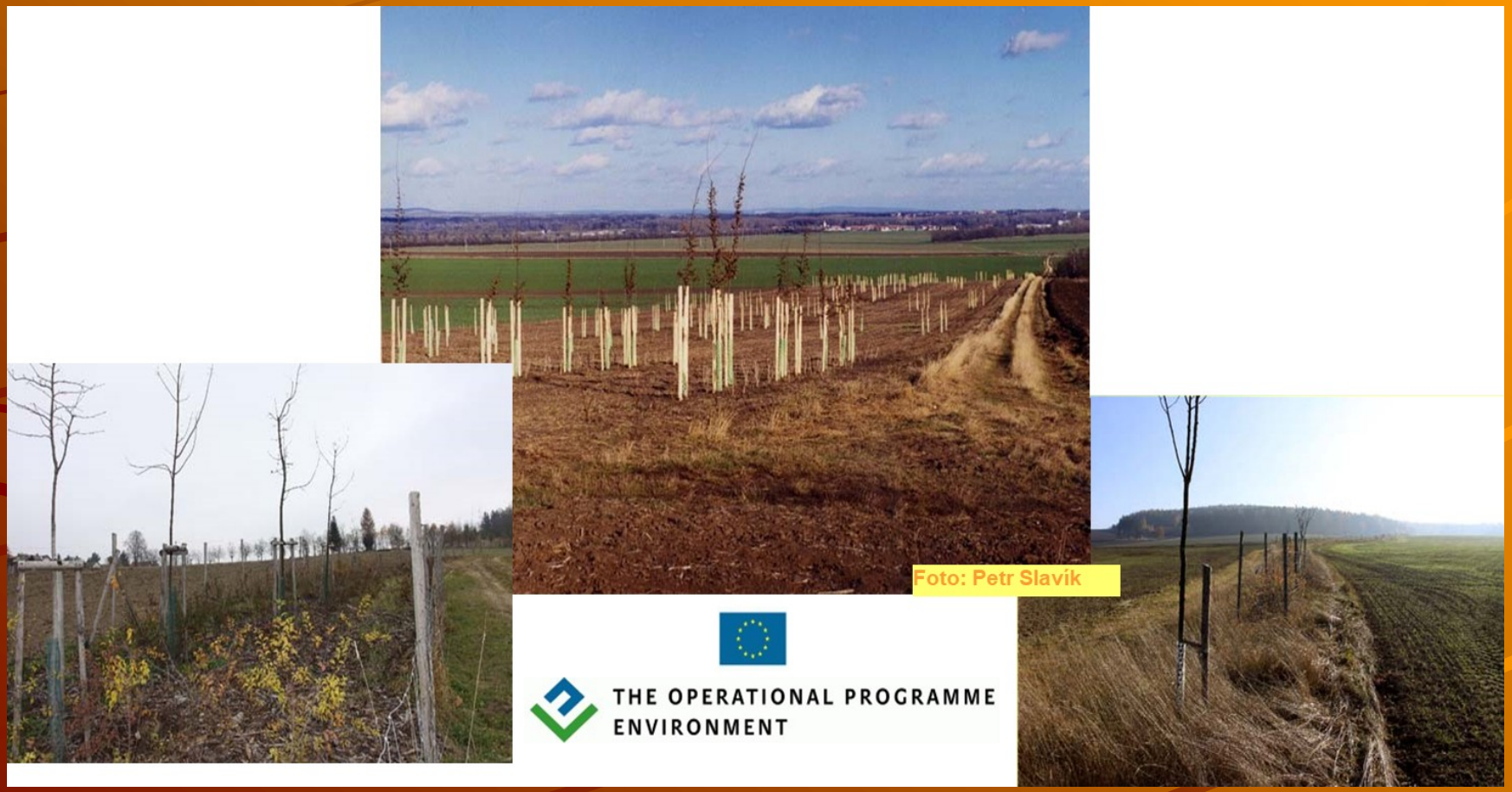
- TSES is an obligatory part of spatial plans and of complex land consolidation in the Czech Republic.
- As regards the practical application of environmentally-based approaches, it is necessary to mention especially the method of environmental impact assessment (E.I.A) used for the evaluation of investment plans as well as important state development conceptions.
- However, TSES projects often have remained on paper only; but recently their support has intensified thanks to the "discovery" of their diverse practical benefits (an example is their using as multi-purpose, e.g. recreational areas or their positive impacts on effectivity of agriculture).

Why a green Infrastructure?

It can be said that green infrastructure is an important tool to strengthen the interconnections between the development of social and natural systems. For their general economic interpretation can be used the concept of quality of life, understood by some economists (e.g. well-known American economist M. Porter) as a perspective driving force of territorial competitiveness.

From a natural point of view, green infrastructure is a very important multifunctional tool that promotes sustainable development of human civilization with positive impacts on the effectiveness of fighting with the threat of global climate changes and other negative effects induced by social development.

Implementation of TSES into territorial plans by means of relevant programmes allow to build new segments of „green“ infrastructure



Designing of TSES

When designing the TSES, it is assumed that the main priority is not the creation of new landscape structures, but maintain the minimal parameters which are necessary for the sustainability of landscape structures. The fulfilment of this objective can be controlled through the following five criteria:

- *the criterion of diversity of ecosystems that is based on biogeographic landscape differentiation,*
- *the criterion of spatial relationships of ecosystems based on the definition of biocorridors according to similarities of the nearest core areas,*
- *the criterion of necessary spatial parameters aimed at securing the minimum functionality of system,*
- *the criterion of the current state of landscape aimed at maximizing the role of TSES*
- *the criterion of societal interests (relevant laws and limits) in relation to TSES projects.*

Landscape evaluation of transport infrastructures building

Relevant analyses are oriented on environmental and urban components and consist of three steps: 1. delimitation of the territory, 2. selection of map of suitable scale and GIS databases, 3. analysis of territorial components (geology, geomorphology, water flows and resources, forest ecosystems, agricultural land, archaeological sites, historical buildings and urban or village monument zones).

Synthesis of environmental component is based on the definition of 3 zones:

- zone 1 of the most important values of ecological stability and natural resources where localization of new important transport structures (e.g. highways and HSR) is excluded,
- zone 2 of important ecological values where localization of new transport structures is possible if relevant technical and economic measures are implemented,
- zone 3 of relatively unimportant environmental values where localization of new transport structures is permissible.

Landscape evaluation – continuation

The second synthesis of urban component is also based on the definition of 3 zones:

zone 1 of the most important urban functions with high protection requirements (localization is exluded).

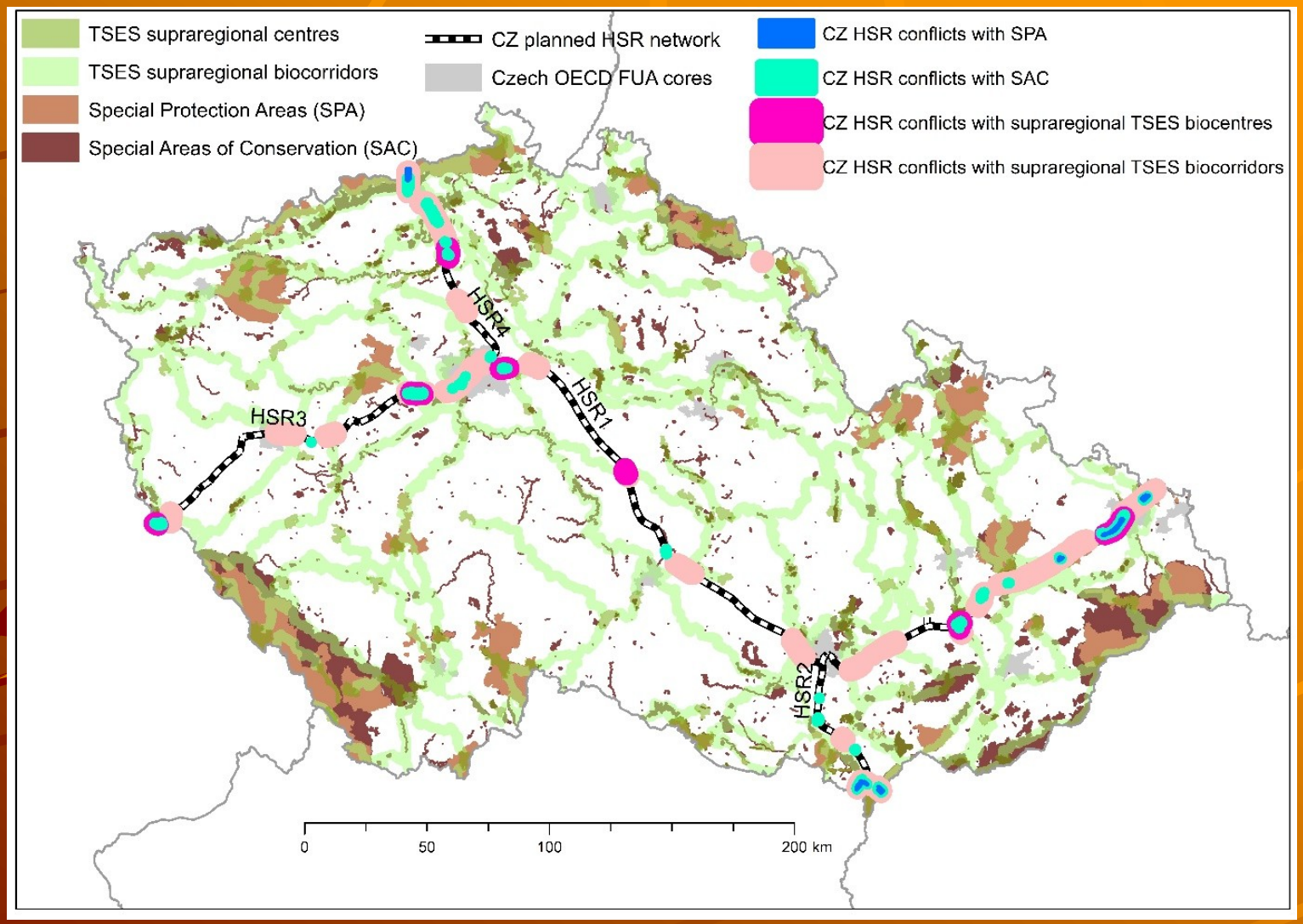
zone 2 of important urban functions where compromises (e.g. noise barriers) are possible.

zone 3 of relatively less important urban functions where localization of line structures is generally permissible.

The final synthesis then aggregates the results of previous analyses into 3 complex groups:

- group 1 = areas with the highest protection of territories with important ecological functions and urbanized areas,
- group 2 = areas of possible compromises where localization of new transport structures is conditioned by full respecting of these values,
- group 3 = suitable investment areas where construction of an infrastructure is not in conflict with other public interests.

Potential conflicts of the planned HSR network with Natura 2000 (SAC and SPA) and supraregional TSES



Thanks for your attention