

The concept of the territorial system of ecological stability (TSES) in the planning practice in Slovakia

*Zita Izakovičová, László Miklós,
Institute of Landscape Ecology, Slovak Academy of Sciences*

Introduction

The creation of ecological networks represents basic strategy of the nature and landscape protection. This principle is declared in many international documents, as are: AGENDA 21, Convention on biological diversity from Rio Summit 1992, Pan-European strategy about biological and landscape biodiversity, EECONET in European programme IUCN, Landscape Convention etc. The maintenance of valuable natural ecosystems is basic principle of NATURA 2000, too. From these international concepts and programme outcomes national programme of ecological networks. Development of documents for ecological networks has been intensive for the last decade. This development can be seen as a response to fragmentation of land and restructuring and intensification of land use (Jongman, 1996, Jongman, Kristiansen, 2001).

The establishment of ecological networks has been proposed as an ideal way to counteract the increasing fragmentation of natural ecosystems and as a necessary complement to the establishment of protected areas for biodiversity conservation (Boitani, et al., 2007). The creation of ecological networks have been developed in many European countries. The principal reason for creating the European Ecological Network is to integrate protected areas in individual European countries with areas to be protected in the EECONET system, according to international criteria and standards [Bischoff, Jongman 1993]. EECONET aims to promote co-operative action across the whole of Europe contributing to the evolving international process of developing a stronger strategic component to nature conservation in Europe. It is a conceptual and operational framework for translating these objectives into action. (Agger, Brandt, 1988, Forman, 1990).

Background

A primary concern of EECONET is to secure a pro-active approach to preserve what remains of Europe's natural values increasing the biological and landscape diversity of the continent. Concrete measures aimed at enhancing the functions of natural systems are (www.econet.org):

- the identification of core areas to ensure the conservation of habitat types and species,
- the provision of corridors or stepping stones to enhance the coherence of natural systems,

- the creation of restoration areas serving to extend the network, providing new habitats and facilitating dispersal and migration,
- the provision of buffer zones to protect core areas and corridors in the network from adverse external influences, and the enhancement of the environmental quality of the countryside as a whole.

The approaches to the creation of the ecological networks in individual countries are different (Nowicki, Bennet, Middleton, Rientjes, Wolters, 1996, Buček, Lacina, 2000). The networks have been created with the purpose of different function in landscape. From this aspect we can divide European approaches to the two basic groups:

- conservational-biological approach
- eco-stabilising approach

The conservational-biological approach means that the main purpose of creating networks has been the ensuring the survival of different species and ecosystems while they are fragmented, dispersed and threatened in the landscape. Eco-stabilising approach of creating ecological network is oriented to stabilisation of the whole landscape by a functional zoning of landscape elements into ecological compensative areas, that compensates zones of intensive land use. Eco-stabilising approach dominates mostly in the Central Eastern European countries (e.g. Czech Republic, Slovakia, Estonia, Lithuania, Russia, Poland, etc.) and conservational-biological approach in the Western Europe (Netherland, United Kingdom, Spain, Denmark, Belgium, Italy etc.).

Originating from terminology of American landscape architecture and planning sometimes the ecological networks are referred to as “greenways” The Greenway networks include ecological, recreational and cultural heritage aspects (Fábos, Ryan, 2004).

In Slovakia, the concept of Territorial System of Ecological Stability (TSES) has been developed. It is a result of long-time effort of Slovak landscape ecologists to prepare landscape-ecological tool as a support to solve landscape-ecological problems.

Design of TSES is based on concept of understanding of spatial landscape ecological stability as dynamic ability of landscape structure to maintain spatial ecological relations within individual ecosystems for dynamic variability of conditions and life forms (Forman, Godron, 1993, Naveh, Lieberman, 1993). This is valid also if landscape consists of local ecosystems with different (often very low) degree of ecological stability. Such a state can be achieved by maintaining of “inner” ecological stability of key stabilizing landscape elements and by maintaining of spatial system of mutually interconnected ecosystems as well (Miklós, 1996).

Concept of TSES changes the “classic” idea of the nature conservation based on the division of the landscape to protected and non-protected areas towards a system which maintains the ecological stability of the whole territory by an ecologically suitable spatial structure of the landscape even in the case that it is exploited in different – even in intensive – way. Thus the concept of the TSES is an important tool to secure spatial stability of landscape

Goal and objective

The basic goal of the paper is presenting of a special ecological network concept, the concept of the territorial system of ecological stability in the Slovak Republic and its application in the planning practice.

The (TSES) is a concise method based on landscape ecological research which modified the ideas of ecological networks towards integrated management of optimum organisation and utilisation of the landscape as a whole. TSES was developed as a routine procedure to the spatial planning practices very early, since 1984, together with the methodics of landscape ecological planning LANDEP (Ružička, Miklós, 1982). After the political changes in 1990 the TSES has been implemented as one of the basic idea to the act on nature and landscape protection. During 1990-1992 within former Slovak Commission for Environment first legislative basis for TSES were prepared. **Concept of territorial system of ecological stability** has been approved by Government in year 1992. Here, TSES was defined as a territorial model, being constructed by optimal structure of biocentres, biocorridors, interactive elements and ecologically stabilizing measures. The concept defined basic principles of TSES, the basic elements of TSES, selection criteria (such as degree of representativeness, landscape-ecological importance, size, location, and functionality), hierarchical levels of TSES and put attention on necessity to create legislative and economical conditions for TSES realization. The TSES was successively implemented as obligatory regulatives to the act on agricultural land arrangement, act on spatial planning, act on water, act on flood protection, act on environmental impact assesment, act on forests.

Results

As for the time being, there is elaborated the general TSES for the whole territory of Slovakia, the regional TSES for all districts of Slovakia, and several hundreds TSES on micro-regional and local level

The procedure of the TSES is contains the basic actions as follows:

- a) Delineation of main elements of the TSES: **biocentres, biocorridors and interactive elements**. Those elements compose the **frame** of an ecological network. As biocentres should be delineated those biotopes which serves as the basis for food, shelter and site for reproduction, as the biocorridors and interactive elements should be projected chains of biotopes which brake the

isolation and ensure the migration and interaction as well as the spatial ecological stability of the landscape,

- b) Definition and proposal of so called **eco-stabilising measures**, which should fulfil different practical ecological function as soil and water protection, microclimatic, hygienic, aesthetic and other function. Among those the agro-technical, agro-ameliorative and forest management measures might be underlined. Proposals of eco-stabilizing measures, consist from:

- *Proposals for location of new eco-stabilizing elements* – particularly localization of groups and non forest vegetation belts. The aim of this set of proposals is improvement of overall ecological spatial stability. Proposals for eco-stabilizing measures have to be done with respect to improvement of water-bearing capacity of landscape, decrease of runoff from landscape, increase of natural purification of landscape, measures for anti-erosion protection in a landscape and etc.
- *Proposals for ecologically optimal land use of agricultural landscape* – it represents proposals for agro-technical, agro-chemical and agro-ameliorative proposals that come out from an analysis of natural conditions (abiocomplexes) of the given territory.
- *Proposals for eco-stabilizing measures within forest ecosystems* – particularly change of species, diversity securing, revitalization of damaged forest ecosystems, and specification of delicate ways of forestry techniques.
- *Proposals for eco-stabilizing measures within urbanized areas* – these means proposals for improvement of overall quality of environment.

The aim of these proposals is improvement of spatial stability of a territory and the enhancement of the environmental quality of the countryside as a whole.

- c) Proposals for elimination of **stress factors**, with focus on mitigation of effect of stress factors in a landscape. These consist of:
- *Proposals for new technological measures with focus on decrease of inorganic elements*. This comes out from proposals for reduction of air pollutants, soil pollution, pollution of water resources and elimination of noise sources as well.
 - *Proposals for revitalization of environmentally devastated areas* – these are represented by proposals for activation of individual features of environment and natural resources.

- *Proposals for reduction of effect of physical barriers of anthropogenic elements of landscape on TSES elements.* It means proposals for passing the barriers, such as locations where ecological corridors are cut by roads, which can not be closed, it is necessary to build tunnels, underpasses, or other types of econducts with focus on the most delicate species of biota, which uses the corridors.

The aim of these proposals is the elimination of factors that threaten individual elements of TSES, natural resources and environment.

By combination of three groups of actions the TSES becomes a whole-space covering – „territorial“ – system, what differs of „classic“ ecological network concepts, which mostly concentrate only to biocentres and biocorridors.

The basic output of the TSES project is a set of **maps** with a **projection** of biocentres, biocorridors, interactive elements, eco-stabilising measures, conflict of interests of TSES and threatening phenomenon (Izakovičová et al., 2000).

The real importance of the TSES is ensured by **legal support** in following acts:

- a) Act on Nature and Landscape Protection 284/1994 and 543/2002 Z.z.: there is the basic definition of TSES, European network NATURA 2000 and its determination as basic document for different planning;
- b) Act on Territorial Planning and Construction Order, amendments 262/1992 Zb. and 237/2000 Z.z.: defines, that the elements of TSES are obligatory regulative on all level of territorial plans.
- c) Act on Land Arrangement and Land Ownership 331/1991 Zb. and its amendment 549/2004 Z.z.: defines that the TSES is an obligatory basement and part of each Land Arrangement Project, moreover, the need for improving the TSES function might be accepted as a legal cause for enactment the land arrangement procedure. In the land arrangement project, the elements of the territorial system of ecological stability and important landscape elements are considered as common arrangement
- d) Act on Environmental Impact Assessment 127/1994 Z.z. and 24/2006 Z.z.: defines that TSES is an obligatory object of impact assessment.
- e) the Water Act 364/2004 Z.z. (based on Water Framework Directive 2000/60 of EP and EC): forces the utilisation of the water protecting function of TSES with the coordination of water management tasks.
- f) the new act on Flood Protection (coming into force by February 1st, 2010): enacts that the long-term management plan of watersheds should project also the TSES, important landscape elements and the eco-stabilising measures. The TSES projecting became the subject of the authorisation according to the Act on Authorised Architects ... 138/1992 Zb. and its later amendments.

For an effective implementation to of the TSES of decisive importance the determination of the position of the TSES elements in the spatial-planning documentations. In the basic act on territorial planning are the elements of the TSES defined as obligatory regulatives on all level of planning process. In fact, the set of ecological regulatives might be quite wide-ranged and demanding. Many of basement ecological data were not designed for direct use in spatial planning processes. Therefore such basement materials need to be to reevaluate and transform into the form of regulatives. The processing of those data and regulatives is the part of the step of territorial planning named as “Surveys and analyses” in territorial-planning documentations supported by Amendment 237/2000 Z. z. to the Act 50/1976 Zb. on Territorial planning and building order. The regulatives can be later reflected also in other kinds of project documentations (land records, hydroecological plans, forestry plans and etc.).

Discussion

The reflection of regulatives into the project documentation means, that for every area are determined:

- activities, which cannot be localized within the given parcel
- activities, which can be localized from the environmental point of view, but when certain limited conditions of management, with specified technologies are applied
- hierarchical assessment of those activities, which are most suitable from the environmental point of view
- determination of the measurements, which must be realized for the establishment of a functional ecological network, and for enhancement of the environmental quality of the countryside as a whole

The regulatives as outlined here determines the selection of suitable activities for the territory. This has to be done in such a way that proposed activities on each sites of the territory are in best possible harmony with natural conditions thus ensure the ecological stability, diversity, protection of natural resources and environment. Regulation of territorial development by such regulatives serves as a preventive tool for elimination of landscape-ecological problems that come out from conflicts of interests in a landscape.

The new strategic principle of the TSES in Slovakia - the whole-space covering integrated nature protection, protection of natural resources and environment protection – ensures at the same time the functions as follows:

- a) A “classic” nature conservation by creating a of network biocentres as sites for food, shelter and reproduction. An important action in this phase is also the strengthening of the legal protection of current protected sites as well as declaration of new ones.

b) Elimination of ecosystems isolation via biocorridors – biotopes enabling migration and interaction of organism's, as well as preservation and strengthening area wide ecological stability of landscape as by convenient area-organization of stable and less stable parts of landscape by creating of interactive elements, localisation of non forest vegetation, shrub vegetation and grasslands.

Except of above mentioned main goals the biocentres and biocorridors fulfil also other functions (Miklós, 1996):

- maintain and support of development of natural landscape genofond (biodiversity)
- maintain and complete the framework of stabilizing landscape elements and secure their favourable effect on adjacent landscape parts with lower degree of ecological stability
- eliminate stress factors and factors endangering individual positive elements.

c) TSES fulfils also some key ecological functions as water and soil protection, micro-climatic, hygienic and other functions by applying convenient whole area covering eco-stabilizing arrangements (optimal use of space, agro-technical, agro-chemical and agro-ameliorative arrangements) also outside of biocentres, biocorridors and other protected landscape areas.

Conclusion

TSES is one of the most successful landscape ecological conception involved to environmental policy after 1989. It presents also an already practically proved methods for the development of real procedures for broadly promoted ideas of the integrated landscape management for the near future. The concept of the TSES responds also to actual trends which is best defined in new act on flood protection (§9(1): „... the plan of the flood risks management as well as the plan of the watershed management shall be coordinated with the other planning instruments of the territory, in particular with the projects of land arrangement, territorial plans, forest management plans, they altogether will constitute an instrument of the integrated landscape management ... „

The most important practical and methodological problems that come out during the design process, these are necessary to be solved are as follows:

- Different interpretation of conception of TSES: sometimes only frame of TSES is in the focus of designers, ecostabilizing measures and neglected, assessment of threat for TSES elements are neglected, formal understanding of corridor function and function of interactive elements.
- There were competitive fights on TSES elaboration until 2002. Since 2002 TSES can be elaborated only by professionals listed in the list provided by Ministry of environment of SR.

- Insufficiency of financial resources for elaboration of local TSES and for realization of TSES proposals of different hierarchy (these steps followed after Concept of TSES was elaborated, and after elaboration of regional TSES, which were donated by Ministry of Environment of SR).
- Problems related to integration of TSES documentation into the territorial-spatial documentations. In Slovakia, the transfer of ecological regulatives resulting from documents of territorial system of ecological stability is still unsuitable.

References

- Agger, P. and Brandt, J. 1988. Dynamics of small biotopes in Danish agricultural landscapes. *Landscape ecology*, 1(4): p. 227-240.
- Boitani, L. et al., 2007: *Conservation biology*. 21/6. p. 1414-1422
- Buček, A., Lacina, J., 2000: *Geobiocenologie II*. Brno: MZLU Brno, 225 pp.,
- Forman, R.T.T. 1990. Ecologically sustainable landscapes: The role of spatial configuration. In: Zonnenveld I.S. and Forman R.T.T. (Eds.). 1990. *Changing Landscapes: An Ecological Perspectives*. Springer Verlag, New York, p. 233-260.
- Fábos, J. G., Ryan, R. L., 2004: International greenway planning: an introduction. *Landscape and Urban Planning*, Vol. 68, Issues 2-3, p.143-146
- European Landscape Convention. CETS No.: 176. Council of Europe, Florence, 20.10.2010-02-20
- Izakovičová, Z., et al. 2000: Methodology for elaboration of the projects territorial systems of ecological stability. *Združenie Krajina 21*, Ministry of Environment SR, 120 pp.
- Jongman, R.H.G., 1996: Research priorities: scientific concepts and criteria. In: *Perspectives on ecological networks*. European Centre for Nature Conservation, series *Man and Nature*, vol. 1., chapter 14, p.151 - 160.
- Jongman, R. H.G., Kristiansen, I. 2001: National and regional approaches for Ecological Networks in Europe. *Nature and environment* No 110., 86 pp.
- Miklós, L. 1991: Principles of the slovak environmental policy. *Environment*. 25, p. 174-178.
- Miklós, L., 1996: The concept of the territorial system of ecological stability in Slovakia. In: Jongmann, R.H.G. (Ed.): *Ecological and Landscape Consequences of land use change in Europe*. *Man and Nature* 2., Tilburg, p. 385-406.
- Naveh, Z., Liebermann, A., 1993: *Landscape ecology - theory and application*. Second edition. Springer-Verlag. 360 p. + 75 p. of supplement.
- Nowicki, P., Bennet, G., Middleton, D., Rientjes, S., Wolters, R., (Eds.), 1996: *Perspectives on ecological networks*. European Centre for Nature Conservation, series *Man and Nature*, vol. 1., 192 pp.
- Ružička, M., Miklós, L., 1982: Landcape-Ecological Planning (LANDEP) in the Process of Territorial Planning. *Ekológia (ČSSR)*, 1, 297-312. p.
- The Pan-European Biological and Landscape Diversity Strategy. 1995, Council of Europe, UNEP, ECNC, 50 pp.

The paper is result of the solution APVV project- 0240-07: Representative geo-ecosystems on the regional level.