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A sustainable landscape planning system and landscape ecology

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The article deals with the idea of an effective landscape planning system as a background of sustainable development. The process of landscape planning must meet the requirements of the European Landscape Convention. The prerequisites are: 1) official regulations for landscape policy on state level, 2) a strong component of natural and cultural landscape use and protection in all territorial (land-use) plans, 3) development of special landscape management plans, 4) landscape ecological background for all strategic plans or programs. The concept of landscape and the main landscape planning paradigms (eco-geographical and architectural) must be employed for determination of the landscape potential. An original coherent system of the integrated landscape design tasks is presented as a basis of the general landscape policy.

A new planning approach is necessary to the national and regional planning of ecological landscaping, associated with approved principles of sustainable state landscape policy, implementation of a special legal system of landscape management models, an integrated spatial concept with determination of land use strategies and a large-scale system of priorities, as well as the legal concept of a special landscape planning methodology. Planning in landscape ecology, especially in natural systems, is the basis of increasing its quality.

Key words: landscape planning, landscape ecology, sustainable development

INTRODUCTION

The sparing and balanced land use in each state is in close relation with the landscape planning system, as well as the system of national and regional planning in its reflection with development of the land management methodology (Butterfield et al., 2006). The rational concept of land management must govern this complex system of the measures on social, economic and ecological policy, human space activity, landscape and environmental maintenance (Kavaliauskas, 1992; Kavaliauskas, 1995).

We must recognize that Lithuania was among the leading states that turned their planning system close to the concept of the sustainable development. The first attempts were made already in the Soviet period (in the 80s–90s of the last century). Most significant steps in the field were preparation of "The Lithuanian integral scheme of nature protection" in 1984 on the planning level and implementation of the program "Man and Biosphere" ECOSLIT (Ecological sustainability..., 1997) on the scientific level. Many of ecologically important works of this early period were analysed by author in special retrospective articles (Kavaliauskas, 1996; Kavaliauskas, 1997) and later were presented in special conference proceedings (Tausojanti plėtra..., 2001).

Unfortunately, the idea of sustainable development (Baker, 2005; Пузаченко, 2006), in spite of its pervasive popularity in all EU countries, often remains a summary of trivial well-wishing objectives with some desirable quantitative indices of natural, economic and social environment quality. Priority of sectorial (branch) approach, even in the sphere of national and regional planning, is one of the main demerits in the process of realizing this idea. The territorial aspect alone, especially in landscape planning, is insufficient both *de jure* and *de facto*. Only Germany and Great Britain could be named as a pleasant exception. Landscape planning in these countries is officially recognized as a very important part of the general state planning system, and this experience is of practical interest for other European countries, Lithuania included.

The European Landscape Convention of 20 October 2000 (European..., 2001) requires developing a special landscape planning approach aimed at landscape management and protection and its integration into regional and town planning as well as cultural, environmental, economic and other policies (Steiner, 2002). All these requirements provide a good prerequisite to surmount the sectorial and to strengthen the territorial approach in realising the principle of sustainability, especially on national and regional levels of state planning.

The results of the latest workshops on implementation of the European Landscape Convention (European Landscape..., 2006a; European Landscape..., 2006b) as well as landscape planning conferences (Richling, Osowiec, 2001; Ландшафтное планирование..., 2006) clearly show remarkable positive attempts in the sphere of landscape identification, assessment and enhancement as well as in landscape planning and forming the landscape policy on the landscape ecological (Forman, Godron, 1986; Naveh, Lieberman, 1990; Farina, 1998) or landscape geo-

graphical (Matthews, Herbert, 2004; Ландшафтоведение..., 2006) background. Practical attempts were mostly made on the level of separate countries (Kiemstedt, 1994; Лихачева..., 1997; Кочуров, 1999; Bell, Nicodemus, 2001; Landschaftsrahmenplan..., 2002: Самойленко, Когорода, 2006, etc.), but some interesting examples could be also found in the Pan-European context (Meeus, 1995; Vos, Meekes, 1999; Jongman, 2005).

Finally, the Council of Europe recognized landscape as a crucial objective for sustainable development (Council..., 2006), and now the problem of integrating it in the system of state planning sharply arises. The common situation is not brilliant because the streamlined populist approach is often proposed, and even the European Landscape Convention has some populist flavour. New constructive ideas, new methodological systems and a more professional approach are needed. This article presents the integrated positive experience of Lithuania and other countries and proposes a deductive model of one of the possible ways for the professional solution of the problem.

THE PROBLEM OF LANDSCAPE IN THE SYSTEM OF STATE PLANNING

Landscape development includes a combined effect of autonomous changes and planned steps (Antrop, 1998) because each new state of the landscape structure, especially in large areas, is a result of adapted planning mixed with processes of stochastic changes. Great differences are observed between countries with a strict and a liberal governing of their socio-economic development. A state where the planning process is more liberalized usually encounters more stochastic landscape changes not prognosticated by its planning system. Presentation of general planning directions in the sphere of landscape design is one of the main objectives of physical or land use planning (Kavaliauskas, Veteikis, 2004; Leitao et al., 2006).

A radical solution of the landscape planning problem lies in the methodology of the regional development policy of countries. The new approach needs a more integrated ideology of the sense of sustainable development with the total "landscaping" of the whole state planning system. An integrated regional planning policy implies not only the traditional goal-softening the disproportions in the development and the population's living quality among the regions, but also the modern goal the most effective use of regional and local peculiarities and preservation of regional identity.

The main principles of the development and implementation of sustainable land management could be as follows:

1) functional complexity (coordination and approximation of interests in all kinds of land use);

2) regional conditionality (accounting for and sustaining the natural and socio-economic peculiarities of the territory);

3) historical continuity (protecting and using the traditions and heritage);

4) spatial polarization (clear territorial division into zones with nature reconstruction and conservation);

5) geo-systemic equilibrium (securing the bio-ecological, geo-ecological and socio-ecological stability of the landscape);

6) social expediency (ensuring the adequacy to the wishes of society);

7) economic feasibility (principal viability of planning proposals).

The presented ideology expresses the governance of the regional planning process in which the strategic and the physical planning subsystems are coordinated and balanced. The solutions worked out in the documents of territorial planning must be recognized as one of the main factors for the determination of the state regional policy. The rational concept of an integrated regional policy means sustainable and balanced social, economical and ecological measures, human space activity and landscape and environmental maintenance. It is a result of planning efforts in the sphere of spatial integration of social, economic and ecological development, realized by the strategic and especially by the physical (land management, land use) planning system. These circumstances require projected landscape management models developed in all land use plans and the basic result of the physical planning.

The outburst of regional and municipal planning after the Master Plan of Lithuania was adopted in 2002 requires a clearly determined legal system to ensure the sustainable and balanced cultural landscape design. Formally it includes these components:

1) official regulations for landscape policy on state level;

2) strengthening a regard for natural and cultural landscape use and protection in all territorial (land-use) plans;

3) development of special landscape management plans;

4) landscape ecological background for all regional strategic plans or programs.

Lithuania took an important new leap in the field of the ecological "landscaping" of its state planning system in 2004 when the state landscape policy was approved by the Government. The significant handouts of this document (Lietuvos..., 2004) are:

1) formulation of the main directions for state landscape policy on the basis of sustainable and balanced development;

2) determination of priorities for implementation of the tasks envisaged by the Master Plan of Lithuania and European Landscape Convention;

3) setting a system of principles for natural and cultural landscape design on the basis of its scientific background, integrated anthropo-ecological quality and geographical and architectural paradigms presented below;

4) special attention to the tasks of landscape historical continuity;

5) emphasis on purposive functional landscape models with specified landscape quality objectives;

6) fixing the conservation, regeneration, renovation and reconstruction as preferable methods for landscape design.

A SYSTEM OF CRITERIA AND PRINCIPLES FOR LANDSCAPE PLANNING

The sets of methodological principles and systems of evaluation criteria constitute the scientific paradigms as the theoretical fundamentals of cognition. At present, landscape planning is based on geographical and architectural paradigms applied in a number of specific landscape planning models. The sense of the proposed *geographical paradigm* (Fig.1) formed on the basis of methodological experience of more advanced countries (Germany, Russia, Netherlands, Finland, Czech, Lithuania,

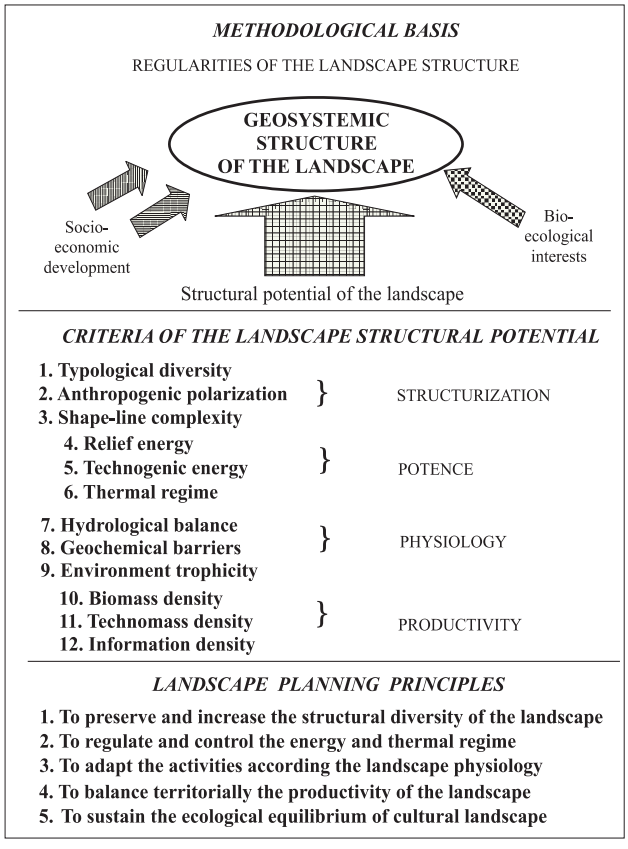

Fig. 1. Geographical paradigm for sustainable landscape planning

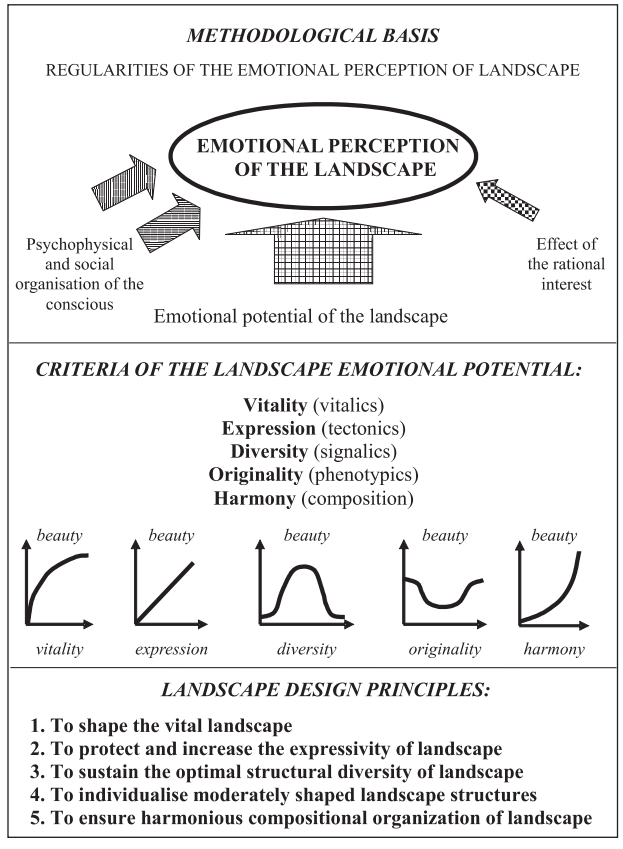

Fig. 2. Architectural paradigm for sustainable landscape design

Estonia, etc.) could be expressed by the following tasks for sustainable landscape design:

1) to preserve and increase the structural diversity of the landscape (represents the aspect of structurization with typological diversity, anthropogenic polarization and shape-line complexity criteria);

2) to regulate and control the energy potential of the landscape (represents the aspect of potency with relief energy, technogenic energy and thermal regime criteria);

3) to adapt the activities according to landscape physiology (represents the aspect of physiology with hydrological balance, geochemical barriers and environment trophicity criteria);

4) to balance territorially the productivity of the landscape (represents the aspect of productivity with biomass, technomass and information density criteria);

5) to sustain the ecological equilibrium of the cultural landscape.

Realisation of this paradigm in landscape planning depends on fundamental and applied research advance. Landscape morphology and geoecology as the geographical disciplines of fundamental science possess important keys for performing numerous tasks of planning: protecting, using and controlling both structural and productional potentials of landscape.

The sense of the *architectural paradigm* (Fig. 2) formed on the basis of methodological experience of more advanced countries (Great Britain, USA, Poland, France, Italy, Russia, Lithuania, Latvia, ect.) could be expressed by the following perception tasks for landscape design on the basis of its emotional potential: 1) to shape the vital landscape (represents the aspect of viability with the criterion of vitality), 2) to protect and increase the expressivity of landscape (represents the aspect of tectonics with the criterion of expression), 3) to sustain the optimal structural diversity of landscape (represents the aspect of signalics with the criterion of diversity), 4) to individualise moderately shaped landscape structures (represents the aspect of phenotypics with the criterion of originality), 5) to ensure a harmonious compositional organization of landscape (represents the aspect of composition with the criterion of harmony).

Relationships between the indices of aesthetic criteria and the intensity of the emotional perception or consciousness of landscape beauty have a different quantitative subordination for different criteria – from direct linear to nonlinear logarithmic or normal (Fig. 2).

DEVELOPING A NEW APPROACH TO SUSTAINABLE LANDSCAPE PLANNING

One of the main objectives of sustainable development of each country is to achieve the ecological stability of its landscape (Steiner, 1991; Turner, 1998; Lindenmayer, 2006), and a new integrated approach to planning is required to achieve this goal. On the basis of a critical analysis of the physical planning experience some general propositions could be made. The most important among them could be:

1. Developing an integral spatial concept of the territory.

2. Introducing a system of landscape planning models.

3. A wide spreading of special ecologically substantiated landscape plans.

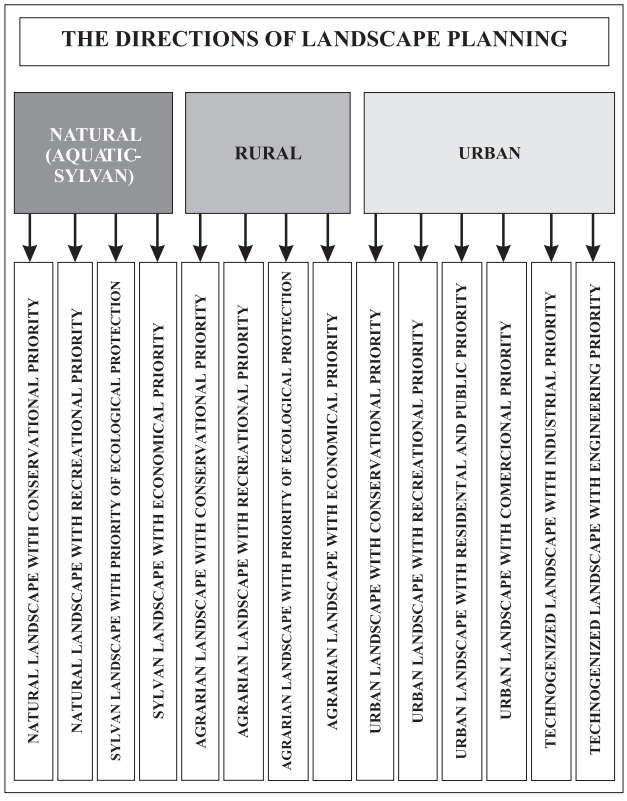

Fig. 3. System of the functional landscape types for sustainable landscape planning

One of the most effective instruments for the sustainable holistic physical planning is developing an integral spatial concept with determination of land use strategies, functional priorities and types of land use regimes. Lithuanian experience in this case is based on setting a spatial equilibrium between territories of urban (axes of economical activity) and natural (axes of ecological compensation) frames, defining the territorial strategies of intensification, sparing, conservation and conversion.

Special attention must be paid to realising the idea of the nature frame, or the natural backbone of the territory (Mander et al., 1992; Buuren, Kerksta, 1993; Kavaliauskas, 1994). The protected natural and other ecologically important areas comprise this frame as an ecological compensation network. The nature frame enables us to regulate the urban and industrial development. The main principles of developing the nature frame are:

- the nature frame should be localised in physical planning documents as a spatial system of landscape ecological stabilisation;
- the nature frame as a territorial system needs planning "where it must be" but not only "where it is now" and integrates all environmentally important and sufficient natural or semi-natural areas ensuring the ecological equilibrium of the landscape;
- the nature frame includes the network of protected habitats – the ecological network in a narrower biological sense – as one of the most important subsystems of its structure;
- the nature frame in a regional or municipality master plan is a network of areas of great geoecological significance and includes the following three metafunctional subsystems: geoecological watersheds, internal stabilisation areas of geosystems and migration corridors as the main directions for intensive geodynamic and bioinformation exchange, based on flow and migration channels;
- the main types of landscape management in the nature frame are as follows: 1) territories where the existing natural landscape is maintained and protected (mostly areas covered by forests), 2) territories in which areas of natural landscape need to be expanded (areas covered by forests and agricultural lands or by forests with a damaged natural potential), and 3) territories in which natural elements of landscape need to be returned or restored (areas covered by intensive agricultural lands or other lands changed by human activities);
- the main factors influencing the localisation of the nature frame are as follows: the compensatory importance of nature frame areas on the national or regional level, status of the natural compensatory potential, existence of protected areas, biodiversity richness and recreation intensity.

Setting a regional or local system of land use regimes presents a separate problem in which the principles of legal conventionality, preference of broad public interests, insurance of landscape quality, functional convergence and planning hierarchy must be kept. The strictest regime systems are always defined as territories predominated by most valuable protected areas. It is important that according to the new edition of the Lithuanian Law of Territorial Planning in 2004, the solutions of landscape management tasks became obligatory for all levels of general (master) plans. A useful experience in landscape management by many countries was gained, as usual, in the sphere of planning of protected areas, national and regional parks in particular. The Standard Territorial Regime System for Different Landscape Management Zones (Saugomų..., 2004) was adopted in Lithuania by its Government in 2004 on the basis of experience in the planning of protected areas.

One of the main components in working out the spatial concept of a territory is setting a system of zones with various complexes of functional priorities, especially with preference of conservation, recreation and sustainable agriculture or forestry. As the types of landscape to be dealt with are unequal with respect to functional priorities, differentiation of the planning and management means in the planning process was achieved by introducing a system of landscape planning models. The fourteen landscape planning models distinguished according to the land use functional priorities (Fig. 3) could be grouped into six main landscape design types – conservational, recreational, sylvan, agrarian, residential and technological. These models comprise all the possible directions of natural, rural and urban landscape planning.

In the process of landscape moulding for sustainable co-living of man and nature, the clearly determined conceptions of each landscape planning model, including its simulation version, must be formulated and applied in physical planning. All types of landscape planning models deal with a number of specific vertical and horizontal structures of natural and anthropogenic (technogenic) components. With respect to landscape planning, an optimal structure of technocomplexes means harmonisation of technocomplexes and natural environment in every landscape planning model.

The ecologically substantiated landscape plans or special plans of landscape regulation must be prepared and incorporated in the system of sustainable physical planning. The best example of specialised landscape planning was developed in Germany with its total landscape planning system throughout all levels of state planning (Kiemstedt, 1994) and a very high ecological quality of the planning documents.

Special landscape regulation plans were started in Lithuania in 1994 within the system of national and regional park planning. At present, special landscape plans could be prepared autonomously following the Instruction certified by Ministry of Environment (Kraštovaizdžio..., 2004), or they could be worked out as a special part of general plans of the territories. Landscape plan always uses a multi-resource and cross-sectorial approach and provides the ecological and visual criteria necessary for safeguarding the capacity of the geoecological features, ecosystems and scenic landscape. Landscape planning makes it possible to consider all the requirements of land use, nature and cultural heritage protection, as well as landscape management and maintenance in the planning solutions. Landscape plans, as a significant instrument for ensuring sustainability, are undoubtedly the best area for implementing the results of landscape ecological research.

CONCLUSIONS

1. One of the main demerits in the process of realizing sustainable development is the priority of sectorial (branch) approach and insufficient presentation of the territorial, especially landscape, planning.

2. Functional complexity, regional conditionality, historical continuity, spatial polarization, geo-systemic equilibrium, social expediency and economic feasibility could be determined as the main principles of the development and implementation of sustainable land management.

3. The sense of the geographical paradigm could be expressed by the following tasks of landscape design: 1) to preserve and increase the structural diversity of landscape, 2) to regulate and control the energy potential of landscape, 3) to adapt the activities to the physiological needs of landscape, 4) to balance territorially the productivity of landscape, 5) to sustain the ecological equilibrium of cultural landscape.

4. The sense of the architectural paradigm could be expressed by the tasks of landscape design: 1) to shape the vital landscape, 2) to protect and increase the expressivity of landscape, 3) to sustain the optimal structural diversity of landscape, 4) to individualise moderately shaped landscape structures, 5) to ensure a harmonious compositional organization of landscape.

5. Developing an integral spatial concept with determination of land use strategies, functional priorities and types of land use regimes is one of the most effective instruments of sustainable holistic physical planning.

6. Setting the spatial equilibrium between territories of urban (axes of activity) and nature (axes of ecological compensation) frames defines the territorial strategies of intensification, sustaining, conservation and conversion.

7. The differentiation of planning and management could be achieved by introducing a system of fourteen landscape planning models distinguished according to the land use functional priorities.

8. Special landscape plans, as a significant instrument for ensuring sustainability, are the best area for implementation of the results of landscape ecological research.

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TVARAUS KRAŠTOVAIZDŽIO PLANAVIMO SISTEMA IR KRAŠTOVAIZDŽIO EKOLOGIJA

S a n t r a u k a

Viena iš būtinųjų sąlygų realizuoti tvaraus vystymo idėją yra efektyvus kraštovaizdžio planavimo įtvirtinimas bendroje valstybės planavimo sistemoje. Antra vertus, kraštovaizdžio planavimas turi atitikti Europos kraštovaizdžio konvencijos reikalavimus. Tam yra būtina turėti: 1) patvirtintas kraštovaizdžio politikos nuostatas valstybės lygmeniu, 2) privalomą gamtinio ir kultūrinio kraštovaizdžio naudojimo ir apsaugos klausimų sprendimą visuose teritorijų planuose, 3) specialiųjų kraštovaizdžio planų rengimą, 4) visų strateginių planų ir programų ekologinį pagrindimą. Kraštovaizdžio formavimo potencialas turėtų būti nustatomas kraštovaizdžio tvarkymo koncepcijos bei geografinės ir architektūrinės planavimo paradigmų pagrindu. Integruota kraštovaizdžio planavimo tikslų ir uždavinių sistema turi atitikti bendrąsias šalies kraštovaizdžio politikos vykdymo gaires.

Siekiant įtvirtinti kraštovaizdžio ekologijos nuostatas šalies bei regionų planavime būtinas naujas požiūris apimantis tvarios kraštovaizdžio politikos principų nustatymą, specialių funkciškai diferencijuotų ir ekologiškai pagrįstų kraštovaizdžio tvarkymo modelių sudarymą, planuojamų teritorijų erdvinės koncepcijos ir funkcinių prioritetų bei specialiųjų kraštovaizdžio planų metodologijos parengimą. Konstruktyvus pagrindimas kraštovaizdžio ekologijos požiūriu, ypač gamtinio karkaso teritorijų, užtikrinančių bendrąją kultūrinio kraštovaizdžio pusiausvyrą, lokalizavimas yra būtina kraštovaizdžio planavimo kokybės gerinimo sąlyga.

Raktažodžiai: kraštovaizdžio planavimas, kraštovaizdžio ekologija, tvarus vystymas